PRINCIPAL DOCUMENTS

I

RELATING TO THE

SURVEY OF THE COAST

OF THE

UNITED STATES.

SINCE 1816.

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PUBLISHED BY

F. R. HASSLER,

SUPERINTENDENT OF THE SURVEY.

NEW YORK:

WILLIAM VAN NORDEN, PRINTER.

1834.

National Oceanic and Atmospheric Administration

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D O C U M E N T S

U. S. Coast Survey 94

1816 - 1843

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NOTE.—The principal papers preceding those here printed, containing the plans of operation for the work, and its putting into activity, are related in the "Philosophical Transactions of Philadelphia." Vol. II., new series. For those here printed, an attentive reader will need neither introduction nor notes.

F. R. HASSLER.

DOCUMENTS

RELATING TO

THE SURVEY OF THE COAST.

Philadelphia, June 11th, 1816.

MOST HONORED SIR:—The duty of every man is to be honest and to do good. Circumstances out of his control determine his sphere of activity. The independence of character of man is the greatest means to exercise his activity, according to these principles, and forms the chief part of his moral existence.

Circumstances have narrowed my sphere of activity. With a natural propensity, and the innate republican habit of devoting my life to general activity, I am obliged to confine myself within much narrower limits—I must find in the result of my actions a benefit for my family; the care of which is the natural duty of every man.

Your letter of the 5th instant brings me, after mature reflections, as well as by its first impressions, to this application of the first principles of all my actions. It obliges me to enter upon the question of the determination of my compensation in the work of the Survey of the Coast into more length, than I thought I should have to do, or like to do, because its result must determine completely the direction of my future life.

The proposed salary, of $2500 yearly, would not allow me more than the mere decent existence of my family, to the exclusion even of a proper education of my children; to which, by my constant employment in other concerns, I would be unable to bestow my personal care, and it would not procure to my family any lasting benefit from my work.

The subjection of my expenditures to the control of a final account, would subject my whole existence, in some measure, to the control of the accounting officers of the Treasury Department; who, by their absence from the work itself, cannot possibly have any idea of its incidences, and of whose principles of determination, and rules of office, I have not yet had an opportunity to form an opinion. It would take away from me that independence, and regard of the persons whom

it would become my duty to direct, which I think it is indispensable that a chief of such a work ought to have.

I have no ambition, and the life of a farmer has more charms for me than any other—it was my original view in coming to this country, and I abandoned it only by the compulsion of circumstances, against which honest exertions proved unavailing.

Though I feel as much as any man, the duty of establishing my family in as high a rank of society as may come within my reach, by honest means, yet, not only it must, but it is always very willing, to follow my fate, whatever it may be.

If the benefit from my work, is not likely to enable me to place my family in a decent standing in the rank of society, which I should occupy by it, I should do them great injury, was I to accustom them to the appearance of a station, in which I may leave them destitute, after my possible early demise in a work, which is for me not without dangers in point of health, and it would become my duty to apply the small remnant of its property to a farming establishment, apportioned to the means which may be at their disposition in future.

Before my departure for my mission to London, I mentioned to Mr. Gallatin my doubts, or even expectations, that it would not be advantageous to my economical circumstances. My prediction has been now verified by the following results:

On leaving Schenectady I sold all my moveables, some books, &c., though at low prices, to the amount of about one thousand dollars.

The death of my father in Switzerland, of which I got the intelligence on my arrival in London, gave me the means to assist my expenditures by realizing something of my inheritance, which I did to the amount of about one thousand and one hundred pounds sterling.

While in Paris the winter before last, under the impossibility of drawing upon my compensation, because of the protest of my former drafts upon the Treasury Department, the death of my mother-in-law in Switzerland, enabled me again to draw upon the produce of her moveables, &c., which I did to the amount of six thousand French francs.

To be able to pay my passage back from London to this country, and close my accounts there, you know that I have contracted a debt of four hundred pounds sterling, which I have yet to pay, under the great disadvantage of the present exchange of twenty per cent. premium.

So only accidental circumstances and good friends supported me, for upwards of two years, while the non-payment of my salary kept me in distress, and obliged me to great losses, and accessories which cannot be mentioned, but are easily inferred from the result of such a situation.

My account is in your hands, and you are, therefore, the better able to judge what it will produce to me, on account of the reimbursement of all this.

I thought I would avoid mentioning all this, and wished to consider my losses as a kind of outfit on my side, for a future advantageous establishment in the work, of which my mission was the beginning.

The reduction of my means forbid me imperiously to enter in future into any engagements admitting the chance of future losses, I should, though with regret, yet without any improper feelings, or expressions, abandon the future pursuits of a work, in which I engaged with agreeable expectations; which I have attempted to bring to the point of an honorable execution, and to which I have devoted my time since my return from my mission, though uncertain in which light I should consider myself to stand in it.

The total sum of five thousand dollars yearly, mentioned in my letter of the 24th, will, as near as can be calculated, under any superintendent whatever, and at all events, be the expenditures of the Government for the part I comprehended under it. Defect in management will bring it higher—much more, particularly if the public should be chargeable with the expenditures in detail. In bringing these under the head of my own compensation, I consider it possible to subject them to a proper economy, while, if it was an object of account with the public, economy would be considered a reproach to me, by every one employed under me; and I should, on the other hand, have to bear the blame of any want of economy from those receiving my accounts.

My idea was, that I, for my part, and every one of the assistants or detail surveyors, for his part, should use his own stationary, drawing implements, and all similar, except what is provided by the collection of instruments, and calculated for such an arrangement.

The officers of the Corps of Engineers, standing in this respect all ready, under proper regulations, I thought these should extend to their assistance in this work.

If I should want any of them, at any period of the work, to calculate, plot, draw, &c., under my direction, in my own house, I wish it to be considered as an object of my private arrangement, and neither room-hire, nor fire-wood, &c., to be paid by government; because it is necessary that I shall be the full master of the arrangements.

My own living, in my absence from home, I wish not to be the subject of the observations of any body about me, or subjects to passing of accounts.

What relates to the military assistance, is fully explained in the plans of operation of 5th January and 15th May.

The expenditures to be put on the account to the Treasury Department, should, in my opinion, be no other than those relating to the preserving and keeping in order the instruments, and erecting of the signals.

Those two latter to be under the care of the officer first in rank accompanying me, without my interference or responsibility, otherwise than to order the work which may occasion them, and in case of necessity, verifying and acknowledging them. I have distinctly stated in my plan of operation, of the 5th January, as a matter of general arrangement of the work, that I think it proper, and even necessary, that I should be relieved from all accounting concerns, and that these should be referred as stated.

My task would be fully large enough, to make all the combinations, operations, and principal observations; to bring up the young officers given to me to the capability required for their employment, (as it will in fact be a practical school that I shall have to keep, besides the work,) and to direct, inspect, and verify, the detail surveys, and their uniting in proper charts, &c. To load me with any of the mechanical, or economical parts, would be impeding the work, to the great detriment of it, and place me in a situation not to be supported.

The following is therefore my proposition, as resulting from all the above observations.*

F. R. HASSLER.

The Hon. A. J. DALLAS,
Secretary of the Treasury, Washington.

TREASURY DEPARTMENT,
June 18*th*, 1816.

SIR:—Without making any comment upon the general topics of your letter of the 11th instant, I content myself with stating, that the President assents to allow you a salary of 3,000 dollars for your entire services, as Superintendent of the Survey of the Coast, to be made in pursuance of the Act of the 10th of February, 1807; and the additional annual allowance of 2,000 dollars, in full of all your expenses, upon the principles and propositions contained in your communications of the 5th of January, the 15th of May, and the 11th of June, 1816.

The details of the engagement will be reduced to form after your arrival at Washington, which you will expedite as much as you conveniently can. The accounts of your mission to Europe, have been submitted to the proper officers for settlement. The expense for preparing the instruments for use, with a just compensation for your agency, will be allowed. And the business of your superintendence may commence whenever you are prepared for it.

I am, very respectfully,
Sir, your most ob't serv't,
A. J. DALLAS.

Mr. F. R. HASSLER, Philadelphia.

Philadelphia, June 21*st*, 1816.

MOST HONORED SIR:—This morning I received your favor of the 18th instant, informing me of the President's assent to allow me a salary of 3,000 dollars a year for my entire services, as Superintendent

* These details appear hereafter, properly embodied and made authentic.

of the Survey of the Coast, to be made in pursuance of the Act of Congress of 10th of February, 1807, and the additional allowance of 2,000 dollars in full of all my expenses, according to the principles and propositions contained in my communications of 5th January, 15th May, and 11th instant.

I shall make every possible haste to come to Washington, leaving the preparatory part, in which I was engaged now, to apply to those which the season favors, particularly, according to what I had the honor to mention in my former letters.

I hope to arrive in Washington about the middle of next week.

F. R. HASSLER.

The Hon. A. J. DALLAS,
Secretary of the Treasury, Washington.

Washington, July 12th, 1816.

SIR:—Herewith I have the honor to deliver the more detailed articles of the agreement between the Treasury Department and myself, relative to the Survey of the Coast, as desired by the letter of the Secretary of the Treasury, under the 5th instant.

You will judge if I have expressed myself clearly, upon the subjects under consideration, or not; and dispose in consequence as you find most proper.

I have the honor to be,
With respect and esteem,
Sir, your most ob't, humble serv't,
F. R. HASSLER.

——— JONES, Esquire,
Treasury Department, Washington City.

Articles of Engagement between the Treasury Department of the United States and F. R. Hassler; relative to the Survey of the Coast of the United States.

A.—Mr. Hassler engages to bestow all his time, labor, and attention, to the work of the survey; as well to make, himself, the principal part of the general large triangulation, and the consequent calculations, as to superintend, and direct, the establishment of the observatories, and the officers of engineers, or naval officers, who will be engaged under his orders, in the detail parts of the work, and give them proper instructions to that effect; according to the plan proposed by him, under the 15th May, 1816.

B.—He will to that purpose, have the use of such instruments and books, of the collection he has procured, or which are yet to be procured, for the use in this work, as he may find necessary for his objects;

and give directions relative to those which are to be used by the officers under his direction.

C.—He will be provided from the Corps of Engineers, on his application to the General of said corps, with the following assistance to his own works, or such part of the same as he may deem necessary, according to circumstances, viz:

1. Two officers of engineers, topographical or others.
2. Some cadets of said corps, in number according to the circumstances.
3. Twelve men of said corps, for the most part artificers, with a corporal or sergeant.
4. One large baggage wagon with four horses, or two smaller ones, as he may require, with the necessary drivers to them.
5. Two saddle horses.
6. Tents for the accommodation of himself, the above mentioned officers, cadets, and men, and the shelter of the instruments.
7. The necessary field utensils, as well for the personal accommodation of the company, as for the works occurring; not comprehending Mr. Hassler's private equipment.

D.—Under Mr. Hassler's orders, the officer first in rank accompanying him, will have the chief command of the above military assistance, and act as treasurer upon the funds which will be given to said officer, to defray all the expenses of a public nature occurring, or ordered by Mr. Hassler; and said officer will render account upon these funds, to the Treasury Department.

E.—The following are to be considered expenses of a public nature, viz:

1. The keeping in order, and securing from injury, of the instruments, belonging to the Government, their stands and boxes, and the fitting them up for use.
2. Such additions to the collection of instruments and books, as may be found necessary by Mr. Hassler in the progress of the work; as well to complete the collection from time to time, as to furnish a sufficient number of them for the use of the detail surveyors.
3. The construction of the signals, and signal lamps, and their attendance and protection.
4. The preparations of the stations for the convenience of observation, and the securing of them for future utility.
5. The transport of the instruments, and the baggage of the company.
6. All expenses consequent or relating to the keeping in order, and maintenance, of the military assistance, stated in article *C.*
7. All expenses for the establishment of the permanent, or temporary observatories, to be erected according to Mr. Hassler's plans.
8. The printing of blank formulas of journals and calculations, for the detail surveyors, if such are found advantageous, as it is probable.

F.—Mr. Hassler will receive, as compensation for his personal work in the survey, his superintendence and direction of the whole, and all his personal expenses consequent thereof, the sum of five thousand

dollars annually, to be paid quarterly on his drafts upon the Treasury Department, or otherwise.

G.—It is understood that the work shall not be carried on in the form of a bureau, or office; but that Mr. Hassler himself, as well as the officers under his direction, shall execute such work as devolves upon them, or are ordered to them, in the field, by defraying their own personal expenses, and at home in their private quarters. Therefore, no accounts will be admitted upon room-hire, fire-wood, stationary, or smaller drawing implements, not provided by the collection of the Government. The above mentioned compensation is to be considered compensating all his personal expenses, in his absence from home, in the work of the survey, and the items here mentioned, required for his personal use in this work; exclusively only of the expenses stated as of a public nature in article *E.*

H.—The appointments to be made in future to officers, undertaking separate parts of the work, will be fixed so as to comprehend the same articles, and to follow the same principles.

I.—If, therefore, Mr. Hassler shall at any time require officers to work under his direction in his quarters, it will be at his option, and entirely a matter of his private arrangement. Otherwise, every officer is to be understood to execute his housework in his own quarters.

K.—From these regulations are excepted:

1. All expenditures relating to the use of vessels or shipping for soundings, and the nautical part of the survey, for which proper arrangements will be made in time by the Treasury Department, upon propositions to this effect.

2. The clear executed copies of the maps and charts, either general or special, which will be required by the proper authorities, or prepared for publishing; for which, proper draftsmen will be appointed, and paid according to separate arrangements, to be made with men who may have applied to such works with particular success.

3. All expenses and consequences of engraving, printing, publishing, or executing such number of copies of the maps or charts, as may be required for this purpose, or desired by the Government, or the officers to whom it may belong.

F. R. HASSLER.

Washington, July 12th, 1816.

TREASURY DEPARTMENT,
3*d August*, 1816.

SIR:—The correspondence and documents relative to your being employed as Superintendent of the Survey of the Coast, under the act of Congress respecting that object, have been submitted to the President, and your services are engaged on the following terms:

1st. The whole of your time, labor, talents, and attention, shall

be given to the work, as well in relation to the superintendence of the duties to be performed by military or naval officers and assistants, or by draftsmen and engineers, as in relation to the parts of the work which are to be executed by yourself.

2d. You will be provided with competent assistance of officers and men from the corps of engineers and from the navy, with tents and field equipage, with baggage wagons and horses; and you will have the free use of the public instruments and books for the purposes of the survey.

3d. The party of officers, men, and assistants, accompanying you, will be ordered to conform to your instructions; and all the incidental expenses of the survey which are of a public nature will be defrayed by the government; but your own personal expenses are to be defrayed by you, whether you are employed at home or abroad.

4th. Funds will be placed from time to time, upon your requisition, in the hands of the chief officer accompanying you, to be disbursed, upon your order, in the payment of the expenses of a public nature, and to be accounted for by him at the Treasury once, at least, in every three months.

5th. You will receive in full for all your services a compensation at the rate of 3,000 dollars per annum, and for your personal expenses an allowance at the rate of 2,000 dollars per annum; to commence on the 18th day of June, 1816, and to be paid quarterly at the Treasury upon your drafts.

6th. You will make frequent reports of your progress to this department, and deposit here all the surveys, drafts, notes, charts, maps, journals, and documents in any wise belonging to the survey of the coast; and you will return the public instruments and books to such place as shall be directed, when they are no longer required for the business of the survey.

7th. If at any time it should be necessary to explain the nature and extent of your employment and engagement, your communications to this department, and particularly the articles submitted by you on the 12th of July, 1816, will be resorted to.

It only remains to repeat the President's solicitude for a successful and speedy execution of the great national work which is thus confided to you, and to assure you of the esteem with which

I am, Sir, your most obedient servant,

A. J. DALLAS.

Mr. F. R. Hassler.

To the care of Robert Patterson, Esq.
Director of the Mint, Philadelphia.

Copy certified conformable to the original,

F. R. HASSLER.

Philadelphia, 18th August, 1816.

On my return to New York, the 16th instant, from a reconnoissance on Long Island and Connecticut, I was honored by your favor of the 8th instant, announcing the President's approbation of the special terms of my appointment for the Survey of the Coast, being that

1st. The whole of my time, labor, &c. shall be given to this work, &c. (repeating here the terms of the said letter); to all of which I shall conform myself duly and to the best of my abilities.

Major Abert having not yet been provided with means to second me, when I passed at his abode, on setting out from here the 29th of last month; nor General Swift yet been able to procure the necessary men and other requisites to assist me, I proceeded with three cadets of the Military Academy, then just present at New York during their vacancies, who joined me, upon the invitation of General Swift, through Long Island and Connecticut.

The details and results of this reconnoissance I reserve for a report upon the whole when continued on the south of New-York Bay, along the Jersey shore to the mouth of the Delaware, till to which it became necessary to proceed, before I can fix upon the details of my plan of operation in this quarter. General Swift expecting in a few days to procure the means, and Major Abert to be possessed of the necessary funds to activate the proper required assistance, I chose this intermediate time to effect, without impeding the work of the survey, the removal of my family from this to Newark, where I intend to fix my future residence, and intend to set off from here to-morrow.

You would very much oblige me, Sir, if you would be so kind as to assist me in the establishing of my family in its new abode by the advance of the part of my compensation from the 18th June, date of my appointment, to the 1st October next, time which would bring the quarters of my compensation in a regular run with the year. I take the liberty to say, also, that this may be done by drawing on the State Bank of Newark, directed to me there, if a draft upon New York, in which state my expenditures for the survey will be made, cannot be obtained, which would avoid the partial loss yet incurred upon a draft in Newark, but more southern drafts or notes would occasion to me too considerable losses.

I am, &c.

F. R. HASSLER.

Honorable A. J. DALLAS,
Secretary of the Treasury, Washington City.

Brooklyn, 5th Nov. 1816.

DEAR SIR:—After having written to Washington, to know if I should supply you with articles of transport, &c., it occurred to me that my business at West Point would prevent my doing any service;

further, I think it will be found cheaper and more convenient to you for Major Abert to procure carriages as you require them, and to have your signals constructed as near the place where they are to be used as you may be able to find carpenters and lumber for tripods, &c.

The small quantum of gunpowder that you want had better be purchased by Major Abert. The tents Major Abert can procure from the Quarter-master General by an order from the Secretary of War.

So you see how I propose to have no trouble; but this is not my object. I believe the mode that I have mentioned will be found most convenient to all parties.

Yours, affectionately,

J. G. SWIFT.

Mr. HASSLER, New York.

Newark, New Jersey, 23*d Nov.* 1816.

MOST HONORED SIR:—Herewith I have the honor to forward to you my first report upon the work of the Survey of the Coast, containing the result of all that it was possible to do since the time of my appointment.

I postponed it until now, intending to present in it together all the operations made for the purpose of finding a proper locality for the base line and the system of the first triangle, which, as one of the fundamental works, it is proper to do with full knowledge of the locality and configuration of the country to be surveyed. You will see that circumstances, however, prevented me, to do this as fully as I would wish, though I made every possible exertion towards it. It would be very important for the advancement of the work that I should be enabled to make this fall yet the works necessary to arrest fully the plan of operation. I am very desirous to do it, though at this season works in open fields are not without disagreement.

On speaking lately with General Swift upon the manner of providing the necessary assistance for the work of the Survey, which, according to my plans, was intended to be provided by the War Department, the following ideas occurred, which I wish to present to your consideration:

1. For the transport of the instruments, next spring and in future, when the best instruments of the collection will be used, and particular care required for them, the conveying of them by hand of men, which is the best mode, would require such a number of them as could not be spared in the corps of engineers, and would be very expensive; that it would therefore be more advantageous, and even the only practicable way, to have a spring carriage constructed, of proper dimensions and proper arrangement for that purpose, and to furnish it with two horses and a driver, in like manner as it was done in the survey of England, though the operators in that work have recorded in their journal frequent complaints of their theodolite being injured by the

conveyance. But the two-feet theodolite of Mr. Troughton, in the Government's collection, is of far better and more secure construction; so that, with proper care, and the slow path naturally adopted in the conveyance, I should think as well this as the other necessary instruments could be well trusted to such a carriage.

2. For baggage and necessary tools, it seemed proper to make use of the wagon and horses which Major Abert has procured as long as they may serve, requesting only a driver to it.

3. For any conveyance of larger bulky things, stands, signals, &c., which will be required only when moving at some distance, or on certain occasions, it would be the cheaper plan to make use of hired assistance.

4. For the measurement of the base line, next spring, the number of men mentioned in my plan for putting the Survey of the Coast into operation is absolutely required. According to General Swift's account, they cannot be spared from the service of the corps of engineers. A certain number of them will also be required for all future times; it will therefore be necessary to provide them by some arrangement. Their numbers will however in part depend on the number of cadets from the Military Academy who will follow the work. When the time of work for next spring draws nearer, and I shall be informed of the means that may be furnished, I shall try to adapt to it as much as possible, and be able to be more precise in this respect.

5. As no carriage like that mentioned in the first article here, nor tents and the other articles, mentioned as requisites in my plan of operation, are present in the military stores, and no expenses authorized for it in the War Department, it might be most proper to furnish Major Abert with instructions and means to procure them.

I have just received a letter from Major Abert, stating that he had been refused funds which he had required for the public expenditure, to enable him to accompany me in the proposed works, and to defray certain expenditures which I had mentioned to him as to be encountered now, because, according to the arrangement of the Treasury Department with me, funds were to be given only upon a request from myself. We are, therefore, stopped in our further proceedings at present.

I take the liberty to state, upon this subject, that this request has been made by me, before I left Philadelphia for reconnoitering, and that I have mentioned the sum of at least 2,000 dollars as necessary to put to his disposition for the different expenses to be encountered before next spring. I have also at the time given in an estimate, naming the items of expenditure, among which I did not comprehend either the maintenance of the soldiers and the horses, or the purchase of horses and wagon, both of which I had considered as part of the requisites to be furnished by the War Department, free of expenditures from the funds of the Survey.

The sum mentioned has been only partially received by Major Abert, as I understand, for which part he will be able to give account; the disbursements hitherto occurred have all been in consequence of travelling for reconnoitering, and some temporary signals; therefore, the

items stated in my estimate, and now at hand to be disbursed, remain yet, as they were stated at the time; and if the proposal of article 1st, heretofore, meets your approbation, it will be proper to insert it at the rate of six or seven hundred dollars probably.

I must however observe, that all the estimates in detail which I am obliged to attempt can yet be but extremely vague and uncertain, and that it is impossible to make an accurate estimate before some progress in the work will have furnished me with experience to ground a judgment upon; and as it seems that nothing will be furnished from the military stores, the articles for which I relied upon them must necessarily be added, and augment the disbursement.

Not to be uselessly prolix here, I take the liberty to refer, for all these particulars, to my former plans, letters, and other communications, made at different times, and a letter which General Swift has written to the War Department in consequence of our conversation.

F. R. HASSLER.

The Hon. W. H. CRAWFORD,
Sec. of the Treasury, Washington.

TREASURY DEPARTMENT,
November 30*th*, 1816.

SIR:—I have to acknowledge the receipt of your letter of the 23d instant, accompanied by a report of the progress made by you in the Survey of the Coast.

Considering that the season for active operations is drawing to a close, and consequently, that answers on all the points alluded to in your communication, are not immediately required, I will confine myself at present to remarking, that as you must necessarily be most competent to decide on the means best calculated for the transportation of the instruments, baggage, tools, &c., I have no hesitation in confiding the management of the business to yourself, under a firm persuasion, that in the measures you may adopt, all possible attention will be paid to economy.

Whatever may have been the understanding on the subject of advances of money, it is proper to observe, that, not only the uniform usage of this Department, but the agreement also requires, that every advance so made, shall be preceded by a requisition from you. Whilst this arrangement, therefore, can be productive of no inconvenience to you, it will obviously supercede the necessity of my maintaining a double correspondence with Major Abert and yourself.

I am, very respectfully,
Sir, your ob't serv't,
WM. H. CRAWFORD.

F. R. HASSLER, Esquire,
Newark, New Jersey.

Newark, N. J., December 18th, 1817.

MOST HONORED SIR:—Unforeseen expenses occasion me to take the liberty to request the favor, to forward me the amount of my compensation for the quarter, which will expire the first of next month, by a draft of 1250 dollars, upon any of the banks of this neighborhood. You will oblige me very much by it.

I have just returned from Rockaway, where the bad weather has frustrated me of the hope to make that station yet this year, which, therefore, remains postponed to next spring, with some more in that neighborhood.

I intend to take some of the first fair days, to make the station at the north end of the base, and shall later make the observations on the station here, in the high part of this town. I shall also, in the course of this winter, make a series of latitude observations here; and, for that purpose, fix a proper sheltered place for observing.

The verification base having agreed in its measurement so exactly, with the results of the calculations, the execution of the two stations above mentioned, during this winter, will enable me to propose the beginning of detail surveys next spring, though the base in English Neighborhood is not yet measured with the means of accuracy, which it is intended to employ, by the apparatus intended for it. The possible difference, affecting only very large distances, I dare safely postpone this, so very important part of the work, until next summer. It becomes, therefore, interesting to know the intentions of the Legislature of this State, in respect to the plan I proposed; for which purpose, I shall in a few days speak with the Governor, who has, in answer to my letter, said he would propose it, and expected an early decision, in what is called the long session in January.

I have the honor to join here, on a small scale, a sketch of the triangles executed this year, within which the detail survey can be begun. In the course of this winter, I shall have the honor to present to you the results of the calculations, and the projection of the triangles, on the papers to be used for the detail surveys, which I shall now work upon.

I have the honor to be, &c.

F. R. HASSLER.

The Hon. W. H. CRAWFORD,
Secretary of the Treasury, Washington.

Newark, N. J., April 3d, 1818.

MOST HONORED SIR:—I take the liberty to request, that you will be so good to forward to me a draft upon some bank of this neighborhood for 1250 dollars, as amount of my quarterly compensation, which becomes due the 1st instant.

The calculations upon the works in the survey of last summer, have advanced so far, that all triangles are calculated. I am now engaged in the calculations of the differences of latitudes and longitudes from them, and the azimuth and latitudes observed, which latter are already calculated, and the reduction of them upon one point begun. I have also prepared the elements of the projection by which they are to be brought upon paper, to be used in the detail surveys.

To obtain all the results of the quantity of work at hand, after having protracted the summer campaign of field work until January, in order to have the honor to present it in full to you, together with the necessary propositions for beginning the detail survey, before the season would again open for field operations, has obliged me to so close confinement, that my health has been considerably affected by the great change between this and the active summer work in the open air. I hope, however, in a short time to have it completed, and to have the honor to present it to you.

I have the honor to be, &c. &c.

F. R. HASSLER.

The Hon. W. H. CRAWFORD,
Secretary of the Treasury, Washington.

TREASURY DEPARTMENT,
April 6th, 1818.

SIR:—In conformity with the request, contained in your letter of the 3d instant, measures have been taken for remitting to you the amount of your salary for the last quarter.

Permit me, sir, to avail myself of this occasion, to apprise you of the absolute necessity for forwarding to this office, without delay, the result of your past labors, accompanied with an estimate, as well of the time required to complete the Survey of the Coast, as of the probable expense attending the same; for it must not be dissembled, that the little progress hitherto made in the work, has caused general dissatisfaction in Congress, which, if not removed, may lead to a repeal of the law under which you are now acting.

I am, very respectfully, &c.

W. H. CRAWFORD.

F. R. HASSLER, Esquire,
Newark, N. J.

Newark, N. J., 9th April, 1818.

MOST HONORED SIR:—Your favor of the 6th instant, received this morning, obliges me to enter into a lengthy discussion upon the subject of the Survey, as well relative to my work in it hitherto, as the principles of it, according to the plans approved by the President, Mr. Jefferson, and Mr. Madison; it will also best answer the question of time and expenses, which it is impossible to answer in numbers nearer than what I have done in my letter of the 14th February, 1817.

The circular letter of the Treasury Department of the 25th March, 1807, requested me, like all other persons who received a like one, "to suggest the outlines of a plan as may, in my opinion, unite correctness and practicability."

By a number of other gentlemen, who had given in plans like me, (I believe ten—eleven), my plan, under date of 2d April, 1807, was approved of, joined, and recommended to government, in preference to theirs, without my knowledge, in a special conference, held at Robert Patterson's, Esq. in Philadelphia, upon directions to that effect from the President;—the report will be upon record in your office. Mr. P. communicated this to me the 21st July, 1807, mentioning, at the same time, that the execution was suspended on account of the political aspects, requesting me, however, to propose the necessary instruments, which having done under the 10th August, 1807, Mr. Patterson proposed to me if I would go to England to direct their construction, for which I declared myself willing when required.

There the whole rested until 16th April, 1811: it was again taken up by direction of the President, in consequence of which I set off for London the 30th August, 1811, and returned with the instruments the 28th October, 1815. I need not to enter here into detail upon this epoch, as it may be considered as settled, except the consequences of the unlucky circumstances in which I was left in London, which you know hang yet over me in a very disagreeable law-suit.

It was not until August, 1816, that I was actually appointed to work in the Survey; I must therefore request that all the time from the passing of the law, 10th February, 1807, to middle August, 1816, be left out of consideration, when the question is asked, what work has been done in proportion to time?

I went immediately into activity for reconnoitering, a preliminary as necessary as the viewing of the ground upon which a building is to be erected. No funds had yet been given for the public expenditures, which I defrayed myself. In the fall of the same year, you will recollect, by my letter, and the report of the 23d October, that my nearer inquiry for a base line was again stopped for want of funds, as I had then gone to the end of my own disposable funds. Your letter of the 30th November, 1816, had postponed also the decision upon various subjects, on consideration of the season for active operations drawing to a close. It was due to these circumstances that the proper locality for a base, this first requisite in any survey whatever, was not found until April, 1817, and all the consequent plan-

ning of the work to be grounded upon could only be done afterwards.

I must also take the liberty to recall to memory my situation relative to assistance, which is in part contained in many of my letters, especially those of 2d April and 6th August last year, and 2d February of this year, and add to these informations the following:

The letter from the Treasury Department to me of the 3d August, 1816, under sanction of the President, says, art. 3d, "The parties of officers, men, and assistants, will be ordered to conform to your instructions;" a measure absolutely necessary for the chief of such a work.

Major Abert, who was before acquainted with my plan of operation, was ordered by you, when Secretary of War, to report himself to me; but had no instructions referring to me, and was not ordered to conform to my instructions; the consequence of which was, that he did not find himself obliged to more than what he found discretional, and, for instance, has the free disposition of his time without my control. I intended to request some regulations in this respect this spring.

As evident by my reports, I had no assistance at all during the winter before the last, which he passed at Mount Holly. I had hired a man, at my own expense, for the many works in which I needed assistance. He was not with me at the inquiries relative to the base of Long Branch, for want of funds, as by my report of 23d November, 1816. He was absent while I was on Weasel Mountain, a few days excepted. Last winter, he passed about three months in Washington, &c., and followed completely different orders from the War Department. (Upon this I must yet remark, that it rests with the Treasury Department, and not with me, whether his compensation for that time, which appears in his last quarterly account, is to be paid to him in consideration of his responsibility for the funds.)

I must state a consequence of the circumstances more important to me. His independent situation and absence have produced very disagreeable situations for him and for me, and reduced his services to the mere mechanical parts and the keeping of accounts, which alone he had in his orders; therefore, he has also not made the progresses in the scientific part which should now already make him my chief assistant in this respect.

Various other circumstances I omit, and take only the liberty to observe, that it was not until the beginning of last January that I had the number of assistants promised to me by art. 2d of the Treasury Department's letter, and that in the three lieutenants of artillery now present, lately come from the Military Academy, who had, notwithstanding their application to the studies there, not the practical knowledge which might have rendered them useful for more than mechanical calculations. No more could be expected from them with any right. They are now only beginning to gain insight into the nature of the work, by which, and future studies, they may become more useful in future. Before that, my son was often my only assistant, who has been with me all the time, at my own expense, and without any compensation.

My actual work on triangulation, except the preliminary base measurement, began only the 15th July of last year, and I protracted

the summer work till the end of December, when none about me thought it possible to stand it any longer for cold. This is only about five months, of which at least five weeks were rain, as my journals may prove.

No angle has been observed to use but by myself: that I have been up and at observations, with or before sun-rise, is proved by my journals; and the taking out of the results occupied me most commonly till about eleven o'clock at night. All this was witnessed enough by every person about me.

In less than four months, therefore, I formed about eighty triangles, by which the respective distances of about forty places or points are determined to a degree of accuracy which I think more than sufficient and satisfactory for the present purpose of my work. I have measured two bases, verifying them by a coincidence above expectation. I have determined a sufficient number of latitudes and azimuths to place the work in its proper place on the earth, and given to it its proper direction.

The detail of surveys which, according to correct principles in this kind of work, are to be grounded upon this, can be begun next summer, as well by land as by water, as stated already in my letter of December last, and extend over all that may be wished for the shipping to the harbor of New York, in its interior waters, and the defence of the same, as I think all this must naturally be the aim of the Survey to answer the ends of government. I have done more since August, 1816, than has been done in the beginning of the English survey, a work parallel to this, in double that time, with choice assistants, and at far more expense, as you will see by the description of it, of which I take the liberty to join here the copy procured for the use of the Survey of the Coast. I must only observe, that the naval part is not published, as a matter of political precaution. I pray you will return it after perusal.

The calculations to be grounded upon the observations of last summer, forming the elements for the future works, were to be made with great care and comparative weighing and combination of their results. They must be all united in one system, and all those of an equal nature be compared and reduced, one upon the other, before a final result is to be decided upon. They must, for all future parts of the work, determine the degree of reliance which is to be put upon each kind of observation, the degree of accuracy obtainable by a certain number of observations, or mode of observing, which, as I stated in my report of last August, is to be found out for every individual instrument used in accurate work. Without this the future work would continue to be trials after trials, which would greatly delay the work. I can have the pleasure to state, as a result of these inquiries, that when I shall have observed twice upon a signal, according to the method of observation I determined upon, I am sure within the size of my signal, that is fifteen inches, therefore sufficient for secondary points; and such two observations can be made, for about six or eight points, within two hours; but to find this, I had to repeat my observations frequently at first.

But I will not trouble you here with scientific discussions, which, though closely connected with the subject, appear not to be the object of the remarks in Congress which you communicated to me; and, in fact, could not be; as the subject has not been discussed there from the side: *How* the greatest accuracy, obtainable within certain limits of time, was to be obtained, in order to unite accuracy with economy and speed, this was my task.

As I have, of course, employed in the mechanical parts of the calculations the three lieutenants of artillery, who have passed this winter with me, it could not otherwise but that they had to be repeated several times, as they could not be expected to do them, at first sight, without errors, to which even able calculators are subject.

You see easily by all this how many circumstances united to delay the final conclusion of these works, more than would ever be the case in future, as it would soon be possible to make the calculations in the field even, in proportion as the data for the same are obtained.

I had the honor to state to you, in my letter of the 3d instant, how far these calculations are advanced; the work is, of course, continuing as fast as possible.

It would be improper to forward you the work in its present state, and so near being brought into the proper shape for its future usefulness. Much of my work would be lost by it; it would take a very long time to a new man in the business to make proper use of it without my directions; and if given out of my hands at present, it would be impossible for me and my assistants to go a step farther.

It was always my intention to have the pleasure to present you the work when in its proper state, as I said in my last letter; and I expected this to be the case in the course of next month. If, however, you should determine otherwise, I shall act exactly according to your orders.

I cannot help thinking that the execution which I have given to my plan hitherto, and which will become always easier in future, would, on proper inquiry, always be found reaching the aim proposed to me, "to unite correctness and practicability;" and I can add with confidence, celerity and economy above any other schemes. You would therefore oblige me exceedingly, if it is ever in your power, to communicate to Congress this letter, as well as my plans of operation of the 5th January and 15th May, 1816, and my special articles of agreement of the 18th July of the same year, with any such as you may find proper quoted in the present. I join, for the same purpose, several copies of the sketches of the main triangles executed last, which I communicated to you last December, and which give an idea of what has been done. I think these communications are necessary to Congress, to judge with justice, and comparatively, upon the manner in which I have acted upon the plans approved by the President, and how I have executed my engagements.

On your request, I could, in a few days, communicate to you also the numerical results of the triangle in a copy made for the purpose.

I must acknowledge I feel it hard, to be said to have given general dissatisfaction, when I am conscious of having done my duty, I might

say, to excess, as I did it till to the detriment of my health, under difficulties which did not depend on me, in order to administer practically the proof, that the advices and plans I had given in time upon the best mode of operating were proposed with the most honest intentions, and would as certainly reach the aim in all points required.

The communication I pray for would certainly vindicate my honor in this respect. This is my only reason for wishing this communication, as no personal consideration should lead Congress, instead of a due, unprejudiced consideration of the subject.

I must add one more observation relative to the acceleration of the work. My first plan of 1807 proposed to send two surveying parties at once out, one in the southern, the other in the northern part of the coast, intended to be divided about the state of Delaware. Upon Mr. Gallatin's orders, the instruments were mostly all procured double, for this express purpose. I referred to this arrangement yet in the plan for activating the work, under the 5th January, 1816; but being then told there was no person at hand to take up the second part, I had to act according to these circumstances, and make my plan of 15th May, 1816.

(This circumstance has enabled me to furnish from the collection the necessary instruments for the boundary line with Canada, which, I was happy to hear, has procured to the commissioner of this country the credit of having brought better instruments than the English, who wrote back to get others.)

If there is any person now at hand to take up such a part, to go to work on the southern coast at the same time, this circumstance might tend to accelerate the final execution of the work. There are yet some instruments at hand that could be got for it, and some of those sent for the northern boundary could, I think, be spared from it, and employed to this use.

This measure would give me great satisfaction; it would also return nearer to my original plan, which was judged the most advantageous.

It remains to me now only to take the liberty to request the favor of an early answer for my direction.

I have the honor to be, &c. &c.

F. R. HASSLER.

WM. H. CRAWFORD,
Secretary of the Treasury of the U. S.
Washington City.

Washington City, April 14th, 1818.

MOST HONORED SIR:—After writing the enclosed letter, I found it would be more proper for me to come myself to Washington with the work, as I could also give with it every explanation which may be required.

I arrived last night; having run post haste, I am over-fatigued. Some of my papers have by the same circumstance been rubbed, so as to be unpresentable. I must copy them.

In the mean while, being at hand, I shall be ready whenever called upon for any explanation that may be wished.

Knowing the press of your business at this moment, I considered it best to communicate this to you in writing.

I am yet at the tavern of Davies, but engaged in finding a private lodging, that I may be more undisturbed at work.

I have the honor to be, &c. &c.

F. R. HASSLER.

WM. H. CRAWFORD,
Secretary of the Treasury of the U. S.

Washington City, April 22, 1818.

MOST HONORED SIR:—The act authorizing the Survey of the Coast, having been repealed by Congress, it is my duty to make you some propositions relative to the preservation of the work which has been done, arising out of the following considerations.

The stopping of this work, which has no protecting law for the preservation of the necessary signals and station points, discrediting it in the public opinion, it is not to be expected, that without precautionary measures the station points, which have been determined with so much care and accuracy, will remain preserved.

The work of the calculations being interrupted unexpectedly, it cannot be supposed to be in such a state as to speak every where by itself, without explanation.

Some of the accessary requisites of the survey, will have to be disposed of, to stop the expenses of their maintenance.

The instruments will require care for their preservation.

I take, therefore, the liberty to propose the following measures:

1. That Major Abert and Lieutenant Adams be recalled from the survey, to save the expense of their appointment, of $3.75 per diem.

2. That Lieutenant M'Neill and Lieutenant Vinton, be ordered to stay with me until the dispositions hereafter mentioned are executed; their assistance being sufficient, and preferable.

3. That Major Abert be ordered to pay into the hands of Lieutenant M'Neill, the balance of the public moneys he has yet in hand.

4. That in addition to this balance, five hundred dollars be sent to Lieutenant M'Neill, to Newark, N. J., to defray the public expenses necessary for the dispositions hereafter to be mentioned, and the allowance of $1.25 per diem, for himself and Lieutenant Vinton, as by disposition of the Treasury Department. Enjoining Lieutenant M'Neill to render account of said sums to the Treasury Department.

5. That I be ordered to go round to all my stations, to take away

the signals, and properly secure in the ground the earthen cones which I have placed on many of the stations; to put such cones in those stations which have not yet any; and, at those stations on the rocks, make proper permanent marks in those rocks.

I shall, in this turn, need the assistance of the two officers named, the soldier, and the two drivers, together with the two carriages and the horses, all now at hand for the use of the Survey of the Coast. As the persons, signals, and cones, are to be brought to places in a circuit of more than fifty miles, and manual labor is to be performed there.

These works will occupy me, with my assistants, at least four weeks, in case of bad weather more; and, therefore, consume nearly the whole time of the present quarter; after it, the soldier and the two drivers may be discharged, and the carriages and horses sold, which cannot be expected otherwise but with considerable loss.

6. The appropriation returning to the surplus fund with the end of the present week, I must take the liberty to request, that the quarter of my compensation, running since the first instant, be paid to me in advance, as I could no more receive it at the end of it. I shall, therefore, consider myself obliged to work yet all this quarter, as much as ever possible on the calculations, but cannot expect to finish all.

7. In respect to the instruments, I take the liberty to propose, that the smaller instruments, which might be of use to the War Department, be directed to be delivered into the Engineer Department. The large, and of course more delicate ones, the loss of which cannot be replaced but with great difficulty and expense, should necessarily be spared all useless transportation, which might so easy occasion their destruction. In this view, I take the liberty to propose to leave them with me, until such time as they will either be needed elsewhere for proper use, or their removal from my place of residence becomes indispensable, on account of my leaving it myself. I should then, and as relates to the present division of the instruments now, wish to agree upon the proper measures with the Engineer Department.

8. It will also be necessary to keep from the appropriation for the survey, some funds dispensable to pay the zenith seitor, which shall soon arrive from Mr. Troughton of London, for which I have forwarded him a letter of credit of 300 guineas, and other smaller things ordered to him. I expect the accessaries, of freight due, may be paid yet out of the funds requested in article 4.

I have now only to state to you, what works are yet required, in calculations, &c., to take all the advantage from my work and observations of last summer, as contained in my day-books.

1. To continue and finish the calculations of the differences of latitude and longitude, of all the points determined by the trigonometrical survey.

2. To finish the calculations of the elements of the projection, and make the projection itself on a large scale upon paper.

3. To introduce the results of article 1, upon these papers, containing the projection, so as to bring them in the state to be used in the detail surveys.

4. To calculate the altitudes over the sea of all the stations, from the vertical angles observed, as recorded in the day-books, and the level taken to the sea, at the signal in the Narrows; a work which has not been touched, having postponed it for next winter, when I expected more leisure time for it; while I considered my time better employed last winter, in bringing the work to the state of usefulness for detail surveys.

I must take the liberty, to request your speedy answer upon my above propositions, as there remains but a few days until the expiration of the appropriation would deprive of the means of doing any thing in them.

I have the honor to be, &c. &c.

F. R. HASSLER.

Hon. W. H. CRAWFORD,
Secretary of the Treasury, Washington City.

Washington, April 27th, 1818.

MOST HONORED SIR:—The President directed me yesterday, to speak with you upon arrangements relative to the Survey of the Coast in its present situation, as there is only this day allowed to act. I take the liberty to present to you the following propositions:

1. That according to the propositions made by the Secretary of the Treasury, which will lay at the President's, the whole, together with the appropriation, be transferred to the War Department this day.

2. That I be directed to deliver my work in the state it is to your Department, against receipt for the same.

3. That certain instruments, which may be of use in the Engineer Department, to be sent to the same, and the other parts remain with me until further orders.

4. That I be allowed the use of such instruments, and other means from the Survey of the Coast, now in my hands, as I shall need, and have been allowed by the President, for the mission to the northern boundary, which he has pleased to honor me with.

Any more detailed information that you may wish upon the subject, I will be happy to give, verbally or in writing, as you will desire.

It would be proper that an inquiry would be established, by a person or persons purposely charged upon the whole transaction, from the beginning in 1807, in order that it might be refreshed in the memory, with all its bearings, and the intended consequences and objects in them. I will, if you desire, make out of all the documents, and the dates of all the letters relating thereto, from the beginning, and any one that may be lost or mislaid in the Treasury Department may be replaced, in so far as it may have emanated from me, out of my collection of the same.

As this inquiry would also elucidate all my transactions for this

business, as well as the views I had in it, relative to public benefit, it would also be an object of private satisfaction to myself.

It being useless to be more lengthy here, it remains me only to assure you of my readiness for any service I may be able to render in this subject, though I might not be in case of further direct co-operation.

I have the honor to be, with perfect, &c. &c.

F. R. HASSLER.

The Hon. J. C. CALHOUN,
Secretary of War of the U. States, Washington City.

PRINCIPAL DATES OF THE SURVEY OF THE COAST.

As it may be of some interest, in future times, to refer to the transactions relating to this work, it may be proper to add to these papers the notice, by order of their dates, of the principal documents to which it has given rise, and of the success proceeding of the work itself. This public notice, given herewith, may serve to find the documents themselves if needed.

1807. *February* 10*th*. Act of Congress authorizing the President to cause the whole of the coast and harbors of the United States, with the adjacent shoals and soundings to be surveyed.

March 25*th*. Circular letter of the Secretary of the Treasury, requesting to suggest a plan of operation for the intended work. One was addressed to me in Philadelphia.

April 2*d*. My general plan of operation for the work, (in French.)

July 21*st*. Letter of Robert Patterson, Esq., Director of the Mint in Philadelphia, informing me, in West Point, of the President's confidence in the plan I suggested; but that the situation of external relations occasioned to postpone the execution, requesting me to communicate upon the necessary instruments, in a preparatory manner.

August 10*th*. I communicated to Mr. Patterson my ideas upon the necessary instruments, the different manners of procuring them of good quality, and proposed to make plans for same.

September 2*d*. Letter of Mr. Patterson to me, proposing me, if I would go to London to direct the construction of the instruments there, as no man of this country was just there, acquainted with this subject, and requesting an estimate of the amount of the instruments.

September 12*th*. My answer to Mr. Patterson, containing the desired estimate, and announcing my willingness to undertake the mission if desired.

1811. Here the whole rested until March, 1811, when a friend of mine informed me, that Mr. Gallatin, Secretary of the Treasury, wished to know if I would yet undertake the mission to London, for the instruments; upon which, I mentioned him my willingness for it.

1811. *April* 16*th.* Mr. Gallatin, by the direction of the President, proposed the mission to me.

May 14*th to* 25*th.* Definitive agreement for the mission; the letter arriving while I was in a bilious fever; with the first recovery I worked at the plans for the instruments—base apparatus, &c.—making drawings of them in full size, upon eleven plates, (I showed after to Mr. Gallatin and Mr. Patterson,) and took with me to London, for the instruction of the artists.

July 27*th.* Left Schenectady for my mission, and my first compensation began.

August 1*st.* Arrived in New York, where Mr. Gallatin was expected, which delayed however.

August 9*th*, 10*th*, 11*th.* Met Mr. Gallatin in Philadelphia, and, upon his direction, agreed with Robert Patterson, Esq., about the instruments, &c.

August 25*th.* Mr. Gallatin approved of the instruments proposed, and gave me my instructions, passport, and a letter of credit upon Messrs. Baring, Brothers & Co., in London, for the payment of the instruments.

August 29*th.* Embarked on board the Armata for Liverpool.

September 27*th.* I arrived in Liverpool.

October 10*th.* I arrived in London.

October 11*th.* I visited Mr. Troughton, and various other artists.

November 2*d to* 14*th.* I made report to the Treasury Department of my arrival in London, and my visits to the artists; the necessity of applying to Mr. Troughton alone for the main instruments; and the probable necessity of a longer stay than contemplated, on account of his being yet occupied with the mural circle of Greenwich; entering into various other details.

December 10*th.* Letter from his excellency Mr. Barlow, Ambassador at Paris, promising to procure the books for which I had written to him.

1812. *January* 8*th.* My report to the Treasury Department, giving a detailed account of the manner in which I had distributed the work among the artists.

February 22*d.* Letter of Mr. Hardy, engaging definitively for the two clocks, and two chronometers.

March 22*d.* My further report upon the proceedings with the artists; first account upon money received from Messrs. Baring, Brothers & Co.; and request for directions in the case of a change of the political connexions between the United States and Great Britain.

May 30*th.* Further report to the Treasury Department.

August 24*th and* 26*th.* Further report of mine, and second account upon money received.

June 27*th.* Letter from the Treasury Department, directing me to remain in London until the completion of the object of my mission, political changes notwithstanding.

September 6*th.* I wrote again to Mr. Barlow, in Paris, upon the books to be procured in France.

1812. *September* 12*th.* I delivered to Mr. Russel, Chargé des Affaires of the United States in London, the chronometer of Grimaldi & Johnson, bought on the highest recommendation of Dr. Pond, Royal Astronomer.

November 30*th.* I reported to the Treasury Department; presenting all details of my mission, in form of a table, and sent my third account upon moneys received.

1813. *January* 20*th.* I applied to the Alien Office for a passport to France, to procure in Paris the standards and the books required for the object of my mission; and to care some private interests in Switzerland, occasioned by the death of my father.

January 29*th to February* 1*st.* I made all the necessary dispositions for the continuance of the concerns of my mission during my absence; leaving proper detailed directions, and power to the artists, and particularly to Mr. Troughton; and also to Messrs. Baring, Brothers & Co., relative to my credit upon them, providing for any case of accident or delay which might befall me. I gave notice of all these dispositions to the Treasury Department, and sent in my account upon the money received until then.

February 9*th.* I left London to ship for Caen.

March 22*d.* Arrived in Paris, having been much delayed by storms and formalities.

March 30*th.* I reported to the Treasury Department my transactions at Paris.

April 4*th.* Arrived in Switzerland.

April 28*th.* I left Switzerland again.

April 10*th.* The box of books, bought in Paris, was forwarded to Guernsey.

May 25*th.* I left Paris for Morlaix, with the standard of French weights and measures.

June 14*th.* Arrived in Dartmouth, where I had to wait for my passport from London; it having been refused, on the application of Messrs. Baring, Brothers & Co., made upon my request from Paris.

June 25*th.* I arrived again in London.

July 28*th.* I made report to the Treasury Department, upon my transactions on the Continent of Europe; the state of the works of the artists in London; and requested order for the case of my having to stay longer than then contemplated. I sent also my fifth account upon the money.

August 1*st.* Letter to Robert Patterson, Esq., Philadelphia, upon the subject of my mission.

November 25*th.* Letter from the Treasury Department, prolonging my stay in London, and answering the questions contained in the letter to Mr. Patterson.

December 24*th.* I received the two clocks of Mr. Hardy.

1814. *January* 3*d.* I made a detailed report to the Treasury Department, upon the state of each object of my mission, and sent in my sixth account upon the money.

February 15*th.* Further report to the Treasury Department.

1814. *March 18th.* Letter to Mr. Gallatin, in Petersburgh, upon the objects of my mission.

April 9th. Mr. Gallatin having arrived in London, I had frequent communications with him, upon the subject of my mission, during his stay.

May 21st. I moved in the house next to Mr. Troughton, to be present at the finishing part of his work. But his ill health delayed his work very much; and, with the approach of summer, I was also obliged to remove my family to the country, on account of the ill health of my children.

June 16th. I reported to the Treasury Department upon my mission in detail.

September 19th. Letter to Mr. Gallatin, in Ghent, relating to my transactions.

September 22d and 23d. Mr. Troughton divided the standard scale.

October 15th. My report to the Treasury Department upon the details of my transactions, and the causes of the delay.

October 25th. Letter to Mr. Gallatin, communicating the foregoing, and requesting his direction, or advice, upon various subjects.

November 18th. I set off from London to bring my family to Paris over the winter, on account of their health; and seeing the impossibility that the instruments should be completed during the winter.

December 20th. I directed from Paris the forwarding of the box of books, which had remained in Guernsey. I procured more books, and had the Iron Metre standarded by Lenoir, &c. &c.

1815. *February 15th.* I arrived again in London.

March 3d. Mr. Beasley told me the drafts upon my compensation, which I had sold to him, had been protested by the Treasury Department.

March 10th. Compared with Mr. Troughton the French Metres with the Standard Scale he had made for me; when the news of the events in France obliged me to go quick to my family in Paris.

April and May. Severe sickness in my family obliged me to remain in Paris.

June 7th. I left again Paris for London.

June 10th. I arrived again in London.

June 20th. Mr. Dollond delivered the telescopes, which he had made upon my orders for trial, having agreed with him, that I should take those I found the best after repeated trials. I took the others needed from Mr. Tully.

June 24th. I delivered to Mr. Gallatin, in London, a general account, upon the employment of the funds of the credit given to me; showing by estimate also, what was needed to complete the full payment of the instruments.

June 27th. Mr. Gallatin took arrangements with Messrs. Baring, Brothers & Co., for the payment of the government's instruments; but they refusing to advance any thing towards assisting my return, I procured the means for that upon my private credit, as

I could not sell my draft upon the Treasury Department, on account of the protest of my former draft, sold to Mr. Beasley; though this had been occasioned by circumstances foreign to me.

1815. *July* 25*th.* The instruments having been all packed, they were this day begun to be brought to the Custom House of London; and on the following day some boxes visited, &c.

August 1*st.* I informed Messrs. Baring, Brothers & Co. of this delivery, and requested them to make the insurance, according to the direction of the Treasury Department.

August 2*d.* Messrs. Baring, Brothers & Co. paid the balance due upon the instruments, on government's account.

August 4*th.* Date of my last report from London upon my mission; my last account upon the money of the credit upon Messrs. Baring, Brothers & Co., and duplicates of all the vouchers belonging to it, which I delivered the day after to his excellency Mr. Adams, Ambassador of the United States in London, to be forwarded to the Treasury Department. During all the time, I kept a regular journal upon all my proceedings, in which I inserted every detail, &c.

August 8*th.* I left London for Gravesend, to embark on board the ship Susan for Philadelphia.

October 16*th.* I informed Mr. Dallas, Secretary of the Treasury, of my safe arrival in the Delaware Bay, with the instruments.

October 22*d.* Landed in Philadelphia.

October 31*st till December* 14*th.* I deposited all the instruments and books of the government's collection, at the University of Philadelphia, under the care of Robert Patterson, Esq., unpacked them, and delivered them in form, as completion of my mission.

December 31*st.* I arrived in Washington for the first time.

1816. *January* 5*th.* I delivered to the Secretary of the Treasury the plan for putting the Survey of the Coast in operation, according to the desire of the President.

January 11*th.* I delivered to the Secretary of the Treasury the sketch of my accounts, both for compensation and balance on the instruments, and other papers relating to my mission.

January 20*th.* Mr. Dallas communicated to me the President's approbation of my plan, handed in the 5th instant, upon which would be acted when the appropriation, then before Congress, would pass; until that time also, the settlement of my accounting concerns was referred.

January 24*th.* Arrived again in Philadelphia. From then until June, I made various preparatory works, needed for the future use of the instruments, directed the construction of the stands, and made a turn to New York, with the view of preliminary reconnoitering, considering that part of the country likely the most favorable to begin the work.

April 4*th.* Message of the President, and report of Mr. Dallas, upon the progress for the arrangements for the Survey of the Coast, stating my return from my mission, and that the instruments had given satisfaction.

1816. *May 2d.* Notice of the Secretary of the Treasury, of the passing of the appropriation in Congress, and request to concert with Mr. Patterson upon the measures to be taken to activate the work.

May 15th. My report upon the measures to be taken to activate the work.

June 5th. I forwarded to Mr. Troughton, in London, a letter of credit, sent to me by the Treasury Department, and the order to furnish a zenith sector of six feet, which he had formerly begun for the government, and then laid aside upon counter order.

June 18th. Letter from the Treasury Department, communicating the President's approbation of my appointment, upon which various letters had been exchanged previously, and requesting me to come to Washington, to make a detailed paper upon the agreement, and to pass my accounts from my mission.

June 26th. I left Philadelphia for Washington, but fell sick in Baltimore.

July 3d. I arrived in Washington.

July 17th. I delivered to the Treasury Department the detailed articles of my agreement for the work of the survey.

July 20th. The accounts from my mission, and to the date of the new appointment for the work, were settled, and the balance paid to me. The amount of the protested draft was paid to Mr. Beasley; and the Treasury Department promised to arrange with him for the indemnification, which he claimed on account of the protest.

July 21st. I set off for Philadelphia, where I had a conversation with the Secretary of the Treasury, upon various details of arrangement; and asked if it was desired that I should begin in a certain place; which he saying to be indifferent, I proposed to begin near New York, as being most favorable in principle, which he approved of.

July 27th. I arrived at Mount Holly, near Burlington, New Jersey, with the necessary instruments for reconnoitering, and requested Major TJ Abert, of the United States Topographical Engineers, who had been appointed by the Secretary of War as officer to assist me in the work, to come with me; but not having any funds, for the expenditures to be made on public account, he did not come with me. I proceeded therefore alone, and went to Brooklyn, requesting General Swift to send some young officers or cadets with me, for the continuance of my turn.

J.J. Abert

August 6th. I left Brooklyn with three cadets, then there in vacancy from the Military Academy, and proceeded on Long Island, to view Hempstead plains and the hills till Setauket; then passing the Sound, visited the opposite hills of Connecticut, till again to New York.

August 16th. We arrived again in Brooklyn; I received there, at General Swift's, from the Treasury Department, the President's confirmation of my detailed agreement, dated August 3d, 1816.

August 17th. I returned to Philadelphia.

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memoirs of Bowditch, etc.

1816. *August* 18*th.* I reiterated my request to the Treasury Department to furnish Major Abert with funds for the public expenditures. As I could not proceed effectually in the mean while, I took this time to move my family to Newark, N. J., to be more central to my work.

September 8*th.* I arrived in South Amboy, where Major Abert had arrived the evening before, on my request, having received funds; but bad weather interrupted all proceedings until.

September 17*th.* We reconnoitered on Long Branch, Navesink, and the adjoining country till to Monmouth Court House, expecting to find a locality for a base line on Long Branch, as Hempstead plains had been found unfavorable.

September 23*d.* Bad weather interrupted this turn; Major Abert and I parted, to meet again in four days in New Brunswick, some repairs being needed at the conveyance, &c. &c.

September 28*th.* Left New Brunswick with Major Abert, and continued the reconnoitering from the Beaver dam in Monmouth county, and all the Jersey shore south till Cape May, and up on both sides of the Delaware till Philadelphia.

October 16*th.* At Philadelphia, had a conversation with Mr. Dallas, and directed the construction of the boxes for the base apparatus. Then returned to Newark, to combine the results of the reconnoitering, which giving some probability for a suitable base on Long Branch, I requested Major Abert to meet me with the wagon and horses at Mount Pleasant, and General Swift to send there two soldiers for the manual assistance needed.

November 4*th.* I left Newark for Mount Pleasant, with my son and instruments; Major Abert sent me there a light wagon with two horses, but did not come himself, for want of public funds; the soldiers also did not come. I proceeded, therefore, the third time (paying myself the public expenditures). I made an approximate survey of the neighborhood of Long Branch, with the assistance of my son, and was interrupted by a law-suit from a man, about some branches of a cedar bush, in the preceding turn, to make the rest serve as a temporary signal. This circumstance I communicated to the Secretary of the Treasury.

November 23*d.* I sent my first report upon my operations to the Secretary of the Treasury, accompanied by a letter, stating the difficulties under which I labored; requesting an ostensible paper to be given to me, to legitimate myself as acting under public authority. I requested also funds to be given to Major Abert, to enable me to reconnoitre further, under the favor of the naked woods, and to transport the necessary instruments from Philadelphia to Newark.

November 25*th and* 30*th.* Letters from the Treasury Department, forwarding me a copy of the letter of the Treasury Department, of the 3d August last, and postponing the answer upon my other requests, and the funds, on the consideration of the season for active operations drawing to a close.

December 18*th.* I communicated to the Treasury Department

the decision of the Legislature of New Jersey, to receive proposals for an accurate map of the state, and proposed certain arrangements, by which these views of the State Government could be made to concur with the Survey of the Coast, with mutual advantage, for economy, acceleration, &c., in which I had reason to believe the State Government disposed to enter, and make a law, so much wanted for the protection of my work and signals, permission to clear views, &c., presenting general views upon this subject, and requesting instructions upon it. I pressed, also, the building of an observatory, &c. To this I added a separate letter, requesting again funds to be given into the hands of Major Abert.

1817. *January* 11*th*. Major Abert wrote to me from Mount Holly, that he had received funds for the public expenditures; and I had just written to him, appointing him to meet me in Philadelphia, to bring the necessary instruments to Newark, for which I intended to advance the necessary funds.

January 29*th*. I set off for Philadelphia, for the removal of the necessary instruments.

February 11*th*. We arrived at Newark with the instruments, and I found a letter from the Treasury Department, of the 31st January, requesting me to state the probable time which will be required for the execution of this Survey.

February 14*th*. I answered the above question as well as possible, entering into various details relating to the work.

March 12*th*. I gave account to the Treasury Department on various subjects, and pressed the decision upon those of my letter of the 23d November last as, indispensable, to take advantage of the first opening of the season, and deducing the reason for the order given to the military for the manual assistance required.

February, March, until April 16*th*. The standards of the bars for the base apparatus, the comparison of them and the French and English standards, and the pyrometric experiments, were made, of all which a separate account has been given. A wagon and springs was constructed for the conveyance of the instruments, and other preparations made.

April 2*d*. In a letter to Mr. Crawford, I pressed again the decision upon the remaining subjects of my former letters.

April 12*th*. I stated to the Treasury Department the situation of Major Abert as to funds, and required what was needed for the campaign of the summer.

April 13*th*. Major Abert arrived from Mount Holly.

April 16*th* Set off on reconnoitering the Newark Mountains and the Hackensack Valley, in which the configuration of the country led me to expect a locality for a base line, which on Long Branch was too small. Such a locality was found in the Valley of the English Creek, one of the tributaries of the Hackensack.

April 20*th*. I received a letter from Mr. Crawford, of the 15th, answering my request relative to soldiers for the manual assistance, and sending me Piazzi's Catalogue of Fixed Stars, produced in Naples by Mr. Pinkney.

1817. *April 22d.* I informed Mr. Crawford of the result of this reconnoitering, the finding a locality for a base line, and what arrangement I had taken for the further work. I caused signals to be made at the projected base ends, and various other places, &c.

April 27th. I went with Major Abert to Wesel Mountain and Cranetown Mountain, which were intended for the first triangle points.

April 29th. Major Abert left for Philadelphia, and I made preparations for the preliminary measurement of the base.

May 7th. I began the preliminary measurement of the base, and the detail survey of the neighborhood of it, with the assistance of my son and two hired men.

May 17th. Major Abert joined me again.

May 20th. I returned to Newark, to work out the plan surveyed, and to attend to various arrangements for the future work.

May 28th. I returned to the base with Major Abert and my son, to make the second measurement of the base.

June 10th to 19th. I was employed in searching for proper further triangular points to correspond with the first triangles from the base; Major Abert in placing signals on Staten Island, &c.

June 19th to July 6th. Accompanied by Major Abert and my son, I continued the research, and fixing upon further triangle points on Long Island till Babylon and Huntington, placing signals where proper, &c.

July 6th. Major Abert procured from New York one sergeant, two corporals, and twelve soldiers, the necessary tents, and other equipments, for which he had been authorized by the War Department.

July 9th. Major Abert arrived in Newark with the above;—made a contract for provisioning them. During this time, I prepared all that related to the instruments and other fittings-out for the work, and made several more excursions in the neighborhood, until

July 15th. We set off altogether, with all the necessary equipments, instruments, &c. to Wesel Mountain, and encamped there in the evening.

July 16th. Major Abert left for Mount Holly, to remove his family to Newark.

August 2d. I went to New York to speak with General Swift, in order to obtain some cadets from the Military Academy for assistance, as had been agreed, and which were much needed, as I had only my son, and that at my own expense; but General Swift was absent.

August 5th. Major Abert returned.

August 6th. I again made report upon my proceedings to the Treasury Department, and joined a letter, pressing the sending of some cadets or young officers, according to the plan agreed upon.

August 25th. Left Wesel Mountain station, and established on Cranetown Mountain. Major Abert having been poisoned by weeds in an excursion for night signals, was absent on account of sickness.

1817. *September 3d.* I moved to the third station on Springfield Mountain.

September 5th. I wrote to the Treasury Department, pressing also the decision upon the junction with the Jersey Survey, and various other subjects.

September 9th. Major Abert joined again with Lieutenant M'Neill arrived from West Point, as second assistant.

September 28th. Lieutenant Adams joined also as assistant.

September 29th. We moved to the station at the south end of the base, in English neighborhood.

October 4th. Received from the Treasury Department authorization to treat upon the junction of the Jersey Survey, upon which I wrote immediately to Governor Williamson, of that state.

October 9th. Moved to the station on Bergen Neck, where bad weather interrupted the work very much; and a view had to be cut through a near wood, to see one of the signals on Staten Island.

October 17th. Lieutenant Vinton joined the work of the Survey as third assistant.

October 18th. Lieutenants M'Neill and Adams left, to attend the court-martial in West Point.

November 8th, 9th, and 10th. Moved to the station on Staten Island, at the place where fire signals had been during the war.

November 15th. Sent Major Abert to place the signals of the verification base, near Gravesend, and various others, to join the triangulation to Long Island, south of the Bay of New York, according to the locality which he had been visiting with me in June and July.

November 27th. Major Abert returned to the station from the above excursion.

November 28th. Moved from the station to Long Island, near Fort Lewis, making successively the stations of the west end of the base, the Narrows, and the east end of the base.

December 5th and 6th. The verification base was measured by Major Abert once, and by Lieutenant Vinton once.

December 8th. Forwarded to the Treasury Department the report upon my proceedings to that day, and moved to Rockaway.

December 15th. The weather having been constantly bad, I made the preliminary calculations of the triangulation, and the comparison with the verification base, the results of which were satisfactory. There being no hopes of the weather becoming favorable again, this station was postponed, and we moved home.

December 18th. I made report to the Treasury Department upon the state and progress in the work, and sent a sketch of the triangles which had been executed; adding the information, that the coincidence of the results, the accurate calculations of which would occupy the whole winter, was satisfactory enough to allow to ground the detail surveys upon them, which might therefore be begun the following summer in the parts of the country over which the triangulation extended.

1817. *December 29th.* Major Abert left for Washington, on private business, after having returned the soldiers to their garrison, and the tents and other effects to the public stores.

1818. *January 5th.* Lieutenants M'Neill and Adams joined me again.

January 11th. I gave to the three lieutenants, Adams, M'Neill, and Vinton, now for the first time united, a written instruction upon their duty in the Survey of the Coast, and communicated the instruction to the Treasury Department.

January 12th to 18th. We made the station at ~~Clove~~ Cherry Hill at the north end of the base.

January 21st. Lieutenant M'Neill went to New York, and fell sick there; returned the 5th February. Lieutenant Adams was sick at home; and Lieutenant Vinton alone able to do something in calculations.

January 27th. The information from the Treasury Department to me, that an additional allowance of $1.25 had been made to the four lieutenants with me, upon proposition of the War Department.

February 2d. My answer to the above, requesting the determination of the period of the beginning, and observing that my views in proposing officers to be employed, who would besides reap instruction in the work, was also, that, as they were paid by the War Department, the Survey fund had been intended to be alleviated from all such expenses for assistance of any kind.

March 7th. Lieutenant Loomis informed me that he had received intelligence he would be ordered to report to me for the Coast Survey. (He never joined.)

March 9th. The results of the geodetical observations were all brought in order at that date, so that the final calculation of the triangles was begun, and other such calculations.

March 18th. Major Abert returned; but being now in no way introduced in the state and manner of the work, and my own attendance to the calculation pressing, he could not be of any assistance, there being no time to introduce him.

April 3d. I reported to the Treasury Department the advanced state of the calculations of the work of last campaign, and that I would shortly present to him the full results, in order and brought upon paper, for the detail surveys, upon the organization of which I should make the appropriated propositions.

April 6th. Date of the Secretary of the Treasury's letter, that I should send in the results of my works without delay, and alleging, "that the little progress hitherto made in the work had caused general dissatisfaction in Congress," &c. &c.

April 9th. I received the above letter, and answered it by a ~~small~~ full statement of facts relating to the work in its different stages, and proved how ungrounded the accusation was which had been stated.

April 11th. Major Abert left for Mount Holly on private business, and I set off for Washington in the afternoon, with all my work in the state in which it was.

1818. *April 13th.* I arrived in Washington, delivered the above letter to Mr. Crawford, and announced my presence and readiness for the delivery of my work.

The law authorizing the Survey of the Coast was repealed, under No. 58 of the session, limiting it to the sole employment of naval and military officers.

April 21st. I visited the President, and delivered to him a copy of my letter of justification, which he promised to read, and proposed to me the work of ascertaining the boundary line with Canada.

April 22d. I proposed the necessary measures for securing the station points of the work done, and the other arrangements arising from the circumstances, which being approved, I gave the proper directions for their execution to the Lieutenants M'Neill, Adams, and Vinton, and my son.

April 27th. The funds from the appropriation for the Survey were transferred to the War Department, to make it possible to continue under the modification of the law, as otherwise the appropriation would have expired that day.

April 29th. I delivered all my journals, results, and other works, to Brigadier General Joseph G. Swift, Chief of the Engineer Department, after having brought the triangles in a proper order for easy use, and took receipt for the same. That day Major Abert had also gone to Newark, dismissed one soldier who was yet there, and discharged the officers, so that these had to hire assistance and volunteer their services for the execution of the direction which I had given to them.

April 30th. I left Washington for home.

May 9th. I delivered to Major Baron, Deputy Quarter Master General, in New York, such part of the instruments and books as had been agreed upon with General Swift; the delivery of the others being postponed until my return from the boundary line next fall.

December 5th. Having returned from the boundary line, I wrote to the Secretary of War, to state my readiness for the delivery of the rest of the instruments, requesting only the loan of those which were expected to be needed in the boundary line, under the supposition then made, that I should continue in that work next season.

December 24th. I delivered the horses and the carriages to Major Baron, Deputy Quarter Master General, in New York, which were sold at auction the 31st December.

1819. *February 12th and 13th.* I delivered to Captain De Russy, of the United States Engineers, the remaining instruments, books, stands, and other objects of the collection for the Survey of the Coast, except those allowed to me as above stated.

Various letters were exchanged after this, referring to details relating to instruments, &c. &c.

F. R. HASSLER.

Newark, New Jersey, February 16th, 1820.

The following paper was read before the Columbian Institute, on the 9th of December, 1826, *by* Col. Roberdeau.

OBSERVATIONS ON THE SURVEY OF THE SEA-COAST OF THE UNITED STATES.

This matter, so important to the Government of the United States, as well as to the interests of the nation, in its various relations and results, may be justly entitled to the attention of the community, and more particularly, to the notice of the national institute here, as being intimately connected with the investigation and advancement of science; and, if an object of such acknowledged importance be passed by at the seat of Government, and within the sphere of this Scientific Institution, erroneous opinions might, and probably would attach to the omission, and its utility, by other societies of a similar character, doubted, because, in no other way than under the immediate patronage of the General Government, can any such project be successfully undertaken. For these, and other reasons that might be adduced, the subject is now brought before the Institute, in preference to any other, where a mere abstract proposition of speculative science might be substituted, and the impression of its importance will, it is hoped, be a sufficient apology. In doing this, it is not intended to enter into arguments, or minute details, which would require more mature consideration than can be now devoted to it, but merely give an outline history of what has been attempted, with such general observations as may appear to arise from it, the correctness of which is with great deference submitted to the Institute.

The survey of the sea-coast of the United States was brought before Congress, by the President, (Mr. Jefferson,) during the session of 1807, and an appropriation of $50,000, for this object made on the 10th of February of that year. The act authorized and requested the President to cause a survey to be taken of the whole of the coast of the United States, with the adjacent shoals and soundings, employing proper persons in accomplishing the purposes described in it.

Agreeably to this provision, on the 25th of March following, the Secretary of the Treasury, (Mr. Gallatin,) addressed a circular letter to several gentlemen of science, requesting their opinions individually respecting the plan to be adopted. This letter explains the objects of attention in these words:

"The President of the United States being authorized by an act of the last session to cause the whole of the coast of the United States, together with the adjacent shoals, and soundings, to be surveyed, it is his intention that the work should be executed with as much correctness as can be obtained within a reasonable time," requesting the suggesting of the outlines of such a plan, as may, in their opinion,

unite correctness and practicability. Mr. Gallatin then defines three distinct parts of which the work should consist, viz. :—

"1. The ascertainment by a series of astronomical observations of the position of a few remarkable points on the coast, and some of the light-houses placed on the principal capes, or at the entrance of the principal harbors, appear to be the most eligible places for that purpose, as being objects particularly interesting to navigators, visible at a great distance, and generally erected on spots on which similar buildings will be continued so long as navigation exists.

"2. A trigometrical survey of the coast between those points of which the positions shall have been astronomically ascertained; in the execution of which survey, the position of every distinguishable permanent object should be carefully designated; and temporary beacons be erected at proper distances on those parts of the coast on which such objects are rarely to be found.

"3. A nautical survey of the shoals and soundings of the coast, of which the trigometrical survey of the coast itself, and the ascertained position of the light-houses, and other distinguishable objects, would be the bases; and which would therefore depend but little on any astronomical observations made on board the vessels employed on that part of the work."

These three propositions were submitted for the consideration of those gentlemen to whom this circular letter was addressed, and a question respecting the difficulties attendant upon the nautical survey is also made, viz: "Can a nautical survey be made with one vessel alone? Can angles be taken with sufficient correctness from on board a vessel, so as to ascertain its position in relation to three visible objects on shore, or is it necessary that the vessel's position at the time of taking any particular sounding should be ascertained by observers on shore, &c."

This circular was addressed to Mr. F. R. Hassler, among others, who was then Professor of Mathematics at the College at Schenectady in the State of New York, a gentleman well qualified for the task, and it was replied to by him on the 2d of April following: both of which are to be found in the 2d volume of the Transactions of the Philosophical Society of Philadelphia, published in 1825.

In this reply of Mr. Hassler, he enters into a minute description of two methods, each of which may be pursued in the attainment of the object.

The first by a complete triangulation survey of the whole coast, including the determination of the latitude, longitude, and azimuths of the principal places, such as light-houses, capes, &c. The sides of the triangles to be from about 60,000 to 100,000 feet in extent, resting on two or more bases, measured with the greatest possible accuracy; together, also, with a survey of the harbors, shoals, soundings, &c. of the coast, and filling up the details of all included within it.

The second method omits the large triangulation, but retains the design of fixing the prominent points and features of the shore, by the same mode of determining by astronomical observation, their

latitude and longitude, and correcting the differences in time, by the comparison of good chronometers, the details to be filled up by smaller instruments, as circumstances might direct.

Together with this description, a plan was also submitted for putting the survey into operation, in which a prominent feature is the establishment of two observatories, which were to form the fixed points, to which the survey, and particularly the nautical part of it, should be referred, their situations were recommended to be in the State of Maine, and in lower Louisiana, "from them nearly every celestial phenomenon observable from the tropic to the arctic circle, and within about 20 degrees of difference of longitude could be observed at one or other of them; at the same time, affording the means of comparison with each other, and supersede the necessity of referring to Europe for corresponding observations." Still, Mr. Hassler observes, "that various considerations might occasion, and favor the desire of placing one of these observatories in the city of Washington, as observatories are placed in the principal capitals of Europe, as a national object, a scientific ornament, and a means of nourishing an interest for science in general. This observatory would then be the proper place for the deposit of the standards of weights and measures, which makes a part of the collection of instruments."

This plan also embraces all the details of the intended survey, the persons necessary as assistants, and their respective duties. The principal survey proposed by it, was to form a chain of triangles, with sides of about thirty miles in length along the whole extent of the coast, determining the azimuths of their sides, and the latitude and longitude of their angular points; within these, a series of triangles of about 10 miles in their sides, in order to furnish an ample number of determined points to which the survey may be referred in all its details.

From this epitome it is evident that the first method, by large triangulation, was contemplated, and preparations for it made.

An objection to this method might arise, from an imperfect knowledge of the localities of the country, which he acknowledges, and which would lead to uncertainty in the adaptation of fixed principles of action (how perfect soever in other respects) to its peculiarities. Difficulties would doubtless be interposed to the forming of a chain of triangles of 30 miles in their sides, by the intervention of canebrakes, &c. to the South, and at other places by the extensive and dense forests, with which the low grounds are sometimes covered; other impediments would probably be presented in certain parts of the country, arising from its present uncultivated state, and occasion a tardiness in obtaining the necessary correctness, and an increase of expense in the execution wholly inadmissible; Mr. Gallatin may have had this in view when, in his circular letter, he observes, that the work should be executed with as "much correctness as can be obtained within a reasonable time," knowing that Congress were to be the judges of the reasonableness of the time, as well as of the attendant expenses, and that an excess in either would endanger the success of the whole project.

Whether any or what systems were recommended by the other gentlemen to whom this circular was addressed, is unknown; but this of Mr. Hassler being adopted, the first step towards the execution of the law was to procure the necessary instruments from Europe; and he was employed, under the authority of the President, to proceed to London, and there to superintend their construction.

Mr. Hassler sailed for England on the 30th August, 1811, to perform the duties assigned to him, under instructions dated the 23d of that month, from whence he returned to the United States in October, 1815, bringing with him the instruments and books, &c. necessary to the Survey, agreeably to a list which had been prepared, and which were approved by Dr. Patterson, then Director of the Mint, in whose care they were then placed.

The cost of these instruments and books, as appears by a settlement of the account in the Auditor's Office in the Treasury, July 17, 1816, was as below:

Cost of instruments and books, procured by Mr. Hassler for the Survey of the Coast of the United States, in London and Paris, including packing, &c. . . .	$17,167 61
Compensation and expenses of Mr. Hassler in procuring them	20,382 37
Total* . . .	$37,549 98

Soon after his arrival, Mr. Hassler commenced his operations by forming a base line on Staten Island, from which a number of triangles were taken, and reported; these also are recorded in the philosophical transactions, in the account there given of the Survey, and the best results were anticipated from the well-known abilities of that gentleman; but circumstances unforeseen at the commencement of the undertaking had occurred, unfavorable to the present prosecution of it; for, in the mean time, a war had commenced and terminated between the United States and Great Britain.

Emerged from a contest which had called forth all the energies of the nation, the expenses of which were undefined, a disinclination to the promotion of science, or to improvements of this kind, very naturally prevailed; and, consequently, of all times to propose the continuance of so expensive an undertaking, how important soever in its results, this was the least propitious: but, from whatever causes, the project now appeared to want sufficient patronage, the appropriation for defraying the future expenses was withheld, and the operation ceased, if, indeed, it might properly be said to have been begun, nor has it since been renewed.

It may be observed, that at the time when this object was first proposed, and so ardently patronised by the great man who then presided over the United States, the knowledge of its usefulness was limited; and, during the preparations which were making for its

* Being a saving of nearly one-fourth of the original appropriation of $50,000.

commencement, little attention was given to explain the nature and importance of it: in the time of war, and in the disturbed state of affairs which followed, it could not have been otherwise expected; this want of proper information might have been a leading cause of the failure of the design.

It may also be observed, that when this survey was first proposed, the requisite science was rarely to be found under the immediate command of the Government; the Military Academy at West Point was not *then*, what it has since become. The corps of Topographical Engineers was not even formed, nor was the Engineer Department organized: recourse to other means was therefore indispensable to the prosecution of such an undertaking; had it been otherwise, and had the national institutions been as they *now* are, it is manifest that a different process would have been adopted, because the necessary qualifications, and all other means, are now within the immediate command of the Government.

Under these circumstances, should a survey of the sea-coast be resumed, a method, similar to the second recommended by Mr. Hassler, might be pursued, being less subject to those inconveniences and delays than the first, and at the same time sufficiently correct in its results for the purposes required. By determining the latitude and longitude, &c. of the important places on the sea board, and of certain points on the contemplated road from Washington to New-Orleans, an opportunity would be afforded of verifying both those surveys, by a comparison of each with the other, and by using smaller appropriate instruments for the details of the survey of the harbors, bays, and rivers, valuable materials for an accurate map of that portion of the country, as well as for a chart of the sea-coast, would thereby be furnished, and by running a true meridian line from some one of the given points on the coast to the Lakes, and there determining other latitudes and longitudes as well as on its course, the connexion for all geographical purposes would then be permanently established.

The great changes and improvements which have taken place in the national institutions of the United States, since the first projection of this survey, will justify the proposition, that should the work be resumed, the execution of it may, as well for economy, as to ensure its success, be entrusted to the Topographical Engineers, with the co-operation of the Navy; as to these departments, it appears more properly to belong, at the same time that they are particularly interested in the results. An accurate account and delineation of the bars, shoals, soundings, &c., without the coast, in a nautical view, appertain to the latter, the trigonometrical and topographical portions, to the former, and the astronomical observations for latitude and longitude, and other general matters to both. The number of engineers should be such as to admit of subdivision for the purpose of topographical surveys on the shore, where any such might be considered important, without interfering either with the observations, the nautical survey, or the necessary attentions to minor triangulation, meteorological observations, &c. To the command should be added persons skilled in other branches of science important to it, in order that the report

might be, in all respects, as perfect as possible, and exhibit also the geology and natural history of the different sections of the country. This method, by the subdivision of talent and attentions, would admit of despatch, and, if required, the work might be continued during the whole year, to the south in winter and north in the summer season. The annual expense would be comparatively small, and should a great triangulation of any particular parts be hereafter required, with large instruments, it could then with advantage be undertaken, as all the prominent points would be determined, and therefore no loss of time or expense would, by this method, be sustained.

Were this survey to be undertaken under a commission, or independently of officers of the army and navy, a large increase of expense would evidently be incurred, and less assurance of the perfect performance of it had, than in almost any other civil contract, where the requirements are more definite than those which this work admits of. In this case, there would be no concentration of command, or obligation to duty, other than that arising from personal motives; when the service led to places prejudicial to health, or otherwise inconvenient, disagreeable, or hazardous, obedience might, and probably would be refused, to the orders of the superior, who (be his qualifications for the work, and his ardor in the prosecution of it, what they may) is, nevertheless, dependent on the co-operation of others in subordinate stations, who have not the same impression of its importance, nor the attachment that officers have, either to the government, or for themselves, *in such matters; thus, the project would be subject to disappointment* in its progress, and uncertainty in the result; and, at best, no part of the survey could be adapted to military purposes, and, therefore, *in this respect*, it would be incomplete.

No nation has exerted its energies in the pursuit of geographical research more, or with greater success, than the British; the names of Anson, Cook, Des Barres, Gauld, and many others, of former times, and of Le Roy, Mudge, Parry, Sabine, Clapperton, &c. &c. of latter, will ever be recollected for their exertions, and the ability with which their explorations and surveys were directed, the latter of which, at no future period, can be surpassed. After having made accurate surveys of their own coast and harbors, their attentions were directed to the like pursuits in other parts of the world, which has continued during the boisterous scenes of war, as well as in the calmness of peace, to the present time, and they are now engaged on the same object, regardless of expense, of difficulties or danger. To that nation, and to the skill and science of its naval and military officers, to whom the direction of these explorations and surveys are exclusively entrusted, are the United States, and the nations of Europe, indebted for a greater part of the charts now in use, as well as for geographical information of the most valuable kind. The employment of officers on this service does not, however, preclude the association of others skilled in sciences connected with it; on the contrary, they are generally employed; but the command and management is confided to the officers, and they *only* are responsible, at the same time that due merit is allowed to each individual concerned in it, for their respective investigations and services.

There is, perhaps, but one instance on record of a contrary system being pursued by that government, and which occurred in the year 1698, when the celebrated philosopher and mathematician Doctor Halley had charge of the expedition, with orders, by observation to seek the discovery of the rule of variation, and to survey or explore his Majesty's possessions in North America; a brevet commission of Lieutenant was procured for him from King William, and Lieutenant Clark, of the Navy, served under him. But with all this precaution, the crew, denying the legality of his authority, mutinied, and he was obliged to return in 1699, without accomplishing the object of his mission; Clark was cashiered, but that was poor recompense for the failure of the expedition; it served, however, as a precedent in after times, for the Royal Society of London, in the year 1769, petitioned the King to fit out an expedition to the Friendly Islands for observing the transit of Venus over the sun's disk and for other purposes; Alexander Dalrymple, Esq. an eminent member of that body, was recommended to the duty: In order to obtain the proper command of the vessel, he demanded a brevet commission of Captain, in the same manner as had been formerly granted to Doctor Halley, which Sir Edward Hawke refused to sign, declaring that he would not, on any account, consent to entrust one of his Majesty's ships to a person not regularly bred to the service; on this occasion it was that the celebrated Captain Cook was promoted to the rank of Lieutenant in May, 1768, and took command of the *Endeavor*, which had been appointed to that service.

The same system has since been uniformly pursued: under it are those now engaged in pressing the explorations into the interior of Africa, and to the Polar regions; whether by land or water; be the object an extension of commerce, or the advancement of science, in every instance officers are employed.

With peculiar propriety does the same system apply to similar undertakings in the United States, and it offers the only means of acquiring practical information in the various branches of science connected with the duties of an Engineer, and which in order to attain excellence requires subdivision in the pursuit; but principally because the departure from a method universally adopted by other nations would argue a want of confidence in the talents of the officers, as well as in its national institutions, which does not exist, and thus tend to depress the spirit of enterprise so essential to the prosperity of Military and Nautical Science.

In the large armies of Europe this subdivision is made by separate corps, and embraces a certain portion of science to which the attention is principally, if not exclusively devoted. To this arrangement may be attributed in some measure the eminence to which the engineers of France have arisen, and become so important in civil or military service to their government, and in their example to the world. The institutions of the United States do not admit of such a subdivision by corps; but, yet the same principle is attended to and aimed at by the topographical engineers in their surveys reconnoissances, and by con-

tinuing this practice, a suitable classification may at some future time be advantageously made.

Connected with the survey of the sea-coast are two other important, or indispensable objects; one the establishment by law, of a Board of Longitude, and the other the construction of a national observatory.

The former is necessary to receive and regulate all matters relating to nautical and geographical science, to encourage improvements in it that may be proposed, and to authenticate such publications, as may from time to time be considered useful.

A Board of Longitude was first established in England in the year 1714, for rewarding any successful endeavors to keep the longitude at sea. It was not until 1767 that this Board first published a Nautical Almanac, which has been continued annually since, by the advice, and under the direction of the Astronomer Royal at Greenwich; the importance of this work is too well known to need animadversion. Under the auspices of this Board too, besides giving encouragement to the authors of many useful tables and other works, which would otherwise be lost, time-keepers have been brought to a wonderful degree of perfection, which would not, without this aid, have been attempted.

The connexion between this Board and an Observatory is obvious, and the duties of them inseparable, the one to furnish the necessary observations and tables, the other to employ competent persons to make the necessary calculations, and to publish authentic copies of them for general use; all others than those appointed by the Board are prohibited by the laws of the realm from editing this or a similar work.

A National Observatory is required, as well for the purpose that has been mentioned, as to ascertain by astronomical observation the geographical position of places: but a great object in this establishment here would be, by numerous observations at the seat of government of the United States, to investigate and fix, as far as may be possible to do so, the doctrine of *refraction*.

This subject, particularly as it refers to the heavenly bodies when viewed from the earth, has engaged the anxious research of European astronomers and men of science for a great length of time, without producing satisfactory results; in the inquiry is involved so many and such various properties, indefinite in their nature and effects, that no positive or distinct conclusion has yet been drawn from all the endeavors to investigate them. It has been theoretically explained, and subdivided into different terms, such as celestial and terrestrial refraction, &c.; and by repeated observations of the effects produced by weather, in various temperatures of heat and cold, clear and cloudy, attempts have been made to establish some rule or principle by which this phenomenon may be satisfactorily accounted for and fixed: but there are properties in nature beyond the reach of mathematical reasoning, and require only the attentive and constant observation of *facts*, which, when attained and acknowledged as truth, are yet inapplicable to any rules or theorems, resting solely and independently upon the principle that the result is such. Of this class may perhaps be regarded *refraction*; for no settled maxims respecting it have yet been decisively explained.

For some time past, very many observations, with reference to this subject, have been made at different observatories in Europe, particularly at those of Greenwich and Paris, but without the desired effect. Depending, as it may be supposed to be, on the peculiar state or qualities of the atmosphere, and as those qualities differ, not only in the difference of latitude and longitude, but also, at the same places at different times, when the medium is more or less dense, occasioning a greater or less inflection of the rays of light in passing through it; if there be other causes more definite, and approaching nearer to any fixed principle, the geocentric distances of those observatories are not sufficiently great to discover it by corresponding observations made there, and particularly as the same atmosphere, by this proximity of position, may be supposed to be common to both at the time of making the observations, and therefore the results, on this account also, would be the same.

But, were an observatory fixed *here*, the case would be materially different in every respect, and by corresponding observations made at Washington, so much nearer the Equator, and with the difference of nearly 77 degrees of longitude, results might and probably would be produced of a most interesting kind to the advancement of this branch of science; for, besides the geocentric difference of position, that of the surrounding atmosphere here is still greater; not occasionally so, but at most times, and particularly at those seasons of the year most favorable for observation. At such times, there are comparatively few days or nights on which the heavenly bodies may not be seen to the greatest advantage, through a medium more free from exhalations and vapor, or other impurities, that may affect the atmosphere at the places which have been mentioned.

Whatever other advantages may arise from the establishment of a National Observatory at Washington, this is of itself sufficient to justify the measure: it is due to the national character, as well as to those nations, who by their exertions have hitherto afforded the means of directing the wayward course of our mariners on the ocean, and furnished the land-marks on our shores, that some attempt be made by us to improve this essential branch of science.

Independently, however, of this consideration, it is evident that an observatory is essential to the proper success of any undertaking of this kind in the United States. Upon it the Survey of the Sea-Coast will greatly depend, as will that of the national road from Washington to New Orleans, and the proposed meridian to connect the western lakes with those of the Atlantic. To all these an observatory, as a fixed point to which they must refer, is indispensably necessary. Besides, it is the only means whereby practical knowledge can be attained by the officers of the army and navy, in this useful branch of science. To afford this opportunity is an object of great importance; without it, the talents of the nation, in this respect, never can be developed or known, but remain for ever dependent upon the investigations and intelligence of others, without the means even of verifying or correcting the differences arising from the position of this country.

That there exists here native talent abundantly sufficient for the

management of such an institution, is not to be doubted; but all energies are cramped and rendered useless for the want of a theatre on which to exercise and improve them. The necessary instruments are now in the possession of Government, and it needs but the further extension of its fostering hand, in the construction of a suitable building, to afford ample facility to the improvement of science, and the promotion of those researches which will hereafter, in their results, place the United States, in this respect also, on a level with the enlightened nations of Europe.

That this Survey must be undertaken at some time, is certain. Under what circumstances can it be more favorably done than at the present? In the full enjoyment of the blessings of peace:—when the national institutions are successfully progressing;—when a desire for internal improvement of the country so generally prevails, and science in the prosecution of it is sought for and cherished! Surely, at no future time can it be supposed that so many circumstances will concur to favor the accomplishment of this object, so important in its relations; and the more so, as they may be considered the first fixed principles on which the correctness and permanency of all geographical improvement must depend.

Washington, December 9, 1826.

[From the New York American.]

In conformity with the general and constant manner of treating me in all my connections with the Government since 1817, the Editor of the Daily National Journal has not kept his word given, to insert the paper here following before the 25th instant;—I suppose "to show the very age and body of the time, its form and pressure." It is therefore my duty to do what I promised to do in this case, namely, to insert it in another and more liberal paper. Comments every reader may make himself.

F. R. HASSLER.

To the Editor of the Daily National Journal, at Washington City.

Having seen in your paper of the 1st January, a discourse of Colonel Roberdeau, read before the Columbian Institute, entitled "Observations on the Survey of the Coast of the United States," I feel it a duty to my character, and even to the nation, to request you to insert the following remarks in your paper, at as early a period as possible, in order that they may meet the same eyes as the paper you have published.

Colonel Roberdeau has mentioned me, in the paper to which I allude, as having done something in the Survey of the Coast. But although he has been now for many years the keeper of all the instruments, books, and manuscript documents which were delivered by me to the officers appointed by Government to that purpose, and among the rest to Colonel Roberdeau himself, his statements are altogether erroneous; and I must correct them from my documents and my intimate knowledge of the facts and the subject.

Colonel Roberdeau states—that "*The appropriation* for defraying the further expenses *was withheld*, and the operation ceased, *if indeed it might be properly said to have been begun.*

It is, in the first place, incorrect to say that *the appropriation was withheld*, as will be seen from the following simple statement of facts.

My agency in the Survey of the Coast closed in consequence of an act which was hurried through Congress without debate or committee (in the House of Representatives), under date of 14th April, 1818, which enacted, *That so much of the Law relating to the Survey of the Coast shall be repealed as allowed to employ others but naval and military officers.*

The original Law did not even mention naval or military officers. Only I had in my plans proposed the use of them, as advantageous, by forming some of them in a school of practice to greater usefulness, and with a view to economy, considering them otherwise paid. The idea had not previously existed here of any part of this work being adapted to them. For this liberal anxiety of mine to take the greatest advantage of this work for the country in general, and to be serviceable to the army or navy, and to Colonel Roberdeau's corps in particular, I am now paid by his general argument, that none but military men are fitted for such a work! —!

On the 28th of April, 1818, date of the expiration of thea ppropriation for the Coast Survey, there was a large balance of unexpended appropriation remaining. By a rule in the transaction of public business in Washington, the departments, except the Treasury Department, can protract an appropriation, so as to be two years longer disposable, by having the balance paid over to the Treasurer.

That the public might not be deprived of the result of my labors, notwithstanding my interest in the work had thus been cut off in the most unjust and unhandsome manner, and by agreement with the Secretary at War, Mr. Calhoun, I announced myself to Mr. Crawford this transfer of the funds to the use of the War Department, to enable it to continue the work as the law supposed, and it was done about one o'clock that day.

Immediately after I delivered also to the Engineer Department my manuscript journals and results of calculations, and, soon after, the instruments required for the work, the books, &c. (see the duplicates of receipts.) The spring was at hand,—my signals were all standing on the respective stations. If the Department had had under its orders *only one man capable* of continuing any part of the Survey, it might have been done instantly, as indeed the repealing act required.

Nothing, however, has been done up to this day, notwithstanding

the anxiety frequently expressed for the continuation of the work. I am therefore warranted in saying, that no man of the requisite attainments does exist in either of the Engineer corps; and I may say this without affecting their character as soldiers and otherwise useful men, because *this branch of knowledge is actually neither their business nor within their reach.*

Since my papers on the Coast Survey have been published in the philosophical transactions of Philadelphia, a new light appears to have arisen to them, though my journals, results of calculations, &c. which form for them the truly essential part for the carrying on of the work, and which every man competent to replace me could not fail to understand, have been nearly nine years in their hands. But with all this aid, neither is my plan understood by the writer of the observations, nor does his proposition of another contain ideas that could be carried into effect, or show the slightest acquaintance with the subject, as every man of science in this branch will all at once see, so that I need not even enter into particulars; it administers the positive proof, that even with all my papers in hand, they are as little able to make a rational step in the work, as I have seen others trying to determine the latitude with the encyclopedia in hand, all the native talents notwithstanding.

The hopes grounded upon the capability of the Cadets of West Point for this duty, are equally unfounded. For the correctness of this position, I appeal to the Engineer Corps, and the government of the Academy themselves. The instruction of this Academy, though good, is but elementary and general; the time spent in it is too short to embrace with their other essentially military studies, this more extended and complicated one. A wide chasm remains between such a work and their studies: it does, in short, not belong to them. Another field of great detailed extent, requires all their time and exertions; because it is the essential part of their duty. Attempting to do more, or expect more than is possible, is doing or obtaining nothing that is right.

In every fully organized system of education of men for public utility in these branches, separate establishments for the different branches, superior to the elementary ones, are found necessary; and the military part is, and must be, separated from the civil part; each having its peculiar principles and sciences, must also have its separate establishments,—men, organization, &c.

Whether (in the second place) "*the survey might indeed be said to have been begun.*" Any of our military gentlemen would have apprized the public at the sound of drum and trumpet, if he had, as I have done, furnished all the plans in detail, and every idea that led in the work; superintended the construction of the instruments on my own new principles, (1) which, after fifteen years improvements in the arts, are still considered as master-pieces; proposed and executed methods of observation and calculation on new principles, mathematically demonstrated, furnished the whole organization of the details of a work of such extent, importance, and peculiar difficulties, in a manner as I will let these gentlemen read themselves, in the

scientific journals of Europe.* In truth, it is customary in civilized Europe to allow some merit to such works, because they are considered the most essential, and, in an intellectual point of view, the most valuable part of the work.

But besides this, I delivered, at the time when my operations were suspended, and I, condemned without a hearing (nor even a chance for it), to the use of the continuance of the work, and in perfectly clear order in my journals and results, ninety fully-executed triangles, and thirty more, partly done, which are leading to the further works, in all, therefore, the data or elements of 124 triangles,† grounded upon a base and a verification base, measured and verified by a coincidence more than sufficient for the topographical purpose within the limits they were to serve for the time, though the measurement with the peculiar means of accuracy, invented by myself for the use of the great extension of the main triangulation, was necessarily postponed for the next intended campaign. Latitude and azimuth determinations were sufficiently on hand to assign to this work its proper place and direction on the spheroid of the earth, &c. The state of forwardness was such, that I had already announced to Mr. Crawford, that with the beginning of spring, 1818, two brigades of officers, the one naval, the other topographical, might be set to work to fill up the details of that part of the Survey, for which I would present the proper plans of operation. It remains, therefore, with those who question whether the work was begun, to shew the public how it happened that this was not done, with all the means in hand, and the law in favor.‡

That the plan of operation which produces the most good work within a given time, is certainly the cheapest, I hope will not need to be discussed; and as a testimony of the faithfulness of my word, given in my letter of the 5th January, 1816, "to conduct it in a manner *permanently useful and honorable*," I will take the liberty to insert a letter from the very hand that drew up the Declaration of Independence, the head and character who conceived it and supported it for half a century, whose head, heart, and judgment, in both these branches of science, may be permitted to overbalance the aspersions with which I am honored from other sides.

Monticello, Dec. 3, 1825.

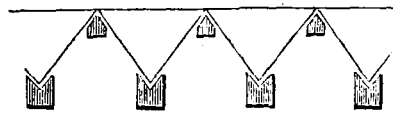
Dear Sir:—Your favor of Nov. 24 is just now received, with the papers on the Survey of the Coast, which you have been so kind as to send me—for these be pleased to accept my very particular thanks. In the last volume of the Transactions of the American Philosophical Society, I had especially remarked these papers, and the processes so peculiarly accurate and ingenious, by which you had proposed to execute the Survey of the Coast. I regret much that it was not carried

* Brewster's and Rees' Encyclopœdia (circle).—See reference (1) ante, p. 48.
† Receipt of 28th April, 1818.
‡ My letter to the Treasury Department, of 7th July and 8th and 18th December, 1817; 3d, 6th, 9th April, 1818; to the War Department, of 27th April, 1818; and to Mr. Gallatin, 28th April, 1818.

into execution, as, independently of the permanent security it would have procured for the navigation of our coast, it would have been an honorable monument of the state of science at this early period of our history. Attentive, in every thing, to what I can find in it which may be useful to our university (now the only object and occupation of my life), I singled out your plan of an observatory, which, for its simplicity, solidity, and every aptitude for its purposes, and for its economy, presented at once what I had, for some time, thought of requesting some kind friend in Europe to procure for me. I therefore deposited the volume in the library of the university, with a note on a blank leaf at the beginning, specially referring to your plan, as suiting us exactly, whenever our institution should be sufficiently advanced to call for an observatory: we have secured a site of peculiar advantage for one in future.

There is a material part in your description, which I did not understand, and I was intending (with a request of your approbation of our adopting your plan) to have asked of you some more particular explanation of that part. Your letter furnishes the occasion of doing it now. The passage is page 148, beginning with the words "the roof over the transit," &c. to the words "cannot be described here," page 149. I do not understand this construction at all, and if you can aid me in it you will oblige me.

Permit me, at the same time, to suggest to you a construction of flat roofs different from yours. In fig. 4 you have two strata of joints, the one five or six feet above the other. I do not see the use you propose to make of the space between them. In the house in which I live, and its offices, I have flat roofs of a different construction; they consist of rooflets, thirty inches wide, with gutters between them; there are two strata of joists, the one about nine inches higher than the other, arranged thus:



A single length of shingles reaches from the top of the upper joists to half way down the gutter, which is made in the lower joists, overlapping just enough to deliver the water safely into the gutter. These gutter joists, as well as those constituting the ridges of the rooflet, have a descent of six inches from their middle point to each end, which over-jets the wall so as to deliver its water clearly over it. A floor is laid over the whole to walk on, the water first falling on that, and passing through its cracks, drops into the gutters. I have had upwards of twenty year's experience of these roofs in this house, also in one I built at another residence, and more than half our buildings at the university are flat and so covered. They never have leaked, cost less than a rafter roof, as needing no rafters, and admit repairs more easily than any others. I think it the best possible roof for an observatory.

With every wish for your welfare and happiness, accept the assurance of my great esteem and respect.

TH. JEFFERSON.

This letter may also answer Colonel Roberdeau's Treatise on a National Observatory, &c. The information asked for by Mr. Jefferson was given in my papers; this part was purposely only hinted at for brevity's sake: I stated also why a flat roof was not proper for an observatory.

I have now to notice that part of the observations which urges the employ of none but military and naval officers, on the ground that *they would never obey civil directions.* I am reluctant to believe that this be a fair statement of the views and *character of our republican military.* It is a principle of the constitution, that the military *shall be in subordination to the civil power.* The President of the United States, who can happily rarely obtain that elevation by mere military character, is the constitutional commander of the army, and can delegate this power, in the whole or in parts, as he pleases: instances of it are too abundant, and the subject not to be debated here. No officer fit for the occupation would think of such a cavil, in a work as the Coast Survey *was:* nor is there, in the obedience to scientific directions, any thing that could derogate to the highest military character.

The instances which have been adduced in support of this position are very unfortunate. The errors, both in the principles and in the results, of the British Survey, have been for many years subjects of papers in their own philosophical transactions, (see the papers of Mr. Rodrigues, Dr. Tiark's, &c.) and elsewhere. Since the death of General Roy, the character of the work has changed; and the official inquiries made by order of the House of Commons, in 1810, have, by the report (which I brought from London, and which lies in the War Department, though it is my property), shown what I think would, in this country, dispense a military chief of all further troubles in such a work. In all other countries where such works have been well executed, the schemes originated, and the direction was in the hands of civil men of science, who often had officers under their command. In France, Cassini, Delambre, and others. In Denmark, the astronomer Bugge. In the north of Germany, Zack, Gauss, &c. &c. When I accompanied my friend Professor Bohnenberger, of Tubingen, in his triangulation of the map of Swabia, under the patronage of the Archduke Charles of Austria, in order to join his triangulation to mine in Switzerland, he had under his orders an Austrian nobleman, a Captain of Engineers, with other military assistance, who was far from finding a degradation in obeying even a civilian man of science. I might even prostrate, by British examples, those unsuccessful ones, which were quoted to support the *unconstitutional assertion.* But so much is true, that blind, and even ignorant, obedience and strict discipline may suffice for common military purposes, while in a scientific work only actual zeal and scientific interest for the object in view, decide the fitness of the man: *ideas of private interest, false honor and pretensions, are, in their nature, foreign and directly inimical to such a work, and do not even occur to the man fit for it.**

* For my own experience in this particular, see my letter to the Treasury Department, of 6th August, 7th September, 8th December, 1817; of 2d February, 18th March, 9th April, 1818; and to the War Department, of 14th February, 1819.

I owe here an account of the origin and my connexions and agency in the Survey of the Coast. I arrived in this country in October, 1805, having relinquished my public stations in my native country, Switzerland, foreseeing the turn of political events, which have since come to pass, and from a predilection for a rural life, with completely different views, and means quite sufficient for them, but which I have still to claim. Having landed in Philadelphia, the late Professor Patterson, Mr. Garnet of New Brunswick, and several other gentlemen, on seeing the books, mathematical instruments, &c. I had brought with me for my private enjoyment, were so kind as to show me some attentions. I had occasion to show them, in conversation, by the scientific publications of Europe, that I had been engaged in an extensive survey in Switzerland, which was interrupted by the revolution. Professor Patterson sent to President Jefferson an account of my former life, which I furnished at his request; and Mr. Clay, the representative to Congress from Philadelphia, before setting off for Congress, in 1806, asked me if I should be willing to undertake the Survey of the Coast, to which I assented.

The law authorizing it passed in that session (10th February, 1807). I received one of the twelve circulars addressed to scientific persons, requiring plans for carrying it into effect. Thirteen plans were received by the Treasury Department.* By President Jefferson's directions, a commission sat upon them at Professor Patterson's, in Philadelphia, formed of the other gentlemen who had given in plans. In rejection of their own, they recommended mine to the President, and Professor Patterson informed me of this by direction from President Jefferson, under date of 21st July, 1807, (to the Military Academy at West Point, where I had been appointed Professor in the interval,) adding, that the execution was for the time suspended, on account of the aspect of politics, but requesting me to propose the necessary instruments and other details, which I did, and interchanged several letters.

My mission to London for the instruments did not take place until August, 1811,† when I resigned the certain and respectable position of Professor of Mathematics and Natural Philosophy of Union College, Schenectady, to, as I thought myself honorably bound, embark in the execution of my plans for a work, in which the disagreements and the pecuniary losses have exceeded by far my compensations.

Shortly after my arrival in London, the war broke out; I was there four years, under the disagreeable situation of an alien enemy, and by the neglect of the Treasury Department left two years without compensation—my drafts for the first of them having been protested, on the plea *that the endorser bought them with the government money*, being greatly indebted to it. He and I returning to this country nearly at the same time, I having faced all my expenses by my private means,‡ the drafts were paid to him in cash—my note for indemnity left in his

* Circular of 25th March—my answer, *Philadelphia*, 2d April, 1807.

† My instruction is of 23d August; my passport from the Department of State, of 19th August, and from the British Envoy Extraordinary, Augustus John Foster, of 25th August; my letter from on board the ship Armata, at sea, 30th August; from London, 17th October—all 1811.

‡ Accounts of 20th November, 1815; of July, 1816; and my letter of 11th June, 1816.

hands, he began a law-suit against me for it, though I had actually still to claim a balance upon him, the Treasury Department left me unsupported, to shift for myself, notwithstanding the previous promise of Mr. Dallas.* It was not until August, 1816, that the *contract* with me, to undertake the execution of the work, was concluded, (which for good reasons I had preferred to an office-like appointment).† I entered upon the work immediately by the absolutely necessary preliminary steps of reconnoitering, and again at my charge for all expenses, &c., as the funds appropriated to the public part of the expenses, by agreement with Mr. Dallas, were refused by Mr. Crawford,‡ and the same was the case several times afterwards. To relate the other difficulties in my way would detain me too long—the ample correspondence between the Treasury Department and myself gives the account of them.

The result in general was, that, though several young officers were detailed, and received extra pay, as attached to the work of the Survey, no angle was observed, and no calculation made for actual use, except by myself. My principal assistant was my son, who received no compensation, and an intelligent man, whom I had taken into my house, and paid at my expense.

In this way I pushed on, by forced exertions, and to the loss of my health,§ to present, to persons totally unacquainted with such works, who always expect more than is possible, a mass of results, which I feel perfectly safe in saying, exceeds what has ever been done in the same space of time in any similar work whatever. The collateral experiments necessary for such a work, are numerous, require time, reflection, care, &c. &c.,‖ and the expenses of them were borne by myself. How many other works attend such an undertaking in the beginning, which do not appear in the ultimate results, is sufficiently known to men of science. All that was rewarded by my being charged, "*that the little progress hitherto made in the work has caused general dissatisfaction in Congress,*"¶ which I thought even ignorance and malevolence united could not dare to prefer, though Colonel Roberdeau reproduces it in other words, and which I answered instantly.** If that had been the case, how could I, at a sudden, unexpected, interruption of the work, have presented a full, ordered, systematic mass of work, ready for use, and in good order.

I invite competent men or *authority* to a full perusal of all the documents. But I must decline being judged by the report of the Treasury Department to Congress, because the documents are *mutilated;* and even the *compensation* of my manifold *pecuniary losses,*

* Contract signed by Mr. Dallas, 3d August, 1816; my letter of 11th June, 1816.

† Letters of the Treasury Department, of 13th September, 1817; of 18th July, 1816; my letter of 16th October, 1816; of Messrs. Barings to me, London, 28th June, 1815, and others.

‡ Letter of the Treasury Department, 30th November, 1816.

§ My letter of 3d April, 1818.

‖ My papers in the two volumes of the Philosophical Transactions of Philadelphia, and the reviews of them, London Quarterly Journal of Science, Revue Encyclopedique, &c. &c.

¶ Letter of the Treasury Department, 8th April, 1818.

** My letter to the Treasury Department, 9th April, 1818.

in my connexions with the Government, *would by no means be an injustice.* In concluding, I feel it my duty to refer to a fact in relation to national civilization and improvements, as shown by the universal history of mankind. The nation that shall exclude from itself the admission and use of foreign talents and knowledge, must always remain behind in the paths of civilization, and will appear comparatively barbarous, if not really become so. Sciences, arts, and ideas for improvements, are the common property of all nations—their mutual ties—and can not be successfully cultivated without free intercourse, exchange, and intermixture.

It is surprising to hear a contrary assertion promulgated in the United States, (as the writer of the "Observations" does, by the over weight which he claims for his native talents!)—in that country, that ought to be adduced as the most striking instance of the truth of that principle. Every civilized nation of Europe has contributed its share to that happy mixture of knowledge and ideas of improvements, that has caused the character of this country to rise to so high a standing. I do not hesitate to assert, that the continuance of this intermixture is essential to its future progress, and, I may add, vitally important to its existence as an independent nation.

F. R. HASSLER.

New York, January 8th, 1827.

Mr. Hassler, whose answer we this evening insert, to what he conceives an attack upon his professional skill and character, made by Col. Roberdeau, of the United States Engineers, through the columns of the *National Journal*, is a gentleman of the highest attainments in mathematical science, and who has, as it seems to us, been at least harshly dealt with by the Government.

An ACT to repeal part of the Act entitled, "An Act to provide for Surveying the Coasts of the United States"

Sec. 1. *Be it enacted*, &c. That so much of the third section of the act, passed the tenth day of February, one thousand eight hundred and seven, entitled, "An Act to provide for Surveying the Coasts of the United States," as authorizes the employment of other persons in the execution of the said act than the persons belonging to the army and navy be, and the same is, hereby repealed.

Approved: April 14, 1818.

Montpelier, December 3d, 1825.

DEAR SIR:—I have received your favor of November 25th, with a copy of the papers relating to the Survey of the Coast, for which I return my thanks. Not being able to bestow on them a critical examination, I must infer, in part, the merit of what has been done, from the scientific and other qualifications, a confidence in which led to your selection for the important work. With an expression of my continued esteem and respect, I pray you to be assured of my best wishes.

JAMES MADISON.

F. R. HASSLER, Esq., New York.

Translation from the Bulletins des Sciences of Paris, of 1826, *vol.* x, *page* 207, *part Plans and Charts.*

Papers on various Subjects connected with the Survey of the Coast of the United States, by F. R. Hassler, &c.

These papers which form the greatest part of the second volume, in quarto, of the American Philosophical Transactions for 1825, are composed of different parts, which we shall here analyze.

1. A letter of Mr. Gallatin, Secretary of the Treasury, requesting the solution of several questions relating to the Survey of the Coast, and the soundings. It is proposed in it to determine, by astronomical observations, the true position of the most remarkable points; then to unite these points by triangulations; lastly, to take the soundings of the coast, and particularly those of the ports.

2. An answer of Mr. Hassler, which passes under review the principal difficulties of the subject, and indicates a series of operations, as well geodetical as astronomical, proper to fix the situation of the most important points of the coast, and especially of the light-houses and the high grounds. As this discussion is entirely conformable to the principles adopted in geodesy, it would be useless to quote here the processes proposed by Mr. Hassler, which are entirely those in use,—at least, so far as localities do not oppose; and it appears from this letter, that Mr. Hassler, having but shortly before arrived in the United States, could not yet foresee and determine these difficulties.

3. The same scientific man furnishes afterwards a general plan of operation for the Survey of the Coast of the United States. He proposes to build two astronomical observatories, the one in Maine, the other in Lower Louisiana, in order to observe all the celestial phenomena, both of the arctic and the tropical regions. These two observatories would be the points of departure of the general operation, which would thus rest upon perfectly fixed points, and of which the republic would afterwards derive great advantages, either for

navigation or for science; they would be the residence of permanent astronomers, having in charge from the Government to accomplish all the public functions, having reference to the applications of all the most approved methods of astronomy to geodetical as well as astronomical operations. Proper measures for the measurement of base lines were then to be procured, and the effect of the temperature upon their length ascertained. The country should be explored, to find a proper locality for a base line. At the same time, a chain of triangles should be extended over the whole coast, of which the sides would be about thirty miles; and besides the angles, the azimuths of their sides would be measured, and also the latitudes and longitudes of a number of points. Other triangles of a secondary order, the sides of which would have about ten miles, would be determined within the first, in order to determine a sufficient number of points for the topographical survey. Mr. Hassler indicates the instruments necessary for those operations, and indicates the principles of subordination to be established between the different engineers to be employed, in order that no opposition should create difficulties in the work.

4. Then follows the catalogue of the books and instruments procured for this geodetical operation, as theodolites, repeating circles, reflecting circles, artificial horizons of mercury, magnetic needles, transit instruments, standard bars to measure the base lines, the French weights and metres, chronometers and astronomical clocks, large achromatic telescopes, micrometers, barometers, thermometers, &c.; lastly, various French and English works relating to astronomy and geodesy.

5. Mr. Hassler gives a very detailed account of the standard length measures which he has made use of: the first is an iron metre, standarded in Paris in 1799, in presence of Mr. Tralles, then Deputy from Switzerland to the Committee of Weights and Measures, and which may be considered as perfectly authentic, as it has been verified by the Members of the Institute of France: the second is an iron toise, made by Canivet, and standarded in 1768 upon that of Peru, at the temperature of 16° Reaumur; the double length of the pendulum under the equator is marked upon it, because at that epoch, Dionis Dusejour proposed this length, in preference to the arc of the meridian, for the unit of length measure; the third are copies of toises of Laland, which have been compared in 1765 to Bird's scale: the fourth a brass metre, standarded by Lenoir, and compared by Messrs. Bouvard and Arago, in 1813, with the iron metre of the Observatory of Paris, and which was found too short for 0.01 of a millimeter: the fifth an iron toise of Lenoir, standarded by Lenoir, and which the same astronomers have acknowledged as exactly of the same length with that of Peru: the sixth and seventh, two brass metres, not compared to that of the Observatory—(*this is a mistake*): the eighth, a brass scale of Troughton, of eighty-two English inches, divided into decimals, upon a strip of silver inserted in its whole length, bearing the arms of the United States. To this scale is adapted an apparatus to compare length measures, described in Nicholson's Journal. This apparatus has served to compare all the length measures together, and with the

standard of Sir George Shuckburgh, upon which all the English toises (fathoms or double yards) are regulated.

The paper gives the description of an instrument proper to draw upon a straight line exactly perpendicular to its length. It is not possible to analyze this part of the work.

Then follow all the details relating to the comparisons of the various measures—the cares that are necessary to dispose properly the comparing apparatus, to determine the temperature, to avoid that the heat of the body of the observer could alter it.

It is certain that this operation has been conducted with great precaution and real talent. The various numerical results are given in the paper, with those of Pictet and of Kater; the consequences which are drawn from these comparisons deserve to be ~~given~~. quoted.

6. These different results prove that all the metres standarded are somewhat shorter than the original which has served as type for them; because when they were worked, whether by filing or by grinding the extremities, to reduce them to the proper length, they have unavoidably taken a certain degree of heat, which has lengthened them, and has not yet entirely disappeared at the time of the comparison for the standarding; the metre being made equal to the standard under those circumstances, becomes too short when it is completely cooled down.

Mr. Hassler describes his apparatus for measuring the base lines: he states that he had means to obtain multiples of the metre, such as it results from the measurement of the twelve degrees of the meridian measured in Europe. He will elsewhere give an account of this. His bars were eight metres in length. The author explains with what care he has fulfilled the four following conditions.

(1.) To determine with precision the length of the bars used as units in the measurement.

(2.) To make that at the beginning of the end of the bars coincide exactly with the beginning point of the base line.

(3.) To orient it in a certain direction.

(4.) To ascertain the inclination of the bar to the horizon. The apparatus used in these operations are described, and the figures given in the plates.

7. There is a description and a drawing of a theodolite of two feet, used in the observations; details upon the use of this instrument, and the means to avoid all possible errors.

8. The author then explains the system of the signals he used, and the mechanism of the wires of his telescope. He rejects vertical posts and truncated pyramids, which he considers as offering deceiving phrases. He prefers a gilt globe, which adapts very well to the angles of elevation. He employs also truncated cones of sheet tin. These cones, of about twenty inches high, are placed with their axes vertical upon a vertical post; they appear as luminous points, at thirty to forty miles distance.

There are also some additions to the telescope described.

9. The description of the adjustments of the repeating circle, and of the methods of observing a series of vertical angles to determine the level. The author makes use of the reflection of the stars upon a

mercurial horizon to ascertain the verticality of the revolution of the telescope. He views directly to the pole star, then to its image in the artificial horizon, and if the telescope in its motion meet the two objects exactly upon the central wire, the telescope revolves in an exact vertical. The levels of the instrument must be adjusted so as always to give this position when the column is vertical.

10. The method to ascertain the exact time, and regulate the chronometers. The author uses the method of single altitudes, which, if made with care, and corrected for the refraction, and, if necessary for the parallax, give the time with great precision, by resolving the spheric triangle formed by the celestial body, the pole, and the zenith, of which the three sides are known; but the celestial body must be near the prime vertical. Taking six or twelve successive observations, the precise time of observations is written; the mean of the time corresponds to the mean of the altitudes, or at least only a small correction is made by the method of Mr. Soulnier.

11. The author gives the description of a repeating theodolite of one foot diameter, and the method to observe horizontal and vertical angles with the same.

12. The description of a repeating circle of reflection, and the method of observing with it—that of a plane-table and its alidade with telescope, to survey the details; lastly, that of a magnetic needle. We pass rapidly over these subjects, which would not be analyzed without the assistance of figures.

13. Mr. Hassler gives details upon the peculiar construction of the transit instruments of Troughton, and of the clock destined for the observatory. The telescope is excellent; the axis formed of two truncated cones, thirty-three inches long; the axis ends are of bell metal, and their pression is eased by counterpoises; the wires are illuminated through one of the arms of the axis; there are screws to place the axis horizontally and in the meridian as usual. The alidade, to indicate the elevation of the telescope, is placed upon an ingenious apparatus which we cannot here explain. To distinguish well the meridian mark, which is commonly not very distant, it has been proposed to add a second object glass before the telescope to procure a distinct image of it. Mr. Hassler prefers to place before the object glass an additional tube, with a diaphragm of an opening of only half an inch, which, according to him, will cause the mark to be seen distinctly, without any hindrance from the loss of light. The clock is of Mr. Hardy. Mr. Pond, who has observed it carefully, has not found half a second variation in its daily rate. The scapements, holes, &c., are of rubies; the scapement is new, and of the invention of Mr. Hardy; the pendulum has a spring suspension, and its supports are immovable; the compensation is made by a column of mercury, seven inches long and 1.9 inch diameter, inclosed in a glass tube, which forms the lens of the pendulum.

14. Then comes the plan of the proposed observatory to be built at Washington, with various remarks upon the principles of its construction, of the trials to put the instruments to. These subjects give no particular occasion to analyze.

15. Lastly, the papers conclude by details upon the organization of the operations in large geodetic surveys, and the application to the Survey of the Coast of the United States,—then tables indicating the manner of registering the daily observations.

These papers, nearly 200 pages in quarto, are of very great interest; they present few new ideas, but the details are extremely well made: they prove the work of a very learned and well-exercised engineer, who knows perfectly all the geodetical methods and the methods of observation, who knows their difficulties and defects, and has diminished the causes of error, and given to the results all the precision possible. This work does honor to Mr. Hassler, and places him in the first rank of geographers.

FRANCŒUR.

The corrections of these papers, published separately by the author, are a table of errata that have slipped in by effect of the distance of Mr. Hassler from the place of printing.

We have besides received the *New York American* of the last Jan. 1827, containing a defence of Mr. Hassler against the Observations of Colonel Roberdeau. Mr. Hassler enters in it into details relating to his life and his works. The author, born in Switzerland, where he has also made trigonometrical observations, came to the United States in 1805. Of a dozen of plans presented to the Government for the Survey of the Coast, his was preferred, and the execution committed to him. Mr. Hassler went to England to procure the instruments, and was there four years as an alien enemy—made a great deal of preparatory work—spent much money—and, notwithstanding that, it appears that he is refused to continue the work at public expense.

D.

Translation from the Révue Encyclopédique of Paris, 1826, *p.* 335.

(In the Review of the Philosophical Transactions of Philadelphia.)

The largest paper contained in this volume is a collection referring to the trigonometrical Survey of the Coast of the United States. This great undertaking was projected in 1807, before the Floridas were detached from the Spanish dominions and enclosed in the United States, which augmented considerably the extent of the coast. The beginning of the work was retarded by the intervening war, and only in 1816 could it be begun.

The instruments had been procured from England and France: it appears that the artists of the United States do not yet construct them with sufficient accuracy. It was also from England and France that the books, the tables of logarithms, nautical almanacs, &c. were procured, which were to be given into the hands of the young officers that were to co-operate in this work. The instruments are described,

and drawings in perspective given of them. This kind of drawing, in which the dimensions are altered, is not that which fits the best for the description of machines. These descriptions, even, are nearly useless; their insertion could have been dispensed with. The method indicated to fix the position of sounding at sea is pretty elegant, though less expeditious and exact than that used by Meunier to determine with the greatest precision the figure of the bottom of the Bay of Cherbourg, for the establishment of the cones which made a part of this open bay.

There is in these papers an excellent one upon the comparison of the French and English standard measures of length, sent from France and England, and the verification of their length. This delicate operation was made with all the means that can afford the best instruments, the science of natural philosophy, the methods of calculation, work and perseverance can furnish. The details must be read in the paper itself; a short analysis would give but an imperfect idea of it. The author of the paper is Mr. Hassler.

Mr. Gallatin was directed by the President of the United States, in 1807, to consult this man of science upon the means to execute the intended Survey. The correspondence relating to this subject is in the beginning of the papers, and presents a very methodical and clear summary of the work.

[Remark.]—There are many oversights and mistakes in these two reviews, but it would be too long to enter into details.

Translation from Mr. Schuhmacher's Astronomical Journal, (Astronomische Nachrichten,) Hamburgh, No. 137. On the plans, arrangements, and methods, proposed and used by Mr. F. R. Hassler, with a view to an accurate Survey of the Coast of the United States, by the Chevalier F. W. Bessel, Professor in the University of Königsberg. (Communicated to the New York American by Professor James Renwick, of Columbia College, New York.)

In 1807, Mr. Hassler, then residing in Philadelphia, was requested, on the part of the government of the United States, to furnish a plan for the survey of the whole coast of that country. This was done in a letter to Mr. Gallatin, which exhibits great knowledge of the nature of such operations. It is evident from it that the survey was to have been a work of great extent, and such as should satisfy the requisites both of geography and of navigation.

In consequence of this plan, Mr. Hassler went to England, to procure the necessary instruments, &c. A most complete apparatus was brought together, consisting principally of instruments constructed upon Mr. Hassler's own ideas; and in the year 1816, the operation

itself began. It appears to have been interrupted soon after, and therefore not to have given the expected results.*

But Mr. Hassler describes his arrangements and methods in a paper, which has also been printed, as an extract from the Philosophical Transactions of Philadelphia, which contains so many new views in relation to instruments, that I believe I shall make an agreeable communication to the readers of this journal by an extract from this paper, which has probably not become very extensively known (in Germany). Mr. Hassler appears in it as a man who would rather think for himself, than imitate others, and whose arrangements, therefore, always bear an independent character.

It is to be lamented, that circumstances should have occurred which prevented the complete execution of the work. To judge from the contents of the publication, not only complete success in reaching the intended object would have been obtained, but also many other useful results.†

According to Mr. Hassler's plan, two observatories were to be established, one in Washington and one in New Orleans;‡ these were calculated, not only for the purposes of the survey, but also to subserve the general objects of astronomy. Of the observatory for Washington the whole plan is given, which appears to me very appropriate: it recommends itself by a minute attention to all that can secure the accuracy of the observations; we miss in it none of those arrangements which on this side of the Atlantic have been made in the most modern observatories; in its special arrangements, this observatory often agrees with the most modern one in Germany, that of Altona.§ The instruments are a *transit* of five feet of Troughton, a *clock* of Hardy, an eighteen inch *repeating circle;* there were also to be placed in it finally a *zenith sector* and a *meridian* (mural) *circle*, &c. I cannot describe the building in detail, but I will remark that it was to be surrounded by a ditch, in order the better to avoid the oscillations of the ground by the passage of wagons, &c. The pillars of the instru-

* The suspension of the operations for the Survey of the Coast of the United States, begun in so admirable a manner by Mr. Hassler, may be considered as a national misfortune. It is such in truth; not so much from the loss of the previous expenditures, in consequence of the delay, or from the deferring of its advantages to a future period, as from the fact, that the principles and methods proposed, and some of them actually used, by Mr. Hassler, were in advance of the science of Europe at the period. As these principles and methods require the highest proficiency in mathematical and physical science, their application to practice originally in the United States, would have redounded to the national honor.

† The opinion thus expressed by Mr. Bessel is praise of the highest description; for no man has ever stood higher as an astronomer than that distinguished professor.

‡ According to Mr. Hassler's original plan, one of the observatories was to have been established in the State of Maine, near the north-eastern frontier, the other in Louisiana, near the south-western boundary of the United States. Circumstances led to the choice of Washington for one; the exact place of the other, although it must have been near New Orleans, was not decided.

§ The close coincidence between the plan proposed by Mr. Hassler for the observatory at Washington, and that erected under the superintendence of Schuhmacher at Altona, is very remarkable. This last is unquestionably the best in Europe, as well as the most modern. Mr. Hassler's plans were presented to our government in 1816; but his papers were not published until 1826. The observatory at Altona was finished in the last named year. Thus it appears that these two astronomers deduced from obvious principles two plans of the closest similitude, each without any knowledge of the other's proceedings, while the American project is prior in point of date by several years.

ments were to be placed upon solid bases six feet thick, standing in a cellar of five feet in depth, and to pass through the floor of the observatory, which was to be supported independent of them. The axis of the transit is thirty-three inches long, which also corresponds to the views of Reichenbach, who considers long axes as not advantageous; the cylindrical parts are of bell-metal, as usual with the English artists. The supports are not between the pillars, but upon them; a strong metal plate is fixed upon the middle of the pillar, bearing the parts which move the Ys, and these are moved in the direction of the meridian by screws, by which the adjustment to that direction is made; the usual vertical screw is not in the arrangement; instead of this, the piece bearing the Ys is formed like an arch, the middle of which is supported by a screw, the higher or lower position of which elevates or depresses it by the different degree of tension of the metal which is produced by the action of the screw and its own elasticity. This method promises to secure complete stability; but it is supposed that the two pillars have the same altitude, and also that no remarkable change should take place in them. The counterpoising apparatus is placed about five inches from the end, and consists of springs, which press rollers under the axis, performing what Reichenbach effects by levers and weights. By Mr. Hassler's arrangement, this counterpoising apparatus occupies the place on the pillars which the supports formerly did: this arrangement likewise appears to me good; whether it would be applicable to very heavy instruments, remains still to be tried.* The two conical axes are not joined by a cube in the centre, but by a zone of a sphere of eight inches diameter, to which the two parts of the telescope-tube are screwed: this arrangement is made with a view to greater stability.

Of the other instruments of Mr. Hassler it will not be possible to give an adequate description without drawings; but I may, however, indicate some of their peculiarities. The theodolite of two feet, not constructed for repetition, appears to me to possess a peculiarly good construction. From a hexagonal centre-piece emanate six horizontal conical arms, whose bases are three inches, and ends one and a half inch, in diameter. Upon these arms the two feet horizontal circle is made fast: three of these cones are longer; these contain at their ends the screw-work for the stands by which the instrument rests upon three vertical cones of brass fastened to the wooden stand of the instrument: between this and the six horizontal conical arms there is room for the verification-telescope, which has precisely the arrangement of a transit, and hangs in its Ys, which are fastened underneath to two opposite radii. This telescope has no lateral motion, but the wires in the focus are directed by means of a screw to the object which is taken as the point of comparison during an observation. In the same hexagonal centre-piece is fastened the vertical axis, eleven inches long, and two inches in diameter. Upon this revolves a drum, nine inches in diameter, and five and a half inches high; upon the upper surface of this

* The transit of the observatory at Greenwich is adjusted in this manner; and, as it is ten feet in length, the doubt whether the plan be applicable to large instruments, is settled by actual experience.

stand two columns bearing the Ys for the transit-telescope, by which the observations are made; this is a complete transit, and the columns are sufficiently elevated to allow its passage through the zenith. The horizontal angles are measured by the revolution of this upper part of the instrument upon the vertical axis, and are read off by three microscopes, which are fixed at the end of as many conical arms coming from the central drum, each having a micrometer-screw. The illumination is made through the axis of the telescope, the one side of which is perforated; the other has an altitude-circle of six inches diameter. The axis is about twelve inches long; which is more than the interval between the columns. Its supports are therefore set upon pieces of brass, elevated above the columns, and extending outwards: they have the same kind of vertical adjustment as the large transit described above.

In relation to the observations with this instrument, Mr. Hassler properly remarks that the eccentricity is equally corrected by means of three equidistant readings, as by two, four, and so on; he also shows that when the vertical axis is not perpendicular to the plane of the horizontal circle, the errors of the angle will be corrected if the position of the instrument's place is alternately changed to the three truncated cones of the stand, so as to give the three regularly succeeding positions of a full revolution. These three observations, each made in the two diametrically opposite positions of the telescope, and by a half revolution of the instrument, give a mean which is free from eccentricity, from any error arising from the inclination of the circle towards the axis, or from any inequality in the supports of the axis; the readings being besides made upon twelve different parts of the division. This two feet theodolite is very properly considered as the main instrument for the survey. For the other observations, repeating circles of eighteen inches, repeating theodolites of twelve inches, and repeating reflecting circles of ten inches diameter, smaller theodolites, needles, plane-tables, &c., are provided. To the most of these instruments Mr. Hassler has given a peculiar construction; but it would be too long, and perhaps without figures not sufficiently intelligible, to give a description of them here.

As signals Mr. Hassler employed truncated cones of block tin, about nineteen inches high, seventeen inches in diameter at bottom and fourteen at top; these were erected upon poles eight feet high, and rendered the best service. At a distance of about forty (English) miles they appeared as a luminous point when the sun stood so that the rays of it were reflected towards the observer; and this reflection lasted during a sufficient length of time. At shorter distances the light was so strong that a dark glass was often required for the observation. Here the same principle is made use of which in Mr. Gauss's heliotrope produces such a decided effect; but the advantages of the different arrangements are very unequal; because the cones of Mr. Hassler do not constantly reflect an image of the sun to the observer, while the heliotrope is constantly kept in the proper position to produce this effect. If the angle of the cone is represented by $2m$, then the cosine of half the azimuthal angle, when light shall be reflected to the observer, must be equal to

the sine of half the sun's altitude divided by the sine of *m*. This would take place only during a moment if the sun had no diameter, and, generally speaking, one signal would be invisible when the other is visible; but, as *m* is only a small angle, (in the cone used by Mr. Hassler it is only 4 deg. 58 min.,) and as from the altitude of the sun, on account of the magnitude of its disk, two limits may be accepted, which are at 32 min. distance from each other, the azimuthal distance corresponding to the altitudes of the sun, which admit of a reflection to the observer in a direction nearly horizontal, has a considerable magnitude within these limits; it, therefore, can have rarely happened that both the signals needed for the measurement of an angle could have shown at the same time an equally well reflected image of the sun: it seems, therefore, that the use of these signals might rather be recommended in particular cases than generally. However, Mr. Hassler says that even without the direct light of the sun, they also rendered good service, and were visible at great distances.*

Mr. Hassler has also communicated his methods for the comparison of the standard measures of length, and the results of their application; we gain by this a new comparison of the French and English measures, which I shall quote more in detail. There were three metres present: one of iron, which was one of those made by the committee of weights and measures in Paris, 1799, and distributed as authentic among the foreign deputies; the two others, the one brass the other iron, were of Lenoir, but not compared directly with the original; they, therefore, were not considered as principal in the results of comparison. These metres were compared with a scale of Troughton of eighty-two inches in length, divided upon silver to tenths of inches, to which is added a micrometic apparatus to take off measures from the scale. Instead of the usual method in comparing a metre *à bouts* with one *à traits*, (to place butting pieces with lines drawn near to the end of them, the distances of which are measured by the microscopes when these pieces are laid together,) Mr. Hassler employed the end planes themselves; for that purpose he constructed the butting pieces exactly of the same thickness as the metres, and obtained, by the close juxtaposition of both, a line, which presented itself like a division-line of the scale. By means of several experiments, (reduced to 32 deg. Fahrenheit, and adopting the expansion of the iron and the brass as Mr. Hassler determined it by his own experiments: namely,

* To use the heliotrope two conditions are indispensable: the attendance of an assistant at each signal-station to direct it to the observer, and its actual illumination by the rays of the sun. Had Mr. Hassler's operation been intended to include no more than a network of great triangles, the heliotrope might perhaps have been used; as no more than two signals need have been observed from each station, and two assistants would have sufficed for their management. But the survey being necessarily conducted with a view to its immediate application to geographical and hydrographical purposes, it would have been necessary to multiply the signals to such an extent as to have rendered it impossible to employ so many separate attendants. Mr. Hassler's signals also answer well even in a cloudy state of the atmosphere, if the other circumstances be favorable, as frequently happens. The objection that two signals could rarely have shown an equally well defined image of the sun, does not hold good when a fixed instrument observing without repetition is employed. We cannot, therefore, but think that for all general purposes the signals of Mr. Hassler are preferable to the heliotrope of Gauss.

between the point of melting ice and the boiling heat of water, iron $=0.0012534363$, brass $=0.0018916254$,) the length of the metre was determined to be 39.381022708 inches of the scale, which, as the standard temperature of the English measure is 62 deg. Fahrenheit, gives the length of the metre in English inches:

$$=\frac{39.381022708}{1.0003152709}=39.36861 \text{ inches English.}$$

The two copies of metres give less, (0.001 inch,) but these were compared both with the scale of Troughton in America, and that which this artist himself uses in London, and had upon both very nearly the same length; whence it may be concluded that both English scales agreed very nearly. Thus, according to Mr. Hassler's comparison, the metre is 39.36861 English inches; according to the comparison of two other copies by Kater, $=39.37079$. According to Vol. III. of *Base du Système Métrique*, page 369, the metre of platinum was $=39.382755$, that of iron $=39.382649$: both measured upon the brass scale of Mr. Pictet reduced to the temperature of melting ice, at a mean $=39.3827$; which, according to Borda's expansion for brass, (0.001783,) by which the experiments made in Paris were reduced to the point of melting ice, from a temperature $=12.75$ deg. centigrade, at which they were made, gives 39.37100. The two last comparisons agree very nearly, and their difference lies entirely within the limits of the uncertainty of thermometrical influence. The authentic metre of Mr. Hassler appears, however, really to be shorter; though it could be brought nearer to the others by accepting other proportions for the expansion of metals.* This, however, appears not to be allowable when the results of different comparisons are to be collected: for the determination of the expansion is as important as the comparison itself: therefore each observer must remain answerable for that one which he adopts. I think it should be inquired whether two metals of the same chemical composition have the same proportion of expansion, or if a small chemical difference may not have a remarkable influence upon it: this investigation is more easy than that of the absolute expansion itself. It can be known only after a previous experiment of this kind, whether the results of the two observers must agree in the same metal, or if it is really necessary to determine the expansion of each piece of metal in particular. I fear that without this inquiry there must always remain an uncertainty in respect to the comparisons of standard measures.†

Among the various copies of the toise which Mr. Hassler compared to the English scale, that constructed by Lenoir, and compared by Messrs. Bouvard and Arago, appears worthy of being accepted as

* The metre used by Mr. Hassler in his comparisons, and which the Chevalier Bessel suspects to have been too short, was *an original issued by the French commission*, and is therefore far more authentic than the *copies* used by Kater. We are happy, however, to be able to state that Mr. Hassler has recently been engaged at Washington in further comparisons, and will probably make his results public in a short time. They are said fully to confirm his former experiments.

† Copies of the metre have been made of platinum; but it will be obvious from these remarks of Bessel that it is by no means a fit substance for such purposes, inasmuch as it is both difficult to work, and not free from adventitious substances.

authentic. When both measures are at the temperature of melting ice, this toise measures 76.74192710 inches of the scale of Troughton. By the normal temperature of both,

$$=76.74192710\frac{1.0002036843}{1.0003152709}=76.73336 \text{ English inches.}$$

As the metre is = 443,296 lines of the toise, (*Base Métrique*, tome III. page 433,) the proportion between the English and French foot, according to Mr. Hassler, will be by the

$$\text{metre,} = \frac{39.36861}{443,296}12 = 1.0657063,$$

$$\text{toise,} = \frac{76.73336}{72} = 1.0656411.$$

According to Kater's comparison, it is = 1.06576411.

It appears, then, that the different copies of the metre do not always agree together. Mr. Hassler deduced from several comparisons the value of the metre in parts of the toise; but this I consider as not allowable: for the ratio between the two is determined by a law, by which the metre has received its true definition; and the earlier one, that it shall be the ten millionth part of the earth's quadrant, was lost. If certain copies of these measures do not agree together, it shows only that the law is not exactly fulfilled by them; and as it is much more difficult to transfer to another metallic bar 443,296 lines of the toise than the whole length of the toise, the comparison of the metre is a circuitous and unprofitable way, as long as the toise itself is yet obtainable as easily as it was at the time of the construction of the metre.

The apparatus which Mr. Hassler had constructed for the measurement of the base line differs essentially from all that are known to me; therefore I will describe it somewhat more particularly. The ends of the bars are not planes, but cut out, so that viewed from above they present the form ⊏⊐; over this middle excavation the hair of the spider's web is stretched, which therefore indicates the end of the bar; over each of the ends a compound microscope is placed, which stands upon a separate support, and therefore does not change its place when the bar is moved or taken away. When this microscope is placed over the spider's web, the place of the end of the bar is determined by it; the bar can then be taken away, and the other end of it can be made to coincide with the point where the first had been before seen to coincide with the cross strokes of the microscope, which in the meantime has retained its position independently. The microscope has the following arrangement: the object-glass consists of two half lenses of different foci, one of which makes in the focus of the eye-glass an image of the spider's web of the bar, and the other an image of two rectangular crossing black lines, drawn upon an ivory plate, which is fastened to the microscope; this arrangement can be elevated and

lowered, and moved in two horizontal directions at right angles to each other. In the use, the stand being first properly placed, the microscope is brought to that elevation in which the spider's web thread is distinctly visible; then it is moved until this thread appears exactly to cut the cross upon the ivory plate; the bar is then removed, and advanced one length forwards; the end of it is next brought into the proper position by the mechanism of the bar, and it is moved by it until the spider's web of this other end coincides again by an optical contact with the cross on the ivory plate. Of these microscopes there are three, with all their arrangements; the last ones always remain standing during the next subsequent operation, that in case of any accident the work might be begun again from them. The bar itself is a junction of four pieces, each of two metres in length, held together by iron clamps: the inclination of this bar to the horizon is measured by a sector, nearly as in Delambre's apparatus. When the work is interrupted during the night, the last position of the bar and the microscopes remain undisturbed in their position until morning. The arrangement of the boxes in which the bars are contained, and the mechanism of the movements, appear to me very well planned.

From what little I have quoted it may be easily seen that the paper of Mr. Hassler deserves the attention of those who take an interest in the mechanical arrangements necessary in practical astronomy and geodesy. It is to be lamented that such a complete apparatus as that now on hand in America has not been applied according to its intention and by its author.

F. W. BESSEL.

NAVY DEPARTMENT,
June 8th, 1830.

SIR:—In compliance with the request contained in your letter of the 26th ultimo, I enclose you the paper entitled "Principal Dates of the Survey of the Coast," which had been loaned to the former Secretary of the Navy, Mr. Southard. I have taken the liberty to retain a copy.

I am respectfully, Sir, your obedient servant,
JOHN BRANCH.

F. R. HASSLER, Esq., New York.

Translation of a Letter of Admiral Krusenstern, from St. Petersburgh, March 6th, 1831.

I present to you a little late my thanks for your kind letter that I have received by Lieutenant Antoless. Absence, sickness, and official business, have hitherto prevented my answering your letter.

I remember very well that I made your acquaintance in 1814 and '15 at old Mr. Troughton's, and frequently I have tried to obtain information if your intended Survey of the Coast of America, for which you had the instruments made in London, had not come to execution: unfortunately, this is not the case, though the navigators need very much an accurate Survey of the Coast of America.

It appears that the American Government has often good intentions, but they shipwreck not unfrequently by the different views of a new President.

As it happened with your Survey, so it happened also with the voyage of discovery; it was ready to sail, and abandoned, as I am informed from America, because the present President did not approve of the undertaking. By the papers I understood, however, that the expedition sailed at last, but shipwrecked—that is, morally. I was informed that two chiefs had been appointed—the one for the nautical part, the other for the scientific. "Two cooks spoil the soup" is an old but very true proverb, which was also verified in this. Two chiefs make chaos, against which the theory also opposes; in the praxis, such an arrangement is entirely to be rejected.

After I had become acquainted with your book upon the Coast Survey, by the Astronomical Journal of Schuhmacher, I am now, by your kindness, in possession of the book itself, which indeed contains excellent things. I have sent it to my son, an officer of the imperial navy, who has already made a voyage round the world with Captain Leïtke. My son works now, under the order of Captain Wringels, (a scholar of our famous Struve,) at a new survey of the coast of the Baltic Sea: he will study your book with great advantage to himself and his work. I regret exceedingly that your talents and extensive knowledge in this branch have not been taken advantage of in America, and that therefore the sciences and yourself lost all the benefit. In Russia your talents would have been better estimated. Such men as Admiral Greig, the astronomers Struve and Knorre, Captain Wrangel, we all would have been happy to take advantage of your services.

I have read with much pleasure the various elementary works that you have been so good as to send to me: it is a great pity that they are so little known with us; notwithstanding the great number of such works in Europe, it could not fail that also, upon these works of yours, an equally advantageous judgment would be given as Mr. Bessel has given of your Coast Survey. Your logarithmic tables I find extremely well appropriated, and I should like to see them introduced here; all depends upon it that the price be not too high; therefore, I pray you to mention to me soon what would be the price of the copy, if a number of 500 or 1000 were taken.

Once more I thank you for your letter, with which you have given me so much pleasure. I hope that, notwithstanding the great distance, you will often give me the pleasure to write to me. If I can be of any service to you here, be assured that it will give me great pleasure.

Accept the assurance of my attachment, with which, &c.

KRUSENSTERN.

REMARKS OF MR. WARD, OF NEW YORK,

In the House of Representatives, on the 29th instant, on the Bill for carrying into effect the Act providing for the Survey of the Coast of the United States.

Mr. WARD, of New York, said he did not rise to oppose the bill under consideration, but for the purpose of submitting to the consideration of the Committee on Naval Affairs the expediency of proposing an amendment to the bill, and which, if adopted, would be a means of saving much money to the nation. The Survey of the Coast, he said, was first contemplated in the year 1807, as appears by letters from Mr. Gallatin, then Secretary of the Treasury, to Mr. Hassler, and was intended for the benefit of our navigating and commercial interests. The law of that year is now proposed to be revived by the present bill, which provides that the President of the United States shall have the power to appoint a suitable person, as astronomer, to conduct it, together with officers of the army and navy. That part relating to an astronomer, or rather the employment of civil characters, was abolished in the year 1818.

Two methods were recommended for the Survey of the Coast, under the act of 1807, and, in his opinion, the wrong one was adopted—*i. e.* one by measuring a series of triangles all along the coast, connecting by them the principal points, and called a triangulation; the other that of ascertaining all the principal points by the use of chronometers and astronomical observations, and technically called the *chronometric mode.* The triangulation mode was adopted, and after being continued for ten years, and at an expense of upwards of $200,000, so little had been accomplished, that Congress put a stop to it, and wisely too, for it would have been an almost endless work, and would have expended for the nation several millions of dollars. Indeed, said he, it would have taken almost a century to complete it, judging from the progress that was made during the ten years that it was continued, and from the progress which other nations have made in similar works:—both the English and French began theirs in 1789—the former was not finished until 1820, and the latter is not yet completed. The triangulation of Ireland began in 1825, and by the report of the proceedings in 1831, it appears that only about one third part was finished. If the law of 1807 should be revived without limitation, it would bring this burthen again upon us.

The reasons why the bill ought not to be adopted, as it now stands, are, that a correct knowledge of our coasts may be obtained in a much shorter time, and at very moderate expense, by adopting the chronometric mode. It is well known, doubtless, to all the members of this House, that very great improvements have taken place in the making of chronometers within these twenty-five years. This mode of ascer-

taining points and places of a coast has been practised with very great accuracy in Europe by the English, French, and Russians, in all their late surveys; the accuracy in combination with astronomical observations is not surpassed by any other mode in ascertaining the position of places. It has been employed to correct the triangulations, and successfully, having detected an error of five seconds in time of longitude in all the stationary points in the triangulation of England.

The Coast Survey, said Mr. Ward, will not be completed, if the method of triangulation is again adopted, under sixty years, and that too at an expense of many millions of dollars, and our navigating interest will derive no earthly benefit from it whatever during all that time. Whereas, if the chronometrical method should be adopted, (and he hoped the committee would propose an amendment to the bill to that effect, when it shall have been reported to the House,) it may be completed in five years, and the results will be of use immediately to the commercial and shipping interests of our country. There are already several accurate surveys of the coast; and all that is now required is, to examine the harbors and different inlets, as also all the principal light-houses, capes, and headlands.

To the Editor of the Globe.

SIR:—Mr. Ward, in speaking in Congress, the 29th May last, on the bill "for carrying into effect the act providing for the Survey of the Coast of the United States," introduced my name in his statement of what had been done under the act of 1807, with such statements as, with all the respect for the full liberty of speech of the members of Congress, oblige me to use my liberty of a freeman, to correct statements that would be injurious to my character with people unacquainted with the facts, as provable by documents.

Mr. Ward says, in substance, as far as relates to me, that two plans were proposed for the work, the one by triangulation, and the other "a chronometric survey;" the first of which was wrongfully chosen by the late President Jefferson, continued for ten years at the expense of $200,000, by which so little had been accomplished, that in 1818 it was very properly abolished.

The facts are:—I proposed but one plan, namely, mathematical, of which all the methods that would be required, and best adapted to the localities and cases, should be applied in their proper place; going, of course, into some details, in which the triangulation, which is under any circumstance the most essential, occupied its proper rank.

Chronometric surveys were then as little in existence as now, or as they ever can be; though chronometers will in all cases be used, as the most conveniently transportable measure of time, which is an indispensable element in all such works.

The whole amount of money laid out under the act of 1807, according to the detailed amounts, passed and deposited in the Treasury Department, is $55,634 $\frac{2}{100}$.

Of this amount was spent for instruments procured from Europe, that have been used in that and other works, and most of which are still on hand, $37,549 $\frac{98}{100}$.

For the other necessary permanent parts of the establishment, and the preservation of the stations, and other incident, in setting the work to rest again, in 1818, was spent about $4000.

Some of the objects produced by this were again sold, and others, I suppose, may be still on hand.

The work of the Survey, in compensation of all employed, and all the incidental expenses, amounted, therefore, to about $13,000.

All the rest of the money, appropriated at different times, returned also at different times to the surplus funds; among these an unexpended balance of $50,000, which had been paid over to the War Department in 1818, with the view that the work should be continued by that Department, under the limitation act then passed.

The contract passed for the work, between the Treasury Department and myself, is dated 3d August, 1816.

The necessary reconnoitering, and other preliminary steps and works, occupied the time up to the 7th May, 1817, when I went into the field for actual survey operations, until 15th December, 1817, and during my calculations of that winter; the whole was interrupted the 14th April, 1818.

The ten years stated dwindle, therefore, into seven months and eight days actual field work, and the whole duration of my agency in the actual work, to about eleven months, exclusive of the time necessarily employed in procuring the instruments, and making all the necessary preparations for a work of such extent as the coast of the United States shows.

The work of the triangulation itself occupied, of this time, from 15th July to 15th December—five months, bad weather included.

What was done in that time is shown by the journals and other documents in the topographical bureau, and the account which I rendered of my plans and methods, in the Philosophical Transactions of Philadelphia, vol. II., new series, (which, I am sorry to say, is full of the most serious misprints).

For the fifteen years elapsed since, notwithstanding all that has been spoken upon that subject, certainly not as much can be shown for far more money spent with similar intentions.

The other parts of Mr. Ward's statements are foreign to the subject. I abstain, also, from all particulars and details, and refer to the documents, the book quoted, and a more detailed statement, which a similar misstatement occasioned me to publish in January, 1827, after which I thought future misstatements impossible.

The errors of the statements relating to European surveys stand corrected long ago by the documents published upon them.

I have only to add, that, upon my communicating to Mr. Ward detailed correct statements, in accordance with the above, he immediately

agreed to correct what he had said, in accordance with them, when the question would again come up in Congress; and if that occasion was delayed, a statement to that effect should appear in the papers, as is here done, with his full consent and approbation.

F. R. HASSLER.

Washington City, 18th June, 1832.

An ACT to carry into effect the Act to provide for a Survey of the Coast of the United States.

Be it enacted, &c. That for carrying into effect the act entitled "An Act to provide for Surveying the Coasts of the United States," approved on the tenth day of February, one thousand eight hundred and seven, there shall be, and hereby is, appropriated, a sum not exceeding twenty thousand dollars, to be paid out of any money in the Treasury not otherwise appropriated; and the said act is hereby revived, and shall be deemed to provide for the Survey of the Coasts of Florida, in the same manner as if the same had been named therein.

Sec. 2. *And be it further enacted*, That the President of the United States be, and he is hereby authorized, in and about the execution of the said acts, to use all maps, charts, books, instruments, and apparatus, which now, or hereafter, may belong to the United States; and employ all persons in the land and naval service of the United States, and such astronomers and other persons as he shall deem proper: *Provided*, That nothing in this act, or thereby revived, shall be construed to authorize the construction or maintenance of a permanent astronomical observatory.

Approved: July 10, 1832.

PRINCIPAL CONSIDERATIONS RELATING TO THE COAST SURVEY.

1. The act of 10th February of 1807, and the present act, equally authorize the President to cause an accurate Survey of the Coast and Shoals of the United States to be made. The additions in the second section do not alter this disposition.

2. President Jefferson never put it in any of the Secretary's offices, *ex officio*, but kept the dispositions always in his own hands, generally using Mr. Gallatin for the correspondence, (though he did also some himself,) because Mr. Gallatin understood the subject.

3. So all dispositions remained during the subsequent changes of Presidents and Secretaries, and the instruments are now yet under the

sole disposition of the President, only deposited in the topographical bureau for safe keeping.

4. It is necessary to make the President acquainted with the state and bearing of the subject as soon as possible, that he may not be committed for to the Navy Department, as this might otherwise expect to have the work in hand as matter of course, the bill being reported by the Naval Committee; but it originated in a separate motion of Mr. Verplanck, occasioned by the Presidential Message, four years ago.

5. It is absolutely necessary, for the credit of the Government and the usefulness of the work, that it be conducted in a scientific manner.

6. The general conduct of the work must be in the hands of a man of science, and under a secretary that can call to its assistance, impartially and free, all proper assistance from where it can be properly obtained.

7. The union of various means, in persons and things, is necessary to execute this work; the Navy and the Engineers will be required, each for the part appropriated to them, and civil assistance for others. This will require great knowledge of connections and interests, to prevent clashings that would destroy the utility of the work and its accuracy.

8. If the conduct of the work was in the Navy, or in the War Department, either of them would alternately refuse to work under the other, if not explicitly, at least virtually, by such clashing interests, or views, and dispositions, as would make its progress and useful execution impossible.

9. The Secretary of State appears the best adapted to take the commission of the President for that work, having less detail cares than the Treasury Department.

10. A proper Survey of the Coast must embrace, not only all that relates to the navigation of the coast, but also all the data required for directing its proper defence, &c. &c. from the Cabinet in Washington.

11. This work must be the foundation of all future surveys and similar works; the points of the main triangulation must therefore also be preserved, as starting points for the future; and the mathematical account rendered of the work must arrest and state the results referring to them, to which the alteration which the coast undergoes can be attached at any future time.

12. When properly conducted, this work will furnish several more useful results besides those of the mere survey: in a scientific respect, in spreading useful knowledge—in educating young men of the navy, army, and others, to usefulness in their professions and in the knowledge of the country, so essential in their future career.

13. Details of the plan can only be discussed after the President has decided upon the main preliminary questions.

14. If the work is not introduced so as to reach honorably all these aims, it leads to discredit, and is not worth the public attention and expense.

15. So far as only naval officers, in their present state of instruction, could do it, chart-makers by trade do it already equally as

well. Proofs enough of that exist in the complete absence of any result from all the former attempts made by the navy in that line.

The original of this I delivered to the Honorable Edward Livingston, Secretary of State, together with a letter of Admiral Krusenstern, in original, the 9th July, 1832.

F. R. HASSLER.

Washington City, July, 1832.

MOST HONORED SIR:—The President having committed to your department the execution of the law of the 10th July, 1832, reviving that of 10th February, 1807, "to provide for the Survey of the Coast of the United States," I take the liberty to present to you herewith the principles and views of my plan of operation, which, in 1807, was selected from among the thirteen under the consideration of a committee of gentlemen purposely convened, by the order of the late President Jefferson, under the late Robert Patterson, Esq., Director of the United States Mint at Philadelphia. The length of time that has since elapsed appears to have obliterated the recollection of its nature and tendency, which then procured for it the preference, as capable of giving the necessary accuracy of results, and as uniting the greatest public usefulness with economy in time and expense.

The subject appearing therefore as if new, I must take the liberty to enter into details, occasioning repetitions of things that I have formerly stated; for which I hope I may be excused.

1. In all the applications of exact sciences to practical purposes, the main aim must always be to obtain *the greatest certainty of accuracy in the results;* thence also to obtain the means of proving them by the principles of the science itself: it is even necessary to aim at a much more minute accuracy than might be considered satisfactory, if that degree of accuracy shall be secured which is absolutely requisite in the ultimate results.

These principles dictate positively for the foundation of the work of an extensive survey, the necessity of a triangulation, made with all the best means that science and its auxiliary arts afford; therefore, also, there is not upon this subject a single dissenting voice among men of science in these branches. The peculiarity of the application of this ground-work according to the means and aims in a given case, directs the further use to be made of it; and, in the present state of improvement in practical mathematics, no difference of any consequence could be found in the choice of means and methods to obtain a given aim among professional men of science.

Thence came the approbation which my plans and the description of my work received from the most eminent men of science, both of Europe and of this country, when I published them in the Philosophical Transactions of Philadelphia, vol. III., New Series.

2. In the application of these principles to the Survey of the Coast of the United States, it is required to unite by the shortest route, and therefore by the largest triangles that the localities of the country may admit of, the whole extent of the coast. This will often compel the work more or less to recede from the outer line of the sea-shore; because a great part of it is a low, level, and uniform line, bordered by forests and marshes presenting no prominent objects.

The large inland bays and rivers that empty into the sea, and keep, most generally at no great distance from the actual sea-shore, for a considerable extent a course nearly parallel with it, will present the main facilities for this operation: their outlets and remarkable headlands, capes, and thence also the lighthouses, will thus be united in the most accurate and shortest manner, and receive their precise determination and relative situation.

3. This triangulation will be grounded upon an appropriate number of base lines, measured with the utmost accuracy, distributed over its whole extent in the most favorable and convenient situations. The apparatus provided for this purpose, and described in my papers on the Survey of the Coast, is peculiarly adapted to accuracy, and has been much approved as such.

4. The station-points of this main triangulation must be permanently secured for any future use, of extending the work, or applying its data to other surveys; as, for instance, to the determination of the successive changes in the soundings and channels, of the entrances of the bays and rivers, the shifting of the shoals, bars, &c., to which they all are more or less subject; insomuch that at a future period it will be found advantageous in some places to determine them anew, at regular intervals of time, of twenty or thirty years perhaps: because the history of these changes which would be thus obtained, must guide in any work that may be undertaken for the improvement of the navigation of these places; and other useful applications will certainly present themselves.

By this precautionary measure, which I took at the time of the interruption of my former work, every one of my triangle-points can now be made available in the future work.

5. To the trigonometric operations are to be joined all the astronomical determinations that are required to locate the Survey, in respect to its position upon the curved surface of the earth: these must be made with the greatest nicety, and with all the means that the science presents.

They consist chiefly in determinations of latitudes, azimuths, and longitudes, made, as often as time and circumstances will admit, upon all the principal stations; their reference to one another, by means of the trigonometric determinations, will, in addition to the mutual verification that they afford, furnish very interesting data for the figure of the earth, that are indispensable for this work itself, on account of their great influence upon our coast, in consequence of its geographical position, under a considerable angle with the meridians and the parallels for a great part of its extent.

6. It hardly needs mentioning, that a properly qualified operator

will observe such momentaneous celestial phenomena as may occur during the time of his work; these will afford data for his purpose, if his otherwise laborious task allows him to take advantage of them. The establishment of an astronomical observatory, as I had proposed in my plan of 1816, would be of great assistance in this part of the work, besides its general utility; it was therefore, in fact, *economy in time and money*.

7. At each of the principal stations, the magnetic bearings of the compass are to be observed at regular stated times of the day; for this purpose there are, in the collection for the Coast Survey, instruments, azimuth compasses, of proper construction, as described in my papers. It will be proper also to provide other apparatus for experiments upon magnetic intensity, dip, &c. &c. I had some of my own, when I was at this work before; but the press of time and circumstances did not allow me to carry on these observations with the proper regularity.

8. The many and varied observations and other works, requiring scientific knowledge and practical skill, that are included in the large triangulation, and the works connected with it, can, evidently, not be the work of a single individual; it is therefore absolutely necessary, that the chief of the work shall, besides his own work, have the assistance of able and, as much as possible, well-instructed men, having real zeal for the science itself, as well as for the object they are engaged in: these qualifications alone can command that constant assiduity, under all circumstances, which is the essential requisite for success. The results obtained by these means will present a large mass of important information, of great and special utility for the navy, the general use of the Government, and those branches of science which touch the public utility so closely as to be indispensable to any government.

9. Of this operation, a full, clear, and minute scientific account must be published, from the very observations up to the final results, with a description of the instruments, means, and methods employed in it, such as has been published of all such surveys in Europe, in East India, &c., by which such an interesting mass of documents is now on hand, that any man of science, or a government, may consult for a given purpose; among these it is proper that the proposed work shall take an honorable rank. Without such a public and satisfactory account, a work like the Coast Survey could never meet either confidence or approbation; therefore, it would be deprived of all usefulness, and of all credit, in the eyes of the public. We might, perhaps, even say, that, possibly, some parts of our coast may be laid down in the common sea-charts with sufficient accuracy for common seafaring purposes; but the want of any account of the manner and means by which, if ever, they were surveyed, causes the whole to be considered as not deserving of any credit.

10. But only of such a systematic trigonometric operation, with its accompanying astronomical part, is it possible to render such a satisfactory account: all determinations grounded upon accessory means, as chronometric determinations, needle surveys, and such like, do not admit of it; because they are grounded upon repeated approximations

that always leave an uncertainty, inadmissible in a concatenation of determinations, and keep every result in a floating condition, rendering the whole unsatisfactory. While, on the contrary, the accounts of triangulations that are extant, such, for instance, as of the French works, of which some are now a century old, are such, that they could be, and actually have been, calculated over again, by the newer scientific means, to a satisfactory comparison with the newest works. In fact, such descriptions, and the results of such works, never die for the sciences and for future usefulness; and such must be the aim of the Coast Survey, if it shall deserve the attention of the nation, and the expenses inseparable from it.

11. In point of economy of time and money, it must be at once obvious, that only that method can be economical in both respects, which gives directly accurate and constant unchangeable results, and the most in a given time: this is obtainable by the trigonometric operations above described, and *by no other*.

To presume upon stating a precise time within which such a work, undertaken in any way whatsoever, will be fully accomplished, is altogether preposterous, and might be considered as a proof of a want of acquaintance with the subject. The localities of the country, which have never yet been closely investigated; the peculiarities of the ground of the soundings; the more or less favorable seasons or circumstances; and the means in operators, instruments, and accessories, that may be disposable, have too great an influence, to allow one to speak upon that otherwise than for giving detail parts. The men in whose trust the work is given must, by their honesty and zeal for the work, deserve the confidence of the Government in this respect, as well as in all others: their honor and credit are too closely enlisted in the task, not to call forth all their exertions towards presenting honorable and early results: in this, and in their ability, lie the principles of all possible acceleration, as well as of the successful execution of the work.

12. Those parts of the sea-shore that do not admit of being taken up directly in the large triangulation, and which lie intermediate between any two points of the same, will be accessible, from the one or the other of them, by secondary triangles, receiving their determination and verification from the large triangulation. Thus the errors which a close following of the sea-shore, by too small triangles, might introduce, will be avoided, as well as the local difficulties which these localities present; this proceeding will relieve the operators from all anxiety upon their ultimate results, and avoid the influence of all those local difficulties upon the great main results of the work; it will therefore greatly accelerate the work, and it will be possible to execute these parts with much less expensive means.

13. Besides this interpolation of the less accessible outer sea-shore, the interior of the main triangulation will be filled up with similar secondary triangles, receiving their determination from the larger chain, and forming the trigonometric canvass of the detail surveys of the bays and large rivers, which must be inserted in the general work by their means.

14. These two parts will be the works of able assistants or engineers, either from the army, the navy, or civil engineers, who may present sufficient guarantee for accuracy; they shall give a proper scientific account of the part of the work committed to them, proving the accuracy of their results from the very observation up, in a similar manner as in the large triangulation; and these accounts must be deposited, for future use, with the whole mass of the works.

15. The fully minute detail topography, forming the filling up of all the preceeding operations, will be made best, and more quickly, by the plane-table, which, for this purpose, has peculiar advantages; presenting to the surveyor the land, at the same time that he makes his geometrical delineation of it; dispensing him from loading his memory or note-book with details that can never be so minute and accurate as the actual aspect; besides that, any accidental omission or mistake can be corrected immediately, which would lead into difficulties, in the habitual way of plotting from field-books. To these surveyors the triangulation is given accurately upon the papers which they have to fill up; and, for this purpose, the projection of the triangles must be peculiarly adapted; under this guidance, no error can occur without being immediately detected, before it has become of influence; thence, also, the surveyor works with great security and consequent celerity, relieved from all anxiety as to his results, because all distances are given to him.

16. Surveys with compasses and chains, as in common land-surveying, are, in no case or stage of the work, admissible, under any form whatsoever. The scale of the whole work is given by the triangulation down to the very details; only minute detail distances may occasionally be measured by the chain, where, in a line of sea-shore, off-sets are to be taken, which the detail surveyor may not be willing to delineate by estimate.

17. For the main triangulation, the principal instruments are still on hand, from the collection made in time for this work; though needing some repairs, they are, however, immediately available, though, in future, an extension of the collection may become desirable and advantageous. For the secondary triangles, this collection, as formerly made, is more reduced, on account of their application to other useful works, of the Engineer Department, and otherwise.

Of the plane-table instruments I caused only two to be constructed in London, to serve as samples for the greater number required, which it was my intention to have constructed in this country as they should become necessary.

It will be proper to observe here, in passing, that the great variability of the refraction on our sea-shore precludes entirely the use of the repeating circle with two telescopes, measuring the angles in the plane of the objects; for the triangulations, an instrument of the theodolite kind, that is, measuring the horizontal angles, is alone applicable, while a repeating vertical circle is indispensable for the vertical angles, both terrestrial and celestial.

18. Thus, and by these means, the Survey must be brought to delineate the whole sea-shore, and all the principal bays, harbors, and

rivers, navigated by sea-vessels, to such limits as may be desirable. The multitude of triangle-points, and other well-determined prominent objects, along the sea-shore and in the neighborhood of it, selected also with a view to their greatest distant visibility at sea, furnish now a number of well-determined accurate base-lines for the nautical survey; upon them the determination of the points of the soundings must be grounded, and can alone be grounded with any hope for accuracy, within the limits of their visibility.

This applies, therefore, equally to the soundings along the outside sea-shore, and to those of the inlets and inside bays and rivers.

19. The method most advantageous, as well as most expeditious, for the determination of the places of soundings, within sight of some of the points determined by the survey on land, is the application of the problem of these points: it is proper that this be done always upon a double series of points, if ever possible, for mutual verification; because, the position of the vessel being temporary, any error or omission would be irrevocable; and in the case of the points falling in a circle, which cannot always be judged from the point of observation, the problem itself becomes indeterminate, and no result would be obtained: other methods, which individual localities may suggest to a well-informed observer, will but seldom occur, so that it would be useless to enter into details in respect to them.

20. The determination of the place of a vessel at the moment when any sounding is taken, requires therefore, at least, three simultaneous observations with reflecting instruments, which are the only ones applicable on board of vessels. The collection of instruments for the Coast Survey has several reflecting repeating circles, made according to my directions, so as to correct all the errors of the instrument by a double observation. Though, in this individual case, the repeating circle may not always be applicable, for want of time of stay of the vessel, their result will, however, be preferable; because, even by a single observation, they furnish correction for eccentricity, &c. Though, therefore, for this special part of the work, other good reflecting instruments will, of course, be equally used, they will serve better in all observations connected with astronomical observations, as admitting more time. A greater number of reflecting instruments will, of course, be required in the sequel of the work, and it will be proper to have them as uniform as possible, because the observations made by them will necessarily often be plotted by other persons in an office, in the absence of the observer, whose journals must therefore be kept very explicit and minute, as well as upon a general conventional form.

21. For soundings out of sight of land, where such may occur, those operations will be brought into activity that are dependent upon the joint results of chronometers and reflecting instruments, in the manner of determining the place of a vessel at sea, or the simple geographical determinations of latitude and longitude, by astronomical observations, which are too well known to need a detailed mention, except that it must be observed, that the chronometric determinations of time on board must always be compared with corresponding ones on shore, at the nearest well-determined places, and that

even without removing the chronometer from the vessel to the shore, or inversely, as the alteration they might undergo by it might easily be more than all the errors of the observations might be. For these observations out of sight of land, the repeating reflecting instruments will be particularly advantageous; the results obtained with them, by different observers and under various circumstances, have given the fullest satisfaction.

Though it might be attempted to try the determination of soundings out of sight of land, by the rate of going of vessels from well-determined points, either with steam-boats or others, there is too much uncertainty remaining, in respect to the steadiness of this rate of going, to allow the expectation of greater, or perhaps even the same, accuracy from such a method, than from the mere geographical determinations just quoted.

22. Otherwise than in the manner and in the case detailed in the preceding section, chronometers can never be used for any determination of distances in an actual survey; though they will be used as the most convenient instrument for the determinations of smaller intervals of time for the astronomical observations connected with it, on account of their transportability; by this qualification they have greatly superseded the use of the clocks that were employed before. But, notwithstanding all the improvements of later years, they, by their construction, as well as by the nature of the determinations themselves, which they are intended for, cannot enter into any line of comparison with the means that we possess from other sides, and the methods above described; their accuracy is, besides, subject to uncertain chances, to which it would be the utmost imprudence to subject the results of an extensive survey. It is seldom that a chronometer retains the same rate on board of a vessel as it has on shore; therefore, not only the transfer from one state to the other is to be avoided, as above stated, but even the well-determined rate on shore is no fully certain proof of its rate at sea. From all these circumstances, the accuracy of chronometric results is always more or less in a floating state, inadmissible in a survey, though it may be disregarded in trans-marine determinations.

This uncertainty forms, in some measure, for each chronometer, a certain determined quantity, that may equally affect small and large differences of longitude; because, the effect of any defect of a chronometer is dependent on the accidents to which it is subject by it, and not on the intervening length of time. Chronometers free of defects are never obtainable with certainty; chance has still the greatest share in producing them; thence arise the high praises which chronometer-makers bestow upon themselves in their public advertisements, when, among so many hundreds of chronometers, which they make, two or three are successful; and these have been bought, as a reward, by the government of the country where they were made.

23. It may be still observed, in relation even to that use of the chronometers which has been assigned to them, that a permanent well-attended observatory would be of considerable service, in like manner as the observatory of Greenwich has served for the determination of the longitude of Madeira and Heligoland, &c. &c., made by Dr. Tiarks, under order of the British Government, which has been both the most

successful expedition of this nature ever made, and the fullest proof of the inapplicability of chronometers to actual surveys, and wherever geodetical means are possible; for, of twenty-nine chronometers, all equally well recommended and tried, and rated in observatories, in fact, about three gave satisfaction, and of the rest, a great number cannot even be said to have given a result.

24. In determining the soundings of bays, harbors, or any special part of the shore, it is necessary to have tide-waiters at both ends, and even at intermediate places, observing its stand at properly-divided parts, erected for the purpose, and at determinate small intervals of time, agreed upon and determined by the chief of the sounding embarkation, in order that the soundings made at any time on board may be referred to the state of the tide at the moment, and reduced to an uniform state of low water. The quantity of rise and fall of the tide must be ascertained, as well as the direction of its currents in rising and falling. All the peculiarities of this phenomenon must be minutely explored and recorded, as they are necessary data for the navigation. Such details, and many others relating to other parts of the work, will form the subject of the special instructions, with which it will be proper to furnish every operator in detail parts, all through the work.

25. These are the outlines of all the successive operations that will procure an honorable and permanently useful execution of the work, uniting the greatest utility and the accuracy absolutely required with all reasonable speed and economy. It must be executed by the best means and methods, obtainable from proper artists, and devised by science; the more perfect the means in assistants, instruments, and all that can facilitate the observations and other works, the greater will be the speed, the economy, and the usefulness of the results,—the more fully it will answer its aim, and become the base and standard of any future surveys that may be desired.

26. The present renewed law, by a proviso, prohibits the application of it to the establishment of a permanent astronomical observatory, no doubt, with the view to provide, in a more adequate manner, for such an establishment as the state of civilization of the country, and the wants of the navy, actually require, for utility and credit equally. When even New Holland and the Cape of Good Hope have such observatories, that have yielded permanently useful results; and Russia, a country that rose out of complete darkness, at the same epoch when our country received the first impression of civilized footsteps, has about twenty well-endowed public observatories,—we can no longer delay such an establishment. The amount paid annually by the navy, for ascertaining the rates of chronometers, to watch-makers ill provided for accurate determinations, and which ought to be done in such an observatory, would provide a considerable part of its maintenance; and some of the most essential instruments needed are still in the collection made for the Survey of the Coast. The absence of the assistance of such an establishment, for the Coast Survey, must necessarily be supplied, in the mean time, by temporary arrangements, such as I had already begun preliminary to my former operations.

27. Of the mechanical organization of the work it will not be neces-

sary to speak much in detail. It is necessary that the general direction be under a man of proper scientific acquirements in that branch of applied mathematics, in the same manner as all the great works of this nature have been in Europe: all originated first and were directed by members of academies of sciences or philosophical societies. For the assistants, the secondary triangulation, and the details, men of sufficient capacity and knowledge in each kind of work must be selected and placed under the direction of the chief, to enable him to accelerate the work gradually more and more, as more elements are obtained for their employment; and the law very properly provides, that naval and military officers, and citizens, should be employed indiscriminately, according to the peculiar direction of their knowledge and their fitness to the different works. A chief to whom the work can be entrusted will know how to make the distribution and the detail organization in such a way, as to take the best advantage of this disposition of the law, and of the men in the three classes, who undoubtedly will present themselves, to tender their assistance in a work that will be considered as an occasion for useful and honorable employment of their endowments and acquirements.

28. It is, of course, necessary that the assistants be all directed to follow the directions of the chief, who will give them written instructions as to their functions, and the principles most proper to follow in their works; that they deliver all their works, journals, &c. to the chief, and to no other person; that, therefore, the work shall centre around him, until ready for delivery to the Treasury Department, without whose orders or direction, no part of it shall be communicated to any other person. The chief must, by his own work and the organization of the whole, have provided himself with proper means to verify the works of the assistants in each branch.

29. As the results of the works must present, not only the delineation of the shore, the soundings, and what may appertain to the safety of navigation, but also all that can in any way be useful for the direction of the defence of the coast, in any given case or place, it is evident, that the entire mass of the results of the work is for the Government of the country alone, and only the part useful for general naval purposes is published in the charts. Thus the works of this nature are always treated in Europe, and this very reason is alone the cause why they are not generally known.

30. As my former operations in this work were already made with all these views, and in conformity to this plan of operation—as the instruments procured by me in time for this work are calculated for such a plan, there are in general more means on hand to execute the same than there would be for any other plan; my work of 1817 becomes immediately available for the purpose, and it will be possible to present, at a much earlier period and at much less expense of outfit, valuable results. The preliminaries of such works are, by their nature, always long, and very tedious; these are, in part, made by my former works, and, therefore, so much of time and expenses is directly saved; besides that, the approbation which this plan of operation has received from every competent judge and the public in general, appears to

stamp it as the only one that can be adopted with credit and success.

31. I might quote, as additional support, more particular details of the numerous works that have been executed, all invariably upon the same principles; but they may be considered as sufficiently known by the extensive public accounts of them that are printed. I consider it therefore proper to refrain from extending this letter over these particulars, as not properly appertaining to an official paper.

I have the honor to be, with perfect respect and esteem,

Most honored Sir,

Your obedient servant,

F. R. HASSLER.

Hon. LOUIS M'LANE, Sec. of the Treasury of the U. S.
Washington City.

Upon the Articles of Agreement between the Treasury Department of the United States and F. R. Hassler, relative to the Survey of the Coast of the United States.

1. Mr. Hassler engages to undertake the direction of the Survey of the Coast of the United States, according to the law to that effect of 1807, and the act to put the same in activity, passed in 1832, as well by performing such of the principal parts of the same as will require his own personal work, as by directing and superintending the work of such officers of the army and navy, and also civil engineers, as will be appointed, upon his recommendation, in the other parts and the detail surveys, the determination of soundings, and such like.

2. He will, for that purpose, have the use and disposition, for himself or his assistants, of the instruments and all other necessary implements, books, &c. that have been procured in time for that purpose, and such others as will be procured successively for the same use.

3. He will also be provided with the proper means of safe conveyance of these instruments and other objects, either by land or by water, according to the arrangements which he will make, at proper times, for that purpose.

4. He will receive the assistance of such officers, cadets, midshipmen, or other men of the military or naval service as will be appointed upon his request, and who will be provided with all their necessary field equipments, &c.

5. All the assistants and men, military, naval, or civil, that will be appointed for this service, will be ordered to conform to his instructions and directions, and in case of their refusal, he will have the liberty to order them to report for other services, or dismiss them.

6. He will have the sole and free disposition of the carriages or other means of conveyance, and other objects or implements appertaining to the equipments for this work.

7. He will be provided with tents for the instruments and for the accommodation of himself and his assistants, with the necessary tools for preparing stations, placing signals, and the other necessary works, for the encampment on the stations, and mending implements, &c. that might be in need of it, the necessary means for signals, and for the preservation of the stations of the Survey.

8. One of the assistants will act as accountant for all public expenses made upon the orders of Mr. Hassler, and will receive from the appropriations made for the Survey such sums, at different times, as shall be agreed upon. He will account for them, at stated times, to the Treasury Department, for which service he will receive a compensation.

9. All drawing, plotting, execution of maps, or such like, will be done by the assistants, upon Mr. Hassler's orders, either in their private quarters or in an office, as may be judged best adapted to the case; the office expenses will be paid by the accounting officer on public account.

10. All the stationery needed in the work, as well for Mr. Hassler as for any of the assistants, will be provided by the accounting officer, at public expense, in the field or at home.

11. Officers or engineers, detailed out by Mr. Hassler for separate works, of detail parts, or others, will conform to the instructions which they will receive from him upon their work; they will be furnished with such instruments, implements, and assistance as he will direct; and their expenses of a public nature will be accounted with the accountant above stated. They will report to Mr. Hassler as he will direct: for such works they will receive adequate compensation.

12. Mr. Hassler will receive for compensation of his services $3,000 per annum, and in lieu of his private personal expenses, $2,000 per annum; to be paid together quarterly, upon his draft, bill, or otherwise, unless, in the progress of the work, he should be obliged to make voyages at greater distances, when an allowance, by the way of milage, will be determined.

13. Mr. Hassler will be provided with an ostensible public paper, stating his employment, and the nature and object of the same, to support him in his actions and transactions in any part of the country he may have to go for the purpose of his work, to serve equally for his assistants and the persons employed under him.

F. R. HASSLER.

Washington City, August 6th, 1832.

Instruments, Implements, and Assistance required.

1. These cannot be very essentially different from what they were in 1817. In the present state of the instruments and their accessories, it will be best to give them under detailed inventory, as stated in its

place, to the disposition of the chief of the work, to take the best advantage of them that they will afford, to have them put in as good order as possible, and to allow him to replace the missing accessories the best he can.

2. The carriage made purposely for the transportation of the principal instruments was sold, but is yet on hand, and can be made serviceable until a new one may be constructed, which would most likely delay too long at present. For the other parts of the transportation it will be easy to get a Jersey wagon, as has been used before.

3. Horses and harnesses it will be necessary to purchase, the first strong and sure, the second simple but strong. The mode of transportation of the instruments by a proper carriage, made of a size exactly to serve as a box for them, and upon springs and thorough braces, has been found more secure and economical for this country than the transportation by hand. It admits therefore also to reduce the number of laboring hands for the work of the triangulation.

4. The whole party in the work must be supplied with the necessary tents for their encampment in the field, and other necessary field equipments, besides axes, pick-axes, spades, and other tools, required for the placing of signals, preparing stations, and keeping every thing in good order. (I have even always such tools with me as are proper for keeping the instruments in good order and repairing lighter accidental damages.)

5. It must be observed, that the proper provision and arrangement of the accessories, and even the ease of an observer, are essential elements of accurate observations, as well as attentive and intelligent assistants; both favor the unimpeded and proper progress of the work, and are therefore essentially economical. A defective state of these parts is very detrimental.

6. It is expected that none of the chronometers will be in a serviceable state; that defect may be supplied by the loan of a second-pendulum clock at West Point (of Troughton's arrangement), made expressly for transportation, which is not expected to be in use there;—even a circular instrument of Troughton's, which is there, most likely, in the same predicament, might be borrowed with advantage for the secondary triangles mentioned in the proper place.

7. The selection of the assistants in officers or other able men must, of course, belong to the chief of the work, who will recommend them, and they will receive their appointments from the Department, but, if necessary, removed upon the proposition of the chief of the work. For the present first beginning, to execute the part stated for the immediate work, three such persons will only be required, whom I wish to name, besides what accidental help I shall have to call my son in for, on account of his acquaintance with the former work.

8. The number of laboring men will vary at different times; when the base lines are measured, fifteen to twenty will be required; for the simple triangulations, particularly that proposed at present in completion and extension of the triangulation made in 1817; six or seven may be sufficient, besides the drivers for the carriages and what may be needed for detail triangulations, if they are undertaken simultaneously.

9. The best manner of getting this part of the assistance in laboring men, is to take them from the military, where they may be easily spared from some garrison or other: their habit and regulation of discipline, and their being placed under the order of an officer, introduces much easier the necessary regularity; and they stand for their conduct under proper regulation.

10. The pay and maintenance, in every respect, of the officers and men taken from the army and navy, is in all cases to be provided for and paid by the army corps to which they belong, or the navy in general, according to the regulations in which they otherwise stand: so also they will receive all their equipments. They must in general be considered as coming to this service in the same manner as to any other in their line to which they might be ordered.

F. R. HASSLER.

Washington City, 6th August, 1832.

TREASURY DEPARTMENT.
August 9th, 1832.

SIR:—With the President's approbation you have been appointed to make, under the superintendance of this department, the Survey of the Coast of the United States, directed by the acts of the 10th of February, 1817, and 10th of July, 1832.

The act last mentioned having authorized the employment of other persons as well as those in the land and naval service, such assistants of either description as may be necessary in the work will be provided at your request.

Funds will be placed from time to time, upon your requisition, in the hands of one of your assistants, to be disbursed for such expenses of a public nature as may be properly chargeable to the appropriation for the Survey of the Coast; and he will render his accounts, approved by you, quarterly to the first Auditor.

Those expenses of the persons in the military and naval service employed in the Survey which are chargeable to military and naval appropriations, will be defrayed by the officers of the respective departments, and accounted for under the direction of those departments.

You will receive, in full for all your services, a compensation at the rate of $3,000 per annum, and for all your personal expenses an allowance at the rate of $1,500 per annum, payable quarterly, to commence on the 2d of August, 1832, you having been employed since that time in the necessary arrangements of the instruments and other preparatory works. It is to be understood, however, that you will still continue your services in the construction of weights and measures for the custom-houses as far as may be compatible with your duties in the Coast Survey, without any other compensation than what is allowed for the Coast Survey.

In all other respects than those indicated by this letter, the terms and nature of your employment will be the same as were fixed by the letter addressed to you by this department on the 3d of August, 1816.

The plan of operations and methods formerly adopted by you in the Coast Survey having been approved of, you will recommence and continue the work in conformity with them, including such modifications as are suggested in your report of the 6th instant.

I am respectfully
Your obedient servant,
LOUIS M'LANE,
Secretary of the Treasury.

F. R. HASSLER, Esq.

Washington City, 12th August, 1832.

MOST HONORED SIR:—I have the honor to acknowledge the receipt of your favor of the 9th instant, by which you are pleased, with the authorization of the President, to give into my charge and direction the important national work of the Survey of the Coast of the United States, with a compensation of $3,000 annually for my services, and an annual allowance of $1,500 for my personal expenses, to begin from the 2d instant.

I am too well aware of the great importance of the work, its exigencies and nature, and the magnitude of the task, not to appreciate duly the value of the confidence you place in me by this trust. I shall call up all my exertions to prove these feelings, by conducting the work in a manner as honorable as permanently useful to the country; for which it presents so valuable means, that I feel highly honored by the occasion thus given to me to contribute my exertions toward such an aim.

The diminution of the allowance for my personal expenses, from what they had been rated at in my first appointment in 1816, is not such that within the limits of such estimations made beforehand its effects could be distinctly foreseen; I could only say, that while I was in activity in this work in 1817, my annual expenses in my absence from home amounted to about $2,000. What effect the now somewhat changed prices of things may have in this respect, is of course impossible to foretell; therefore this is so much less an objection with me, as in any case I am certain it is not the intention of the Government to put me to pecuniary loss, and that, therefore, in case it should be found appropriate, this part may easily be modified to the exigency of unforeseen circumstances.

I shall also attend to the standarding of weights and measures, in which I have hitherto been engaged. I have taken such arrangements as will enable my assistant in it, Mr. Schmid, to prepare the works to the last stage of their adjustment which I shall then make

myself next winter, after my return from this year's field-work in the Survey. His acquaintance with the subject, and his practice in that part during his presence in all my former operations, render him fully capable to the task; and his work will abridge mine so as to bring the necessity of my personal attendance within such limits of time as will be compatible with my work in the Survey.

With thanks for the honor of your confidence, I remain, with perfect respect and esteem,

Most honored sir,

Your most obedient servant,

F. R. HASSLER.

Hon. LOUIS M'LANE, Secretary of the Treasury of the United States, Washington City.

Washington City, 19*th September*, 1832.

MOST HONORED SIR:—The journals of my former work in the Survey of the Coast, and the instruments, that I had requested from the collection made for that purpose, are now in my hands, and perfectly packed up. I have fully finished the correction of the proof-sheets of my Report upon Weights and Measures. I am therefore, on my part, fully ready to go into active operations, though late in the season, with the hope, under some favor of the weather, to execute yet such a part of work as, in conjunction with that of 1817, will enable me to present to Congress, before the end of next session, some satisfactory insight into the nature of it.

I take, therefore, herewith the liberty to request the necessary authorization, in any form you will find best, to call upon the proper departments for the assistants that it will be advantageous to provide me with for the present, until, next spring, the nearer and constant measures can be taken upon this part.

I take the liberty to propose, with this view, the following gentlemen, who have offered themselves, and from whose fitness for the present operations I have every reason to expect the assistance which will now be most advantageous to the work, besides that they are now not otherwise engaged, viz.: *Dr. Howard*, of Baltimore, of the Civil Engineers; *Lieutenant V. Bomford*, of Washington, late graduate of West Point; *Midshipman James L. Henderson*, of Washington. I should have liked to add the name of a private citizen also; but circumstances of the moment preclude me from it.

It will be necessary also to have seven or eight men of the army, to assist as laborers, and in the conveyance of the instruments, preparing stations, making signals, and all other incidental works that are consequent in this Survey; and that they be furnished with the necessary tents and field-equipments for their encampment on the stations, the

tools and other implements for their works, also tents for the assistants, &c. A general authorization to that effect, furnished to Dr. Howard, who, from the works he has been engaged in hitherto, is in the habit of making such requisitions, will, I suppose, be all that is needed for him to obtain all this in New York, in the neighborhood of which place my work will be; and I should furnish him with a proper list of the needful. It will be proper also to furnish Dr. Howard with funds to the amount of about $3,000, to defray the public expenses daily occurring, and provide for the restitution of such parts of the appurtenances formerly on hand for the work as are now missing, and others that will become necessary. In this part some expenses have already been incurred, of which the bills will then be handed to him. I take also the liberty to suggest the propriety of fixing for the accounting officer in general a certain allowance, such as you will find adequate to his responsibility and unavoidable small losses in such disbursements.

Upon the special functions of each of the assistants I shall, on their meeting me, give them proper written instructions, as I have done heretofore.

You will oblige me by the earliest possible decision upon the proposed choice of assistants, as also in relation to the funds, and by your communication to that effect. If any delay should occur, I will leave here directions where they may meet me in New York; as the fast advancing season commands also my celerity, in going myself to the actual scene of my work. I have the honor to be, &c.

F. R. HASSLER.

Hon. LOUIS M'LANE, Sec. of the Treasury, Washington City.

TREASURY DEPARTMENT,
September 28th, 1832.

SIR:—In answer to your request of the 19th instant, that funds might be placed in the hands of one of your assistants, to provide for the expenses which will necessarily be incurred in the Coast Survey, I have to inform you that no advances can be made to any public officer or agent for disbursement, without the consent of the President; and, owing to his absence from the seat of government, that cannot now be had. On the President's return, which is expected about the middle of next month, application will be made to him for the necessary authority. In the meantime, payment will be made at the Treasury, on settlements in the usual way, for any articles purchased or any expenses incurred for the Coast Survey. I am repectfully

Your obedient servant,

ASBURY DICKINS,
Acting Secretary of the Treasury.

F. R. HASSLER, Esq., Washington.

New York, October 21st, 1832.

MOST HONORED SIR:—Your friendly favor of the 16th instant reached me only ~~at~~ last night, on my return from some of the numerous errands which I have daily to make when I am here, to activate the mechanical part of my work. I passed next morning at Park-Place, to have the pleasure to see you; but you had left, early in the morning, for Washington. On going the day after to West Point, to see after some instruments, I was introduced to Governor Lewis, who spoke to me in relation to his grandson, Robert Livingston, who had left your letter at my house; I had therefore occasion to inform him of the situation of things relating to my assistants. On my return, I met also Mr. Robert Livingston at my house: after stating to him again what I had said to his grandfather, I advised him to apply during the winter to trigonometry and such parts of astronomy as are of direct use in the work of the Survey, to be the better prepared when in spring the regular arrangements for the assistants in this work will be made.

For the present, my assistants are one (not passed) midshipman and a late graduate from West Point, both good-willing, and therefore useful for the parts intended for them, but unprepared for assistance in the actual observations, for which I had expected the assistance of Dr. Howard, of Baltimore, who was very desirous to join me; but work being on hand for him, in his capacity of civil engineer, the decision was delayed until the arrival of the Secretary of War, whose consent was expected. On his arrival, however, he ordered Dr. Howard immediately to the Monongahela. By this circumstance, not only my own part of work is much impeded, but also my project of giving into his hands the detail triangulation of the part of my work executed in 1817 becomes impossible; and thereby the epoch at which the activity of the navy in this work, which appears so much desired, is postponed for one season farther than I had expected, because only the execution of such a work this fall could make it possible to activate them in the next season.

I have of course tried other means of getting this assistance, but hitherto without effect. I am in daily expectation of an answer upon some demands in this respect, and shall write more in detail upon this, as well as upon other parts of the arrangements that are all in arrear, to the Secretary of the Treasury. That I had thought proper to delay, until I had replaced all those signals of my former work which were to be used in my present: this is now done; and I had for it the assistance of my son, who had been with me in the work before, and therefore had the knowledge of the localities required for this part of my work; and his assistance was gratuitous, as at present I am not authorized yet to employ any assistants to whom a pay would have to be given; and even the mileage usual in active service was refused to the young midshipman accompanying me, which had been allowed before to the officer accompanying me.

I shall not be remiss in my personal exertions in any part; but this

state of things deprives me of much of their effect: as for instance, I had relied upon Dr. Howard, who is much in the habit of making reconnaissances, for this part of my work, and the consequent signalizing, on both sides of Long Island Sound, where our plan was, that he would take one side of it, while I would take the other,—therefore working double, &c. &c.

I have procured under favorable circumstances the necessary means of conveyance, and sent out a trusty and intelligent man to purchase the necessary horses, as the horse-hire during the remainder of this season would already cost more than the horses will cost.

By my personal credit in Philadelphia and here, I have indeed supplied the want of advance of funds for the public expenditures which it had been habitual to make in my former work; because it cannot be expected that so large advances as are required could be made by me. This will not hinder however that, on tendering my accounts in the beginning of next month, I shall be obliged to repeat my request for such an advance, in addition to the payment of the past, which will only supply the extinguishment of these debts.

Besides that, the breaking up of my house here, and the necessary arrangements relating to my family, will require for my private expenses even more than I shall have; and, as the discounts cannot be placed upon account to Government, the operations of that nature have too ruinous a tendency for me.

You will easily conceive also that the precautious economy to which I am naturally compelled (as my credit, as well as my daring in adventure, and the means to bear it, must be a limited quantity) is no advantage to the advancement of the work, therefore not economical.

I shall also have to repeat my request for the assistance in soldiers and field equipments, which has not yet been authorized, and which will be necessary as soon as my reconnoitering tour on both sides of the sound, for which I am now preparing to start, will be finished.

The kind interest which you have taken in this work will, I hope, plead for me in excuse for thus stating details to you upon the present state of the work and its prospects; at the same time, you will be better able to judge, and make such arrangements as will tend to placing, next spring, your grand-nephew among the assistants in the work, upon which I may have the pleasure to speak more with you after my return to Washington, next December.

Renewing to you my thanks for your interest in my behalf in this work, I have the honor to be, with best wishes and perfect esteem,

Most honored Sir,
Your obedient servant,
F. R. HASSLER.

Hon. EDWARD LIVINGSTON, Secretary of State of the U. States,
Washington City.

New York, October 24th, 1832

MOST HONORED SIR :—Having by friends in Philadelphia procured the means necessary for the expenses of the work of the Coast Survey, I was enabled, immediately on my arrival here, to begin my operations, by placing signals again, which my son had here ready for the purpose, upon those stations of my former works which I stand in need of, to continue it further as my plan of operation requires.

In addition to my two assistants, Midshipman Henderson and Lieutenant Bomford, I availed myself of the assistance of my son, who, having been present at my work in 1817, was acquainted with the localities, and therefore of peculiar assistance. I have procured the carriage and Jersey wagon, necessary for the safe conveyance of the instruments and their appendages. Not finding the horses in this neighborhood of proper quality at such a price as I thought would be agreeable, I have sent the man whom I have engaged to take charge of this part of the assistance to a part of the country where they are cheaper and good, to make the necessary purchase.

I have also put in activity the making of the instrument-tents, and other necessary preparations; and Mr. Patten will soon have finished the transforming of the lower part of the repeating circle, that was broken, into a theodolite, according to the plan which I gave him for it, which will produce a very useful instrument for secondary triangles, in replacement of those missing from the former collection for that purpose. The weather was most generally not favorable to my operations; however, I am now ready for the reconnoitering necessary to extend the triangulation over the Long Island Sound, &c., which is the most favorable and advantageous extension of the work in its present state.

I had the expectation that Dr. William Howard, of Baltimore, who desired much to join me in my work, would be detailed for this service on the return of the Secretary of War; but he has been sent to the Monongahela, and I am thereby deprived of an assistant able to second actual observations, as this cannot be expected from my present assistants, who serve well in that part of the work for which I had requested them, but cannot yet be acquainted with observations. I had relied upon Dr. Howard, to carry on, by combined operations, the reconnoitering of the two sides of the Long Island Sound: for the above-stated extension of the work, our plan was to act simultaneously and jointly, on both sides of it. After he would have staid some time with me, I intended to direct him to make the detailed triangulation of the part of my large triangulation of 1817. By these means I had expected to make it possible that the naval operations, which must necessarily be grounded upon those works, could begin next season.

I take the liberty to suggest in this respect that Lieutenant Mackay, of the Topographical Bureau, may be detailed, for this fall at least, to join my work, as I have good reason to suppose that he would soon be able to render the necessary service in a satisfactory manner.

I expected that ere this the order from the Quarter-Master Depart-

ment, for the manual assistance of soldiers, and the furnishing of articles of field equipment, would have been received by Lieutenant Bomford; but he has not yet received any thing: this, however, will be indispensable for the further progress of the work; already in my late operations it would have been an advantage to have two laboring men at disposition.

If Lieutenant Mackay should be directed to join me, he would be the officer to whom the order for the men and the equipments would be directed; and therefore he would bring it with him, if he was to join me immediately, as it is very desirable.

I have been at West Point, to see the clock and circular instrument belonging to the Land Office, which I was authorized to receive, if not in use. Finding the clock now in use with a transit instrument, I considered the usefulness of which it would be to the Military Academy a sufficient reason not to request it; the circular instrument I found such as not to be immediately useful for me, and I therefore also concluded not to take it away at present; it may perhaps be useful in time, for the laying out of the directions of base lines, which just now cannot be undertaken. Colonel Thayer told me, on presenting the letter of request, that these instruments having now been since many years upon the list of those present at the Military Academy, it would require an order of the Secretary of War to authorize him for the delivery.

You will oblige me very much by making the request for the assistance stated here above as soon as possible, and by informing me of the result, for my direction. I have the honor to be, with perfect respect and esteem, most honored Sir,

Your obedient servant,
F. R. HASSLER.

Hon. LOUIS M'LANE, Secretary of the Treasury of the U. States,
Washington City.

New York, January 7th, 1833.

MOST HONORED SIR:—Allow me the liberty which I take herewith to communicate to you a copy of the plan of operation for the Coast Survey, which I have handed in to the Treasury Department, upon request, (some time ago,) as it appeared necessary to present again in detail the principles, nature, and tendency of the work, more than I had thought at first, under the supposition of the recollection of my earlier papers and past events.

As you may easily suppose, it was desirable for me to have the opinion of Mr. Nicollet upon it, he being an impartial man, of experience in this branch, and just near; he has perused it, and in addition to his approbation, I find, in some pamphlets which he communicated to me relating to the plan proposed in time for the map of France, the

confirmation of my assertion, "that there is not a dissenting opinion upon the principles that I proposed among the men of science in this branch," by the speech of Mr. Laplace upon that subject in the Senate, where he said, "that to make such a work there is but one way of proceeding," upon which he goes into a description of the methods, the same as you will find in my present paper, even in the details. I have caused a copy to be made of that pamphlet, which will be delivered to you as soon as done.

The arrangements for the assistance which I needed to proceed in my works having been somewhat delayed, I began of course with the smaller means I had, which gradually increased, as to young officers, to all that I could make use of. But as the necessary field equipments, for my assistance, officers and men, were never authorized to be received, by which the going out with the larger instruments was made impossible, and became unadvisable to attempt at a later season, I found it best to proceed further in placing signals, and laying out the work for the next campaign; and indeed the time would then not have been sufficient to bring the instruments in proper order for use, an operation which is to be done upon the first station in the field.

I returned here on Christmas eve, expecting to find an authorization of the Treasury Department, or the Topographical Bureau, to receive in Boston the instruments from the Coast Survey collection that have been lent to the Governor of Massachusetts, as had been promised to me long ago. As they will be needed for next summer, and may need repairs, &c. before, it is proper that they be procured now, not to be obliged to lose a more precious time for this object next spring. I have repeated my demands to that effect, and am ever since in daily expectation of this authorization, without which it is not proper for me to go to Boston, to expose myself to a refusal on account of the want of it.

I have in the meantime directed the repairs of the instruments that I have now in hand, and intend coming to Washington as soon as I have done the same in relation to those which I hope to get in Boston.

After my arrival at Washington I shall bring into proper order the particular plans, formed in my late excursions, for the triangulation to be executed fully next summer, and its connection with my work of 1817, which I shall then also have the pleasure to present to your inspection.

I have taken the liberty to intrude upon you with this letter, not with a view to call forth any active interference on your part, but because I consider it on my part a duty as well as a satisfaction to keep you informed of the state of this work, which owes to your exertions the benefit of being brought again into a proper and, I hope, honorable channel, towards which I consider myself bound to all exertions in my power.

I have, some years ago, requested from our legation in London the procuring of some weights from Mr. Troughton, and last summer directed Dr. Tiarks also to procure some books, desirable for the collec-

tion of the Coast Survey, to deliver to the legation. The Treasury Department has added to both the authorization to pay all expenses on the account of the Department. The first have never yet been received, but are said to be ready; the second are promised by a letter received yesterday. It would be very desirable that you would please to mention occasionally to the legation, that acceleration of both is much wished for.

If upon the call for foreign weights and measures, which you was so good as to direct last year, some should have arrived, I shall be glad to make the comparison of them this winter.

I have as yet only a part of the copies of my Report upon Weights and Measures, so that I have not been able to give it all the course abroad that I wish. It might lead to informations, if copies of it were communicated by the legations abroad, as the same subject has of late been treated by most European governments, as Austria, Russia, Prussia, Denmark, Holland, &c., besides England and France, from where we have the public accounts. The return communications of the proceedings of other operators in this line would be of great interest for me.

Please to excuse this long letter, and accept with my best wishes my perfect respect and esteem.

Most honored Sir, your obedient servant,

F. R. HASSLER.

Hon. EDWARD LIVINGSTON, Sec. of State of the U. S.
Washington City.

DEPARTMENT OF STATE,
Washington, Jan. 12th, 1833.

SIR:—I have received your letter of the 7th instant, and will at the first opportunity transmit to the Chargé d'Affaires of the United States at London an extract of that part of it which relates to the purchase of weights, and call his attention to the subject. I now transmit herewith an extract of a dispatch from Mr. Vail respecting the books requested of Dr. Tiarks, with copy of a letter from the brother of the latter gentleman. It gives me great pleasure to be informed of the progress making in the interesting work in which you are zealously engaged, and to assure you that every facility in my power will be afforded you for the fulfilment of that object.

I am, very respectfully, your obedient servant,

EDWARD LIVINGSTON.

F. R. HASSLER, Esq., New York.

MR. TIARKS TO MR. VAIL.

48 *Fenchurch Street, Nov. 9th,* 1832

SIR :—I take the liberty to state, that, after having forwarded Mr. Hassler's letter from Washington to my brother, Dr. Tiarks, who has been residing this summer on the Rhine and last at Heidelberg, I have received his reply by yesterday's post, with an inclosure from Mr. Hassler, which I have forwarded by way of Liverpool

As you were kind enough to send the letter, I beg to state that Dr. Tiarks has written to the booksellers at Hanover for the works which Mr. Hassler will require from thence, and that he has sent a list of books which he considered essential, to be bought in London, independent of those which Mr. Hassler specifies. The books from Germany are to be addressed to Mr. John Hunæman, of Queen Street, Soho, who is a literary agent for almost all the Germans who have such kind of business in London, and an exceedingly honest man, and who will therefore, by the time he receives the German books, have collected here and be ready to forward the whole to Washington. I shall take the liberty of stating to you when every thing is complete.

Dr. Tiarks felt very much pleased to find Mr. Hassler again in active service in an undertaking for which he is so very capable, and which has been the hobby of the best part of his life.

I have the honor to be, Sir,
Your very obedient servant,
H. F. TIARKS.

Extract of a Despatch from Mr. Vail, Chargé d'Affaires of the United States at London, of the 14*th November,* 1832.

On the receipt of your despatch No. 6, I called on Dr. Tiarks, for the purpose of delivering to him the letter inclosed in it from Mr. Hassler, requesting the Doctor to purchase certain books wanted for the Survey of the Coast. Finding that Dr. Tiarks was in Germany, I left the letter with his brother. The communication of this gentleman, of which I inclose a copy, will apprize you and the Secretary of the Treasury, to whom I beg that it may be submitted, of the progress which has been made in the execution of his commission.

Montpelier, February 22d, 1832.3.

DEAR SIR:—I have received your favor with the accompanying copies of your Report on Weights and Measures. I have forwarded the two—one for Professor Patterson, and one for the University of Virginia—and shall dispose of the others as you desire. For the copy allotted to myself I return you my thanks. The decrepit state of my health, added to my great age, and other causes, have prevented me from looking much into the work. My confidence in your aptitude for it takes the place of a positive proof of its merits.

I am glad to learn that you are to resume the important labor of Surveying the Coast. I hope you will be able to complete it, and to your own satisfaction, in which case I doubt not it will be to the satisfaction of those who invite you to the undertaking.

I tender you, Sir, my esteem and friendly salutation.

JAMES MADISON.

Mr. HASSLER.

Washington City, February 27th, 1833.

MOST HONORED SIR:—This morning I wished to speak to the Secretary of War upon the subject of the assistants for the Coast Survey to be ordered from his Department, he answered that he would speak with the Secretary of the Treasury upon it, as he was going there.

This evening I am informed that he proposed to establish a Committee of the Under-Secretary of the Treasury, a gentleman from the War Department, and one from the Navy Department, to direct this *business.*

You know that it is the question of *work* which requires certain determined scientific acquirements, and a Committee can do no *work* in this *business*, but impedes all work; now that I was preparing for my early going out, all would come under deliberation, with conflicting interests, and the work of course would be lost.

I will not enter into details or personalities, which I know too well, but wish to disregard. I take only the liberty to state to you the fact, with the wish that you would please to prevent the *starting even* of such a project, because it would undoubtedly bring the work to that shame from which your kind exertions have retrieved it some months ago.

I am sorry that the subject lies so close to me and what I suppose would be considered my private interests, though in an economical respect it is by no means so; I would otherwise have quoted the reasons on the side which interests me more—namely, the true

interest and honor of the country. All that I can say here, therefore, reduces itself in its ultimate: that under any Committee whatever, established as above, the work being impossible, I would be obliged to withdraw instantly, and leave the whole to its unhappy fate, from which I had tried to rescue it, and for which your kind exertions had so well laid the foundation, and concurred with me to make it honorable and useful to the country.

This circumstance gives me to lament that the work itself was not put in your Department, as I had first proposed; though for the ease in respect to the necessary money arrangements, which, by the nature of the work, fits better in the Treasury Department, the arrangement in itself is good, and its former placement in it was an induction for placing it again in that Department. That the proposed Committee would bring it in the line which it is absolutely necessary, for the honor and interest of the country, not to let it fall, is certainly evident to you, and I hope will excuse me with you if I pray you would please to bestow some exertions upon letting the arrangements taken subsist as they are now.

The President having given this law in commission to you and to the Secretary of the Treasury equally, I am, I hope, excused in addressing myself to you, even in form of regular business. The case requires immediate action; because, if a resolution is once taken, ever so erroneous, it is tried to be supported, and any delay will deprive us directly of the work of this year and its expected result, at which I was until this evening laboriously engaged. I hope therefore also to be excused with you for this intrusion, and recommend myself to the continuance of your kindness, and the work itself to your protection.

I have the honor to be with particular esteem,

Most honored Sir, your obedient servant,

F. R. HASSLER.

Hon. EDWARD LIVINGSTON, Secretary of State,
Washington City.

Washington City, March 25th, 1833.

MOST HONORED SIR:—Immediately after my return here from my work of last fall for the Survey of the Coast, I planned a full report upon my past work, an exposition of the plans for the work of this year, with a statement of the assistance which I stand in need of for their execution.

This paper being ready, I considered it proper on my part to speak with the Secretary of War in relation to the officers which my report required, in order that I might present to you at the same time his consent and co-operation in the plan.

Speaking to the honorable Secretary on the 27th February, upon that

subject, and naming to him the officers required, he answered that he would speak with you that same morning.

In the evening of the day I was informed that plans of another nature than those adopted by you, according to my propositions and plan of operation for that work, were in contemplation, which would be utterly destructive to the work itself and its useful and honorable execution. This communication being only verbal, I found it more proper to make also my remarks principally verbally, and to press a decision in proper time, that I might not, by such propositions as would occasion a discussion leading into a loss of time, be deprived of the time which the work itself requires so imperiously; for if I should meet with a delay of only two weeks in the spring, its consequence might be a postponement of the results which I contemplate to present next winter for one whole year; because, if the work cannot, during one season, be brought to a certain result furnishing the proper elements of calculation for the ensuing winter, these calculations are of course postponed for one whole year, because the summer must be constantly employed in the field operations.

Such a delay implies therefore also the postponement of the secondary triangulation, the detail works, and the naval survey for one whole year, while, on another hand, it is very much desired that these should begin as soon as possible.

In this uncertain state of things, my report, intended to be delivered about a month ago, was supplied temporarily by a mere statement of the assistance now required for my further work, which has been left at your office, and I wish it to be presented to you with the present; your answer upon it having been referred to last Saturday, and being expected to meet with full approbation.

Now the season opens, I have executed the preparatory works till to the packing of the instruments; I have furnished the plan of the instrument which is to supply those that are to be given off to the state of Massachusetts, and otherwise, and those that have formerly been broken by accidents; and nothing remains for me to go to the field-work, except the determination upon the assistants.

I intend leaving here this day week for New York, to finish the preparations to go into the field, and am therefore forced to take the liberty to request an immediate decision upon the question of the assistants that I am to be furnished with, according to the agreement upon that subject of August 9th, 1832.

Before leaving, I wish, by your decision, to be enabled to leave here the directions to my assistants when and where they shall meet me, that no further delay may occur.

For the case of any of the officers required by my note here joined should not be able to join me in proper time, I take the liberty to request that you will please to authorize me to select and appoint from among the many gentlemen who have offered to me their assistance in the work, such as it will be most advantageous to appoint temporarily, under such emoluments and conditions as I shall be able to agree upon with them, and will in time communicate to you for approbation.

I must add that the decision is urgent, and that therefore you will extremely oblige me by such an immediate decision as will save to this important work the loss of this year's work. I have, &c.

F. R. HASSLER.

To the Hon. Mr. LOUIS M'LANE,
Secretary of the Treasury of the U. States.

Washington City, March 30th, 1833.

MOST HONORED SIR:—To complete the assistance required at present for the Survey of the Coast in the part requiring civil appointments, I take the liberty to request that you will please to authorize me to enter into negotiation with the following gentlemen in their different capacities, viz.:

Mr. James Ferguson, of Albany, who has been assistant in the Survey of the North Western part of the Boundary Line with Canada, under Major Delafield, as first civil assistant.

Mr. Charles Loss, of New York, who has been assistant of Dr. Tiarks in the determination of the parallel of 45°, east of Lake Champlain, as second assistant.

Mr. Robert Livingston, of New York, who has directed his studies particularly with a view of application to such work, as third assistant.

You will oblige me also to state what compensation you will authorize me to offer or agree upon with them. As soon as I shall know their answers, I shall take the liberty to present the whole to your approbation.

As the rank and file of the army have been considered as not advantageous to be used for the manual assistance of the work, I take the liberty also to request that you will authorize me to engage proper men, under monthly pay, of good conduct, and such as confidence may be placed in for faithful and attentive attendance. The number required will at first be eight; and when either parties are sent off for secondary triangles, or the base-line is to be measured, there will be need of a proportional increase of them, according to the circumstances of the work.

I have, &c.

F. R. HASSLER.

Hon. LOUIS M'LANE, Secretary of the Treasury,
Washington City.

Washington City, March 30th, 1833.

MOST HONORED SIR:—There is needed for the Survey of the Coast an instrument of superior quality for the mixed astronomical and geodetical operations that require peculiar care, and, with inferior instruments, consume a great deal of time, which is saved, and therefore the work so much shortened, at the same time as its quality is much increased, by superior instruments, particularly of the kind and qualification of that which I have made a full plan of, in its proper size, for the direction of the artist in its construction.

This is so much more needed, as the observatory which it was intended to build, by my former plans, is now not allowed to be of a permanent kind, and one of the instruments intended for this kind of observations has been broken by a hail-storm on the Northern Boundary Line, and the others are rather in less good condition than would be desirable.

It is intended to give off several of the instruments from the collection made formerly for the Coast Survey to the state of Massachusetts and to the War Department, for the determination of some boundaries; the amount of which will be refunded to the Treasury Department, for the Coast Survey appropriation, and which will fully and most likely over pay the expense incurred for the above instrument, which will be much more useful to the work in every respect. I take the liberty to request that you will authorize me to order this instrument of Mr. Troughton in London, who, having made most of the instruments that I formerly procured, under my directions, is the most able to understand now my directions and the aim of the instrument.

In the progress of the Coast Survey, an increase of the number of instruments is unavoidable, and to procure them always from abroad long and expensive. We possess now in this country workmen whom I could very well guide in the construction of them; as it was my intention at all times, in procuring of the inferior instruments only in small numbers, to serve as samples for the rest.

But for all divided instruments, better dividing engines would be needed than the artists of this country have and could well afford to procure under the present circumstances. I wish therefore very much you would authorize me also to order a dividing engine of six feet, of the same artists, or of Thomas Jones, in London, which would enable us to have the instruments as well executed in this country as abroad, with much less loss of time, and more appropriated to our individual uses. It is evident that the instruments daily needed for the navy, and otherwise, could then also be procured in this country under the same advantages.

The expense incurred for such an engine would soon be repaid by these advantages, and is not of a sufficient great amount to be considered in comparison with these advantages; and I should recommend to press its construction as much as possible, after the execution of the above instrument. It is evident that both these objects united are a

very great economy for the intended work of the Coast Survey, by the great economy of time which they will procure. Instruments made in this country can be superintended and their execution pressed: in procuring them from abroad, we can only await for the will or convenience of the artist, and ultimately must abide by what he sends us, whether fully appropriated to our aim or not. To these circumstances it was due, that at the first outfit of the work, my mission to Europe for instruments was unavoidable, and it was even difficult for me to obtain all so entirely appropriated to our peculiar aim. I would hardly have more labor now to direct workmen here, in this line, than I had at the time to direct the artists in England. I consider it besides a valuable object to free our country in this respect from the dependence from abroad.

I have the honor, &c.

F. R. HASSLER.

Hon. LOUIS M'LANE, Secretary of the Treasury.

Washington City, April 1st, 1833.

MOST HONORED SIR:—The unfortunate conflagration of the Treasury Department occasions me to take the liberty to communicate to you copies of three letters handed in to you last, as, even if saved, they would most likely not be found immediately, while the decision upon their objects is very desirable before my departure, which I expected, and still expect, to be possible in about two days.

As I always have copies of any document, letter, or other paper, relating to my connections with the Department, I am able to replace any of importance, and therefore will do so gradually.

I join also here the letter relating to Mr. Clinton which you desired.

You will extremely oblige me by the decision upon the questions of my restored letters, as all the rest of the concerns of the Coast Survey can be pursued, according to my arrangements, without any delay being occasioned by the unfortunate event.

I have the honor to be, &c.

F. R. HASSLER.

Hon. LOUIS M'LANE, Secretary of the Treasury.

TREASURY DEPARTMENT,
April 12th, 1833.

SIR:—In compliance with the request contained in your letter of the 29th ultimo, application was made to the War and Navy Departments to have Captain Swift and Lieutenant Bell detailed for duty on the Coast Survey, and placed under the direction of this Department. This has been done, and those officers have been directed to report to you for duty.

Agreeable to your wishes, as expressed in the communications dated the 30th ultimo, you are authorized to negotiate with and employ the gentlemen therein mentioned, viz.: Messrs. Ferguson, Loss, and Livingston; their compensation and allowance to be the same as that of the officers of the War and Navy Departments who may be employed in similar branches of the same duty.

This compensation will consist of the usual pay and emoluments of those officers, and an *additional compensation of $2 per diem to Captain Swift and Lieutenant Bell*, and of $1 per diem to Lieutenant Bomford and Midshipman Henderson.

The compensation to be allowed to the disbursing officer of the party will be a commission of $2\frac{1}{2}$ per cent. upon the expenditures. That duty may be assigned by you to such one of your assistants as you may deem proper.

You are also authorized to employ, as suggested, such number of men as may be necessary for the performance of the duty required; taking care to be as economical in the expenditures for that purpose as circumstances will permit; and also to procure from London the instruments necessary for the mixed astronomical and geodetical operations, and the *dividing engine*.

You will perceive, by the inclosed copy of a letter received from the Governor of Massachusetts, that he declines the purchase for the state, of the theodolite and telescope, as proposed by you; it being probable, as he states, that they will be able to dispense with the use of those instruments by the time they will be required by you.

I remain, very respectfully,
Your obedient servant,
LOUIS M'LANE,
Secretary of the Treasury.

F. R. HASSLER, Esq.
New York.

Round Hill, West Greenwich, Connecticut,
July 3d, 1833.

MOST HONORED SIR:—Your favor of the 25th ultimo reached me properly, and I have herewith the honor to answer upon the various subjects of its contents.

It is rather difficult for me to state from here the per-centage that the accessory expenses of freight, insurance, commission to Messrs. Baring, Brothers, & Co. should be rated at; it could be exactly ascertained from the accounts in the Treasury Department, from vouchers principally not originating with me; except that part of it which is contained in Mr. Troughton's account for cartage, boxes, and such like, and what is in mine for the purchase of trunks for the transportation. However, such an inquiry would be more tedious for any person not acquainted with the details of my mission. I may therefore be near enough in stating, that about 20 or 25 per cent. may be esteemed to comprehend the part of accessory expenses that you wish to take into consideration, excluding the direct expenses of my mission. The disbursement of the money in London, intended to be made from the amount to be received from Captain Talcot, is principally for—1st. an azimuth and altitude instrument, of a larger size than those yet on hand from the collection, which becomes absolutely necessary for the work from the present state of the instruments that I had procured in time, and by the prohibition of a permanent observatory, placed in the law; and, 2d. for the procuring of a dividing engine, which will enable me to direct the construction of the secondary instruments, such as they will be needed for our use in this country.

The great advantages of this latter part are manifest from the following circumstances: 1. It is, I may assert, impossible to get the better kind of instruments, adapted to a certain use not so specially known to the artist, without the personal direction of the mathematician who shall make use of them. 2. The habits in London in the procuring of instruments for this country are generally bad; so that what I expect in relation to the larger instrument that I have ordered of Mr. Troughton, is grounded solely upon the friendly relations in which I stand with him, and I would not expect it from any other artist in London. 3. It will be a great improvement of this branch of industry in this country, where the mere mechanical part of instrument making begins to comes up, and the dividing part cannot yet be relied upon. 4. That it will be more proper, and therefore more economical, even to have well appropriated instruments constructed under inspection here, than to rely upon the chance of what we may get from abroad. The engine required for that aim will be abundantly paid for by the advantages that will be the consequence of procuring it.

Both these objects I stated to the Treasury Department before I left Washington, and they were both approved by the department. If any money should remain there disposable, above what the above two objects will cost, there are yet so many articles needed for the work of the Coast Survey in its further progress, that the balance will be amply used up for some one or other of them; and if it should not be enough, it will also be easy to pay the balance: but as much as I can esteem, neither the excess nor the defect can amount to much.

Midshipman Henderson having sent to me his resignation of assistant in the Coast Survey, there remains now from this side only to decide upon the allowance to be made to an assistant in the second

rank, from the civil side in general; for which I take the liberty to propose the compensation of a lieutenant in the army: by this then the allowance of Mr. Livingston is decided upon, of course. Mr. Edmund Blunt Jun., of New York, whose appointment you have lately approved of, has accepted the same, and will join the work as soon as some business of his, that is now present, will be over.

The instruments of the collection for the Coast Survey that I have now here in use, are now so far again readjusted, as to be serviceable by the methods that I have devised for the special case in which I am placed. The chronometers are, as I expected, very little to be relied upon, above the few hours of interval between the observations, for which alone I make use and have need of them: they administer the full proof of the impossibility of what was once called a *chronometric survey!*

My exertions for the acceleration of my work are extremely counteracted by the quantity of bad weather that we have had: hardly more than one third of the time since I left Washington could be advantageously employed in observations as would be required, much of the earlier time being needed for signalizing, to ascertain the visibility of the stations from each other; what was expected to need three days exceeded more than eight, and the placing of the signals, though even made sometimes in bad weather, delayed equally. That this impediment is still more felt, is evident in the actual works of survey-stations, in which I have been engaged since the latter part of May; and I am now writing when the severe rain causes a dampness under which the paper can hardly be used.

You will oblige me extremely by an early answer upon the credit that you sent to London, that I may inform Mr. Troughton of it, and accelerate the construction of the instrument, which in fact I stand now so much in need of already.

I have the honor to be, with perfect respect and esteem,

Most honored Sir,

Your obedient servant,

F. R. HASSLER.

Hon. W. J. Duane, Secretary of the Treasury of the U. States, Washington City.

Treasury Department,
July, 18*th*, 1833.

Sir:—Your several letters dated the 12th and 14th instant, together with your account of expenses incurred for the Survey of the Coast, during the quarter ending on the 30th ultimo, have been duly received. The accounts have been referred to the accounting officers for examination, &c.

The course suggested by you for remitting funds to London, to pay

for the instruments being made there for the Coast Survey, is approved.

As there does not appear to be any objection to the transfer of the accounts to Captain Swift, you are authorized to transfer to him the balance now in your hands, and any warrants that may be hereafter drawn will be issued in his favor.

On the subject of weights and measures, I can at present only say, that the importance of fulfilling without any unnecessary delay the arrangements entered into with the Treasury Department, will be urged upon the proper officers of the Ordnance Department.

I remain, very respectfully,

Your obedient servant,

W. J. DUANE,

Secretary of the Treasury.

F. R. HASSLER, Esq.

St. Petersburg, July 11*d*, 1833.
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MY DEAR SIR:—Your letter dated New York, 2d January, reached me very late: it is not above six weeks since I received it, through Baron Saken. Pressing business on service, and an absence from St. Petersburg, have prevented me to answer sooner your letter, and to return you my most obliging thanks for the copy of your Report on Weights and Measures, which you have done me the favor to send. The other six copies I have delivered to those persons to whom they were destined. One of the two copies you have left to my option I shall send to Professor Pauker, at Mittau, who has published lately a voluminous work on the same subject, that has won the *prize of Demidof*, adjudged by the Academy of Sciences. He will consider your book a valuable gift; for it is indeed the production of a master, which reputation you deservedly enjoy in Europe as well as in America. I am exceedingly rejoiced to learn by your letter that your government has appointed you at last to carry through the Trigonometric Survey of the Coast of America, unfortunately interrupted for more than fifteen years, a task for which you are so eminently fitted. It appears from your letter that we are chiefly indebted for the great undertaking, so important to navigation and hydrography, to your scientific Secretary of State. Mr. Livingston, indeed, could not have given a more convincing proof of his superior mind, than by appreciating your merit, and intrusting to you, in spite of your antagonists, that great national work. I shall be highly obliged to you, if you were to inform me now and then of its progress, that cannot but interest every navigator.

We are now doing the same thing, surveying trigonometrically the coasts of the Baltic. It is conducted by Colonel Wrangel, an officer of the navy, who has been studying for more than fifteen years under Professor Struve, and has been his assistant from the year 1821 to 1831

in the great geodetical work. You have probably received his work upon the subject, (*Beschreibung der von der Universität Dorpat veranstalteten Breitengradmessung*, 3 vols. 4to.) My third son, a lieutenant in the navy, has been three years one of Colonel Wrangel's assistants, and it is only a few months ago that he has been appointed to another service. In order to determine with the utmost exactness the longitudes of the principal points in our sea, Professor Struve and Colonel Wrangel are making now a tour round the Baltic on board of a steam-boat, having with them fifty-two chronometers; at the head of this expedition is General Shubert, the son of our late celebrated astronomer, Shubert.

With respect to the Logarithmic Tables, I shall take for my institution five hundred copies, at the offered price of nine tenths of a dollar, or rather, I shall give to the publisher a full dollar, provided they are delivered to me free of all collateral expense, having neither time nor knowledge of insurance, freight, the custom-house, &c. As soon as the copies are delivered, the money shall be paid without delay to the man who has the charge of delivering them to me. Our means will not allow me to take a thousand copies, as I intended; we must limit ourselves at first to five hundred. I request you to order, with regard to the Introduction, two hundred and forty in English, two hundred and forty in French, and twenty in German. I further request you to have the copies stitched, in order to prevent mistakes and confusion in collecting them. I hope it is possible to receive them before our navigation is stopped by the ice; this will be of importance to me. I have only one objection to make against these Tables, it is their extreme minuteness; however, young eyes may not suffer by the use of them. Farewell, my dear Sir; favor me soon, I request you, with a letter, by which you will highly oblige your obedient servant,

KRUSENSTERN.

Extract.

Schuhmacher, (Astronomical Journal, No. 239, page 385,) after having given an account of F. R. Hassler having again the Coast Survey of the United States under his direction, adds: The editor of this journal cannot omit herewith to present to the Government of the United States his thanks, in which all men who take an interest in exact sciences will join him, for having taken up again this beautiful work, that had been begun by Mr. Hassler sixteen years ago. This work could certainly not be executed better by any other man than him, who in its beginning already had shown so much talent. The freedom now given to him in the selection of his assistants, is an equally wise and, as the editor knows by his own experience of many years, *an indispensable condition of success.*

Bald Hill, Wilton, Conn., July 27th, 1833.

MOST HONORED SIR:—Your favor of the 18th instant, approving the manner in which the money for the instruments ordered of Mr. Troughton is to be forwarded to him as proposed in my former letter, reached me here a few days ago. The arrangement is in progress of execution. In consequence of your approbation, I shall also transfer the whole of the public funds for the Coast Survey to Captain Swift, and, on my quarter becoming due the second of next month, hand in to him my bill for my quarterly compensation.

The necessity of accelerating the furnishing of instruments as I have proposed and now activated, has proved itself upon this station, by an accident that came very near interrupting the whole work: viz. on the 24th instant, about half past two, P. M., a storm appearing to threaten us, I took preliminarily the telescope off from the theodolite, and secured it, in a bed, in another tent,—but could not return to the instrument itself before the strength of all of us, assistants and men, was needed, to hold the tent of the instrument and the instrument itself against the severest gale, with hail and rain. With difficulty I brought the theodolite, with the help of an assistant, out of the tent in the open hail-storm, leaving the tent, the instrument's stand, &c. &c. to be blown down the hill; but, in putting down the instrument, we were blown of from it, and my coat taking in it by the wind, occasioned that it was upset. The repeating circle, treated in the same manner, escaped all accidents and injury. The derangement of the adjustment, and other accidents to the theodolite, I have been able to repair, I hope, without any further consequences. While we were engaged at the instruments, all our tents except one were fully blown away, partly broken; and the three barometers that were in one of them were entirely broken, so that they have been sent to New York to repair. Not three hours before that, I had been bled, on account of the severe pain in my breast, occasioned by a fall upon a rock three days before, which had been so severe as to deprive me of speech, and made me apprehend some internal lesion. The severe drenching and exertions which the storm brought upon me, together with all the other, are perhaps the cause that I am still suffering under the effect of the fall, particularly in stooping for observations.

I have in general not been favored by the weather, even besides the gale: as I am here since the 20th; and only a few hours one evening, and a few this morning, the weather was favorable enough for observations. It appears, and is stated by the inhabitants, that in this season the Long Island Sound is generally covered with fogs, that prevent the necessary vision of the signals from the two opposite sides.

These circumstances preclude entirely from making any calculation upon the necessary time of staying upon a station; as, for instance, here six clear evenings and six clear mornings would suffice for the observations of the station, and the proportion of what the time passed

here has yielded would delay us more than I hope yet to tarry here, expecting more favorable weather.

I have the honor to be, &c.

F. R. HASSLER.

Hon. W. J. DUANE, Secretary of the Treasury.

Public Notice.

By a law of Congress of 1807, renewed in 1832, an accurate Survey of the Coast is to be made.

Already in 1816, and now again, the execution of this work has been intrusted to my charge.

The great importance and value of the proper execution of it for the navigation and the defence of the country (if needed), is self-evident to every enlightened man.

Though this might have been considered as sufficiently known by the publicity of the laws and dispositions taken for their execution, it appears necessary to state more particularly the object of my stay upon the elevations having a commanding view over the Sound, the Coast, and the adjacent country, and of the signals erected upon them. Both are absolutely necessary, immediate means and consequences of the execution of this law; they have therefore the claim to the protection and freedom from all disturbance, of any kind whatever, that every other property or operation of the Government has a right to enjoy and to expect from every citizen. It is therefore herewith requested, that all the signals (consisting generally of tin cones elevated upon poles with proper means to secure their stability) be left undisturbed in all possible respects, and that the necessary work on the stations be not disturbed by intruding or otherwise.

I shall make such agreements with the owners of the lands on which the signals stand, that any deterioration, disturbance of their perpendicularity, or otherwise injuring them, shall be prosecuted by them as trespass, by which they will become properly amenable to the law, with all the claims for damages that such disturbances would occasion to the work of the Survey; and these are very great, on account of the loss of time that they would occasion, and the daily expenses incurred by the Government for this important undertaking. I join therefore also here a copy of the paper in my hands from the Treasury Department, to show cause, and obtain protection and assistance from any magistrate or public officer to whom I might have to apply in a given case.

F. R. HASSLER.

Tashua Hill, Connecticut, September 2d, 1833.

Copy.

To all whom it may concern, Greeting;

Congress having authorized and directed a Survey to be made of the Coast of the United States, and Ferdinand R. Hassler having been appointed, with the President's approbation, to make the same, in the performance of which duty he will have occasion to pass over such lands as may be in the line of his operations, it is deemed proper by this public letter respectfully to request of the owners and occupiers of such lands, that, in consideration of the great national work in which he is engaged, he and his assistants may be freely permitted to pass over and remain on the same as long as may be necessary in the execution of the duty assigned to him, and that such assistance as they may need may be freely offered them.

Given under my hand and the Seal of the Treasury of the United States, the 9th day of August, 1832, and of Independence the fifty-seventh.

LOUIS M'LANE,
[L. S.] Secretary of the Treasury.

A true copy certified.

F. R. HASSLER.

New Haven, Connecticut, September 20th, 1833.

MOST HONORED SIR:—Since I had the honor to address you last, the weather has been rather unfavorable for my operations for the Coast Survey; besides frequent rains and fogs, the atmosphere between Connecticut and Long Island was the greatest part of the time so hazy, as to impede the visibility of any signals, and even the island itself.

In a few days I shall, from here, first go more to the eastward, to place the signals required to lay out the points destined for the further continuance of the Survey towards Boston, &c., as far as they are in immediate connection with the Mount Carmel station, as they will be the last that I shall make this season upon the northern side of Long Island Sound.

From thence I shall send Mr. Ferguson, with an assistant, westerly, to continue and further to extend the secondary triangulation, of which I have laid the elements from my main triangulation, hitherto made sufficiently to guide all minute details. I shall then, with the main party, pass from the same station directly over to Long Island, to complete the measurements of the triangles upon the main stations there, until again to the junction with my work of 1817, in the same manner as I have started from it, by the northern triangle-points, last spring. On Long Island I intend to send Mr. Blunt, as a second separate party,

to continue the secondary triangulation over Long Island, of which I have partly laid the foundation, and shall further continue to do so upon the island itself from my stations there.

Thus I hope to be enabled to present a mass of work next winter that will prove satisfactory, and show, by a practical example, the principles upon which the work is conducted, and must be conducted, if it shall lead to an honorable result. In the discovery and selection of my main points of triangulation over this part of the country, I have been more successful than the first aspect of the country appears to promise, or any person somewhat acquainted with the country expected; for I found, in general, all the inhabitants unacquainted entirely with distant localities or the appearances presented from the different eminences.

I have also been able, by the special methods that I devised for that purpose, to obtain results of adequate accuracy, more so than might have been expected from the state of the instruments and the general means employed; I have no hesitation to say that also from this side the work will present itself honorably. If the season and my health, which at the present moment seem to combine unfavorably against me, should favor me a little better, I intend to protract this campaign until December, as I did in 1817, and close it by the station at Wesel Mountain, near Patterson, in Jersey, where I then had begun my work, in order to make the junction between the two works complete. If successful in these plans, I hope to put in activity next spring the minuter detail surveys of the shores themselves and the maratime soundings of the Long-Island Sound, the most part of the Long-Island shore and New-York Harbor, reaching from the Neversinks, in Jersey, to the neighborhood of Sag Harbor, near the east end of Long Island. This operation will then require a number of parties of assistants to be fitted out with instruments, help, and all necessary means. It will, of course, then increase considerably the expenditure, if it shall be carried on with the proper activity and means for success. It is therefore very desirable that in stating the appropriation to be made for the Coast Survey by the next session of Congress, proper regard be paid to these circumstances; so much more, as I expect already the above-stated separation of parties this fall will increase the expenses, so as to exhaust as well the appropriation of the last session of Congress as the balance that had remained from that of the former session. Another additional increase of expense will also occur next year by the measurement of one or two base-lines, which it will not be proper to delay longer. It would be of great advantage if the appropriation was not delayed until late in the session, which will be what is called a long session, in order that the different parties may be formed and sent to their respective stations as early next spring as the necessary previous calculations and projections may be finished; because the loss of the early season throws the work of the whole year so much back, that a full aim of results is never obtainable in such a case.

I inclose here also a copy of a public notice which it became necessary for me to give in the papers hereabout, to protect the signals of the Survey, and moderate the intrusion upon my stations of such peo-

ple as, without other interest than empty curiosity, and understanding nothing of the work or the aims of my operations, make themselves much more troublesome than any persons capable of taking an interest in it. The constant exposure to the unfavorable weather, and the cold nights upon the hills, the bleakest places in the country, were extremely contrary to my health: exerting myself always, notwithstanding, in my work, in expectation to overcome this effect by habit, produced ultimately a painful disease, which, on my move from the last station through here, obliged me to stop; besides, my presence at the new station, Mount Carmel, about ten miles in the rear of this place, could well be spared while a road was made to enable us to bring the instruments there, and various preliminary arrangements could be made by my assistants, according to the directions that I gave to them; and even in that they were much impeded by rains, fogs, &c.

I have the honor, &c.

F. R. HASSLER.

Hon. W. J. DUANE, Secretary of the Treasury,
Washington City.

West Hills, Long Island, December 1st, 1833.

MOST HONORED SIR:—According to the plan of my operations that I had the honor to communicate to you in my last, two of my assistants have been engaged since the middle of October last in the secondary triangulation of the Coast Survey, within my main triangulation made this summer and continued since.

To Mr. Ferguson I assigned the part north of Long-Island Sound, and to Mr. Blunt the part of Long Island itself; so that, since that time, we form three parties in active operation in the work, and they have already communicated to me some satisfactory results.

The weather was, however, always very adverse to operations requiring vision at large distances, by so frequent rains, fogs, and haze, that it was difficult for my larger work, with the most constant and close attention, to take advantage of every moment to obtain the observations required; thence my stay upon the stations was necessarily always protracted above my wish, though I ultimately obtained, in every case except one, all the results that I had need of.

I am now here at the station with which I may close my own campaign in the field for this season, notwithstanding that I had intended to make yet the station of Harrow Hill, near Hampstead, Long Island, principally to verify the data from which I started in the spring, grounded upon results taken from my earlier works of 1817 and those of this summer used conjointly.

This change of my intention is grounded upon the consideration that the season does not give sufficient hopes for good weather to compensate for the delay in other parts of the work that would be occa-

sioned by it; and among others in the works required to present to you in due time a report upon the whole of my this year's work, which, by the results hitherto obtained, I may do sufficiently satisfactory to show the principles of the work and their successful application.

The works of Messrs. Ferguson and Blunt in the secondary triangulation not requiring such distant vision, can and will continue, and their results will be communicated to me in time enough to be joined to those of my own work, the calculation of which will have to be my personal occupation during that time.

I shall be obliged to propose to you an increase of the number of my assistants, (therefore also of expenditure,) as well for the work of the winter as principally for the next season, for which it is necessary to provide beforehand; because the separation of two parties already made, and of one or two more that will be required next spring, would leave me entirely alone, and I am now already too weak for the best advantage of the work.

My work of this year closes therefore towards the east with the eastern points determined from Mount Carmel, in Connecticut, and the hills east of Smithtown, upon Long Island; while, on the southwest, connected with my former work, it reaches until south of the Rariton; and will furnish, within these limits, the elements of the detail and nautical determinations that I intend to set in activity next season.

I have lately received a letter from Troughton & Simms, in London, informing me of their being in readiness, and I suppose by this time in activity, for the construction of the principal instruments that I ordered of them upon the peculiar plan best adapted to the nature of my operations in the localities where I have to work; for it is a great drawback upon the advancement of the work, that I have to make out with the instruments I have, which, ever so good in principle and execution, *are no more in that serviceable order* that would be desirable. This was peculiarly and forcibly proved by my work, under the unfavorable circumstances of this summer's campaign. They also informed me of the reception of the draft of £600 that I sent to them, upon the different orders given to them. I am, of course, immediately answering to them, with the detailed special instructions that they require.

I am sorry however that the other parts of my request, relating to the necessary books, tables, &c., forwarded by means of the State Department and our legation in London, have not as yet been productive of any results. However, Mr. Vail having now given the execution of it to Messrs. Troughton & Simms, as they stated to me, I hope also this part of my requests will be accelerated, as they have promised.

As they have also promised to finish the larger instrument that I requested and described, early next spring, I am so much the less adverse to postponing some work for that time, that I may then be able to execute with proportionally greater celerity.

They have also promised to go immediately after at the execution of the dividing-engine that I ordered, which will enable us to have

the instruments for secondary works, &c. executed fully in this country under my personal direction.

I have the honor to be, with perfect respect and esteem,

Most honored Sir, your obedient servant,

F. R. HASSLER.

Hon. R. B. TANEY, Secretary of the Treasury,
Washington City.

Washington City, January 7th, 1834.

MOST HONORED SIR:—By my letter dated West Hills, Long Island, December 1st, 1833, I had the honor to inform you of my intention to end my own campaign of the year with that station, and also of the reasons for so doing. The bad weather that almost immediately fell in justified the measure earlier even than I had anticipated; I left the station, with my remaining assistants, on the 11th December.

To avoid useless transportation, with its consequent expenses, all our heavy baggage was stored in the house of Mr. Chichester, where we had lodged. The instruments were brought to New York, and there deposited in the Custom House, with our other similar objects left there last spring; a few days after, the wind having blown off the sheet-tin of the roof from that part of the building where they stood, they were removed, without receiving any injury, to a more interior part, where I hope they will be safe.

I arrived, however, in Washington only the 3d instant, P. M., on occount of the necessary delays under weigh. In New York, besides the care of the instruments left at the Custom House, I directed Mr. Patten upon various mendings and other arrangements relating to instruments; and all the necessary arrangements were made relating to the works of Mr. Ferguson and Mr. Blunt in the execution of the secondary triangles, for which I specially detailed them, as well for the results now needed as for their further operations at the opening of the season, for which they may likely be able to begin earlier than my larger triangulation will be sufficiently favored by the season.

In Philadelphia I ordered of Mr. Stancliffe, a mathematical instrument maker, who had already worked at the Coast Survey instruments, under Mr. Troughton, a duplicate of all the tangent and clamping screw arrangements for the main instruments, which has become necessary by the wear and consequent looseness of those that have now served so long. I ordered also one more plane-table alidade, as more are needed than only the two on hand, which were originally intended as samples for more.

There I had the misfortune to have one of my trunks stolen from under the care of the Baltimore Transportation-Line, which occasions to me a loss of upwards of $300, besides the inconvenience of being

deprived of my winter equipments and of the beam compasses, and several other objects that I stand in need of for my present work. Only one of the proportional compasses of the Government was included in the loss; the rest were all my private property.

In Baltimore it was proper for me to get nearer information upon the views in the survey of a map of the state of Maryland, upon which Professor Ducatel had corresponded with me last summer; upon this I shall have the honor to present to you a separate letter.

I have not yet received my other trunks and boxes forwarded from Baltimore, on account of the steam-boat being under way taken in the ice.

In the meantime I have directed small beam compasses to be made here, and shall in a few days be active in the calculations and similar works, with the assistance of Lieutenant Bell, of the navy, the only assistant now present with me. I have also requested that the second assistant, hitherto engaged with Mr. Blunt, should join me here until he would again be needed in the field, as I wish to accelerate my report as much as possible, to return to New York to cause the wooden part of the apparatus for the measurement of the base-line to be constructed under my direction, which will detain me for some time, and, as stated in a former letter, this measurement should be the first work of next spring.

Upon various detail subjects, which it becomes necessary to discuss and decide, I shall have the honor to address you in separate letters.

I have the honor to be, &c.

F. R. HASSLER.

Hon. R. B. TANEY, Secretary of the Treasury of the U. S.

Washington City, January 8th, 1834.

MOST HONORED SIR:—From my early youth, I had always taken advantage of every opportunity in my travels to collect a very valuable library of the best scientific works of all ages in the branches to which I applied my studies; the part relating to astronomy was peculiarly valuable, on account of the scarcity of the books which it contained.

During the time that I passed in Europe to procure the instruments for the Survey of the Coast, I took every opportunity to complete this collection at my private expense, because I would not consider myself authorized by my instructions to lay out the funds for that aim, though it was to be expected that at a future period the whole would be purchased by the Government, as a valuable addition to the library for the Survey of the Coast; therefore, when that work was interrupted in 1818, I proposed to the War Department, to which I delivered every public property belonging to the work, the purchase of all my mathematical and astronomical library, and other similar objects, for the

small price (proportionally) of $4,500, which might easily have been paid out of the remaining appropriation of $54,000, and thereby the collection be preserved unimpaired.

The refusal of this purchase affecting very materially my economical situation, gradual sales, at great sacrifices, reduced the collection at last to the scarcest astronomical works alone, which I sold ultimately to the Military Academy at West Point, under the superintendence of Colonel Thayer, for about $1100, paid in six yearly payments.

The peculiar object of this collection is, therefore, not only missed, but also the books themselves are of no use whatsoever to the Military Academy, being foreign to the branches of study that are the proper object there; thence also they are very much neglected in proper care, and lost to utility. On another side, it would be extremely proper and useful to unite them again to their proper original destination,—the Coast Survey. It is, of course, proper for the different branches of the Government to act in accordance with each other to the greatest public benefit. It was by such feelings that I favored, last spring, the request of giving off some of the instruments from the Coast Survey collection to the War Department, against payment of their cost price, to accelerate the work of determining the boundary-line of Ohio, for which the instruments, not otherwise on hand in the War Department, would not have been procured within the time limited for the execution of the work. It is under the same feelings that now I take the liberty to propose to you to request the War Department to sell to the Coast Survey Fund the books that I sold in time to the Military Academy. The few of them that might be useful there, as in some measure touching collateral studies of the Academy, might remain. If you approve of my proposition, I will furnish the catalogue of the books, with their prices, that proper negotiations may be entered into.

The trials to which the chronometers that I had procured in time for the Coast Survey have been put in my last year's campaign, have proved them to be no more in favorable serviceable order, and they will have to be sent to their makers in England, to have them put in order again: it is, however, indispensable to have for my work a time-piece that deserves proper reliance.

Mr. Troughton has, many years ago, furnished to the Treasury Department, among other instruments, a pendulum clock, expressly constructed for transportation, as it was intended for the determination of boundary-lines in the interior. This clock, with a circular instrument, was in the hands of Major Mansfield, when Surveyor-General in the west, and he took them to West Point on his taking up a professorship there; since then they remained there unused until the last years, when the clock was used with a transit instrument, &c. Somewhat more than a year ago, I had from the Treasury Department the letter requesting the return of this clock and the circular instrument; but finding the clock in use, I did not wish to disturb its utility without being able to compensate it by another.

Now one of the clocks formerly destined for an observatory for the Coast Survey might be substituted for it, and thus an exchange made equally advantageous to both sides: the clock of the Coast Survey

is, in its kind, rather superior and more valuable than that of West Point; but there it could be mounted with the solidity which it requires, and would serve better; while the clock of West Point, purposely adapted for transportation, is peculiarly fitted for the use in the Coast Survey, where an observatory-clock cannot be applied to the field-work.

I take, therefore, the liberty to propose, that you would please to propose to the War Department to make the exchange here suggested. I have no doubt but the evident mutual advantage will decide the Department of War to accept it; so much the rather, as these instruments are, in fact, the property of the Land Office of the Treasury Department.

It would be very desirable that the whole of the negotiations upon the two points herewith proposed would be completed during my stay here this winter, that I might receive and deliver the objects, as soon as I leave again here for the next year's field-work, when I could do it with the least loss of time for my work, and when also the clock desired, or some other good time-piece, will be needed for the Coast Survey.

Your early answer will therefore much oblige me.

I have the honor, &c.

F. R. HASSLER.

Hon. R. B. TANEY, Secretary of the Treasury of the U. S.

Washington City, January 9th, 1834.

MOST HONORED SIR:—In the course of last summer, Professor Ducatel, of Baltimore, informed me that he and Mr. Alexander had been appointed by the legislature of Maryland to make a topographical map of that state, and inquired of me for a plan of execution of the topographical part and its junction with the Coast Survey.

Mr. Alexander visited me upon one of my stations, to witness my mode of operating.

When in 1816 I first began the Coast Survey, a similar desire was in the legislature of New Jersey, and Governor Dickerson offered co-operation by the interest he took in it; having, however, been elected a member of the Senate of the United States before I received the (too long delayed) authorization from the Treasury Department to treat upon the subject, and his successor, Governor Williamson, not entering into the same views, the whole was lost.

If you should find proper, in the present instance, to authorize such a mutual co-operation, the plan I then had would be equally applicable in this case as in the Jersey; a considerable part of the state lies equally in the necessary limits of the Coast Survey. This plan was—that I should be allowed, at the proper time in my work, to extend my main triangulation, at the expense of the Coast Survey, over the other

parts of the state equally, and that, in compensation, the detail surveys should be made at the expense of the state, (as it would have to do at all events,) and dependent on my main triangles, in the manner that I would direct, and therefore communicated for the use in the Coast Survey.

Such a proposition on the part of the state, so nearly imbedded in the work of the Coast Survey, would evidently be of considerable economy for both parties, and could be made use of advantageously for the acceleration of the works; I shall therefore be glad if you will please to communicate to me your wish and direction in respect to it.

The state of Maryland having to provide instruments for their works, I also offered, if it should meet your approbation, to cede for their work, against cost price, two nine-inch theodolites from the Coast Survey collection, which, in the present state of the work, are not needed; having been originally intended for the reconnoitering work, which is now carried on in a different manner, the amount to be received for them would be more advantageously applied for some other instrument actually needed for my work in the course of next summer.

The favor of your decision upon both these points, for my direction in respect to them, will oblige me.

I have the honor, &c.

F. R. HASSLER.

Hon. R. B. TANEY, Secretary of the Treasury of the U. S.

Washington City, January 10th, 1834.

MOST HONORED SIR:—I must take the liberty to address you upon the subject of my assistants in the Survey of the Coast in general, and with more peculiar reference to the works of the present year.

Upon the application made to the War Department to have Lieutenant Alexander Mackay detailed for that service, I understand that the application is declined, as well for him as for any further assistance from that Department, on occount of the officers being needed at their respective posts: the official answer may, ere this, have reached you; thence so many more assistants will have to be selected from the numerous applications that I have received from the civil rank.

Mr. R. Livingston, assistant in second class from the civil, having always been refused the compensation equal to a lieutenant of the army, which I had proposed, has so much the rather been obliged to give way to the invitation of his family to enter into other business, and has left me at the end of last year. His brother —— Livingston wishes to take his place; and I take the liberty to recommend that he be appointed, with a compensation equal to a lieutenant in the army and the addition of the daily allowance granted from the Coast Survey Funds.

Lieutenant Bomford, whom I had directed as second assistant to Mr. Ferguson, being unable to attend, on account of sickness, I had to

supply his place temporarily; he is still confined here in his family, and probably can be in no active service this winter.

When I directed Mr. Blunt for the secondary triangulation of Long Island, I had also to make a temporary appointment of an assistant for him, because I had not any of mine to spare. In this capacity Mr. Charles Renard has been employed now for some time to entire satisfaction, at a compensation which it will be proper to augment for the further continuance of his services in the work, if you approve of it.

Captain Swift, who is also the accounting officer, will go reconnoitering in Connecticut, from the east end of our last year's work, as early as the weather will permit; he will likely also need a secondary assistant. As he, however, will come here before that time, nearer particulars will then be determined verbally.

These circumstances occasion me to take the liberty further to propose to you the following:

1. To request of the Navy Department that for the beginning of next campaign, that is, in about March or April, the following two passed midshipmen be detailed as secondary assistants for the Coast Survey, with the emolument fixed for that station—namely, Thomas J. Page and John A. Dahlgren. After the measurement of the base, I expect a further call upon the Navy Department; for a lieutenant and midshipman may likely become desirable, which I will mention in due time.

2. That I shall be allowed to appoint Mr. C. M. Eakin as assistant on the civil part, with an emolument intermediate between the first and second assistants, approaching about that of Mr. Blunt, or that of a lieutenant in the navy, as Mr. Bell now present with me.

3. If, in general, the Treasury Department will give liberty to propose from time to time when an assistant may be needed, such persons as always will present themselves to me, according to the stations to which I shall find them fitted, and with emoluments appropriated to their services, it might ease me in taking advantage of the circumstances that might tend to accelerate the work, and I would most likely be able to make several propositions in the course of next spring.

4. It might be allowed to me to establish and propose a gradual succession of advancement in emolument among the assistants of inferior emolument, as circumstances might render advisable, though it would undoubtedly have to be managed with great circumspection, and only sparingly.

5. With the five assistants as above stated, I shall be sufficiently provided, in addition to those yet attached to the work, until about next summer: to appoint more for the present would be a disadvantage to the work at the moment, particularly on account of their newness in the kind of operations to be performed next spring.

Your answer will oblige, in order to enable me to act in the part devolving upon me.

I have the honor, &c.

F. R. HASSLER.

Hon. R. B. TANEY, Secretary of the Treasury of the U. S.

Washington, January 12th, 1834.

MOST HONORED SIR:—When, by the letter of the Treasury Department of the 9th August, 1832, the Coast Survey superintendance and labor was again committed to my charge, it was thought proper to diminish the allowance for my personal expenditure from what it had been rated at by the contract of 1816, made for the first starting of the work. In my letter of acceptance of the 12th August, I stated that this diminution would most likely not be warranted by the state of things, as I had the experience from before, (as my expenses far exceeded the allowance then made, as then already acknowledged by the persons acquainted with such kind of works,) but that I would try first what might be the effect of the change of circumstances in this respect, so much the rather, as it was so easy to apply a proper remedy.

Now the trial of somewhat over one year has proved to me that, far from any diminution being warranted by the present state of things and my indispensable expenditures, they are a great deal more onerous to me than at the former time. Having not now, like then, private means left, I have also no means to endure the actual pecuniary loss to which the present allowance brings me, instead of affording me prospects of better support of my family for my increased exertions, which is all that they can depend upon; I must therefore, after this trial, already take the liberty to address to you the request to which I had referred in my letter of acceptance, and I doubt not you will see the evident justice of the case, and grant my request.

It might indeed be proper to make a new and more detailed contract upon my works for the Government, as well for the Coast Survey as for the weights and measures, which, by the above letter of the Treasury Department, were continued under my charge, without allowing to me any additional compensation; but in the present press of business, this would occasion useless delay, and a single additional article expressed in a letter will suffice, at least until the further progress of the work, and its extension, might suggest peculiar arrangements.

The whole of the works in which I am thus engaged are of such a nature, as not to be possible by mere office-hours attendance; they constantly require, not only the whole day, but very frequently a great part of the night in addition to it, and under exertions and exposures which nothing but free zeal for the aim can render able to endure: my assistants, or other persons in any way witness to my works, can testify to that, even only in the weights and measures works, when I had them alone.

The constant absence from home and family, during nine or ten months in the year, is extremely expensive,—as well by the living in constantly changing places, as by the consequences of my long absence from my family and from all attendance to its concerns. To execute my task faithfully, my time is entirely taken up, without my being able to attend to any thing at home, or any source of economy or emolument, and rest must be limited to its shortest duration; it can therefore not be found improper that I should also be fully compensated.

The contract which I had with the Treasury Department for the weight and measure concerns, allowed me $3,000 per annum, with all office expenses, &c., which is paid out of the expenditures relating to the custom-houses and revenue collection, to which the establishment is subservient, by the proper and necessary establishment and furnishing of the weights and measures needed in them, which now are in rather too much uncertainty.

Uniting the two works, which have by their nature various points of contact, I can attend the final adjustment of weights and measures in the course of the winter, after they have been properly prepared by an assistant during summer; so that, with proper arrangement, I can execute both charges: it will not be found improper, therefore, that from this side might come the means to complete my compensation to what will certainly, on proper investigation of all the circumstances, be found no more than proper for my labors and my responsibility. I take, therefore, the liberty to propose to you that, in alteration of the part of the letter of August, 1832, relating to the weights and measures, you will please to allow me for those works an additional compensation of $1,500 per annum, over the amount stipulated in that letter, the remaining parts being left as they are now, until circumstances should make it desirable to determine nearer particulars.

Though my experience might make it desirable that this change would extend also to the past year, still, as retro-active operations are rather inconvenient, this augmentation might begin only from the beginning of the quarter now running, and which expires with the 2d of February next; from thence forward I should present a separate bill at the end of every quarter for $375, in the same manner as before used in the weight and measure business.

The state of my economical position renders it extremely desirable for me that you would please to bestow to this my request the earliest attention.

I have the honor, &c. &c.

F. R. HASSLER.

Hon. R. B. TANEY, Secretary of the Treasury of the U. States.

TREASURY DEPARTMENT,
March 12th, 1834.

SIR:—The superintendence of the Coast Survey has, with the approbation of the President, been transferred from the Treasury to the Navy Department.

Your future communications will therefore be addressed to the Secretary of the Navy. I remain, very respectfully,

Your obedient servant,

R. B. TANEY,
Sec. of the Treasury.

F. R. HASSLER, Esq.

NAVY DEPARTMENT,
March 14th, 1834.

SIR:—I request that you will furnish this Department, early as convenient, a report of the system arranged by you for carrying on the Survey of the Coast, of the progress made in the Survey, and the probable time and funds necessary to complete it. I wish you to furnish also a statement of the expenditures on account of the Survey up to this date, and an estimate of the additional appropriation, as well as the officers and assistants, needed for the present year.

I am, very respectfully, &c.,
LEVI WOODBURY.

F. R. HASSLER, Esq., Washington, D. C.

Washington City, March 14th, 1834.

MOST HONORED SIR:—Yesterday I had the honor to receive your letter of the 12th instant, informing me of the transfer of the Coast Survey to the Navy Department. It causes me extremely to regret that I could never have the pleasure of a personal interview with you upon that subject of my works, where it would have been easy for me to inform you of its nature, and to convince you of the inapplicability of such a measure to the execution of it in such a manner as lies in the views of the Government, and the law itself, and which I have therefore considered it my duty to aim at.

The experience of all countries where an army and navy exist, has proved that in works of this nature it is impossible to make the officers of either one of the departments work under the other with that harmony and individual zeal which is an absolute *sine qua non* of the success of the work, and I might add to this my own experience in my work in this country. The moral organization of such a work has peculiar difficulties, which have in all countries decided to give their direction to some man of science, under a department unconnected with either army or navy, until to the latter minute details.

It was with this knowledge, and under that conviction, that the late Presidents Jefferson and Madison placed the Survey of the Coast under the Treasury Department, under Messrs. Gallatin, Dallas, Crawford, &c. It was also principally upon this ground determined, when the work was resumed, again to lay it in the Treasury Department, under which it had been in successful operation before; though, knowing the overwhelming mass of business in the Treasury Department, I had intimated it might be placed under the Department of State.

I regret exceedingly that I must state to you my inability to discharge that duty to the satisfaction, usefulness, and honor of the country, which it would be my duty to aim at, under the circum-

stances which that proposed transfer would occasion: though I have the best possible will and feelings towards the personal of the Navy Department, as well as towards every other department of the Government; and my decision is grounded entirely upon the thorough conviction of the strength of the principles above stated. I cannot, however, omit to state how painful it is for me to abandon for the second time a work to which circumstances have occasioned me to devote the most valuable part of my life and property, when I had brought it again in the course of most successful execution, with all the exertions possible and great additional pecuniary loss; and, at the same time, to disappoint for the second time the expectations which the well informed part of the citizens of this country, and the scientific public in general, had grounded upon the work in which I was engaged.

The works for the establishment of weights and measures, and hydrometers, with which I am also charged by the Treasury Department, remaining thus alone in my hands, I shall devote myself in future exclusively to the execution of the directions that I have received upon that subject from the Treasury Department, under the dates of the 12th June, 1830, 3d March, 1831, 18th June, 1831, 20th June, 1832, and those accompanying my reports upon weight and measure comparisons of the 27th January and 29th June, 1832, by means of the arrangements now in my hands. I pray, therefore, that you will be so good as to place me back again to the compensation fixed for that work, with the approbation of the President, by the letter of the Treasury Department, of the 30th April, 1831.

The favor of an early answer will oblige me very much.

I have the honor to be, with, &c.

F. R. HASSLER.

Hon. R. B. TANEY, Secretary of the Treasury,
Washington City.

C.

Washington City, March 22d, 1834.

MOST HONORED SIR:—Your favor of the 14th instant reached me in due time; the cause of the delay of this answer is known to you by the communication which I had the honor to make to you in time of the letter which the transfer of the Coast Survey from the Treasury to the Navy Department had occasioned me to write, in which I stated my apprehensions of the increase of difficulties from this transfer, grounded upon my former experience.

The peculiar interest which the President has always taken in my work, and the desire to relieve the Secretary of the Treasury, whose department is overladen with business, have occasioned him, with the same friendly dispositions which he has always shown to me, to assure me of his full concurrence in preventing the difficulties and the clashings that might accrue from the concurrence of collaborators taken

from the citizens, the navy, and the army, which you know it is indispensable to unite, as well on account of the nature of the work as its general bearings, in order to make it yield that permanent utility and honor to the country which was always the aim of its establishment, by the law as well as by the executive; and for that even its interruption in 1818 has given the most striking proof, as well as it has shown the breakers that are in the route of this vessel.

As nothing personal ever influenced my conduct, I considered it proper for me to yield to the President's wishes, and to continue to join my exertions towards that aim, sure as I am, at the same time, that the nearer you and the Navy Department in general will be acquainted with the particulars, the more my views upon this work will obtain your approbation and support, as they have, even in their more minute parts, obtained that of the President, and had, before that, of the Presidents Jefferson and Madison, under whom the principal operations have been performed between 1807 and 1818.

As I am just now engaged, jointly with my assistants, in making up the report upon the work of last year, in conjunction with my earlier works of 1817, I refer all that part of your letter which relates to it to its completion; so much the rather, as I have had the satisfaction already, some time ago, to shew to you the sketch of triangles that have been executed over an extensive tract of the country, to which my report must have reference; and I will here limit myself to answering the other questions contained in your letter.

Your second question relates to the probable time needed for the completion of the work. Upon this I must take the liberty to state, that, from my intimate acquaintance with the work and its incidents, I would distrust the ability or veracity of the man who would undertake to decide upon this by the statement of any positive time; as too much depends on the favorableness of the weather—the season—the localities of the country, in situation of prominent points, their being open or wooded—the nature of the soil near the sea-shore—and the state of cultivation of the country in general, &c. As, for instance: it occurred last season, that, in a fortnight, no more than seven hours, scattered over all that time, allowed to make geodetical observations; and all that would have related to astronomical observations was entirely impossible. I may therefore best answer this by the result of a conversation that I had this winter with the President, upon this same question. Having stated to him the impossibility of an appropriate answer in general terms, he limited the question to the part east of my present operations, which, after some reflection, I stated, would require about three campaigns more, after this, for triangulation; but that it was not my intention to make it so in succession; but that, after this year's campaign, my plan was to extend my work southerly, in order that, while the secondary and naval operations were going on over the space of the eastern triangulation, I would prepare for a similar extension southerly, to be able to place two separate parties in operation, and thereby to accelerate the work so much more. The President's answer was—"That is right; that will accelerate the work."

Seeing thus my plans well calculated, no doubt acquired to me the President's confidence—that I calculated my organization of the work to the best advantage, and he was satisfied—(he was equally so with the views which I presented to him upon the work and its requisites in general, in the further continuance of the conversation)—I can only add to this yet, that the certainty of the results obtained is celerity as well as economy.

The question of the funds required for the completion of the work is still more unanswerable: because this has still more chances of variation than the preceding; every one circumstance affecting the progress of the work affecting also this, and many more particulars coming into consideration in it; as it can impossibly be the aim to get a repetition of the common sea-charts, that have now not the trust of the public. The final and different detail executions of the work will have their particular expenses, presenting themselves only gradually, as also an increase of instruments of all kinds will present itself, occasioning proportional expenses, &c. Successive yearly appropriations will, I suppose, be continued to be made as hitherto, and I have reason to hope always more willingly, in proportion as the results and the great utility of the work will become more evident.

In relation to the statement of expenditures, I must observe, that from the very outset, in 1816, to this date, I have always declined having any thing to do with it: it would be utterly incompatible with the heavy task of the work itself. I have always been relieved from it by being directed to select a disbursing and accounting officer from among my assistants, whom I would find most capable and proper, whose accounts I attest, in so far as to state the expenses therein contained to have been incurred in consequence of my directions in relation to the Coast Survey: his accounts are rendered quarterly, and he receives the advances for the expenditures upon his own request. If circumstances occasion that I must make an expense for the public, I return my vouchers to him, and he reimburses me. This was even the case in 1816 and '17, when I put the work twice into activity by my own private funds. When in the fall of 1832 I again began the work with my private funds, and was refunded again, by an advance from the Treasury Department, I rendered one account myself; but when the present accounting officer, Captain W. H. Swift, took up his charge, I delivered to him as well the vouchers that I had in hand, as the remaining funds, which closed my short transactions in this respect.

It is therefore in the Treasury Department alone that the data lie collected which you might wish from that side.

Upon the appropriations I have to state, that the first year's appropriation was $20,000; as I entered the work only late in the season, (October,) I had the means, by proper arrangements, to make an economy in advance for the last year's campaign, for which the appropriation was again $20,000; the accumulation of both, and proper arrangements enabled me to continue the work ever since without interruption, for which the appropriation of one year would otherwise not have sufficed; so I was enabled, as is an absolute requisite for the

success of the work, to keep it in a regular course all the year round; for I must observe, that whenever, by any cause whatsoever, this regularity should be interrupted, the work of one whole year would be lost; because every individual part of it is bound to its peculiar season; and the omission of one season's work will, in almost every instance, prevent to make in the next that part of the work which its regular progress would require.

The funds yet available are calculated to reach until about June, when it is to be hoped that the new appropriation for the present year, which has been rated at $30,000, will have passed: this amount I intend to economize so as to reach the next appropriation, by regulating the extent of my work so as to remain within these limits in respect to expenditure: and I consider it would not be advantageous to extend the work further this year, nor to ask for a greater appropriation. However, next year it would then be desirable to have a larger amount, in proportion to the extent that it may be proper to give to the secondary and detail works. In respect to the present available funds, I must yet state that they are by far not so much as the last quarterly accounts show, on account of the various claims hanging over them at the time they were rendered, and that the measurement of the base-line, which I intend as my first work now, will occasion a considerable increase of expenditure.

In relation to the assistants, I have to state that there are now as many appointed and in activity as are appropriate and available for the work this season; only one or two more, from the military and civil rank, I intend to propose, before or after the measurement of the base-line. The two midshipmen whom you have last appointed are informed that they will be called into activity with the opening of this year's campaign.

Two of my first assistants, Messrs. Ferguson and Blunt, are now already sometime in the field, with their second assistants, engaged in continuing the secondary triangulations which they began last fall, for which the favorable season begins always somewhat earlier than for the great triangulation; two others are engaged with me here in calculating, drawing, &c.; and Captain Swift is engaged in having the wood work for the base-apparatus prepared, as what had been prepared in 1816 had been lost during the interruption of the work.

In all these arrangements nothing could be changed, nor could the assistants and their present situation and disposition be changed without very great detriment to the work.

As I shall inform you successively always of the state and progress of the work, as I have always done hitherto to the Treasury Department, I should of course suggest at the same time if any thing whatever should be required or occur from that side.

The works planned for this year are the most difficult, laborious, and expensive, at the same time as they are the most important, on account of their decisive influence upon the whole work.

Notwithstanding the length of this letter, I must still take the liberty to refer you for the nearer details to the actual documents

that are in the Treasury Department, and, in time, to those that are now in the course of being copied, in restoration of the documents lost by the fire of the Treasury Department.

I have the honor, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
March 25th, 1834.

SIR:—Your communication of the 22d instant has been received. I am gratified to learn that you mean to devote your useful services to the further and efficient progress of the Survey of the Coast. In consequence of your remarks, until I get your report in preparation, I will be happy to wait for a statement of the progress already made. But if the information be not incorporated into that report, it is very desirable for the Department to have, as early as practicable, a brief and separate account of the system or plan you have adopted, and which you are now carrying into effect; and also a list of the names of the persons employed, a statement of the compensation to each, and the particular duties in which they are engaged. This information is indispensably necessary to enable the President and the Department to judge of the character of the measures now in operation, and of the prospect as to their efficient progress and successful termination.

I am, very respectfully, &c.

LEVI WOODBURY.

F. R. HASSLER, Esq., Washington.

Washington City, March 26th, 1834.

MOST HONORED SIR:—Your favor of yesterday I answer immediately, as this can be done fully by reference to the documents that are either of public notoriety or to be transferred to the Navy Department from the Treasury Department; therefore quicker than by any repetition.

1. The plan of operation. My first plan, which collected the unanimous preference over all others, dated April 2d, 1807, and that of January 5th, 1816, for putting the work into activity, are both contained in my "Papers upon various Subjects connected with the Survey of the Coast," printed in the Philosophical Transactions of Philadelphia, 1824, by which means they have collected also the approbation of the well informed public, of this country and of Europe.

The plan how to proceed according to the system so well tried and approved, under the circumstances existing at the time of the renewal of the work in 1832, is one of the documents in the Treasury Department, restored immediately after the conflagration of the Department. In this form, I believe, they have all passed the judgment of the President.

The importance of the present moment for the acceleration of the work itself is so sensible, and my means of assistance necessarily so closely calculated to the exigences, that I must pray you will allow to me this reference to the documents, not to divert my time from its present important employ to that which the copying of them would require.

2. The names of my assistants. These are for the most part named in my last letter by the statement of their employments. I will, however, here put them in one connected list.

Captain W. H. Swift, of the Topographical Engineers. (His present occupation is distinctly stated in my last letter.)

James Ferguson, of Albany. (His present occupation is equally stated in my last letter.)

Edmund Blunt, jun., of New York. (His present occupation is also stated in my last letter.)

Lieutenant H. Bell, of the United States Navy, (is engaged here in the calculations stated in my last letter.)

Constant Eakin (is engaged here in the calculation and drawing stated in my last letter.)

Alfred Livingston, of New York, (is second assistant, employed with Mr. Ferguson.)

Charles Renard, of New York, (is second assistant, engaged with Mr. Blunt.)

John Dahlgreen and Thomas J. Page, passed midshipmen, having no knowledge as yet of the past works, their activity in actual work can only begin with the opening of the campaign on my part; therefore, they were directed to that effect, as stated in my last letter.

In relation to my desire of another assistant from the military rank, I take the liberty to join here a separate letter.

3. The compensation of the assistants. These have been fixed by the Treasury Department, at the time of their appointment, upon my proposition of the principles that must necessarily guide in it. In respect to the numerical statement of their amount, I must take the liberty to refer you to the account in the Treasury Department, as it is actually unknown to me.

4. The character of my measures taken, if adapted to the plans? and their successful execution? My plans being grounded upon invariable mathematical principles, as it is impossible otherwise, the means of execution are also mathematical, and admit of no other characters; they have at all times been discussed when it was the question to establish any part of them, and their proper adaptation to the efficiency, progress, and successful termination of the work, even its most economical arrangements have decided their adoption and the assent to them. If you will allow me, I should like to add, as I did in my last

letter upon the assistants, their destination and occupation; that in the present state of the work, no alteration whatsoever can be made in them, without the most decided detriment to the progress and efficient usefulness of the work, even under any plans or views whatsoever.

5. As a guide to the nearer particulars, and the Documents thereto referring, I take the liberty to recall to your recollection, that you have in your Department a copy of a paper of mine, entitled "Principal Dates of the Coast Survey," which has, against my wish, been omitted to be printed with my papers above stated, leading to the interruption in 1818, and I join here the copy of another one, made for the use of the Treasury Department, as guide, from the renewal of the work in 1832, to very lately.

My being confined to my room by sickness, for several days, I hope will excuse me for not being able to come to you; as in a short conversation so much ideas and information might be exchanged between us, as even a long correspondence is not well adapted to yield.

Allow me to set some value, for the support of my views in the work of the Coast Survey, upon the letter of late President Madison, addressed to me; as under his presidency the main plans and arrangements were in every respect fully discussed, and set in actual operation, in all respects with his personal approbation and concurrence; a copy of the letter is therefore herewith joined, &c. I shall have the honor to shew to you the original itself, on the first opportunity.

I have the honor, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Navy of the U. S.
Washington City.

Continuation of the principal facts and dates relating to the Coast Survey, after the interruption in 1818.

For several years after the interruption, Mr. Felsh, Chaplain of the Navy, who had exerted himself all the session of Congress of 1817, '18, in procuring the law excluding me from the Coast Survey, was considered as engaged in it, though no trace of any work is to be found any where, unless the accounts of expenditures in the Navy Department be considered as such.

1819. *December 25th.* Mr. Jefferson's letter to me, inquiring about the state of the instruments I had procured, and their cost, with a view to purchase them for the Virginia University, saying, "as this object seems to be relinquished."

1820. *January 4th.* My answer to the above letter.

January I gave my papers upon the Coast Survey to the Philosophical Society of Philadelphia for publication; upon the report of a Committee, they were in March ordered to be printed.

1823, '24, '25. Various trials of the Navy Department to establish a

hydrographical corps, &c. &c. Lieut. Sherburne, of the Navy, coming to work near Mr. Felsh, occasioned the breaking up of his employment.

1825. My papers upon the Coast Survey came into the public; but being printed in my absence, they were much disfigured, by the change of the language, and often the very contrary is said of what I said.

December 3d. Letters of Messrs. Jefferson and Madison, Ex-presidents, regretting the interruption of the work, and approving of my methods and plans, &c. &c.

1826. *December 9th.* Colonel Roberdeau's paper upon the Coast Survey appeared in the National Journal.

1827. *January 8th.* My answer to Mr. Roberdeau's paper appeared in the New York American, the National Journal not having inserted it, as it had been requested.

1828. Report of the Secretary of the Navy to Congress, saying upon the Survey Concerns of the Navy, "Nor can such Surveys be made without the aid of the means contemplated by the act of 10th February 1807, to provide for the Surveying of the Coast of the United States."

March 26th. Letter of the Secretary of the Navy to me, requesting a list of the instruments needed for the Coast Survey, besides those on hand.

March 29th. My answer to the above letter.

Various circumstances occurred, and plans were proposed, in which I more or less was in correspondence, until a law was introduced into Congress to renew the law of 1807, upon the proposition of Mr. Verplanck, to refer to the Naval Committee so much of the President's Message as referred to that subject. My accidental passage through Washington occasioned me to speak with the chairman of the Naval Committees, and several other gentlemen, only in a cursory and transient manner.

1830. *June 5th.* Letter of Mr. Branch, Secretary of the Navy, forwarding to me my paper of Principal Dates of the Coast Survey, after having taken a copy of it. About that time also, instruments of different kinds were lent to the State of Massachusetts, to make a map of the State under Mr. Stevens.

1831. *December 22d.* Last date of the law proposed to renew the law of 1807, to activate the Coast Survey. About the same time it was intended to transfer the instruments to West Point.

1832. *July 10th.* Act of Congress, to carry into effect the act of 1807, to provide for the Survey of the Coast of the United States, authorizing to employ any men, adding to it the Coast of Florida.

July 26th. My plan of operation for the attainment of the aim of the preceding law.

August 9th. Date of my new appointment by the Treasury Department, with the President's approbation, stating my compensation at $3,000 per annum, and $1,500 for my personal expenses,

and leaving me the business of weights and measures, without additional compensation.

1832. *August 12th.* My letter of acceptance, stating the insufficiency of the allowance for expenditures; but as this part was easily mendable according to what experience would show, I would proceed to work immediately, and communicate results.

September 19th. My letter to the Treasury Department, requesting authorization to call upon the Departments of War and Navy for assistants, proposing the assistants, and requesting funds to be given to one of them, for the public expenditures.

September 23d. My letter relating to the refusal of Dr. Howard as my assistant.

September 25th. Refusal of funds in advance from the Treasury Department, and referring to payments when bills may be presented.

September 26th. Having in the course of the month received the instruments, journals, &c. from the Engineer Department, I left Washington for New York, where the work was to begin again; Messrs. Bomford and Henderson as assistants going with the instruments upon the steam-boat to Baltimore, where we met together.

October 3d. Arrived in New York with the instruments, found the signals, carriage for the instruments, and various other objects, that I had directed, in readiness, and took measures to procure the rest of the equipments.

October 8th. Began the placing of signals upon those stations of the Survey of 1817, that I intended to use.

October 24th. My letter to the Treasury Department, announcing I had procured funds upon my private responsibility, and thereby the objects and arrangements were ready for further reconnoitering in continuance of the work. Requesting also Lieutenant Alexander Mackay as temporary assistant in the reconnoitering, besides the two I had. Rendered account of the excursion to West Point for the clock and circular instrument, and the reasons why I left them; the clock being in use, and the circle I could dispense with.

October 31st. Date of the first warrant, No. 5996, sent to me for the public expenditure.

November 3d. Letter of the Treasury Department, announcing that Lieut. Mackay had been detailed as assistant; that soldiers and tents had not been required, for reasons stated before; and that I could procure manual help and the necessary equipments by the funds of the Survey; giving me also liberty to appoint a disbursing officer.

November 21st. My letter announcing the accounts to the 1st inst., and referring all the military or manual assistance part to Lieutenant Mackay.

December 6th. My letter to the Treasury Department upon the amount desirable for the next appropriation, with the reasons for it.

1832. *December* 19*th*. About the closing of the reconnoitering turn, the measures taken for some repairs of the instruments, and their location in the Custom House; the closing of the accounts upon the 1st of January, as desired by the Department, and upon the instruments lent to Massachusetts, from the Coast Survey collection.

Closing

1833. *January* 12*th*. Communication from the State Department upon the books and similar objects to be procured from London, as also upon some weights.

January 19*th*. Letter of Dr. Howard from the Engineer Department upon the instruments lent to Massachusetts, which they desire to keep longer, and not to purchase.

January 31*st*. I arrived again in Washington.

February 11*th*. I announced to the Treasury Department, what instruments I had received from the Land office, and their state.

February 21*st*. My letter about the instruments at Boston, and statement of their amount of cost.

February 22*d*. Letter of Mr. Madison upon the Weight and Measure Report sent to him, and expressing his satisfaction upon my resuming the Coast Survey.

February 23*d*. A report, that I had prepared upon my work of that fall, was, however, not found necessary, and remained behind.

March 25*th*. My letter to the Secretary of the Treasury upon causes of delay, and pressing upon a decision that I may go to the field work.

March 27*th*. My letter to Mr. Troughton in London, ordering instruments, upon a given plan of a new large instrument, &c. which was given to the State Department for forwarding.

March 29*th*. My letter, requesting Captain Swift to be detailed as my assistant, and Lieutenant Bell of the Navy.

March 30*th*. Upon Mr. Ferguson and Mr. Livingston as assistants, a letter of mine to the Treasury Department.

March 30*th*. My letter to the Treasury Department, requesting authorization to have a superior instrument made, and a dividing engine procured from the amount to be obtained for the instruments ceded to Captain Talcot, for the determination of the boundary of Ohio.

March 30*th*. Letter from the Treasury Department, informing me of the instruments lent to Massachusetts remaining there, and of those that would be returned, with accompanying documents.

April 12*th*. Letter of the Treasury Department upon the granting of the assistants that I had requested, and their several compensations.

April 13*th*. I arrived again in New York, to begin the preparations for the field work.

April 18*th*. My letter to the Treasury Department, relating to the instruments ceded to Captain Talcot. I informed, also, under the same date, the Treasury Department upon the instruments received from Boston, and their bad state.

April 19*th*. My letter to the Treasury Department upon assistants,

particularly relating to Mr. Ferguson, proposing, also, Mr. Blunt as an assistant, and upon the measures that I had taken to procure the field equipments.

1833. *April 26th.* I left New York for the first turn upon Staaten Island, to replace signals, and further reconnoiterings, with all my assistants.

April 27th. The Treasury Department confirming the compensation of Mr. Ferguson, stated comparatively with Captain Swift.

May 2d. My letter to Troughton upon instruments.

May 24th. Captain Ramsey's list of instruments received from the Topographical Bureau.

June 2d. Letter of the Treasury Department, requesting a list of the prices of the instruments ceded to Captain Talcot, authorizing the appointment of Mr. Blunt as assistant, and upon the draft for the payment of the instruments in London.

June 15th. My answer upon the preceding letter, and other objects, relating to assistants, and similar.

June 15th. The Treasury Department asking about how much per cent. was to be added to the price of the instruments ceded to Captain Talcot, and referring to the letter of the 12th for the compensation of Mr. Livingston, stating it to be midshipman's pay.

July 3d. My answer to the above, and relating to the draft upon London, for the payment of the instruments ordered of Troughton.

July 8th. Authorization of the Treasury Department to purchase a draft upon London for £600.

July 12th. Closing of my accounts upon the public expenditures, and full transfer to Captain Swift; also my letter to the Treasury Department, informing of this transfer, and the reference upon Captain Swift for the future.

July 14th. My letter to the Treasury Department, closing the draft concern.

July 18th. The Treasury Department approving the transfer of the accounting concern to Captain Swift.

July 27th. Upon the transfer, also, of my compensation to the accounts of Captain Swift. And account of the hail-storm that we experienced on Bald Hill.

August 5th. My letter to the Treasury Department, announcing the purchase of the draft upon London, the compensation arrangement with Captain Swift, and asking a warrant on his account.

September 2d. My public notice for the protection of our signals, and my operations upon the stations.

September 20th. Account of my progress to the Treasury Department.

October 13th. I instructed Mr. Ferguson about the secondary triangulation in Connecticut, for which he left soon after.

October 17th. The same for Mr. Blunt, for the secondary triangulation upon Long Island.

October. I received the letter of Troughton & Sims, relating

to the instruments ordered to them, promising to follow my plan, and to try to furnish the large instrument early next spring.

1833. *November* 11*th*. My letter to the Economical Society of Bern, requesting to cede to me the three-feet theodolite of Ramsden; also a letter to Professor Trächsel, to send the theodolite of Schenk, yet on hand, from him in Bern; to Korn in Arau, about his instruments; to Troughton & Sims, upon nearer details upon the instruments to be constructed for me. With the letter to Professor Trächsel was a draft for the payment of the instrument of Schenk.

December 1*st*. I announced to the Treasury Department my intention to close the campaign of the year with the station of West Hills, where I was, and further particulars about the arrangements.

December 7*th*. My letter to the Treasury Department, requesting Lieutenant Mackay as assistant for the winter already.

December 10*th*. Letter to Dolland, requesting a telescope, and two microscopes, upon the peculiar arrangement that I have invented, to substitute optical images for the wires.

December 11*th*. The whole party left West Hills for New York, after having stored our heavy baggage at Mr. Chichester's, where we had lodged on West Hills.

1834. *January* 3*d*. I arrived again in Washington.

January 7*th to* 15*th*. Various letters of mine to the Treasury Department, upon particular subjects relating to the Coast Survey, handed in at once, which were never answered.

NAVY DEPARTMENT,
March 28*th*, 1834.

SIR:—Your letter of the 26th instant has been received. The "last letter" to which you refer, if it be the one addressed by you to this Department on the 22d instant, does not appear to contain the information requested in mine of the 25th; and I regret that none of your letters to the Treasury Department have yet been communicated to me, though I hope soon to receive them. The War Department has been requested to order Lieutenant Mackay, as desired.

I am, very respectfully, &c.
LEVI WOODBURY.

F. R. HASSLER, Esq., Washington.

Washington City, March 29th, 1834.

MOST HONORED SIR:—My letter of the 22d to you being written much with the view of abridging a subject leading into great length, if I had entered into all its details, contained in the information relating to the assistants, renewed in yours of the 25th, in the two articles near the end, beginning with "In relation to the assistants," &c., in a form which I see was too short for you to see all its bearings, because you had not yet in hand the detailed documents, by which I supposed you more informed already than, I see well, you could be, not having received them as yet.

I hope, however, that my list and account upon this part, as contained in my last, joined to the letter of the 22d, will be satisfactory, until, as I hope soon, I shall be able to have a conversation with you, to introduce you in any particulars that you may desire; and then a full letter appropriated to your views may be made, if you desire it, unless something or other should still be needed before.

I am much obliged to you for the application made to the War Department for Lieutenant Mackay, and hope it will be as successful as it is desirable.

I have the honor to be, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Navy,
Washington City.

Washington City, April 6th, 1834.

MOST HONORED SIR:—The President having promised to me last Thursday to give directions relative to the appointment of Lieutenant Mackay as assistant to the Coast Survey, I must presume the decision of the War Department communicated to me by your letter of yesterday, was taken before these dispositions have reached there.

I have therefore, as it was my duty to do, immediately again addressed the President, and communicated to him your favor. I think it also proper to inclose here, for your knowledge, copies of both letters to the President, the first of which was in his hands in less than one hour after his verbal request for it, and his promise to give it effect.

I have the honor to be, &c. &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
April 8th, 1834.

SIR:—Your letter of the 6th instant, inclosing copies of communications addressed by you to the President of the United States, relative to the employment of Lieutenant Mackay in the Survey of the Coast, has been received.

In reply, allow me to assure you, that every exertion will be used by this Department to promote your labors in the Survey; and I have no doubt the War Department feels cordially disposed to do the same. But, as you have been before apprized, there are difficulties in detailing Lieutenant Mackay.

Yet Governor Cass remarks that "any officers of the army shall be ordered on this duty, whose situation will permit it, consistently with the rules and interest of the service."

You will therefore be pleased to furnish a list of other officers in the army, whose services are considered likely to be useful; and it will give me pleasure to submit the list to the War Department, for a selection of such a one as can best be spared from other duties.

I am, very respectfully, &c.
LEVI WOODBURY.

F. R. HASSLER, Esq., Washington.

Washington City, April 8th, 1834.

MOST HONORED SIR:—Your favor of this day gives me great pleasure, by the approbation which you give to my exertions in the Survey of the Coast, and the attention which you bestow upon it now under the guidance of your Department.

I have also no doubt but that the War Department, on full reflections, will equally concur in assisting, by the means at its disposition, a work in which it is, in fact, as much interested as the Navy Department; as by its very nature it will furnish means which, in cases of emergency, both will have equally to consult.

To answer the peculiar occasion of the call upon the War Department to detail Lieutenant Mackay as assistant in the Coast Survey, the detailed history of the whole transaction from its beginning, under the Treasury Department, will best clear up the whole, and the equal and regular course that guided me. I do best, therefore, to communicate it to you as follows:

In my letter to the Treasury Department, dated West Hill, December 1st, 1833, I stated—"I shall be obliged to propose to you an increase of the number of my assistants," &c.

My letter to the same Department, of the 7th December, requested

the appointment of Lieutenant Mackay as assistant, with the special reasons for this selection.

I arrived in Washington January 3d, 1834. I was informed, by a visit to the Treasury Department, that no measures had been taken upon this my request, and I prompted them to be taken.

I had also occasion, in a visit to the President of the United States, to state this my wish, in the course of the conversation. His answer was: the Secretary of War would report upon it, and he would consider it.

As I had immediate use for the services of Lieutenant Mackay, I went, on the 6th January, myself to the Secretary of War, who referred me to Major General M'Comb, who stated his disinclination to comply, in pretty positive terms.

However, the letter of the Secretary of War, of the 15th January, of which a copy is here joined, (as communicated to me by the Treasury Department,) by its closing phrase, did not leave me the least doubt but that Lieutenant Mackay would, on a second application, be, as is there said, "*ordered to report to me.*"

At the same time occurred the riot of the Irish workmen upon the canal; and Lieutenant Mackay was ordered there, as one of the officers nearest at hand. I found it, therefore, not proper to renew my application immediately; and directed Mr. Renard to come here from New York, to replace him for this winter.

On the 24th March, Mr. Renard left here again for his former station, as second assistant to one of the secondary triangulations that was in actual operation already, as stated to you in time.

This occasioned me, of course, to renew my application for the assistance of Lieutenant Mackay, as by my letter of the 26th March to your Department; so much the rather, as he had just returned from the expedition he had been ordered to before, and was only ordered to Fort Washington, where I knew it was very easy to supply his services, as stated in my letter to the President of the United States, communicated to you. As you was so good as to state to me that you would also refer to the President upon it, I have no doubt but that his disposition to favor the work with good assistants will decide him not to deprive it of an officer capable of rendering valuable services, and to leave his acquirements useless to the country, by devoting him to the mere assistance in the command of a few soldiers, where any officer whatsoever almost can supply the place; and I should consider it almost impossible that any rule of the War Department should be contrary to the placing of any officer whomsoever to where his acquirements may be the most useful, when the Military Academy is purposely established to favor those acquirements just for such uses; though, for the special object of the assistance which I now require, no man directly from that Academy could be of any service, on account of the absolute necessity that an assistant as I now require must already possess many practical acquirements that can impossibly be given them there.

I may still be allowed to add, that it is well known in the service of the Engineer Department and the Topographical Bureau, that these corps not being sufficiently strong for the services that devolve upon

them, they have always been assisted by such officers of the other corps of the army whose acquirements render them desirable for these duties. I am sure the case exists now even as it has always been. I may, for all my considerations in favor of the work of the Coast Survey that are involved in this question, refer to the documents in your hands, while, as well the work itself as I, will however ultimately have to abide by whatever resolution may be taken.

I have the honor, &c.
F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the U. States Navy, Washington.

NAVY DEPARTMENT,
April 3d, 1834.

SIR:—In examining the correspondence relative to the Survey of the Coast, it has been discovered that your letter to the Treasury Department, as to the proposed co-operation of Messrs. Alexander and Ducatel in the Survey for the State of Maryland, has not been answered. As these gentlemen have since made a similar proposition to this Department, I inclose for your information a copy of my answer to them on the subject, the arrangement in which you will please to carry into effect.

I am, very respectfully, &c.
LEVI WOODBURY.

F. R. HASSLER, Esq., Washington.

Washington City, April 9th, 1834.

MOST HONORED SIR:—Upon your invitation, in the conversation that I had the honor to have with you yesterday, I take the liberty to enumerate here various subjects of former letters of mine to the Treasury Department that have not been acted upon.

1. Relative to the desire of the State of Maryland to join the survey of the map of that state with and under the guidance of the Coast Survey, my letter of the 9th January last contains all its bearings, and the principles upon which I think myself authorized to recommend it. I may only add, that it will occasion for me personally an increase of exertions, to which I am willing to submit, and an increase of my private expenditures, which I have the hope will be considered in another question as yet pending.

2. The State of Massachusetts has yet in hand some instruments

belonging to the collection for the Coast Survey. On taking to the Coast Survey again, in 1832, they were offered to be ceded to the state against proper compensation; this was however refused by the state, and it was only requested that the further loan of part of them should be granted, which was acceded to, while others were returned in a state mentioned in some of my letters.

By my letter to the Treasury Department of the 28th February, 1834, I stated, that some of them that I wished and needed were refused to me, unless a formal application was made through the Department by the intermediation of the governor of the state; and I desired, therefore, that this should be done. I can also, in this respect, not do more than renew my desire; all the details lie in my letter.

3. Instruments have been ceded to the War Department, for the use of Captain Talcot, to determine the boundary-line of Michigan. The prices were stated by the Treasury Department, and the instruments have all been delivered; but only a small part of the resulting amount has been paid: of all this you will find the details in various documents of the Treasury Department not in my hands.

It is desirable that the payment should be completed. The instruments that are to replace those ceded, such as will be still more appropriated to the Coast Survey in its present state, have been ordered, and funds advanced upon them, &c., which it was calculated should be covered by the amount to be received.

It is therefore evidently desirable that this account should be ultimately settled, and the amount joined to the unexpended appropriation.

I suppose that all the documents relating to these subjects have now been transferred to your Department from the Treasury Department: if any thing should be missing that I can supply, please to order it.

You will see the propriety that all these subjects should be brought to a final close. From the Treasury Department I never received any answer upon any of them.

I have the honor to be, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Navy,
Washington City.

Washington City, April 12th, 1834.

MOST HONORED SIR:—Upon your favor of the 9th, relative to the junction of the survey of Maryland with the Coast Survey, authorizing me to make the proper arrangements to put the measure into execution, I shall make the appropriate agreements with Messrs. Ducatel and Alexander, combine means with them, and then give you proper details upon the plans agreed upon mutually.

Mr. Alexander has already received one of the nine-inch theodolites in New York, of which I had spoken in my letter to the Department; though they have last year been put into serviceable order, they have however seen hard days in their being lent out; and I think it would be proper to cede them at reduced price, to use the proceeds towards the payment of the other instruments absolutely required: they are yet fully adequate to smaller detail works, which it is intended to execute in the Coast Survey by other means.

The full cession of such instruments as may be spared from the collection for the Coast Survey, is far preferable to the lending of them in any way; as to avoid accidents is then the business of the new owner, on his own account; and experience has proved that the state in which those lent may be returned, is not in any way to be relied upon.

I have the honor, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
April 14th, 1834.

SIR:—As recommended in your letter of the 12th instant, should the measure be deemed by you beneficial to the public, I approve the sale of the instruments alluded to, and authorize the proceeds of such sale to be applied to the purchase or repair of other instruments suitable for the Survey.

I am, very respectfully, &c.

LEVI WOODBURY.

F. R. HASSLER, Esq., Washington.

Washington City, May, 1834.

MOST HONORED SIR:—With the present I have the honor to deliver to you my report upon the works made for the Survey of the Coast of the United States, during the whole time of my agency in it in 1817, as well as in the last passed year, which it was necessary to unite.

I have every reason to hope, that the views in which it is drawn up will be satisfactory, and particularly appropriated to make known to Congress the proper character and aim of this important work; the

knowledge of which it is necessary to renew, on account of the long time that has elapsed since the original law, in the framing of which all the bearings of the work were discussed.

It appears to me all-important that this report, together with the maps of the triangulation accompanying it, shall go in full to Congress, with any such additions of yours as you may find advantageous to the further promotion of the work in the most advantageous manner, which I have no doubt will become evident from this report.

Any documents that you may think that it would be advantageous to add to this report, I shall be ready to communicate, as soon as possible, from the collection in my possession, of which copies have been made to restore those lost in the conflagration of the Treasury Department, but which it has not been possible, as yet, to finally collate, certify, and finish, on account of the mass of other work on hand.

I have the honor to be, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Navy of the U. S.
Washington City.

First.

Report upon the Works executed for the Survey of the Coast of the United States, upon the Law of 1832, *and their junction with the Works made in* 1817, *by and under the direction of F. R. Hassler.*

1. That great part of the work for the Survey of the Coast which has been executed since the renewed law of 1832, is grounded upon the work done in 1817, under the first original law of 1807. Therefore, in this first public report, of a more full and general character, which I have the occasion to render, it is necessary to go back to that earlier period, in order to give a proper view of the state of the work, its systematic connection, and its bearings in every respect, so much the more as the circumstances of the interruption, in 1818, precluded me from the presentation of the full report, which was just then in preparation.

2. I may be allowed to suppose the principles upon which the work is to be executed as sufficiently known; as well from the mathematical elements that must guide such a work in general, as by the plans that have been so repeatedly discussed and approved, upon all the occasions that circumstances have presented for their full consideration, and the test of the public approbation, that they have passed.

3. It is, therefore, rather my task here to show how these plans have hitherto been followed, to state the results that have been obtained, up to the present time, and to show their consequences.

4. The first distribution of a country into regular geometrical figures, that will approach its form the nearest, and under the most advantageous circumstances, to procure accuracy in the survey of it, requires the union of a detail knowledge of localities and theoretical principles, which is in general foreign to the habitual knowledge of the country, in respect to its civil connections; the operator can, therefore, be guided in it by no other but his personal inspection of the localities.

5. The general outline of the Coast of the United States presents, in the neighborhood of New York, a considerable angle between the main directions, easterly and southerly, and in some measure a basin, over which lines may be laid and determined, between the surrounding elevations fronting these two main directions, and thereby furnishing proper base-lines for the continuance of the works; though, therefore, I extended my first reconnoitering as far south as the Chesapeake Bay, I was ultimately, for the beginning of my work, arrested particularly by the decided advantages of that locality.

6. Guided by the idea, that behind the straight ridge of the Palisadoes, in New Jersey, bordering the Hudson river, above New York, a straight valley was likely to be found, that would present the necessary first element of any survey, namely, a nearly level base-line, of sufficient length to serve as ground to the triangulation, I directed my attention to, and found the confirmation in, the valley called English Neighborhood, of which I made a detailed survey in the spring of 1817, in order to give it the best location that the ground would admit of, and actually measured the distance between Vreelands and Cherry Hill, as more favorable than any locality that I had visited before, with the same views.

7. As habitual for such kind of works, under the expectation of taking the best advantage of the nearer investigation of the country, and not to make, at the very outset, expenses that might be more advantageously put upon a better line, this base was measured in a preliminary manner, with a chain of twenty links, of one metre each, constructed under my direction, by which it was found to be 9446.16 metres, corresponding to about 30999.8 feet English measure.

8. From Wesel Mountain, one of the prominent rocks of the Newark Mountains, first ridge, which formed the first elevated triangle-point, through a number of other elevated points, a system of triangles was laid over the whole basin of New York Bay and its surrounding valleys, that presented determined distances, eastwards for the further continuation of the work over Connecticut and Long Island, and southerly over New Jersey towards the Delaware, over the valley of which the nature of the country indicates the course for the main triangulation towards the south, to which the survey of the outer coast must attach itself at the two ends, the Delaware Bay and Long Branch; because the sea-shore itself is too flat, too wooded, and deprived of such prominent points as are necessary for a large triangulation.

9. These works exhausted the time of the summer and fall of 1817, until past middle December, even with the omission of the extreme

stations, which it was intended to occupy the next year, at the same time as the survey would be further extended.

10. Though in extensive surveys it is habitual to measure a verification base only at a considerable distance from the first base, I considered it, on the contrary, of importance in my case to have a verification as early as possible of the proportional accuracy of the base-line measured in English Neighborhood, which formed then, and forms as yet, the fundamental unit of the whole triangulation. Therefore, a second or verification base was measured in December, 1817, upon the south shore of Long Island, between a point near the Narrows, and another near Gravesend Beach, though not in a very favorable locality.

11. The length of this line was found 7753 metres, or 25443¼ feet English. The results of three different combinations of the triangles, carried out upon it, falling all within two tenths of a metre (or less than eight inches) of the distance measured, and within themselves, I had reason to consider myself sufficiently authorized to use my base-line of English Neighborhood as a preliminary standard for my work.

As this coincidence is greater than usual in common geographical operations, I considered myself also allowed to propose to ground upon the work thus far obtained the detail survey of New York harbor for the next summer, as I proposed in my letter to the Treasury Department of the 18th December, 1817. The great coincidence of sums of the angles of the triangles with that required by theory, came equally in support of this satisfactory result.

12. The whole of the observations collected during the summer of 1817, I had of course to submit to the necessary reductions, calculations, and clearing up of the results, during the ensuing winter.

Besides that, I made also the theoretical calculations that must be derived from the theory of the figure of the earth, and the best known results of the elementary magnitudes, to deduce from the data obtained by the triangulation the proper location of each point to its place upon the earth, and in time upon a map; from the same principles I deduced and calculated also those principles upon which the future maps were to be constructed, or, as usually called, the projection, which required so much more attention and reflected calculation, as in the case of the Coast Survey, it shall serve to carry the work out in the minutest details, and upon a large scale and great extent of country.

13. While I was engaged in these calculations, the law of 1818 put an end to my further agency in the work; only a few weeks before I would have been able to present a report upon my work, that would certainly have been satisfactory; as I stated in my letter to the Treasury Department of the 9th April, 1818, written in answer to that announcing to me the dispositions that led to the breaking up of the work. In consequence of which I delivered to the War Department all the journals, books, instruments, and other appurtenances of the Survey, together with an unexpended appropriation of upwards of $50,000.

14. It is necessary that the stations of a work of the nature of the Coast Survey, shall be preserved for future times and uses, in any

other surveys to which the determinations made by it will serve as fundamental units. Therefore I had caused hollow truncated cones of stone-ware to be made, which were sunk under ground at the station-points, deep enough to be sheltered from any plough or light accidental digging; they are well centered to the stations, so that on their discovery a signal-pole can be placed in them, to serve at any time equally as at first, as, by their nature, they will remain undecayed for centuries. Where the station-point fell upon a solid rock, I caused a hole, of about two inches in diameter, and seven or eight inches deep, to be drilled at the station-point, and filled with melted brimstone, which will equally serve to indicate the exact point of the station. An exact description of the locality of the station must, of course, form a part of the journal of each station, to guide in the discovery of the point at any future time.

15. It does not belong here to speak of the chasm that is found from that time until the renewal of the law of 1807 by that of 1832, which confirmed the former in all its parts, though with the condition that it shall not be considered as authorizing the establishment of a permanent astronomical observatory, which the most enlightened members of the Government had in 1807 and 1816 considered as a natural consequence of the law, because it should in fact form the fixed point in the hemisphere of America to which the work of the Coast Survey should be attached; wherefore also I had been directed to procure, and actually had procured, suitable instruments for such establishments at the same time with those for the Survey.

16. This peculiarity of the law of 1832 I have always considered, as stated already in one of my letters to the Treasury Department, as intended to provoke a more direct and separate proposition for the establishment of a proper national observatory, upon a greater scale than a mere accessory to the Coast Survey, and properly adapted to the standing of our country among the civilized nations that have a navy, for which such an establishment is an absolute requisite.

17. In taking up the work again in 1832, it was of course proper to take advantage of what had been done in 1817, as base of the operations to be made under the new law, its foundation being good, and all its principal points ascertainable, by the precaution taken, as stated above; the proper acceleration and economy of the work, and good principles, equally indicated that course, in preference to any other.

18. The first operation was therefore, to uncover again the station-points of the work of 1817, and to replace signals upon all the essential points; these were easily discovered, and signals placed upon them of the same kind as formerly used, namely, truncated cones of sheet-tin, elevated upon poles; only two of them, needed only at some future period for the southern extension of the Survey, were not yet found by the assistants who visited the places, but will certainly be found when more especially needed.

19. The direction in which the first extension of the work was by preference to be made, was to be determined by the consideration of where the most advantageous progress could be expected, in order that I might be enabled to present, at as early a period as possible, an

actually executed full scheme and example of the work. For these views the continuation of the work eastwardly over Connecticut and Long Island, presented evidently advantages over that southerly, through Jersey, &c.

20. The line between Wesel Mountain, near Patterson, New Jersey, and Harrowhill, near Hempstead Harbor, upon Long Island, had been determined in 1817 to serve for this direction; therefore I reconnoitred in the fall of 1832, and even in the winter, through a part of the Long Island hills, and over the elevations of Connecticut, that have those of Long Island constantly in view; and though in the various intermixtures which they present, all the information that I received from the inhabitants appeared contrary to success, I was so fortunate as to find a series of five to seven hills connecting very properly and to good advantage for a favorable chain of triangles; and even the corresponding points of Long Island proved more visible from one another than their position, almost in a straight line, had allowed me at first to expect, by the generally wooded state of the interior of the country. Signals were of course placed upon all these points, of the same truncated cones as were always used.

21. All the points thus reconnoitred were placed upon a map of Long Island, according to approximate observations made at them, constructed according to the problem of three points, dependent upon the light-houses of both shores of Long Island Sound. But besides that the intransparency of the atmosphere near the sea-shore in winter always renders distant vision indistinct, the actual inclemency of the month of January prevented the full decision upon the visibility of Wesel Mountain from Buttermilk Hill, in West Chester county, behind Tarrytown, which its locality promised to bring in the line from Wesel through the interruption of the hills of the Palisadoes and the northern hills of New York, commonly called the Notch, which was however of the greatest importance.

22. Circumstances out of my control delayed my stay in Washington above my expectation during the whole winter 1832 to 1833.

As soon as I had again arrived in New York, I placed upon the stations of Wesel Mountain and Harrowhill signals of larger dimensions, though of the same form as I always used. Then I began the summer campaign with the station of Buttermilk Hill, where it was necessary to ascertain whether that point would actually answer in full the condition of joining the triangulation of 1817 with the continuation of it that I had projected; this was actually verified, so that the whole of my projected triangulation promised to be proper and available.

23. Upon this first station I had of course also to put the instruments in proper adjustment, and to introduce my assistants into the peculiarities of the work and the observations, all which protracted so much more the stay upon this first station, in addition to the often unfavorable weather; the extremely unfavorable weather of the most part of the last season, in general, protracted our stay upon all the stations much beyond expectation, and what is hoped will be the case in future, particularly when the arrival of the new instrument

expected from London next summer, will dispense, in some measure, with the numerous and anxious repetitions and cares which the present state of the two-foot theodolite, that had to be used for the great triangulation, obliged me to go through; for this campaign has particularly proved that the accuracy and good state of the instruments is one of the greatest means of economy, by the greater celerity with which results can be obtained by them.

24. It would have been desirable after the success of that station of Buttermilk, to go upon Wesel Mountain and Harrowhill, to observe the angles of this main junction triangle, but it was also desirable to ascertain the whole series of triangles projected, and I hoped to make these stations at the close of the campaign in the fall, with more economy in the moving of the whole establishment. To get however the preliminary determination of the distances required for the calculations which it is necessary to make in the field to guide in the progress of the work, I determined this triangle by the given distance between Wesel and Harrowhill, of which the angle subtended at Buttermilk was carefully measured, by the azimuth carefully observed there, and compared with one that I had observed in 1817 upon Wesel, though I had far less reason to rely upon its accuracy.

25. I prosecuted, therefore, my northern triangle-stations easterly, until past New Haven; and by return, the southern stations upon Long Island; and laid some triangle-points upon the southern sea-shore of the island. From these main stations I measured as many angles upon secondary triangle-points as the localities, time, and circumstances allowed, in the same manner as I had done in 1817. In the course of the work also another station-point was found, the substitution of which for that of Buttermilk will furnish a very desirable and very favorable verification of the large distances, by doubling the series of the largest triangles. I made, therefore, the proper observations for that, from the stations by which it will join the other triangles, the distribution of which is on another side, best adapted for the survey of the details in their neighborhood.

26. Upon one of the southern beaches of Long Island, appears to present itself a locality for measuring a base-line of more extent, and probably under more favorable circumstances, than that of English Neighborhood. This is now under nearer investigation by Captain Swift; and the necessary preparations for this operation, as important as laborious, tedious, and expensive, are in proper progress, as it must necessarily be the first work of this summer's campaign.

27. The operations before described having lasted until December, at which time we were upon the West Hills station, and the winter setting fully in, with the consequent intransparency of the atmosphere of the sea-shore, I was forced to abandon my plan, to visit the stations of Wesel and Harrow myself. To obtain, however, a better determination or verification, I directed these two stations to be occupied preliminarily by some of my assistants, though with inferior instruments: that will, therefore, not dispense my observing there in proper time myself. So, Mr. Blunt observed the angles upon Harrow, and Mr. Ferguson those upon Wesel; and upon their results, joined with

those of Buttermilk Hill, the present preliminary determinations are grounded, as far as they are dependent on this part.

28. When I had executed the station of Mount Carmel, the extreme eastern one to which I had intended to extend my observations that year, I considered myself authorized to form two parties, to carry on secondary triangulations within the limits of country that my main triangulation embraced, as the triangles could all be sufficiently determined to allow the verifications required in future: keeping, therefore, only two of my assistants, Captain Swift and Lieutenant Bell, with me, Mr. Ferguson was directed, with the assistance of a secundant, to fill up with secondary triangles all the parts included between the main northern triangle-points and Long Island Sound; and Mr. Blunt, with another secundant, was directed in a similar manner for all that related to both shores of Long Island; both equally proceeding from the eastern extremity of our work towards New York.

29. The secondary points thus determined must be sufficiently numerous, and placed in such a manner, as to enable from them to fill up all the details by plane-table operations on land, and by observations for the soundings upon the water. Considerable advance was made in these secondary parts already in the latter part of last fall; and the works have been taken up again this spring early, though the weather of that neighborhood has again proved very unfavorable.

30. Upon Buttermilk and Toshua regular series of azimuth observations with the sun were made, with the two-foot theodolite, by myself; and the latitudes of the most essential stations were observed by my assistants, partly with the eighteen-inch repeating-circle, partly with the ten-inch repeating reflecting-circles; by the calculations of this winter these latitudes were all reduced to one collective result by means of the azimuths, and their coincidence has been more satisfactory even than I expected.

31. These reductions, carried through the works of 1817 to the City Hall of New York, the latitude and longitude of which had been determined by entirely different means, gave the point from which the longitudes have been counted, as reduced to Greenwich, there being no other point within the limits of the Survey astronomically determined, nor any fixed point in the United States from which the longitude could be counted.

32. As well in my operations of 1817 as in those of last year, the angles of elevation or depression of the main station-points from one another, have always been observed, except at my two stations upon Long Island, because these will be revisited at a future time. These observations will furnish in time an interesting collection of data upon the elevation of all these points over the level of the sea; but, neither the winter of 1817 to 1818 nor this last, has it been possible, for want of time, to calculate any results; in fact, it is rather more proper to postpone these calculations, until the exact distances are fully determined upon which these results depend; they will, therefore, with more propriety form a part of the calculations of next winter.

33. Since I made, in 1818, my calculations of the elements of the projection that will be the most advantageous for the construction of

the maps, as most concordant with the results of both the triangulations and the detail surveys, the knowledge of the dimensions and figure of the earth has much improved, and been much more accurately defined. I had therefore to make anew all the theoretical calculations thereto referring, upon the most approved elements, of which the leading data are the ellipticity of the earth, and the mean degree of the whole meridian, that is, its three hundred and sixtieth part. It would, however, be out of place, in the present state of the work, to enter into these nearer details of theory, which will become of great interest hereafter, as the ultimate results of the Coast Survey must furnish one or more of the data for the perfectioning of these results themselves; if it shall take its appropriate standing among the works of this nature, it is to be hoped that it will be properly discussed at the end of the work of the main triangulation.

34. It may be here the place to state my reasons for adopting the metre for the unit measure of the whole Survey. 1st. I had a fully authentic metre, made by the Committee of Weights and Measures in Paris; while of any other measure whatsoever, I could only have a copy, more or less accurate. 2d. Notwithstanding older ideas to the contrary, I found positively, in my comparisons made for the weights and measures, that, in a general way, the metres are obtained of greater accuracy and coincidence than the English scales. (See my Report upon Weight and Measure Comparisons.) 3d. By my repeated comparisons of this identical and authentic metre with the scale of Troughton of 82 inches, adopted as English standard in this country, together with a number of other measures, its ratio to either one of them is sufficiently determined, to enable at any time to present any distance in either one of the measures thus compared: as for instance, to obtain the value in English inches, will need only the addition of the constant logarithm = 1,5952859 to the logarithm of the distance recorded in metres. 4th. In the ultimate general account, it will be proper to give the distances both in metres and in yards, or feet, to ease the utility for the various future detail applications of the work.

35. The connection of the station-points of the triangulation by their differences of latitude and longitude, was calculated upon the same theoretical principles stated above; they have coincided with the results of the latitude observations, that are by their nature entirely independent of the geodetical operations, to such a degree as, notwithstanding all my cares, I did not consider myself authorized to expect; and the reduction to the City Hall of New York showed an equal coincidence with observations made some years ago by Captain Sabine, on the occasion of his pendulum observations.

36. This afforded also an additional proof that the result of the measurement of the base in English Neighborhood, measured in 1817, would be sufficiently relied upon, for the preliminary calculations, as it stood the test of being extended to distances about 160 miles from the same. It confirmed equally the near approximation of the azimuths observed last year.

37. It is, however, evident that my dependence for the ultimate azimuths and latitudes of deciding accuracy, must as yet be referred

to future observations, with the superior means, of instruments, &c. that I have in part ordered, and have in part still to contrive; in respect to the longitude, it is too evident how desirable an observatory will be, as no doubt will be provided in proper time, by special means, independent of the Coast Survey.

38. My attention at the present stage of the work must be directed principally to the measurement of a base-line, with all the means of accuracy that I may be able to dispose of, by means of the apparatus of which I have given the description in my printed papers upon the Coast Survey; the brass parts of the apparatus were put in full good order already during last summer, the wood work is in construction in New York, under the direction of Captain Swift, and I have just now put the double metre bars, which shall determine the absolute length, to their proper standard, by means of the apparatus provided for it, and with the help of my assistant in the weight and measure business.

39. In the actual measurement of the base-line, I shall unite all my present assistants, principally because they will all take a great interest in the operation, which is in its kind of a peculiar nature, and not often occurring, wherein every operator will always follow his peculiar ways, according to his situation, and the means at his disposal.

40. As soon as the result of the base-line is ascertained, which will require some time and considerable calculation, the result will be applied to the calculation of all the triangles, and the reductions to the geographical positions will be repeated with this new element. Then a projection of the points, upon the scale of the fifty thousandth part, will be made upon papers, distributed over the extent of the work, in such parts as will be best appropriated to the filling up of the detail surveys, by the plane-table, and the insertion of the soundings, in which works the most of my assistants will then be distributed, while I shall proceed again in the main triangulation.

41. During the execution of these works I hope that the instruments, ordered of Mr. Troughton, in London, will arrive in this country, at least if he can execute the promises given to that effect; I hope, therefore, to be able to avail myself of the new large instruments for the continuation of my work in the main triangles, the determination of azimuths and latitudes, and all the more delicate observations, upon properly selected, favorable stations. The two-foot theodolite, that I have used last summer, I shall then propose to send to Mr. Troughton, to have it again put in a proper serviceable state, for that accuracy of which it is susceptible, when in good order.

42. At the same time with the distribution of the detail surveys upon hand, I should like to put in activity two parties of naval gentlemen, for ascertaining the soundings in the neighborhood of the same parts that the detail surveys would embrace, as they would probably sometimes work in conjunction with one another; they would embrace a great part of Long Island Sound, and part of the south shore of Long Island. This, however, will require to take some arrangements previously, in relation to the vessels, which it will be

necessary to employ in it. Lieutenant Bell of the Navy, who has been one of my assistants last summer, will take the direction of at least one of these expeditions, as his acquaintance with the locality will of course assist him much in the proper execution of this task.

43. I join to this report skeleton-maps of the triangulations that have been executed hitherto, containing all the main triangles that I executed, and so much of the secondary triangles, of the two separate parties, as have been communicated to me until now. The distances in numbers would be of no interest in this report, and belong only to a final report upon the scientific part of the work; it is at no rate proper to mention any, before the calculations have been grounded upon a final base, measured as above stated. These maps present four sheets upon the scale of the one hundred thousandth part, ($\frac{1}{100000}$) which is that upon which it will about be proper to execute the detail maps, for publication; the whole system of the operations, as far as hitherto executed, will become evident by them. It appeared to me to ease the general insight into the bearing of the work, to add a fifth sheet, upon the half scale of the others, that will present the general view of the whole work; the easier reference to the locality of the triangulation will be assisted by the tracing, only in pencil, of the approximate outlines of the coast, for the survey of which the triangles contain the elements. The projections are made upon the principles above stated, and will present no deviation for the filling up to the minutest details, when executed upon the scale of $\frac{1}{50000}$, in which it is proper to execute the main original copy of the Government.

44. It is proper that all the maps should be drawn upon a proportional decimal fraction of the real dimensions; there is a great advantage in being able to ascertain by the single measurement, in any length measure whatsoever, the real distances desired; this can only be obtained by such a system of scales, which therefore also is the only one adopted in the present time. The scales of so much in inches, or any other small measure, per mile, giving altogether an irregular proportion, are very bad, and therefore have been entirely abandoned in the new maps.

45. It is proper to add here some general remarks, upon the character which it is necessary to give to the work of the Coast Survey; its general bearing for the benefit of the country at large; and the influence which its proper execution shall have upon the improvement of the practical mathematical sciences, that are so necessary in our country; and the standing of the Officers of the Army and Navy, to whose departments works of this nature, or requiring similar knowledge, are so often referred; though I have already touched this subject upon other occasions.

46. The Survey of the Coast must evidently, merely as such already, extend land inwards, at any place, until to the ridges of hills or mountains that border the valleys emptying their waters into the sea, or the large bays and rivers; it must present the localities of all the passages and gorges that lead to these valleys, &c. &c., because it must contain all that is needed for the proper defence of the coast in case of any attack whatsoever, just as much as the outlines of the

coast and the soundings; because, as these furnish the guide to the navigation, so the others are the elements upon which the directions for a proper defence of the country, in case of need, must be grounded; and all these elements must be so detailed, and present such a full and self-explaining picture of the country, that, with the map before the eye, the military operations may be properly judged and guided in the Cabinet. It is therefore also habitual to join for each district a statistical statement of its natural means and resources; it is as desirable to have these accounts of the land part as those upon the currents in the naval part of the work.

47. This work must besides furnish the elements of any other survey that may be desired for any public aim whatsoever, either within or in the neighborhood of its extent; its accuracy, if properly executed, and its wide range, render it peculiarly fit to become a standard to which all other surveys may and even shall be attached. Thereby will be gradually obtained the necessary accurate data for any public undertaking of general utility to the country. This feature of the work was felt already in 1817, when the Governor of New Jersey proposed to unite with it the survey of a map of that state; but which was lost by the delay of the decision of the Treasury Department, where I had proposed to accede to the request. It appears equally felt now, by the proposition of the State of Maryland, for a similar junction of the map of that state, which has been very properly acceded to; and no doubt similar occasions will increase in the same proportion as the general improvement of the country advances, and the proper character of the work of the Survey of the Coast becomes established; this is another proof of the propriety of the measure that I took at all times properly to secure the station-points for future use.

48. The character of a work of the nature of the Coast Survey is essentially scientific; unless this character be impressed upon it to the evidence of the public capable to judge of it, neither credit nor confidence will be given to it; it is in fact worse than useless, because it increases the doubts of the cautious and intelligent seaman, and its defects mislead the ignorant who trusts to it:—plans going merely upon what is so wrongfully called sufficient accuracy are inadmissible, and would prove highly expensive. The economy in the work consists in the certainty of producing the most accurate results.

49. In the execution of the laws in any country, and in a new country in particular, it appears to me to be a duty to take all possible advantage of it to promote as much as possible the general benefit of the nation, and especially its scientific improvement, wherever there may be an occasion presented for it, and that upon a liberal scale; because its benefits are always far more extensive than what shows itself at the first outset. I am authorized to this assertion, in the present case, by the approbation which my mode of treating the Coast Survey with these views has caused me to find in the most enlightened men of the country, and even abroad, as testified among others by late President Jefferson himself, who was the author of the original law, and by

many other distinguished citizens. We have besides before us the well known examples of almost all European countries, who have derived valuable benefits of various kinds from the proper execution of similar works in a scientific form.

50. With these views also I found it proper to collect a valuable library of the best works in those parts of mathematics and natural philosophy that are either directly bearing upon the work itself, or more or less connected with its accessory or influencing branches; by which my assistants may properly improve their scientific standing, and become the more useful to the country in future. It will also be proper to add to the work, as soon as it is in a proper train, such scientific experiments or observations as relate to the pendulum, the magnetic attraction, the tides, refraction, and other similar subjects, which are always connected with such works, when properly scientifically treated. I could as yet not do more in this than to cause the magnetic bearing to be observed upon the main stations, merely to determine the declination of the needle at the places and time; but for any other observations nothing is as yet properly provided, nor in fact was there time at disposition for it.

51. By the nature of the services that the navy and the army are engaged to render to the country—these two classes of citizens, that are always of considerable influence in any country, deserve peculiarly, though not to the exclusion of other citizens, to be quoted here in connection with this work. Such officers in either of these services as have applied to the study of the higher branches of their profession, of which mathematics form the foundation, will find in the work of the Coast Survey an occasion of improvement, as well as of gratification for their good dispositions; therefore preference is naturally to be given to those who, with a good foundation in theory, have been successful in the career of practical applications of mathematics, in topographical surveying, drawing, and particularly observing and generally in making geodetical and astronomical observations for actual use. Only such officers can reap some benefit for their individual improvement, or be of any service in the work, because this utility must be reciprocal if success shall attend on either side; the officers or individuals whosoever, joining the work without sufficient knowledge, and even practical ability, cannot reap any benefit from following it, and of course they are also entirely useless for the work, and the Coast Survey would be improperly laden with them.

52. The success of those officers, that have in the work both given and received satisfaction, will invite others to acquire the qualifications indispensably required to become serviceable, and thereby to enter the work; but the work itself cannot be the school for him who is too far behind to be of some actual service in it; the distance to be gone through is too great for him, and the functions of all those actually engaged in some part of the work are too constant, and too fully occupying them, that he might be taught, and schooled, separately who brings not knowledge enough to the work to see himself what he can do, as well in application of his actual acquirements, as

in advance of them. All this applies, of course, equally to the assistants from any rank whatever.

53. To all this it is still necessary to add, that habits of assiduity, and devotion to a scientific object, with friendly and open dispositions, without any pretension, are equally indispensable moral qualifications, to which it is necessary to attend, in the selection of the assistants in this work, as much as to their intellectual qualifications and acquirements. For there can, by nature, not be any control upon any observation entrusted to an assistant, or over the assistance rendered in an observation, except the moral strength of confidence; orders from superiors, fear of consequences, and all considerations of that kind, cannot have the slightest power; the morality and ability of the observer at the very moment decides, what no power whatever can decide. And this is equally applicable to any chief, or any assistant whosoever, and of whatever grade he may be in the work.

54. In thus exposing the principles that must guide in the selection of the assistants for this work, and which shall, therefore, ever guide me in the proposition of any assistant, of any rank or class whatever, I give the pledge, that I shall always be guided by perfect impartiality as to the personal, though I may propose persons of different qualifications, with the view of their different employments; the moral principle which must guide in all such cases, is simply, that every one must see before him an aim for his inclination or ambition, to which he will apply his exertions honestly, the result of which will be useful to the work. With these principles, I hope to be as successful in my choice as the general chances of human affairs will admit, and to be approved in my selections; therefore to obtain from the civil, naval, or military rank, always such assistants as will act with pleasure and satisfaction, and therefore do honor to the work and to themselves, thence reflect credit upon our country and nation; convinced, as they must be, that they act before the whole of the civilized world—because the history of such works is always minutely known to every well-informed man.

55. I can, therefore, also fully rely upon the concurrence of the Department, under which the work is placed, as well in the aim as in the means to reach it successfully. This success must be one of its greatest aims, upon the consideration of usefulness as well as upon that of its high credit.

F. R. HASSLER.

Washington City, May 17th, 1834.

Notices upon the Maps of the Triangles herewith joined.

Four sheets upon the scale of $\frac{1}{100000}$ present, as well the main triangles as the secondary ones, in such sheets as will be proper to allow the necessary room upon the sea-side for the insertion of the soundings, and the insertion of the details of the land near the coast, thence adapted to the actual execution of the charts and maps for publication upon a large scale; they are, of course, properly oriented perpendicular to the meridians and parallels.

No. 1. Contains the neighborhood of New York.

No. 2. Exhibits the continuation of the country, in the same latitude as the former, over Long Island eastwardly.

No. 3. Has that part of the triangulation that falls north of the first sheet, therefore principally the triangle points land inwards, connecting with those of the shore.

No. 4. Contains the triangle points north of sheet No. 2, thereby presenting the part of Connecticut east of No. 3, and the north part of Long Island Sound, in the neighborhood of New Haven, &c.

A fifth sheet is added, presenting the union of the whole work, equally oriented, but only upon the half scale of the preceding ones, that is $\frac{1}{200000}$ part, to show the full connection of the works; to assist in the reference to the localities of the country, the rough outlines of the coast are traced upon this sheet, by which it becomes evident how the triangulation will apply to the detail survey of the minuter configuration of the country, shores, bays, &c.

F. R. H.

NAVY DEPARTMENT,
May 21st, 1834.

SIR:—Your letter of this date, with your report upon the works made for the Survey of the Coast of the United States, during the time of your agency in it, "together with the maps of the triangulation," have been received.

The report and documents accompanying it have this day been transmitted to the President.

It is desirable that the copies of all papers relating to the Survey, lost in the late fire at the Treasury Department, shall be placed on file in this office as soon as they can be completed.

As the appropriation for the continuance of the Survey has already passed the House of Representatives, most of the remarks deemed proper to be submitted by this Department to Congress will be incorporated into the annual report of November next.

I request that you will, before that period, furnish the Department with estimates of the expenditures proper for the ensuing year, a general view of the progress made between this spring and November, and such other observations as may be considered conducive to the most successful prosecution of the Survey.

I am, very respectfully, &c.

LEVI WOODBURY.

F. R. HASSLER, Esq., Washington.

Washington City, May 22d, 1834.

MOST HONORED SIR:—When in 1832 the Survey of the Coast was again given into my charge, I proposed the contract made in 1816 as a form, as relates to my compensation and allowance for expenditures, with such modifications in various respects as, according to the circumstances, appeared likely to lead to more precision: but the Secretary of the Treasury substituted for it the letter of the 9th August, 1832, and reduced the allowance for my personal expenses from $2,000, as it had been rated before, to $1500.

I considered it first of all important to show that the work, as I proposed it, would be satisfactory, which I thought would certainly produce liberal dispositions in relation to it therefore: though I knew the reduced allowance could not possibly suffice, I accepted, with the condition and reserve which you will find underlined in the copy of my letters joined to the present; to which the Secretary of the Treasury never made any objections; wherefore I always considered it fully understood, and accepted tacitly. I grounded, therefore, upon this my request to the Treasury Department, which you will find in the file of letters under 12th January last, requesting an additional allowance under the denomination for the weight and measure works, which it appeared to me could most easily bear it, not weighing in the account of a separate appropriation, as you have seen by the letter communicated to you in conversation.

This was only acted upon the day before yesterday, and negatived from the side of its applicability to the weight and measure works; I must therefore take the liberty, by the present, to request that you will give it further consideration, upon the ground of the Coast Survey itself, and the assurance that I can give to you, that far from the unavoidable expenses to which I am subject in this work being less than in 1817, when I formerly worked in it, they are considerably greater, from the increased price of all those objects that come under my private expenditure, the influence of my more advanced age upon them, and from other circumstances out of my control. My actual pecuniary losses last year were great, and have placed me in a very painful economical situation: it is to be hoped that they will not always be so; but they will certainly always amount to from $500 to $1000 over the stipulated allowance. I take therefore the liberty to request that you would please to augment my annual allowance for expenditures in the Coast Survey to about that amount.

But it is not my wish to cause any interruption in the work, particularly at this moment, when I am just preparing to go off to the most important field-work, and the press of business of the Government may not allow time for a full consideration of the case. I wish that the decision may be taken only after having properly inquired into the subject, by information from persons acquainted with the facts relating to it; as, for instance, Colonel Abert, who, having been my assistant in 1817, can give positive information—all or any one of my present

assistants—and a number of other persons acquainted with the consequences of works of this nature, &c.

Therefore, I have this day procured a loan of money sufficient to bring me again to the locality of my field-work, and I continue my preparations so as to leave here about the middle of next week, and only request you will please to communicate to me, as soon as possible after, to New York, the ultimate, as I have every reason to hope, favorable decision.

I have the honor, &c. &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
May 23*d*, 1834.

SIR:—Your letter of the 22d instant, with inclosures, has been received.

I will be happy to confer with the President and others on your application for increased compensation. The result will be communicated to you hereafter, as requested.

I am, very respectfully, &c.

LEVI WOODBURY.

F. R. HASSLER, Esq., Washington.

St. Petersburg, June 3*d*, 1834.

MY DEAR SIR:—I wrote to you about twelve months ago, and requested you to send me 500 copies of your logarithms. I sent the letters by Mr. Buchanan, the late American envoy at our court. Most likely my letter has not reached you; for I have waited in vain for the logarithms, which I expected to a certainty to arrive with the first ship coming this season from America. I now repeat my request, with this difference—to send me, in lieu of 500 copies, 1000 copies, provided they may be had at the price I offered—a dollar a copy, free of all expenses, to be delivered here: the money will be paid immediately on delivery.

If my offer is not accepted, I beg you to inform me as soon as possible, in which case I shall print myself such tables as will suit us.

I am very anxious to be informed whether you have already commenced your Survey. Pray let me know what progress you have already made. I have a double interest in it: firstly, as an under-

taking of the kind must necessarily interest every professional man; and, secondly, you are at the head of it—a task you are superiorily fit for.

The Emperor has ordered to be built, near St. Petersburg, an observatory, which will, most likely, be the richest in instruments of all those now existing. The director of it is to be Mr. Struve, who will have four first-rate astronomers with him, each of whom is to have a department to himself.

Requesting you once more to let me have an answer as soon as possible,

I am, my dear Sir,
Yours respectfully,
KRUSENSTERN.

F. R. HASSLER, Esq., New York.

New York, July, 1834.

MOST HONORED SIR:—It appears to me proper to keep you informed of the gradual progress that I am able to make in the work of the Coast Survey, under circumstances so much less favorable than would be desirable, by the historical account of the proceedings since I left Washington.

In Baltimore I made a short stay in order to be informed of the progress made by Professor Ducatel and Mr. Alexander for the preparations of the survey of Maryland. Mr. Alexander was absent; Mr. Ducatel, just coming to Baltimore, told me that the Legislature of Maryland having decreed him surveyor of rail-road routes, they had found proper to satisfy this minor call first, and therefore nothing yet had been done relating to the survey for the map. The more than sufficient mass of work that lies before me for this year makes this delay from that side rather favorable for my present plans.

At Philadelphia I found occasionally that the beam compass and proportional compass belonging to the Government, that had been stolen with my trunk on my passage last winter, had been bought by the mathematical instrument maker Young; I found most economical to buy them from him at $4 50, as legal suit for their delivery, as stolen goods, though I could prove the identity to the greatest accuracy, would have delayed me long, and would have led to much greater expenses.

Immediately after my arrival here I went to West Point, where I received the astronomical part of my former library, as agreed for with the War Department, and which can be of no use to the academy; all those books that could be of some use there I had omitted in the catalogue made up for that purpose. I made also the exchange of the clock, as had been agreed upon by the same letter; besides that I borrowed a transportable transit of Troughton which was

there, being more convenient for laying the direction of the base-line than the two feet theodolite, and also with the view to save this valuable instrument. This latter I intend to return after the ending of the base-line measurement, though it is originally the property of the Land Office, as well as the transportable clock. I found here the preparations for the base measuring apparatus in considerable forwardness, as for the necessary carpenter work and such like. I put therefore the work of adjustment of the parts in immediate activity, which occupied me and all the assistants and men present for a considerable time all the day in the loft of the Custom-house, which has served as a place of deposit for all our instruments and effects since the beginning of my operations in this neighborhood.

Last fall the base apparatus had been left with Mr. Patten for cleaning and proper packing, (while I was in Washington;) as he failed early last spring, the objects were removed to the Custom-house by Capt. Swift. On examination, the telescope for directing the bars was missing, and had to be replaced; three eye-pieces of the microscopes are also missing, therefore we must do without, as they cannot well be replaced now.

While thus engaged, arrived here a theodolite of one foot diameter, that I had ordered of Schenk, in Bern, (Switzerland.) The instrument proves to be a very fine one. It was at first thought that, as it came under my directions, it would be subject to pay duty, and I wrote to the Comptroller upon the case, who, mistaking the case, also considered it so, but upon the reception of it and showing the case, many of my assistants being present, it was delivered to me free of duty, as it would have been useless to charge the Coast Survey with it.

Some parts of it had been injured; I had them therefore immediately mended by a young German artist acquainted with this kind of instrument, and whom I have engaged among the manual assistants of the Coast Survey, where he will render valuable services.

The bill of lading of the various objects delivered by Mr. Troughton to Bookseller Miller in London, for the Coast Survey, has also arrived under the directions of the Collector of this port; his absence obliges me to treat with the clerks here for the liberty of opening the package, to prevent their useless forwarding to Washington, while several of the objects are of immediate use for my present work. The package has not yet been delivered from the ship Sovereign; it was at Pine-street wharf since fully a week. During these operations we formed gradually a company of manual assistants of the different classes which we are in need of, and, according to present appearances, we have been pretty successful in our selection. Two days ago the assistants present and the most of the laborers have left here with the instruments and apparatus for the station to be formed upon Fire Island beach, partly by water and partly by land. By the time that they will have made the necessary preliminary arrangements I hope also to have received the objects arrived from London, made my field provisions, and replaced as far as I am able my field equipment, which was stolen from me last winter, occasioning to me a loss of about

$300, for all which I had not yet a moment before, and then I shall leave for the same place, where letters directed to the Post-office of Babylon, Long Island, will meet me. Mr. Ferguson has brought his secondary triangulation towards New York till to Valentine's hill, which was the limit set for his work for this spring. Mr. Dahlgren is now engaged in placing the earthenware cones in all the secondary stations that have been made on the north side of the sound. Mr. Blunt will have finished in two days his task upon Long Island for this spring.

We shall therefore all unite in a few days upon the intended station. The next of Messrs. Ferguson's and Blunt's works will then be to unite in connected operations for the determination of those points upon both shores of the sound which, being separated from the triangle-points behind them by woods, are only ascertainable by triangles from the opposite shores, and which are necessary to bring the distance between the secondary triangle-points within the short distance required for tertiary or the detail operations of the plane-table. The operations of the secondary triangulation have been greatly impeded by the constantly unfavorable weather, either rain or fog, and indeed since I am here there has been no more than two or three days in which the base measurement could have been carried on successfully. All those necessary works and the uncontrollable delays that occurred having still added to those encountered last winter, is known to you. I cannot expect to reach in this campaign the full aim that I had proposed to myself. I hope however to reach the main part of it, and to begin to put the tertiary or full detail operations and some sounding in a train of beginning; these will therefore likely be the main results, besides the base-line on Fire Island beach, that I may be able to present next November, in addition to my report handed in before I left Washington.

It will depend on the time of the reception of the great instrument from Mr. Troughton what part of the main triangulations I shall be able to add by my personal work with it; the promises are for next month, but I shall consider myself highly favored if I receive it in September. To work further with the two foot theodolite which I used last year, in the state in which it is, involves such a great loss of time, that it is proper to defer the important work until the arrival of the new instrument, though I shall also partly supply it by the theodolite of *Schenk*, just arrived.

I have the honor to be, &c. &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Navy,
Washington City.

Cu p. 89 2nd Vol.

Cu p. 60 April 1836 arrival of Langs Chron.

Cu pp 172-81 seq.

Fire Island Beach, opposite Babylon, L. I.,
August 9th, 1834.

MOST HONORED SIR:—The Auditor of the Navy Department being, as it appears, unacquainted with the details of the economical arrangements of the Coast Survey, has made objections to several items of the accounts of Captain William H. Swift, of the engineers, who is the accounting officer for the work; I must, therefore, take the liberty to communicate to you, for his direction, the following statements of the facts and of the principles of the organization of the accounting part of the work, such as they actually are.

1. The Coast Survey Law commits the work especially to the President, without reference to any Department. Mr. Gallatin was first charged with the correspondence by President Jefferson, under his own direction. This principle has always been preserved since; so that it has always remained a special trust of the President, disconnected with either army or navy, and purposely kept in another Department, for the obvious reasons which I have detailed in my letter to the Treasury Department of the 14th March, 1834.

2. All the principles of the organization of the work have been settled, in 1816 and 1832, with me by the Treasury Department, and the accounts have passed there always without either objections or alterations, because the whole was understood. These passages of the accounts ought, therefore, to be the guide of the Auditor, who may now, or in future, have to pass these accounts. It must, in general, be understood in any Department which they may have to pass, that the regulation which may be in that Department for its other business transactions, have no bearing whatsoever upon the arrangements of the Coast Survey, because it is a separate organization of itself, and can never be otherwise if it shall be executed honorably and in a permanently useful manner.

3. Already in 1816, I was authorized to take any measures in relation to transportation that I should find best appropriated, and peculiarly in relation to purchase, and of course maintenance of carriage horses and drivers, which are absolutely requisite to move the instruments, the other objects relating to the work and the whole company engaged in it. To hire horses and conveyances would be quadruple the expense, as some of the accounts prove, which were incurred on such occasions as were not sufficiently provided for; and to have the instruments, &c. carried by men, would require a cartage of forty men, in addition to the six or ten that we now usually have, for the manual labor required in the work. Already this liberty given to me, implied my hiring men whenever the work required it.

4. In 1816 and '17, soldiers were used for the manual assistance as laborers; in 1832, the statements given in relation to the army, and the simplification of the arrangements as well as economy, decided the Treasury Department to commit to me the direction of the hire of the laboring men as I should find most adequate, and at the best terms I could for the benefit of the work. Thus have been engaged more

or less as the circumstances required it, and such as were not needed dismissed, during the winter, &c.; always by consultation and decision between the accounting officer and myself. The same was the case with the field equipment.

5. For the assistants the documents prove, that I have to make the proposition for their appointment and their rank, which decides of course their compensation, (upon which besides I shall have the honor to address you shortly,) and the Treasury Department has approved every one specifically. The proper organization of the work dictates this course, which was always, from the first origin of the work, agreed with me, and has proved good in practice—no one can be appointed without my proposition.

6. The main original collection of the instruments and books has, as you know, been made upon my proposition, approved by the President (Jefferson.) In 1832, I showed the necessity of procuring some large new instruments, besides a number of others, and to continue the library that had been begun, as it is proper to keep pace in it with the modern progress of science in this branch, for those of my assistants who would show an inclination to apply properly to the study required; for it is well understood: that this improvement of my assistants is one of the most desirable accessary benefits of the work. I was then authorized, as I had been in 1816, and even in 1811, to make the necessary purchases of instruments and books; of the latter, a number have been received already by the medium of our legation in London, (like in 1817 by that of Naples,) and more are ordered and expected, both from England and France. For the instruments of a large size a draft of £600 was purchased and remitted to Messrs. Troughton & Simms in London, while the others of a less amount have always been purchased as occasion presented, and appear thus in the current accounts. In a similar way I have lately transferred that part of my former library which I had always as yet reserved for myself, and is so well adapted to the library of the Coast Survey—(the assistants were allowed to use of it before like now.) The catalogue has passed the review of a competent bookseller, as to the fixation of the prices. That part of my library that I had sold to West Point, having special reference in a scientific view to our works, has upon the same ground been transferred to the library of the Coast Survey by special agreement. Such measures are proper, and even necessary, for the work, and its proper character; I have, therefore, at all times during my former and my present engagement in the Coast Survey, purchased or transferred from my own possession such books, and even smaller accessory instruments as were proper—generally after having allowed the use for the public work long before hand—and at prices that gave me no benefit, but generally a loss.

7. Also, the Navy Department has, by the letter of the 10th April last, given to me the authorization to supply such instruments as I should find proper by such others as I should find better adapted. For this there is almost daily need as the work increases in extent, as much as for hiring more manual laborers. Without full liberty, as I had it always hitherto, in respect to the procuring of instruments

and books, the hire of men or conveyance, either by land or by water, the work becomes impossible. Two cases occur now that we are entirely deficient in, because an instrument that has been ordered could not yet be received. and by the necessity of supplying a temporary increase of men. In no such case it would be possible to get in due time special instruction or authorization from Washington, or enter into discussion with any person whatsoever not present at the work, who would be absolutely precluded from forming a proper judgment upon the case. This has hitherto always been included in the trust put in me, by giving me the superintendence of the work; as well as it is allowed to any sea-captain to set the sails of his vessel according to the wind at sea.

8. Some trifling travelling expenses for the horses and drivers, both at the expense of the Government by full authority, have been objected to, while others exactly of the same nature have been admitted. The authorization to provide for conveyances, which was explicitly given in 1817, covers certainly one as well as the other; and as far as such accounts occasionally come from me, when I move alone with the instruments or otherwise for the work, taking only a driver with me to lessen the expenses, I can only remark that if I had not done so in 1816, 1832, and even last spring, the whole work would never have been begun; as in all these cases I always first defrayed the public expenses out of my private money, as the documents prove most fully and authentically.

9. My signing the schedule of the accounts by the statement that, "these expenses were incurred in consequence of my directions for the Survey of the Coast," has been objected to as insufficient; however, this is also fully in order and according to my agreement, and has always been considered as a proof of the legality of the expenditures; as I positively and constantly refused any nearer mixing in the accounting concerns, and this was always highly approved. This statement was all that was desired of me, and every account has hitherto passed fully free with it, (even in the works that I did for the Weights and Measures, where my simple "approved" upon the schedule was considered sufficient.) Also this part must therefore remain, to accomplish the contract under which I work, if inconveniences shall be avoided much graver than may be thought.

10. My two first letters to the Navy Department, in March last, gave ample information upon the organization of the work. No alteration whatever was contemplated in it by the transfer of the trust of the President, from the Secretary of the Treasury to the Secretary of the Navy; all that I stated there has always been fully approved, and as stated above, cannot be changed without destroying the work and its character.

11. Upon these considerations, I take the liberty to request that you would please to give to the Auditor or Comptroller, through whose hands the accounts may have to pass, the information that all the subjects relating to the accounts have been settled long ago, and at proper times, and are therefore to continue to be considered as such in future, upon the same principles as the accounts have at all times

passed in the Treasury Department, where it will be easy to find parallels to every item that has fallen into the accounts since the work is in the Navy Department, or will occur in future.

I have still to acknowledge the receipt of two letters from your Department, relative to the arrangements for the contemplated soundings, with one for Lieutenant Bell, which he will answer about with the mail of this.

I shall shortly have to address you in relation to the compensation of my assistants, when being at the head of a secondary triangulation. Already last winter I intended to have this subject settled, but many intervening circumstances have postponed it.

I understand that also some stage-fares of assistants have been objected to. I must remark upon it, that the transportation of the whole company, effects, instruments, baggage, &c. being at public expense, such accidental expenditures, occurring when our regular conveyances cannot serve, are upon this principle to be paid like any other incidental expense; they appear always only when the travelling is to or from the work, in the course of and for the work, never for any incidental travelling of their own, which however occurs very seldom, as they are all very steadily at their business. Such items are therefore to be admitted, and the accounting officer and myself be considered as having full acquaintance with the case and its full admissibility.

I hope all the above information will be satisfactory, and that the accounts will in consequence be passed in full, &c. as soon as possible. Two quarters being now hanging, it is very desirable for the easy progress of the work, that this part should not remain behind, in order that we may know upon what means we may calculate.

I have the honor to be, with perfect respect and esteem,
Most honored Sir,
Your obedient servant,
F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Station Head and Horns, Fire Island Beach, opposite Patchogue (Post Office), September 16th, 1834.

MOST HONORED SIR:—The favor from your Department of the 10th instant reached me properly.

Upon the information that Lieutenant Gedney will soon be ready for taking up functions in the Coast Survey, and be provided with a vessel of his choice, I take the liberty to request that he be ordered to meet me, about the first or second week of next month, at the station, at which I may be then, which he can easily be informed

of at the Post Office above quoted, upon the southern road of Long Island.

Lieutenant Bell having signified to me that he would leave the Coast Survey, and that had reported himself for other service, I intend to give to Lieutenant Gedney the task which I had intended for Lieutenant Bell, as it will be the most conducive to show the principles of the work in its details at an early period. By the time above stated, the works previously required, to ground his upon, will be in sufficient readiness, and he will receive here the necessary communications to guide him.

On this occasion I must take the liberty to observe, that the third article of my agreement for the Coast Survey, in 1816, stipulates on the part of the Government, "The party of officers, men, and assistants accompanying you, (me) will be ordered to conform to your (my) instructions."

The agreement of the 9th August 1832, confirms, in relation to the organization of the work, all the dispositions of the above first agreement.

In order, therefore, that proper regularity may be observed in the work, I must take the liberty to request, That every officer, directed to report to me, be furnished with an order conformable to the above article, of which he be directed to hand over to me a copy, signed by him, to have our mutual relations documented in my hands.

I have the honor to be, with perfect respect and esteem,

Most honored Sir,
Your obedient servant,
F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
25th September, 1834.

SIR:—I request that you will transmit to the Department, an inventory of all public property that has come into your possession as Surveyor of the United States Coast, including all that you have purchased for the service, except provisions.

I am, very respectfully, &c.
MAHLON DICKERSON.

FERDINAND R. HASSLER, Esq., Surveyor of the U. S. Coast,
Patchogue Post Office, New York.

Station Head and Horns, Fire Island Beach, opposite Patchogue, Long Island, September 27th, 1834.

MOST HONORED SIR:—Your favor of the 24th instant, was handed to me this evening, I shall of course attend properly to furnish Lieutenant Gedney with the necessary directions upon his work when he comes here.

I must take the liberty to request a speedy decision upon the different questions involved in my letter of the 9th of August, relating to the accounting concerns, because their importance is vital, and the delay proves a detention to the progress of the Coast Survey. I have tried in that letter to show why and wherefore the authorizations that the accounting officers of the Navy Department appear to doubt of, were granted to me from the very beginning in 1816, and confirmed by the agreement of 1832. I can, therefore, not have the least doubt upon the decision falling out, as I stated it necessary.

But after having lost in the attempt to give to the country of my adoption, a work, as honorable as useful, besides the exertions of the best years of my life, $15,000 in money, or its equivalent objects, and being in trust upon my authorization, already personally engaged for necessary objects for the work, ordered abroad, I could not with propriety give the orders, which I was just going to give, for the objects needed to present in the course of next winter, a sample of the manner in which the maps shall be ultimately executed, the delay has therefore postponed this satisfaction for the Government, and myself, *for one whole year;* because of the necessary distribution of the work, according to the seasons, which commands to use all the seasons, that admit of field-work, to that part, and only the winter for drawing; besides that the meeting of Congress during winter, indicates this season as the proper one for the aim.

As far as these objections of the accounting officers refer to my transfer of books, which is on my part a sacrifice, and on the side of the work an advantage, it has produced; that being here insulated, away from all friends, menaced to be laden with an unexpected debt, I was forced to such an economy in my living, as, in conjunction with the laborious task in which I am just now engaged, has ultimately produced the loss of my health, for I rise out of the sick-bed to write this letter; this, though no advantage for me, is certainly neither favoring the Coast Survey, nor benefiting the Nation or the Government.

Another instance in the case occurred since my letter, Dr. Wm. Howard of Baltimore, of the corps of Civil Engineers, died. He had always desired to join the Coast Survey, and I wished it, because he would have been the best assistant I could have got for his branch, but he was always refused. With predilection for this branch of science, and the means he was possessed of, he had procured a valuable collection of books referring to it, which are not as yet in the collection that I made for the Coast Survey; he had also some instru-

ments that would be useful. The general habit of this country, in case of death, being rapidly to sell all at auction, my intention was to acquire all that I should find appropriated for the public benefit, as far as committed to my charge, at the same time preventing its being squandered and lost, among people not knowing the value of the objects, like instruments, actually belonging to the Coast Survey have been.

Upon this I had of course also to stop taking my measures under the existing circumstances. Your decision will allow me to act immediately, (if it is not perhaps too late already,) if it gives me that authorization, which was always implied in my agreement for the Coast Survey, and complied with by the passing of every item of the kind in the accounts to the Treasury Department, namely: perfect freedom in the procuring and using of the means needed to execute the trust in my hands. In fact, if the direction of the work is entrusted to me, the means to do it are implied, and have always been considered so. Most likely the arrival of Lieutenant Gedney will occasion a question upon the same point, which if I dare not decide it, will also delay him.

The accounts sent in long ago by Capt. Swift, the accounting officer, have not yet been returned passed. Regularity in this service would, however, have been very advantageous in this case.

I have the honor to be, with perfect esteem,

Most honored Sir,

Your obedient servant,

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Station Head and Horns, Fire Island Beach, opposite Patchogue (Post Office), October 1st, 1834.

MOST HONORED SIR:—I rise again from the sick-bed, to answer, in moments of relaxation of my fever and my weakness, your letter of the 25th ultimo, which I received in bed yesterday, requesting an inventory of all the public property in my hands for the use of the Coast Survey, except provisions.

1. The general list of instruments and books, as I brought them from London, shall be among the documents upon the Coast Survey in your office.

2. There shall likewise be among those documents the receipt of my delivery in 1818, and those of what I received again from the Topographical Bureau in 1832, this last making the inventory of what I received.

Another catalogue is appended to the Report of the Navy Commis-

sioners of (I believe) 1830, to a letter of Commodore Rodgers, printed among the Documents of Congress, when the law for the Coast Survey was again proposed.

4. One instrument was allowed to Massachusetts, which is yet in their possession; for details, I must refer to your documents again.

5. Instruments were ceded to Captain Talcot, and account was settled upon them with the Navy Department, the details of which are unknown to me. Some of the instruments intended for him were taken away, and some remain yet deposited in the Custom House of New York, where also some of those of the Coast Survey are; so that I am uncertain what is yet belonging to the Coast Survey, or not.

6. There are not instruments enough of the Government on hand now for the works; therefore, one of the assistants works with his own instrument: for another, I have caused to be transformed into a theodolite the lower circle of the repeating-circle broken by the hail-storm in St. Regis, which, though not fully what would be desirable, still answers much better than would have been expected, and gives the practical proof of the value of my new method of observing: for more assistants, in the line of triangulations, or the like, I have no instruments.

7. The two-foot theodolite is, as stated in my report, in such a state as not to be useful with proper advantage, and must pass the hands of the artist who made it.

8. Two plane-tables and alidades only are on hand, and more must be procured: I had already ordered one at Standiffe's, in Philadelphia, who died before doing any thing to it. It is my intention to have some constructed next winter under my own inspection.

9. To supply me temporarily with an instrument, I have here with me the theodolite of one foot, of Schenk, received last spring; instead of which I mean to employ the large instrument ordered at Troughton's, when I get it: it was promised for last spring; and if I get it next spring, I shall have to be highly satisfied.

10. Another (eighteen-inch) theodolite, for secondary triangulation, is also ordered at Troughton's, as by Art. 6. you see is necessary, besides other instruments, and accessories of all kinds, which, during the time from 1818 to 1832, had found other applications, and were not more on hand in 1832. Two heliotropes are constructing in Göttingen, under the direction of the inventor, the celebrated Professor Gauss, he volunteering kindly his assistance, from mere scientific interest in my work.

11. A full inventory of the instruments it will be more proper to make when those ordered will have been received; as in the present state, and as I have received the instruments, and not yet been able to supply deficiencies, &c., it would not make a good appearance: it is only by dint of exertions and combinations, that it was possible to work with them hitherto.

12. I have here with me the theodolite of Schenk, the base-apparatus, the repeating-circle of eighteen inches, 2 reflecting-circles with artificial horizons, 1 barometer (in bad order), 1 iron chain, 1 plane-

table and alidade, 1 four-foot eight-inch telescope of Tully, 1 small telescope, several beam-compasses, and rules, and 2 chronometers.

Two assistants in secondary triangulation have the theodolite made of the broken repeating-circle, one $3\frac{1}{2}$-foot telescope of Dolland, and 1 ditto of Troughton.

In the Custom House of New York are, the two-foot theodolite (out of order), the standard scale of eighty-two inches, 1 six-foot telescope of Dolland, 1 thirty-inch dividing plate, 1 nine-inch theodolite (intended and authorized to be disposed of), 1 reflecting circle, 1 plane-table and alidade, and the books from West Point.

In Washington are, 1 five-foot transit, 1 clock (out of order), 1 six-foot telescope, 1 iron toise, and 1 iron metre.

Three chronometers were sent to London to be repaired.

13. A more detailed account, including all the accessories of this kind, would require my going to these different places to make the inventory, which would be the greatest abuse that could be made of my time at present, when I am fighting with difficulties and sickness, and must watch a favorable day to close the work of measuring the base-line, which you know is the most laborious task, and, as it will be $8\frac{3}{4}$ miles long, not a small one. My report of next month will inform you nearer upon it.

14. A catalogue of the books was made in Washington last winter; but it contains, of course, not yet the books received at West Point last June, of which you shall have the list among your documents; and, as the opposition made to the transfer of mine would of course alter it, I must reserve to myself not to deliver it under existing circumstances. Upon the arrangement in relation to the exchange with West Point, the documents lie in your office.

15. For all the articles of equipment, means of conveyance, tents, kitchen utensils, and the like, I shall communicate your letter to the accounting officer, whose special business it is to attend to these things; and I take the liberty to refer to the original agreement that this is not under my personal care or responsibility: my only duty in it is, to direct the accounting officer to procure such things as will be needed, and, in so far as they relate to the work, of proper quality. It is self-evident that the man, charged with the scientific part of a work so arduous as the Coast Survey, cannot be laden with these details without the greatest detriment to the work; therefore, this was positively understood in both agreements with me; and had I been obliged to attend to such things last year, the report of an actually, in extent, unparalleled work—(the Topographical Bureau, having experience in such things, can be consulted)—that I have presented, would have been impossible, and would have turned into an account similar to that of a steward.

16. I must only remark upon this latter item, that a great deal of it is of a transitory nature, as much so as the provisions, and therefore the inventory also daily changing. So, for instance, a great many of the absolutely necessary tools, the signals, and earthen cones for station marks, &c. are as much mere provisions as bread and cheese can be; and as for the unavoidably necessary kitchen tools, every house-

keeper knows their fate. In fact, however, every item of that kind is contained in the accounts that have been rendered; and if a comparative account of the standing of this part, after the unavoidable wear and tear of a season, is required, this will be best referred to the close of a campaign, like last year: on leaving the field, a proper inventory was made.

I have the honor, &c.
F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Inventory of Articles purchased by Captain W. H. Swift for the use of the Party engaged in the Survey of the Coast of the United States, under the direction of F. R. Hassler, Esq., from the 4th of April, 1833, *to the* 30*th of September,* 1834.

One twelve-inch repeating theodolite (Schenk); 3 beam compasses with magnifiers; 1 2½-inch sextant; 1 twenty-two-inch telescope; 1 dividing engine (old); 4 pendulum knives; 6 amethysts for pendulum; 16 tripods for base apparatus; 1 box and appendages for ditto; 1 fly for ditto: 1 large umbrella for ditto; 30 microscopes legs for ditto; 2 instrument stands; 1 stand for telescope; 1 cover for ditto; 1 leather barometer case; maps of New Jersey, Connecticut, and New England; 1 chart of Long-Island Sound; 2 almanacks; 1 small atlas (U. S.); 2 pamphlets (longitude of the Capitol); 1 Herschell's Astronomy; 1 leather case; 1 manifold writer; blank books of various kinds for journals, &c.; drawing-paper and stationery generally; 2 packing trunks for books and stationery; 12 wall tents, with their tarpaulins, poles, and pins, complete; 4 common or soldier's tents for the base apparatus; 18 pair of blankets for the hands; cooking utensils for ditto; 3 willow hampers for packing the same; 1 medicine chest; 1 box instrument and machine tools of various kinds, for repairing instruments; 1 box containing carpenter's tools of various kinds; 6 shovels; 1 spade, 1 hoe, 2 axes, 1 iron crowbar, 1 grindstone; 4 horses; 4 sets of harness complete for the same; 2 wagons; 1 saddle, 2 bridles; 1 wrench hammer; 1 boat with anchor, sail, &c.; 2 stone pillars for the base.

Tin signals and earthen cones have been purchased as they have been wanted, and used accordingly. The same to be said of lumber.

The articles purchased by the former accounting officer, prior to the 4th of April, 1833, (and now in possession of the party,) were 4 horses with harness complete, 1 carriage for the instruments, 1 wagon for reconnoitering and placing signals, 1 wall tent and 2 instrument tents, and 1 saddle.

The carriages, with the horses belonging to them, remain in the main party. The two other wagons, with their horses, are with the parties engaged in the secondary triangulations—one in Connecticut, and the other on Long Island, Fire-Island Beach.

October 3d, 1834.

West Hills, November 11th, 1834.

MOST HONORED SIR:—With the present I have the honor to forward to you my additional report, agreed upon, and desired, by the President, at the time when my report of last May was handed in. The causes of its delay are known to you; however, it was ready some days since, only waiting for the sketch of the detail triangles of Mr. Ferguson, which is just this day finished.

I received just now also your favor of the 7th instant, requesting this same report, which however I had announced to you in some of my last letters, as in hand.

As the report will speak for itself upon the subjects thereto relating, I will not here detain you with any remarks, but answer the other part of your letter, requesting me to state the amount of appropriation that it would be proper to request of Congress for the next year's work.

The appropriation of the current year has been $30,000. I do not know how much of it is remaining; Captain Swift will be able to inform you. I can only say, that I tried to save all expenses that it was possible to save, not only in general principle, as I always do, but also with a view to retain, at all events, means in advance in hand for next year; because, next Congress sitting being a long sitting, and the appropriations being generally made at the end, it is proper that funds should be disposable to progress with the work under such circumstances; and against such a case it is necessary to provide by the appropriation now to be asked for. Thus I had done the first year, and it was the only means that enabled me last year not to let the work be interrupted for want of funds during 1833. This precaution is absolutely necessary; for, if ever any such interruption should occur, the whole summer's campaign would be so crippled as to postpone all results for a whole year.

Next year I should like to extend the detail topographical operations, so as to be able to present a final result of maps, to be executed during the following winter. This extension, which is so desirable, can however not be done without an extension of the expenditure, the other parts remaining as they have been hitherto.

It would therefore be desirable that an appropriation of $40,000 should be obtained. I may add yet the observation, that my intention has hitherto been to provide this winter for the construction of the instruments necessary for this extension of the detail topographical surveys

under my own inspection—as you know well that the necessary instruments are not on hand, neither in the Coast Survey collection nor otherwise, not even in sufficiency for the present establishment—that therefore some funds more than otherwise habitual during winter would be consumed from the present appropriation. How I am in a state of suspense in this, like in fact upon the whole organization of the work for its proper progress and effect, is known to you, and will excuse me for not stating details any nearer.

In general, no detailed estimates have ever been asked of me, nor are they in fact possible, until some years experience will have given means to make the average calculation, as well upon my part of the work, when in regular train of triangulation, as how much each party in the secondary triangulation, and in the detail topographical surveys, will amount to during one year.

In absence of the possibility of giving a proper estimate upon these principles, and because mere random estimates are, in my opinion, highly improper, I have hitherto always calculated the extension given to the work by the means that I had at my disposition; and so I succeeded in never leaving a gap of means by out-reaching the disposable funds, which would be a very great detriment to the work, and highly uneconomical. I shall therefore continue to act upon the same principles, and the extent that I shall give to the work will be decided entirely by the appropriation.

Instruments, and even books, maps, and various other things, will be required; many have been ordered that will become payable the coming spring or summer, which will also diminish the advance in hand from the present appropriation.

I have the honor to be, with perfect respect and esteem,

Most honored Sir,

Your obedient servant,

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the U. States Navy,
Washington City.

P. S. I am sorry your other letter has been miscarried to Patchogue, where I must send a man on horseback to fetch it, about thirty miles from here, if I will prevent its being sent back, there being no direct regular communication between there and here.

Report of F. R. Hassler, as Superintendent of the Survey of the Coast, additional to that dated May 17th, 1834, containing an Account of the Progress of that Work during the Summer and until November of 1834.

1. I stated in my report, of which this is to be a continuation, as well as in many previous communications, that the accurate measurement

of a base-line, by the means especially provided for that purpose, the description of which is published long ago, was, after the measurement of the angles of the main part of the triangulation, presented in that report, the first and, as well known, most important part of the work; to that I had therefore principally to devote my attention and personal exertions this summer.

2. I also stated in that report, that from the observations upon the stations of Rulands and Westhills, upon Long Island, there appeared to present itself the prospect of a base-line far more advantageous, in every point of view, than that measured preliminary in English Neighborhood, New Jersey—namely, upon the beach called Fire-Island Beach, upon the south shore of Long Island, which separates what is called the great South Bay from the ocean.

3. Viewed from the two named stations, this beach presented a narrow strip of land, that appeared straight between the lighthouse, at the inlet of the bay, and the station-point called Head and Horns, and perhaps even farther. Its position lies eminently favorable for the determination of the distance from Westhills to Rulands, which presents itself extremely favorable as a base for the large triangles, crossing Long-Island Sound over to Connecticut, &c., as evident by the maps of the triangulation joined to my report of last May.

4. These advantages were too great not to decide in favor of this location of the base-line, for the execution of which Captain Swift was preparing all the mechanical means in New York, during the time that I wrote my last report, and before. But it would have been very desirable that the actual work could have been begun with the earlier part of the season; this, however, was impossible, on account of a considerable part of my time being taken up in Washington, in the latter part of the winter, to give to the Navy Department all the information, that was requested, on account of the correspondence upon the Coast Survey being transferred to that Department from the Treasury Department, where all the detail arrangements of the work and the tenor of the agreements made with me were known from their very beginning.

5. When I could join my assistants in New York, in the earlier part of June, the means being all on hand, I directed the final adjustment of the whole base-measuring apparatus and what is connected with it; there were also engaged an adequate number of men for the manual assistance required, in the selection of whom we were really fortunate to obtain all efficient regular men, of such different qualifications as are absolutely required for the very varied exigencies of an accurate measurement of a base-line, and the extra works that it requires, in a place entirely isolated, and thence distant from all other means to provide for them.

6. I directed then all the assistants, not otherwise especially engaged, the men, and the apparatus, and equipment, to Fire Island Light-house, in the neighbored of which the west end of the base-line was to fall; and directed the assistants, joining there, to make a detail survey of the beach, from its western end, till to Head and Horns, or even Watchhill; such a previous survey being always necessary, to enable to select the most favorable ground for the actual measure-

ment. The map of this locality hereto joined proves this evidently. Two lines between Head and Horns, and some points near the Light-house, proposed, and scrutinized first by my assistants, presented such difficulties, by intervening sand-hills and bushes, as not only would have required a great length of time in overcoming, but also would have occasioned chances of inaccuracy, besides a great deal of calculations for the consequent and necessary reductions to the too much interrupted horizontal line.

7. When I could join my assistants upon the beach, in the beginning of July, though by no means in a good state of health, and after having visited the projected lines, the difficulties they presented decided me to try to lay off a straight line upon the outward sandy shore of the ocean, between the sea and the sand-hills, which appeared to present a nearly straight line, little different from parallel to the shore. This succeeded so well, that a line was laid out, starting from a sand-hill of moderate elevation, somewhat south-east of the Light-house, and extending over eight miles upon the sandy beach, only in a few instances edging the sand-knolls, and in some others going between the high and low water mark on the sea-side; the lowering of the first, as much as needed, it was easy to accomplish, and the second apparent difficulty, was equally easily overcome, by so regulating the work, as to meet these places during low tide.

8. This line was then laid out accurately straight, by means of a transit instrument; and measured preliminary by the same chain of twenty metres, which had been used in 1817, for the preliminary measurement of the base-line in English Neighborhood, and which serves now for the detail plane-table survey of the south side of Long Island. At every four hundred metres, a peg was driven into the ground, bearing the mark of the distance; these precautions are always required, as a great means of security against mistakes, by the omission that might happen of inscribing a measuring bar box in the registers, as thereby constant verifications are presented.

9. During the months of August, September, and October, this line was then measured in forty-five days, of which twenty-seven in August, fifteen in September, and three in October, the other part of that time being taken up either by interruption from unfavorable weather, or such days as were necessarily employed for the moving of our encampment along the line, for which it was always necessary to employ all the helps otherwise engaged at the manual part of the base measurement; there being never any doublets of men engaged in our work, and I must add, near the end of it also, by my own increased state of sickness.

10. At every four hundred metres, as determined by the accurate measurement, and at every one thousand metres, strong pegs were driven in the ground, marked by their distance from the west end, and every two thousand metres was besides furnished with one of the stone ware cones, that are always used at the station points; these are intended as fixed points, from which the detail points, of the soundings in the sea, that they border, are to be determined.

11. Both ends of the base-line, thus resting upon two sand knolls,

that will by their position, in all appearance, always be secure from the sea, have been marked by two monuments, each consisting of a Newark red sand stone, of about four feet high, hewn square for about eighteen inches from the top, with an even top of one foot square, and a round hole in the centre; under the square cut part, a frame was fixed in, consisting of four pieces of hard wood scantling, embracing it closely by grooves, made expressly in the stone; the lower part being left rough. These stones were sunk entirely even with the sand, together with their frames, which by their extending about twenty inches on each side farther in the ground, will make them stand more solid, and maintain their perpendicular position.

12. The distance between the monuments will exceed fourteen thousand and fifty metres, or eight $\frac{734}{100}$ miles; the accurate number will result from the calculations that I shall make next winter, upon the reductions needed for:

1. The varied state of the temperature.

2. The elevations and depressions, that the localities of the ground obliged to make in many places.

3. The reduction of the line actually measured upon the shore sand, to that between the monuments; for which all the data have been determined upon the place.

13. The apparatus used for this measurement, is that which I have described in my printed papers upon the Coast Survey, which, though grounded upon entirely new ideas of my own, has obtained the approbation of all the men of science acquainted with such kind of works. It has also proved a very expeditious, therefore even an economical arrangement, as the line was measured in the same time, (forty-five days) as the base-line of Mr. De Lambre of eleven thousand eight hundred and forty metres, which mine evidently exceeds considerably. In fact, this base is one of the longest lines ever measured with an accuracy in any way comparable.

14. The details of the operations in principle, and even the manipulations, are already described, in my "papers upon the Coast Survey," and as the statement of the final numerical results, must naturally be postponed until after the adequate calculations will have been made. I have here only yet to state the great satisfaction which it gave me, that my assistants, engaged with me in this arduous task, naturally entirely new to them, acquired the manipulations of the apparatus so well, that when otherwise favored by the weather, and the locality, we proceeded with a rapidity far above all expectations; and their cheerful exertions during the whole time, and even that of the laboring men, deserve due praise, and were a great support to my personal exertions, particularly towards the end, when my ill health had rendered my personal exertions very difficult and fatiguing.

15. The detailed account of this operation, which is of rather a scientific nature, I flatter myself, will be of interest, and therefore enhance the value of the methods that I have devised for the works of the Coast Survey, as well as increase the interest for the work, with the Government, and the well informed public in general; in fact, this

account of the work *belongs rather to the ultimate* scientific account of the main triangulation for the whole work.

16. I had expected at the close of last campaign, that after the measurement of the base-line, I should be able yet during this campaign, to measure the angles of the triangles, that will determine directly from it the distance from Westhills to Rulands, and also those angles on Harrowhill and Wesel, which connect my work of 1817 to the present; this I intended to do with the large instrument ordered of Troughton, and promised in due time for that purpose. But unfortunately, not only this instrument has not yet arrived, but even many unexpected impediments have arisen, that have made the execution of my projects impossible, and deprive me even now of the use of the means, by which I had intended to supply this deficiency. Besides that the lateness of the season, at which the campaign could be opened, postponed naturally every thing for equally as much as my stay in Washington had been protracted, as above stated; an accessory result of which was, that the season for living and working at the sea-shore, falling partly in the equinoxial storms, not only our progress was impeded, but it reduced me ultimately to the sick bed, and the lingering state consequent to it, which last even now, increased and maintained by the difficulties laid in the way of my progress. I had therefore also to avail myself of the assistance of Mr. Blunt, whose operations were near the base-line, for the measurement of the accessory and preliminary angles, that had to be measured at different places of the base-line, for which besides neither I, nor any of the other assistants engaged at the actual measurement, could leave our functions.

17. Though the two assistants engaged in the secondary triangulations, Messrs. Ferguson and Blunt, were some part of the time with me at the base-line, particularly Mr. Blunt, they have continued equally their tasks, as I stated in my last report that they were engaged in, namely, Mr. Ferguson in Connecticut, Mr. Blunt upon Long Island, continuing the secondary triangulations, of which a part is already included in my report of last May; the comparison of the sketch of Mr. Ferguson's triangles here joined with the map of my last report, will show his part of progress; the necessity of calling off Mr. Blunt for the triangulation around South Bay, and to the base, has made it impossible to present with this report a corresponding sketch of his work, besides that herewith from the said South Bay.

18. It is my intention to have the topography of the south part of Long Island near the base-line fully executed this fall, as well upon land as for the soundings of the great South Bay, that lies between Fire Island beach and the main shore of the island. With that view I marked off a part, from the west end of the base easterly, of such length as would serve as base for the triangles, adapted in size to the dimensions of that bay. Such a triangulation was then grounded upon it, by Mr. Blunt, as envelopes the whole bay from its entrance to its eastern extremity; as shown by the sketch here joined.

19. The results so obtained were projected upon the scale of $\frac{1}{10000}$,

to serve for the filling up of the topography with the plane-table, at which Mr. Renard is just now engaged.

20. In the same manner Lieutenant Gedney of the Navy, who has been appointed, upon my proposition, for the first expedition of soundings, namely, that of the bay so enclosed in the triangles, and the sea-shore adjacent to the beach, has been furnished with a projection of these triangles upon a scale sufficiently large to make his preliminary constructions for placing the soundings, in which service he is now engaged upon the bay.

21. It was my intention to procure from Paris the material and implements, (which hitherto I have furnished out of my private stock,) necessary to have a fully finished map executed of the part of the coast in the vicinity of the base-line, where the topographical details are now executing and the soundings are now taking, by which I would have been able to present this winter yet, a real sample of the execution of the maps, early enough yet to lay it before Congress during the course of the coming session; also examples of drawings in all the different scales that it will become necessary to use were to be procured, as I have only (in my private possession,) a single example upon one scale, that was presented to me long ago by Mr. Beautemps Beaupré, of the Depot de Marine in Paris; for it must be here observed, that these objects are not obtainable from any other place than Paris, or where they were brought to from there, and that there has been established for all such works an universally understood conventional language of signs, and manner of distinguishing the objects, which appears not yet much known in this country, and which it is necessary to adopt, in order to be properly intelligible for every body, and to present the results also from that side, so as it is proper in the present state of science. But the impediments mentioned in my correspondence as laid in my way for the best forwarding of the work, by procuring the necessary means in due time, has frustrated me of the pleasure of giving that satisfaction this year; this can only be remedied the following winter, (if in the mean time the difficulties are levied.)

22. The secondary triangulation made by Mr. Ferguson is now brought till to the Pallisades on the west, from New Haven, where its eastern part begins, and that of Mr. Blunt upon Long Island parallel, to it, both upon the plans as already stated, though I had to interrupt Mr. Blunt several times for works at the base-line, as above stated.

23. Thence also of all these parts of the country the work is brought to its ultimate application to the minute details of the topography, which I therefore intend to put in full activity as soon as the necessary arrangements can be made, which in the present state of things is impossible.

24. I am sorry to be obliged to state here yet, what is otherwise evident to every man, who occasionally is a witness to the work of the Coast Survey, that from the most important to the minutest part of the work every thing is arranged in the most strictly economical manner, and at the same time so as to produce the greatest possible effect, in perfectly accurate results in the shortest space of time; for in

this principle lies the true economy of the work; any arrangement whatsoever not fitting to this aim, is a direct loss, as well in work as actually also in money; my experience, by having made similar works formerly at my private expense, I find a sure guide in this respect, and I dare to assert with full confidence that never so much actually valuable work was obtained in the same space of time, and for the same proportional amount of money, in any survey whatsoever.

25. By the change of the Department to which this work is committed, it became necessary for me to spend much time in giving the informations necessary to introduce many gentlemen, completely new in the business, into the proper genius of the work, and its most advantageous organization, which lies in documents reaching from 1807 to the present date, during which time, on one hand the arrangements were constantly perfectioned, while on another even the older documents, in the hands of the Government, have been destroyed by the conflagration of the Treasury Office, so that now I am alone in the possession of them in their original. I had already some time ago begun the copies to restore these documents, and they needed principally only my revision and signature, but it has become necessary to make use of so many of them that the collection is now very incomplete, and actually my time is otherwise too much engaged to attend to this part at present.

26. As this report is rather to be made in haste, to reach in due time for the aim of the President, to present it with the Message to Congress, in addition to that of last May, minute details have been excluded. I expect however to have presented the principal features and the state of the work to sufficient satisfaction for the present purpose, and to have made evident that I have continued the work according to the principles laid out for me from its first beginning in 1816, that is, in a manner *honorable and permanently useful to the country*, which was already the judgment that late President Jefferson, with whom the first law of 1807 had originated, gave upon my work of 1817, and if nothing is altered in my plans and my organization of the whole arrangement, I can promise equally good success for the further continuance, and even assure that by no other means, or arrangements, it is possible to obtain such a result; for this the judgment of all the practical and experienced men of science in this line all over Europe is already recorded in the scientific prints.

F. R. HASSLER.

Westhills, Huntington township, Long Island,
11th November, 1834.

Addition.

The neighborhood of this base line is peculiarly remarkable for the Coast Survey, from the circumstance that it is just the place of the coast of Long Island, where the most vessels shipwreck, because the sea-charts generally represent this coast straight, while in reality it makes a considerable angle out in the sea, so that for vessels arriving from the east, the captains, thinking themselves safe in sailing straight

on, after seeing the shore in the evening, are stranded next night at this projecting point; this is proved by the number of wrecks, the remains of which are strewed all along the base-line, and in one of which actually one of our intermediate marks stands; notwithstanding that the habit of the inhabitants of the beach is, to buy the wrecks, and clear them away as soon, and as much, as possible, we found when we were there, the remains of about eight such vessels: one that had stranded while we were there, was cleared off entirely during the time, and we made use of pieces of it to shelter the base apparatus from the waves, when we were passing between high and low water mark; and one stranded there since.

F. R. HASSLER.

Maps joined to this Report.

I. Maps of the locality of the base line.
II. Sketch of the secondary triangulation around Great South Bay.
III. Sketch of the secondary triangles in part of Connecticut and New York states.

Westhills, November 23d, 1834.

MOST HONORED SIR:—My sickly state of health when I wrote my report, not leaving me time to think of every thing, I omitted in it a circumstance, that may serve to give a direct proof of the utility of the work of the Coast Survey, and thereby increase the interest for it. I take the liberty to communicate it to you herewith, praying you will be so good as to have it inserted after § 15, or as a note at the end.

I sent the long box, containing my report and three maps, to Babylon to be mailed, in order to gain a day in its celerity; the postmaster, however, was uncertain whether he would mail such a large package, and gave it only to the care of the driver, for which he thought even first, he had a right to ask separate pay; however, no account has as yet been handed in to me. But having not received any notice of the reception, I am anxious about it, and therefore would be very much obliged to you for the notice of its reception, for my relief.

I have the honor to be, with perfect respect and esteem,

Most honored,

Your obedient servant,

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Extract of the Report of the Secretary of the Navy, of 29th November, 1834. *Signed Mahlon Dickerson.*

The charge of the Coast Survey, now under the superintendence of Mr. Hassler, was on the 11th day of March last, transferred from the

Treasury to the Navy Department, to which it was thought more properly to belong. I have found this arrangement very onerous, as it imposes upon me new duties, which could not be performed without a careful examination of the accounts of what had heretofore been done on the Survey, contained in a voluminous correspondence, between the Treasury Department and the Superintendent. This arrangement also caused a short interruption in the progress of the work; but which has, nevertheless, been prosecuted with diligence and zeal by those employed in it.

The report of Mr. Hassler, of the 17th of May last, and his supplementary report of the 11th of last month, with the maps, drafts, and sketches accompanying the same, herewith transmitted, show the progress already made in this work under the law of 1832, and its connexion with the progress made in the same, in the year 1817.

The situation of the base-line on the south side of Long Island, has been most fortunately selected; as any error in this line would be attended with corresponding errors in the whole work depending upon the same, the utmost care has been taken to have it measured with the greatest possible accuracy.

From what has been done in this Survey, we may reasonably hope that this important work will advance with all the aid which science, skill, and industry can give it, and in a manner as honorable to the Government, under whose auspices it was begun, and has been continued, as it will be useful to the present and to future ages.

The information wanted for accurate and detailed estimates of the necessary appropriations for the continuance of the Coast Surveys, cannot easily be obtained, until further experience shall enable the officers engaged in it to introduce more system in the detail of duties and expenditure in their work, than they have hitherto been able to do.

The sum of thirty thousand dollars was appropriated for this purpose the past year, and it is believed that an equal sum will be wanted for the ensuing year, as stated in the estimates.

Extract of the Report of the Secretary of the Navy, of the 30th November, 1833. *Signed Levi Woodbury.*

The Survey of our Sea-coast having been placed in charge of the Treasury Department, it is not in my power officially to state its progress; but officers have been detailed, and all available facilities provided, whenever the wishes of those superintending the subject have been communicated.

Extract of the Secretary of the Treasury's Report of the 2d Dec. 1834. *Signed Levi Woodbury.*

In the preparation of new weights and measures, on the authority given in the act of 2d March, 1799, and on the principles set forth in

a report from this Department, of June 20th, 1832, coupled with the provision on this subject in the constitution, some progress has been made since the date of that report. But the difficulty in procuring the most suitable materials from abroad, has retarded the completion of the work, and the present engagement of the distinguished gentleman, specially employed to superintend this business, and which engross most of his time, in a survey of the coast, may with the circumstance before named, prevent the final accomplishment of this desirable object another year. But it is hoped that then, either at the arsenal in this city, or at the mint, the most natural and appropriate place, the new weights and measures will be satisfactorily finished, and greater uniformity and accuracy attained on a subject in which, both as to revenue and commerce, it is much needed, and will prove eminently useful to the public.

The Survey of the Coast before alluded to, has, since the last annual report, been transferred to the charge of the Navy Department, with which it seems to be more intimately and appropriately connected. With this survey the situation and utility of our present light-houses, already being 199 in number, besides 20 light-boats and the necessity for others from time to time, would seem to be in some degree fitly associated. As a measure likely to lead to economy, in not extending the establishment of light-houses beyond the real wants of the country, and in fixing their exact localities, so important to the safety of our navigation and navy, it is respectfully recommended that in the survey now in progress, Congress should require the latitude and longitude of every light-house to be carefully ascertained, and published, the importance of its position to be inquired into; and that no new one be hereafter erected till a report is made in respect to its public benefits, by the two collectors and the commander of the Navy Yard nearest to the proposed site.

Extract of the Memoirs of the Royal Astronomical Society of London, Vol. VI. Report of the Council of the Society of the 8th February, 1833. *Page* 232.

The Council regret that the Standard Scale, mentioned in their last report, has not been finished. It is a work that necessarily takes much time, due attention being requisite to the minutest points which are likely to affect its accuracy. Whilst on this subject the Council cannot omit noticing a public document, laid on the table of this Society at their last ordinary meeting, which contains several new and interesting comparisons of two of the principal European standards of length. This document is a comparison of Weights and Measures, made by our associate Mr. Hassler, to the Congress of the United States of America, and has arrived very opportunely, prior to the adjustment of the present standard.

☞ Detail documents may be produced when needed.

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4	17	apportioned	approportioned
5	4	of work	of a work
19	16	given	give
—	18	detail of surveys	detail surveys
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26	2	proposed the mission	*add*, to me
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28	29	sold him	sold to him
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32	28	reason given	reason for the preference given
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66	last	microscope:	microscope stand;
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129	12	1832	1818
130	31	Chairman	Chairmen
132	3	clossing	closing
134	5	Trüchsel	Trächsel
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138	13	April 3d	April 9th
143	23	coincidence of	coincidence of the
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160	39	cartage	Cortege
164	4	that had	that he had
169	39	were	are

SECOND VOLUME

OF THE

PRINCIPAL DOCUMENTS

RELATING TO THE

SURVEY OF THE COAST

OF THE

UNITED STATES,

FROM OCTOBER, 1834, TO NOVEMBER, 1835.

PUBLISHED BY

F. R. HASSLER,

SUPERINTENDENT OF THE SURVEY.

NEW YORK:

WILLIAM VAN NORDEN, PRINTER.

1835.

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DOCUMENTS

RELATING TO

THE SURVEY OF THE COAST.

NAVY DEPARTMENT,
10th May, 1834.

SIR:—As the transfer of the Survey of the Coast from the Treasury to this Department must be construed to embrace the accounts as well as the Survey, I wish the same rules observed in their settlement in your office, till altered, which have hitherto been adopted in the Treasury Department in other bureaus.

I am, very respectfully, &c.
LEVI WOODBURY.

AMOS KENDALL, Esq., 4th Auditor.

TREASURY DEPARTMENT,
4th Auditor's Office, October, 1834.

SIR:—Your letter of the 5th August last, with the explanatory papers therein contained, was duly received. In addition thereto,
1 I have obtained and examined the correspondence between Mr. Hassler on the one side and the Treasury and Navy Departments on the other, and have compared the authority under which he acts
2 with the vouchers in your account.

Mr. Hassler seems to have a very imperfect idea of the apportionment of duties among the public offices at Washington, and the legal power of one officer over another.

In his letter to the Secretary of the Navy, of the 9th August last,
3 he requested that instruction should be given to the Auditor and Comptroller, that all such accounts shall be passed by them as have heretofore passed by the Treasury Department. The accounts

for the Coast Survey have heretofore passed settlement by the 1st Auditor and 1st Comptroller, but they have recently been transfer-
4 red to the 4th Auditor and 2d Comptroller. If the former officers have inadvertently passed accounts which were not authorized by
5 law, or any lawful instruction given to Mr. Hassler, it is the duty of the latter to refuse to make like allowances for the future; and it would obviously be improper in the Secretary of the Navy to direct their allowance.

He may issue instructions to Mr. Hassler conformable to law, and it will be our duty to allow disbursements made in pursuance of those instructions; he may sanction the acts of Mr. Hassler,
6 after they have been done, provided these acts are in furtherance of the Survey, and in conformity with law, and it will be our duty to allow all proper charges growing out of them. But he can give no general direction to pass all accounts which may be presented, whether sanctioned by precedent or not. The law is paramount to every other power in this government, and the Navy Department has no control over the acts of the Treasury Department, where the question is one of law.

It is proper that Mr. Hassler should understand, that in the settlement of his accounts, the 4th Auditor and 2d Comptroller will look
7 at the authority on which the disbursements are predicated as their guide; and also in a doubtful case, they would follow the precedents set in other offices: yet in all cases where they have no doubt, they will not hesitate to reverse the rule of decision heretofore observed. Thinking it their duty to settle the accounts according to their understanding of the law and instructions, they will not hesitate to overrule any precedent founded in palpable error, even if set by themselves.

The views Mr. Hassler entertains of the powers vested in him by
8 his instructions, seem to me to be equally erroneous. The passage relied upon to justify the purchase of horses, carriages, books, instruments, &c., is found in the letter of the Secretary of the Treasury, dated 3d August, 1816, and is in the following words, viz:—

2. "You will be provided with competent assistance of officers
9 and men from the corps of engineers and from the navy, with tents and field-equipage, wagons and horses, and you will have the free use of the public instruments and books, for the purpose of the Survey."

This clause, it would seem evident, does not authorize the pur-
10 chase of any thing. Mr. Hassler is "*to be provided*," he is not *to purchase* or *provide himself*. The *manner* in which he is to be provided is still left to the direction of the Department. When he deems it necessary to be provided with officers and men, tents and field-equipage, wagons and horses, the use of instruments and books, *his* duty is limited to giving information to the Secretary under whose authority he acts, and asking for a supply.

11 If the Secretary thinks his requisition reasonable, he will take steps to provide them, either from the public stock, or directing some other agent, or Mr. Hassler himself, to purchase or hire.

In many cases Mr. Hassler seems to have so understood his
12 instructions. Repeatedly he has asked for and obtained special authority to procure instruments and books in America and Europe; all of which was supererogative, if he possesses the power now claimed, to purchase all articles with which he is instructed that
13 he will be provided. His instructions are so understood by me in all cases: Mr. Hassler has no power under them to purchase a tent, field-equipage, a wagon, a horse, a book, or an instrument, without previous authority from the Secretary under whose authority he acts for the time being.

The next clause of his instructions, in which he is informed
14 that "all incidental expenses of the Survey, which are of a public nature, will be defrayed by the government," and that the disbursements are to be made upon his order, does not in the least alter the construction put upon the previous clause. He cannot rightfully order the payment of the public money for the purchase of those things with which he is told he will be provided by the government; and this general authority cannot be construed as extending beyond the requisite expenditures for the subsistence, immediate comfort, and necessary transportation of the persons employed in the Survey, and their tools and equipage, with essential repairs to the instruments, wagons, tools, furniture, &c., in their use. For any disbursement beyond this limit, he has no authority in his instructions, and must obtain the special sanction of the Secretary, which ought always to be done, if possible, before the expenditure
15 is made.

In conformity with the principles here laid down, all payments made for the purchase of tents, field-equipage, wagons, horses, books, must be suspended. As none of these articles purchased
16 without special authority can be recognised as public property, so none of the expenses growing out of their purchase or use can be allowed. They are all suspended accordingly.

Vouchers No. 9 and 10, in your first quarter's account, embraced
17 the expenses of a journey from New York to Washington, performed by Mr. Hassler with a carriage and four horses, covering the period from December 23d, 1833, to January 3d, 1834, inclusive, amounting to one hundred dollars, exclusive of the wages of the driver and attendant. These must be suspended, because they all arise out of the horses and carriage, which are not recognised as public property, and cannot be until their purchase shall be sanctioned by the Secretary of the Navy.

But there is a further objection to these expenditures: They are
18 in the nature of Mr. Hassler's "personal expenses." An allowance of $1500 per year is made to him in full of all such expenses.

Had he come to Washington by the usual mode of transportation,
19 it cannot be doubted that all the expenses of stages, steam-boats, &c., must have been paid by himself. It would seem equally clear, that if he had hired a carriage and horses to bring him, he must have paid both the hire and the expenses, and by no rule of construction could have charged them to the government. The facts

20 set forth in the vouchers seem to show that the horses and carriage were not necessary to the safe transportation of articles of any other person, or articles connected with the Survey, which could be needed at Washington.

From New York to New Brunswick, and from Philadelphia to Newcastle, the carriage, horses, driver, attendant, and all the baggage, whatever it was, were shipped on board the steam-boats, and the whole expense charged to the United States. It is evident, that if the baggage could be conveyed safely on board the steam-boats *with* the carriage and horses, it might be *without* them. Nor is it easy to perceive how any instruments or books could be brought
21 more safely in a common carriage than in the rail-road cars through New Jersey and Delaware, and from Baltimore to Washington. The entire baggage appears to have been sent by the steam-boat, and the expense charged to the United States. Nothing appears plainer than that Mr. Hassler might have come himself, and brought his baggage with more expedition and safety by the steam-boats and rail-roads than in this carriage, and that the latter mode of conveyance was for his own convenience and pleasure.

22 He brought the carriage and horses directly from the Survey, where alone they could be legitimately employed, and kept them in this city until the next June, at his own service, together with a driver, charging the whole expense to the United States; and in the second 2d quarter's accounts, we have other heavy charges for their expenses returning to New York, in which even Mr. Hassler's own transportation in steam-boats is charged in addition to that of his horses, carriage, and driver. It would seem enough that the
23 public should furnish a carriage and four horses to convey Mr. Hassler without charge; but upon the principle presented in these accounts, he seems to consider that it is not only bound to do so, but to pay their expenses on the road, and, whenever it may be his pleasure to travel in a steam-boat, to pay not only his transportation, but that of the horses and carriage furnished at public expense to convey him by land. No authority can be found for such disbursements in Mr. Hassler's instructions, and they must be paid by Mr. Hassler as part of his "personal expenses," unless his power be enlarged by the Secretary of the Navy.

The wages of the driver and Mr. Hassler's assistant, and the expenses of both, are considered of the same character. They could not have been employed in the business of the Survey while travelling to and from Washington, or remaining here; or if they were, the nature of their service remains to be explained.

In your account we have, in addition to wages, a voucher for money paid to a "principal driver" in New York. No such officer is recognised in the instructions to Mr. Hassler, nor is it easy to comprehend what are his duties. If he also appertain to the carriage and horses, there could have been nothing for him to do during the time charged; for that equipage was all the time in Washington under the charge of a *sub-driver*. This charge needs further explanation.

The foregoing remarks apply to all similar cases in your account for the 2d quarter.

24 The transfer of Mr. Hassler's own books to the Survey is not only unauthorized, but needs explanation on another point. On the 8th of January last, I find that he addressed a letter to the Secretary of the Treasury, in which he gave an account of his collection of books, and his offer of them to the War Department, when the Survey of the Coast was interrupted in 1818, and the refusal to purchase. He there says: "The refusal of this purchase affecting very materially my economical situation, gradual sales at great sacrifices reduced the collection at least to the rarest astronomical works alone, which I sold to the Military Academy at West Point, under the superintendence of Col. Thayer, for about $1,100, payable in six yearly payments." As nothing in that letter is said about any books of his own remaining on hand, there is ground left for the inference, that those he had sold to the Academy had not been entirely paid for, and that having gotten them back, he has now sold them to the Survey. This is the point on which information is desired.

25 No answer to Mr. Hassler's letter has been communicated to me, nor any authority for him to take into his possession the books at West Point; and yet I find in your account charges for the expense of himself and attendant at that place for the purpose of receiving the books. They must be suspended until the authority is pro-
26 duced.

I have now touched all the important points in your accounts with the utmost plainness. I beg you to believe that I have no ill will to Mr. Hassler, with whom I am not personally acquainted, and that I have no disposition to embarrass the public service in which he is engaged. I look upon an accurate Survey of the Coast
27 as a measure of great interest and importance; and the surest mode of preventing its second interruption, is to take care that the disbursements connected with it be made with the greatest strictness and economy. To have the various points made in these accounts
28 adjusted, I trust Mr. Hassler will at once appeal to the Secretary of the Navy to define more specifically the limits of his authority, and confirm the acts done by him heretofore, which are now deemed without warrant in his instructions. As far as I am able, I will
29 contribute to adjust these points in a proper manner, so that the accounts of the Survey may pass hereafter without obstruction.

Herewith you will receive a list of all vouchers remaining suspended in both quarters' accounts, with the ground of suspension noted in each case, which may form the basis of any communication from Mr. Hassler to the Secretary of the Navy.

Very respectfully, your obedient servant,

AMOS KENDALL.

Capt. W. H. Swift, U. S. Engineers,
Babylon, Suffolk County, New York.

A List of Vouchers suspended in the settlement of the Accounts of Capt. W. H. Swift, for the first quarter of 1834, *and re-examined in the light of Documents Nos.* 1, 2, 3, 4, 5, 6, *and* 7, *transmitted to the Office of the Fourth Auditor of the Treasury, with his Letter, dated Fire Island Light, August 5th,* 1834.

Voucher No. 7, *S. V. No.* 4. Allowed in part, . $4 57 sus. $51 49

Documents Nos. 2 and 4, referred to as authority for the disbursements in this case, are deemed sufficient to authorize the allowance of Renard's board, S. V. No. 4, but not the other suspended items.

Voucher No. 8 . . . . . sus. 25 59

Document No. 4 is deemed sufficient to authorize the employment of *hands*, but not of *assistants*. Mr. Hassler has no authority to employ assistants, or pay them, without the prior approval of the Sec. of the Navy. The amount cannot be allowed without the approval of that officer.

Voucher No. 9. Allowed in part, ... 00 67 sus. 35 70

All the items of this voucher, except the last of 67 cents, are included in the remarks contained in the letter herewith, and must remain suspended.

Voucher No. 10. Same as No. 9, ... sus. 60 61

Voucher No 11. Allowed in part, ... 68 23 sus. 61 51

Document No. 2 does not authorize the employment of *assistants*, without the previous approval of the Secretary, which does not appear to have been given before the three first items accrued, which cannot be passed, therefore, without his authority.

No. 6 is considered sufficient to authorize the fourth item.

Voucher No. 16 . . . . . sus. 48 00

This is a bill of $48, for keeping four horses in Washington one month, from the 3d of Feb. to 2d of March, 1834. It is inadmissible, unless the Secretary sanction the purchase of the horses, &c.

Voucher No. 23 . . . . . sus. 252 25

This is a bill of $252.25, for the purchase of two horses and two halters, dated March 5th, 1834. These, added to the four Mr. Hassler had in Washington, make six horses purchased for the Survey. It cannot be allowed without the sanction of the Secretary of the Navy.

Voucher No. 24. Allowed $637 25

The authority adduced is deemed sufficient by this office.

Voucher No. 25. Allowed 156 07

Same as voucher No. 24.

Voucher No. 28. Allowed 96 14

Same as voucher No. 24.

Voucher No. 29 . . . . . sus. $122 55

See Fourth Auditor's letter herewith.

Voucher No. 30 . . . . . sus. 36 26

This is a bill of $36.26, for wages and board of Thomas Mc Donnell, as an under assistant and artificer, from 26th February to 12th March, 1834. No such employment is recognised in the authorities referred to; and if it had been, Mr. Mc Donnell could not have been employed without authority from the Secretary. As to his actual business, it appears that he is the person brought by Mr. Hassler to Washington in January last, and his expenses charged to the public, when his only business seems to have been to pay Mr. Hassler's accounts for him as far as Newcastle. The rest of the journey he seems to have performed by the rail-road, steamboats, and stages. There is no evidence that he was, during this time, employed in the Survey at all.

Voucher No. 31 . . . . . sus. 96 00

This is a bill of $96, paid Peter Murphy for wages, from the 1st of January to the 31st of March, 1834, and board from the 16th of Dec. to 12th of March, and from the 21st to the 31st of March, while in New York, in charge of the instruments, &c.

Mr. Hassler's report of 7th January, 1834, shows that the instruments were deposited in an interior part of the Custom House, with other similar objects left there last spring; "where," says he, "I hope they will be safe." And he says, "I directed Mr. Patten upon various mendings and other arrangements relating to instruments," &c.

Mr. Hassler was not authorized to employ hands, at a cost of $30 per month, to take charge of the instruments when thus deposited; and whether such employment was necessary, is for the Secretary of the Navy to decide.

Voucher No. 34. Allowed in part . . . . . 153 25 sus. 38 00

The authority referred to for the purpose of justifying this payment is insufficient. Mr. Hass-

ler asked leave to employ Mr. Eakin, "with an emolument between the first and second assistants, approaching about that of Mr. Blunt, or that of a Lieutenant in the Navy, as Mr. Bell now present with me;" and the Secretary authorized his employment *at a compensation between that received by the first and second assistants, as recommended.* On reference to the compensation of the first and second assistants, it appears that a *first* assistant receives $2049, a second assistant $1130, and Lieutenant Bell $1695. The Secretary of the Navy has decided that the proper allowance to Mr. Eakin is that paid to Lieutenant Bell, and the excess is disallowed.

The compensation of all assistants, &c. should be *specially* defined by the Secretary of the Navy before any payments are made to them. The second item for journey to Washington must be suspended for authority to perform the journey.

Voucher No. 35 . . . . . sus. $86 14

This is a bill of $86.14, for wages and board of Stephen Beancroft, laborer and second driver, &c. from the 1st of January to the 31st of March, 1834. *See Letter of the Fourth Auditor.*

Voucher No. 36 . . . . . sus. 63 00

This is a bill of $55 for a set of double harness, $6 for two horse-blankets, and $2 for two surcingles—in all $63. This all depends on the decision as to the horses, &c.

Voucher No. 38 . . . . . sus. 10 00

This is a bill of $10, for keeping two horses in New York, from the 6th to the 13th of March.

Same as above.

Voucher No. 39 . . . . . sus. 4 50

This is a bill of $4.50, for repairs of carriage.

Same as above.

Allowed in settlement of accounts for second quarter, 1834 . . . . . $1116 18 sus. $991 60

Thus it appears that of $2107.78 suspended in the settlement of the accounts for the first quarter of '34, $1116.18 will be passed to the credit of Capt. Swift, in the settlement of his accounts for the first quarter of '34, and $991.60 *will still remain suspended and appear upon the reconciling statement to his debit.*

AMOS KENDALL.

Treasury Department, Fourth Auditor's Office.
October 7th, 1834.

A List of Vouchers suspended by the Fourth Auditor in the settlements of the Accounts of Capt. Wm. H. Swift, for the second quarter of 1834, *with reasons therefor.*

Voucher No. 1.	For two pamphlets		$00 75
" *No.* 2.	One Herschell's Astronomy		1 00
" *No.* 4.	Books sold to the U. S. by Mr. Hassler		454 30
" *No.* 6.	One Copy of Philosophical Transactions		1 25

See Fourth Auditor's letter to Capt. Swift, dated Oct. '34.

Vouch. No. 11,	*S. V. No.* 3. For a pair of black mares and harness	$225 00	
"	*S. V. No.* 4. Surcingle, horse-blankets, and strips	3 93	
"	*S. V. No.* 6. Service as driver paid W. Peck	3 00	
"	*S. V. No.* 7. Shoeing horses	2 00	
"	*S. V. No.* 10. Horse-brush, curry-comb, &c.	1 50	
"	*S. V. No,* 13. Oats, &c.	4 86	
"	*S. V. No.* 16. Horsekeeping	7 00	
"	*S. V. No.* 17. Breeching for double harness, &c.	5 50	
"	*S. V. No.* 20. Oats and stabling	0 62½	

See Fourth Auditor's letter, &c.

"	*S. V. No.* 22. Cutting *one* white-wood tree	5 00	
			258 41½

This voucher is of the nature of damages. The manner in which the damage was assessed, and the authority for payment, are required.

Vouch. No. 14,	*S. V. No.* 1. For horsekeeping	$5 00	
"	*S. V. No.* 2. ditto	0 25	
"	*S. V. No.* 3. ditto	5 95	
"	*S. V. No.* 4. ditto	1 87½	
"	*S. V. No.* 5. ditto	1 87½	
"	*S. V. No.* 6. ditto	0 37½	
"	*S. V. No.* 7. ditto	0 75	
"	*S. V. No.* 8. ditto	3 00	
"	*S. V. No.* 19. ditto	0 25	
"	*S. V. No.* 10. ditto	0 50	
"	*S. V. No.* 12. Damages done to trees	5 00	

Same as S. V. 22, *V. No.* 11.

"	*S. V. No.* 13. For storekeeping	3 37½	
"	*S. V. No.* 14. ditto	0 50	
"	*S. V. No.* 15. ditto	1 75	
"	*S. V. No.* 16. ditto	0 50	
"	*S. V. No.* 17. Shoeing horses	1 75	
"	*S. V. No.* 18. Horsekeeping	0 25	
			32 95

See Fourth Auditor's letter, &c.

Voucher No. 17.	For expenditures of Mid. T. J. Page travelling with instruments and one man, from Washington to New York . . .		$43 25
	The authority under which Mr. Page performed this duty is required.		
Voucher No. 19.	For horsekeeping		3 00
Voucher No. 20.	Contingent expenses while travelling with carriage and instruments from Washington to New York, paid Mr. Hassler .		23 25
	See Fourth Auditor's letter, &c.		
Vouch. No. 21,	*S. V. No.* 1. For horsekeeping .	$48 00	
"	*S. V. No.* 3. Shoeing horses . .	5 87½	
"	*S. V. No.* 4. Horsekeeping . .	48 00	
"	*S. V. No.* 5. Repairing carriage, &c. .	0 93	
"	*S. V. No.* 6. Binding books . .	97 87½	
"	*S. V. No.* 7. Repairing carriage . .	2 50	
"	*S. V. No.* 10. Shoeing horses . .	2 75	
"	*S. V. No.* 12. Horsekeeping and curing the eye of one horse .	53 20	
"	*S. V. No.* 13. Ditto and driver's board .	12 50	
"	*S. V. No.* 14. Passage and freight of four horses and carriage, and driver, and one other person, from Baltimore to Frenchtown . .	10 00	
"	*S. V. No.* 17. Horsekeeping and driver's board	10 12½	
"	*S. V. No.* 18. Freight of four horses, &c.	9 00	
			300 75½
	See Fourth Auditor's letter, &c.		
Vouch. No. 23,	*S. V. No.* 1. For horsekeeping . .	1 25	
"	*S. V. No.* 2. Oats, shoeing horses, &c. .	10 67	
"	*S. V. No.* 3. Horsekeeping & Mc Donnell's board	4 15	
"	*S. V. No.* 4. Ditto . ditto .	4 50	
"	*S. V. No.* 5. Ditto . ditto .	5 81	
"	*S. V. No.* 7. Ditto . ditto .	8 56½	
"	*S. V. No.* 9. Horsekeeping : . .	9 50	
"	*S. V. No.* 12. Ditto & Mc Donnell's board	13 50	
"	*S. V. No.* 13. Ditto	1 50	
			59 44½
	See Fourth Auditor's letter, &c.		
Voucher No. 27.	For horsekeeping :		5 00
Voucher No. 29.	Expenditures by Mid. T. J. Page going to West Point for books		19 87½
Voucher No. 29.	Ditto		6 40
Voucher No. 32.	Repairing harness		16 75
Voucher No. 34.	Blankets and sheeting		35 73
Voucher No. 42.	Purchase of theodolite, &c.		363 17
	The authority for this purchase should be furnished.		

Voucher No. 45.	Fitting a tire on carriage-wheel . . .		$1 12½
Voucher No. 47.	Expenditures of Thos. Mc Donnell, under assistant		12 04
Voucher No. 48.	Freight of theodolite from Havre to New York		2 64
	Same as voucher No. 42.		
Vouch. No. 49, *S. V. No.* 1.	For horsekeeping and Mc Donnell's board . .	$2 31½	
" *S. V. No.* 2.	Ditto	5 00	
" *S. V. No.* 3.	Injury to timber and crops	4 00	
	Same as S. V. No. 22, *in voucher No.* 11.		
" *S. V. No.* 4.	For horsekeeping . .	12 35	
" *S. V. No.* 6.	Ditto	0 62½	
" *S. V. No.* 7.	Ditto and shoeing . .	11 86	
" *S. V. No.* 8.	Ditto	2 00	
	Horsekeeping and Mc Donnell's board . . .	0 62½	
	Ditto	0 65	
	Ditto	0 87½	
	Ditto	0 25	
	Ditto	0 12½	
	Cutting trees at Theolls .	1 00	
	Same as S. V. No. 22, *in voucher No.* 11.		
	Cutting top of an apple tree	1 00	
			42 67½
	Same as above. See Fourth Auditor's letter, &c.		
Voucher No. 57.	For damage done to timber		5 00
	Same as above.		
Voucher No. 55.	For this sum, being an overcharge for compensation to C. M. Eakin (assistant) .		88 50
	See remark on V. No. 34, *in account for first quarter,* '34.		
Voucher No. 55.	Steam-boat fare from Washington to N. York		9 00
	The order under which Mr. Eakin travelled from New York to Washington is required.		
Voucher No. 58.	Travelling expenses of Mid. Dahlgreen from Philadelphia to Greenwich		7 75
	Same as voucher No. 55.		
Voucher No. 60.	For service as principal driver (T. A. Vincent)		120 57
	See Fourth Auditor's letter, &c.		
Voucher No. 61.	For services as artificer, &c. (T. Mc Donnell)		108 35
	The employment of an artificer is not recognised.		
Voucher No. 63.	For tents, &c.		146 09
	The authority for this purchase is required.		

Voucher No. 66.	For horsekeeping, (Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14)	$116 39
	See Fourth Auditor's letter, &c. Did the horse belong to the Coast Survey?	
Voucher No. 69.	For horsekeeping, 7th June, '34 .	0 50
	Same as voucher No. 66.	
Voucher No. 70.	For steam-boat and stage fare from Washington to New York (C. Renard) . .	9 00
	The authority for this journey is required.	
Voucher No. 72.	For board of Jeptha Beancroft while in Washington and New York taking care of horses	32 28
	See Fourth Auditor's letter, &c.	
	Amount of expenditures suspended . .	2327 20
	Commission on $2327.20 at 2½ per cent sus.	58 18
	Total amount suspended by Fourth Auditor	2385 38
	Amount of expenditures allowed $5053 18	
	Commission on the same . . 126 32	
	Total amount allowed by Fourth Auditor	5179 51
	Charged U. S. by agent for his acct. currt.	$7564 89

AMOS KENDALL.

Treasury Department, Fourth Auditor's Office,
October 7th, 1834.

Remarks of F. R. Hassler upon the Letter of the Fourth Auditor of the 7th October, 1834, *addressed to Capt. William A. Swift, in relation to his Accounts upon the Expenditures for the Survey of the Coast of the United States.*

To No. 1 (in margin). The authority under which the renewing law of 1832 and the original law of 1807 placed the Coast Survey, is the President; and it was with special, well calculated considerations that it was not placed distinctly under any department whatsoever. Wherever the correspondence upon the subjects relating to it may be placed, for the time being, it is always what in language of business is called "given in commission," and not under any of the common business rules of that department; such it has always been treated by all Presidents; the proofs are too numerous to quote here.

With this character the agreements, nay *positive contracts*, made at different times with F. R. Hassler, were always invested; they

are *with the government* generally; and he has at all times, since the very beginning, always refused to take the Coast Survey in hand otherwise, or under the form of any thing like an office (see the documents); because it is impossible to do that work under such a form. Of the many works of that kind that have been executed in Europe, *not one that succeeded* has ever been made under the form of an office.

The contract existing, and properly authenticated, between the government and F. R. Hassler, is therefore the *the paramount law for both contracting parties;* the specialities that lie in the very voluminous correspondence form *equally binding by-laws;* nothing can be altered by either side without the concurrence of the other. Such is the *law of contracts* all over the civilized world.

No. 2. F. R. Hassler has held public offices in his native country, the old Republic of Switzerland, from 1786 until 1805, from the Receiver of Public Revenues to Deputy Governor, Attorney General of the whole country, Judge of the Supreme Court, Counsellor, Superintendent of the Public Buildings and the Archives of his native place, several of which he resigned when leaving, and can show the honorable acceptance of his resignation of them.

This old experience occasioned that by his presence in Washington, early in 1816, he fathomed very easily the mode of transacting business in the public offices; thence arose that he took, in his transactions with the government, the course quoted above, and, principally, not to mix in accounting concerns, as positively stated in the earliest correspondence with the Treasury Department in 1816.

Being, immediately after his arrival, made known to the late President Jefferson, with the notice upon his works for the survey of Switzerland, noticed in the scientific publications at that time that had already reached this country, he was asked, in 1806, whether he would mix in such a work as the Coast Survey. Upon his answer that he would be willing, but could not, like he had done in his native country, do it at his private expense, he was answered, "it will be liberally paid." Now compare the results!!!

No. 3. It is astonishing that in the rummaging of every word of the contract with F. R. Hassler, the Fourth Auditor has not found the article, equally obligatory as all others, that the accounts are to be rendered to the *First Auditor;* and that therefore, if F. R. Hassler wished to avail himself of it, he could refuse all intermixture of the Fourth Auditor.

No. 4. The Auditor and Comptroller who passed the accounts of the Coast Survey in the Treasury Department having passed all accounts, since 1811 till those now being in question, with perfect knowledge of all the details of the agreement, competence, incidents of the work, &c. and their whole bearing, their decisions are certainly to be *admitted as lawful precedents* in all respects; and, particularly, what has passed with them before is fully valid, and cannot be revoked, as is done by the Fourth Auditor in his objections.

No. 5. There can be no inadvertence in the passing of the accounts by the Auditors of the Treasury Department, with all the documents in hand, and so long experience, so much less a palpable error. It can also not be supposed that the several Presidents and Secretaries who contracted with F. R. Hassler could have given instructions, or allowed to him any thing that was *not lawful*, or that the minute details which the Fourth Auditor refers to *law*, which is difficult to ascertain, could be determined by a *law of Congress*. *The contract and correspondence make law* between the parties; others, except that which requests the President to have that work done, cannot be imagined as properly to be quoted.

No. 6. F. R. Hassler's letter to the Secretary of the Navy of the 9th August, 1834, did not prescribe the mode in which he should act, but requested him to do that which should be necessary, not to suffer a work wantonly to be destroyed, which is in progress of execution in a manner as honorable and useful as the Coast Survey has been put into by the exertions of F. R. Hassler—(see the letters of the Presidents, Ex-Presidents Jefferson and Madison, and the so frequently expressed opinions of the men of science of this country and of Europe—as Bessel, of Kingsbury, the first astronomer of Europe now living; Schumacher, of Altona, personally experienced in such works; Admiral Krusenstern, the Russian circumnavigator, and many scientific reviews and books).

That all the acts of F. R. Hassler, the expenses incurred under his direction, &c. were in furtherance of the work intrusted to him, in the most economical and successful manner, is proved by the result, which is universally acknowledged to be much greater and much superior in quality than has ever been obtained in this country for the same amount of money, and in the same space of time; a simple rule of three between this and any other similar work, in respect to their value, extent, and expense, would show the great superiority of F. R. Hassler's works in numbers, and will appear by the *investigation* which it has become his duty to provoke. The paramount authority of *the law*, which is here claimed, is of course equally binding upon the Auditors as upon those who render their accounts. Between the government and F. R. Hassler, the contract and the special transactions grounded upon it are the *positively binding laws*.

No. 7. F. R. H. knows all that, and with that knowledge has acted. Every part of the expenditure of the work which he directed, the means towards its execution, &c. were always understood to be granted to him, and he was, either by simple conversation, or otherwise by letters, authorized, of which plenty are among the documents from the Treasury and the Navy Department both, and even by the expressions of the different Presidents themselves at the different times. He was always honored by all equally with full trust in this respect.

For his mission to London, in 1811, he was furnished with a personal credit upon London for about three thousand pounds sterling, for the procuring of the instruments, books, &c. for the

Coast Survey, that he had proposed, with full liberty for any alterations that he would find proper; and the documents prove how much alteration was made, and that they all were not even put in question, but simply all the accounts passed exactly as he rendered them.

Coming back from the mission a creditor of the government for about $6,500 direct for himself, and having even paid a small balance upon the instrument accounts, and for wrongfully protested drafts for about $4,500, which were paid cash to Mr. Beasley, and even the note which he had to give in London upon the occasion of these protested drafts suffered to fall upon him by a law suit, in which he was refused the due protection,—he was repaid the other parts about ten months after his arrival, without that full redress which he might well have expected for having attended to the business of the government in London for two years, and returned with the instruments to this country at his private expense.

The collection that he so procured was, even in England, declared to be the best that ever left England. Upon this example, confidence was placed in F. R. Hassler, as well for honesty as for discretion in the public expenditures, and therefore henceforth all that is said in the contract that he shall be provided with, was left, or positively directed, to be provided by him; the expression of the contract, "that he shall be provided with," meaning there only that it shall be done at the expense of the government—that is, it distinguished what shall be placed upon public account and what not.

He was never attacked like now it is attempted, when not a single penny's worth of all the suspended items is objectionable, upon no ground whatsoever, as the investigation herewith provoked will show.

The whole reasoning of the Fourth Auditor would amount to the parallel: as if a powerful man were to order a pair of good boots of a shoemaker, and then prohibit him to buy leather to make them with; and to procure good leather, obliging him, in this respect, to abide by the decision of a man who never has seen leather.

No. 8. This is a direct mistake of the Fourth Auditor's. F. R. H. assumes no so called *power*, except the *faculty* and *means* to perform the task committed to him to the honor and permanent usefulness of the country, as the late President Jefferson said that he had done in his works of 1817; these means consist:

1. In his intellectual means and acquirements.

2. In the proper advising, procuring, and *organizing* of the means that will lead to accomplish the aim proposed by *the law of Congress* twice, and in revocation even of all that had been done to the country.

3. In the trust laid in him since 1807, as well for the useful and honorable execution of the work as by the confidence of the government, which he has never abused in any way; whence

came that he was always intrusted with every accessory purchase, or other arrangements, just as well as the principal part of the work.

No. 9. The purchase of the carriage, or rather Jersey wagon, with springs, is for the first onset grounded upon a special letter to that effect, addressed to the Treasury Department the 23d November, 1816. In 1832 this was fully sanctioned by the reference of the Treasury Department to the former arrangements that are confirmed by it, and to propositions given in at that time by F. R. H. sanctioned by the reference to them. The whole history of the carriage (which Colonel Abert can attest) is the following:

It was at first intended to carry the instruments by hand from station to station, like F. R. H. was used to have it done in the rugged mountains of Switzerland. This, however, was found by far too cumbersome and *expensive* (as already stated). The habitual construction of carriages was found, as well in form as in softness of motion, entirely inadmissible, as much so as common wagons. To transport safely several delicate instruments of about one hundred and more pounds each, with a number of smaller ones, &c. which would have been useless if not transported carefully over bad mountain roads, was the question to be solved. Therefore, in consultation with the then accounting officer, (Colonel Abert, who can testify to every point,) it was decided to propose a peculiar conveyance, to be constructed for that purpose, which was immediately agreed to by the Treasury Department, by answer to F. R. H. that he must be the best judge upon the means of conveyance: that this included also the horses is an evident consequence—(see the letter quoted). Then F. R. H., with the assistance of a man in his own wages, placed in a corner of his room in Newark all the larger instruments, with their boxes, that were to be used at every station generally, and directed the coach-maker (Campfield, of Newark, yet living) to take the measure for the box that would hold them, just snugly pressed against each other, so as to prevent all jarring and shaking; and to mount this in the form of a kind of barouche, or what it may be found proper to call it, with a top folding down, for the shelter against rain when up, and to pass under the branches of trees when down, which was an absolute requisite,—for which, as also for greater security, the wheels were made lower than habitual, and upon the wide rut; and hang it upon good C springs and thorough braces, &c.; the instrument boxes having to stand even, while to obtain the proper effect of the springs and thorough braces requires a rounded bottom, the space between formed a double bottom, in which the smaller instruments, tools, journals, &c. always were transported; for the telescope, a large sword-case (as generally called) was added to the back of the carriage-box. This all forms the odd appearance by which this conveyance is known, as well as by the complete absence of all luxury. This proves all: that the second article of the older contract, quoted by the Fourth Auditor's letter, has nothing to do with the horses and the carriage, which

were specially authorized, once for all, and confirmed by the agreement of 1832, which positively says—that the arrangement of the first agreement shall be continued, and refers particularly to F. R. H.'s previous propositions, in which these objects, with many others, were mentioned as necessary; therefore also the resulting expenditures passed in the accounts rendered to the First Auditor, who had all the necessary papers to assist a proper judgment, which the Fourth Auditor must obtain, if he has them not.

The above carriage having been sold at auction in 1819, after the Coast Survey was broken up the first time, and while F. R. H. was engaged at the boundary line with Canada, he purchased it, together with the two horses that were sold at the same time, because it was needed for the use in that work; but his leaving that employment left him the whole upon hand as a useless loss, and he used it only to move to his farm in Jefferson county, New York, where it remained well sheltered until the Coast Survey came again into his hands in 1832, when it was immediately brought to his former maker in Newark, N. J. New wheels and axletrees were made to it, and it was otherwise put in full repair, at the expense of F. R. H., so as to be really better than a new one would have been, obtained at that time. Then it was again transferred to the Coast Survey service, its original destination, where it might long yet render service in its destined capacity. The price set upon it, which the coach-maker who mended it said was cheap, was $500. It stood F. R. H. in the amount of $1,000, by the unfortunate circumstance of the failing of the aim of its employment in the northern boundary line.

The economy which this transfer and the purchase of the horses for the Coast Survey effected was very great, as the work could immediately proceed, while the construction of a new carriage of the same kind, which would have been *unavoidable*, would have cost far more, and have delayed the whole remainder of the campain of 1832, and the hire in the meantime would have cost more than all these purchases, and have left nothing at the end, while the maintenance of driver and horses hired would have remained to be paid equally, as will be seen by the accounts; therefore also the accounting officers of the Treasury Department passed all the bills with full knowledge of the case. The principles that appear by the above apply equally to all other horses and carriages, as well as that for transporting the stands and other accessories, the placing of signals, and reconnoitering, indispensable for the Coast Survey's main works as those for the assistants in secondary triangulations. They are all in daily use: and if even in the investigation which is called for with the present papers, it was proposed to substitute the hire instead of the establishment now existing, F. R. H. would, as in *duty* bound to the work and the nation, oppose it; and no man capable to add figures and compare the results could controvert the proofs that lie so numerous in the accounts; while every man knowing the least about mathematical

instruments would directly condemn the hire as well for conveyances as for horses for transportation, reserving this mode only for the transportation of the heavy baggage of the party between distant stations.

No. 10. The state of the collection of instruments for the Coast Survey in 1816 was such, that the work was provided with the proper means, still not only purchases of books and smaller instruments were always occasionally made, and allowed in the accounts as authorized, but F. R. H. was furnished with a letter of credit for Mr. Troughton for 300 pounds sterlings, for a zenith sector, &c. Just like in 1833 he was furnished with a draft of 600 pounds sterling for the instruments that he ordered to the same artist, and which may, in part, soon be expected, as has been stated in the correspondence of the Navy Department. It was also distinctly understood then, that the gradual supply of instruments and books absolutely needed by the state, in which the instruments remaining from the collection made in 1815 were handed over for the renewed operations, should be made *without exposing to any further noise* about it, as more creditable. It has been stated to the Navy Department yet lately, that it was positively improper, and even fully impossible, to make out *honorably* and *economically* with the collection in its *present state*, as the inventory sent to the Navy Department proves decidedly. As for tents, books, hire of men, &c., which are mixed up in this article, each is answered in its place, and in former statements.

No. 11. The information here alluded to, has always been given in due time—generally or especially, as the case required; and upon the understanding therefrom resulting, as quoted under No. 10, were grounded all the measures taken by F. R. H. in such cases.

As for *stock* of mathematical instruments fitted to the work, tents fitted for the special use of it, appropriated books, and such like, it is too well known that the government has none wherewith to supply, that this could even come into question. Not a single work of the kind of the Coast Survey has ever been made in any country in which the chief was not the full master of the selection and procuring of the instruments, and the other means to the aim: and he is really the only proper judge in the case. To make the chief of the work dependent upon another agent for any of these aims, would be a *direct affront*, to which no man capable of doing the work could ever submit. The economy *pretended* to obtain by it would become a direct loss of great amount, because of the unavoidable unfitness of the result. The agent to be employed besides the chief of the work is the mathematical instrument-maker, to whom he communicates his plans and aims, as F. R. H. did in writing with the artists in London, (these are yet among his documents,) and he combines with him the best means for their successful execution.

It is inconceivable how a man can speak of economy in arrangements, and propose that a special agent could or should be employed, and therefore also extra pay and emoluments paid for an

object accessory to what is in the hands of a trusty man in geneneral principles, and that upon a confidence grounded upon twenty-seven years' experience; in consequence of which the Treasury Department considered always F. R. H. as the proper and competent judge and agent in every respect in all such cases. As for any repairs whatever, which in larger instruments often amount to more than the purchase of a new instrument of a smaller kind, to obtain permission from Washington, would be too evident a direct stop of the work. The idea of it could not possibly enter into any man's head. Instances could be quoted as well for this as in case where whole secondary instruments were actually made in camp, of which the trifling expense does not even become apparent; but this paper must already, by the main parts it has to treat, become so long, that it appears proper to omit them. Even the Navy Department can find among its own documents, therefore, in the very office of the Fourth Auditor, the record: that in the times when F. R. H. was in no way engaged with the government, his certificate was required upon the quality and price of an instrument procured by a naval officer for the Department, and that it was admitted as proper and trustworthy. If then he had the confidence of the Department as proper judge, he can certainly claim that quality still more decidedly for instruments to be used by him and his assistants. What consistency in the same office would the contrary suppose?

No. 12. Being decently educated, F. R. H. acted also decently in cases as quoted here, namely: he never undertook, nor would undertake, to order instruments, books, &c., to a very great amount, without informing the Department, whichever it may be, and obtaining its concurrence in his views; and he has obtained this concurrence positively for all the cases of any amount that are objected to; but for objects of not so great amount, and where the delay occasioned by a correspondence would, as was often the case, be far more costly than the object or expense itself, the confidence laid in him by intrusting him with the superintendence of the work, certainly covers all such objections. All that decency requires, F. R. H. will, in any circumstance of life, know how to observe.

No. 13. The constant application of the words, "*power claimed*, authority," &c., which is repeated in this article, F. R. H. *disclaims* all. *Power* has no reference whatever to the necessary operations and means that have reference to the Coast Survey. This work is an extremely laborious task, requiring deeper combinations, more assiduity, corporal as well as mental exertions, and greater means of science, than any work that has ever been undertaken in this country. The chief of it has no time to think of *power*, nor can, nor shall, the pursuit of *power* be in his character or actions. He has an aim far superior to this. Besides, F. R. H. has the innate habit of old Switzerland, to despise *power*, and to admit to any public officer, or any man employed in the public affairs of the country, nothing but *duty*.

No. 14. All the purchases objected to, having been made before the Coast Survey was (unfortunately, as appears) laid in the Navy Department, and having been approved by the proper officers at the time, it cannot be conceivable that the Navy Department can make any objections whatever; they constitute a part of the establishment, as the Navy Department received it, and are therefore valid as long as the existing contract lasts; and such would be the case if the Department was daily changing; and in any change of the contract, F. R. H. as the one party in it, has certainly the full right to give his opinion, and even assent or dissent, upon any point with perfect liberty; therefore, also, at the moment of transfer, Mr. Woodbury, then Secretary of the Navy, positively said to F. R. H. that he had no intention to make any alterations then; and none having ever been proposed or hinted since, it is of course proper to rely upon his word as valid, in full to this day, and until new agreements, if ever made.

It is difficult to conceive how, under such documented circumstances, if the Fourth Auditor entertained other views upon the subject, he could let the whole go on until the third quarterly account, before the objections were made, and the reasons for them given, or explanations asked; so much the less, as with the first quarter he was already called upon, by the accounting officer of the Coast Survey, to state whatever he might find proper to remark. If the conscience, and views of the *law*, of the Fourth Auditor did not admit the passage of the suspended vouchers, it was positively his *duty* to prevent the recurrence of similar cases, by immediate notice, to prevent mischief; to come to the amount to which it is brought by his delay, and still more by just in this moment impairing the making up of the Report asked by the President for next month, by taking up the time of F. R. H. and the accounting officer for such discussions as the present. If, on the other hand, it is for want of having all the necessary documents, that he has acted so *contrary to the vital interests of the work*, then certainly the call upon F. R. H. for them was the first step that he was in duty bound to take; while the accusations of *malversations* and *prevarication*, that are contained in the letter, must necessarily be cleared up by a proper public investigation, if not *positively and fully withdrawn by a public document.*

As for the subsistence, providing, and similar, which the Fourth Auditor thinks to load F. R. H. with, he disclaims it entirely. This is the province of the accounting officer of the Coast Survey exclusively, as positively reserved by F. R. H. in refusing accounting concerns; it was therefore, also, never as yet even hinted at, that he should mix in it.

No. 15. Is answered in the preceding articles in detail. It must however be added, that as far as this sweeping article of prohibition of all the means to do the work goes, its effect is instantaneous. The only instrument for measuring terrestrial angles, now capable to render service in the main triangulation, is the theodolite of Schenk, which is objected to, *therefore prohibited to use*, as by

that it does not belong to the government. If not an immediate answer to the contrary is given, F. R. H. will dispose of it, in order to return the money.

The carriages, horses, tents, &c. being also thrown upon F. R. H.'s account, as unauthorized purchases, their absolute necessity in all the works and movements hitherto made, and the very words of the Fourth Auditor, *that authorize him to hire*, calls for the account to be given in for this hire. If these objections have the sanction of the Department, a proper bill for all this hire will be made up. It will be found exceeding the amount of all the purchases by a great deal. It is well known besides, and sanctioned by all the bills passed by the Auditor himself upon similar hiring, that the rule of the country is, that the maintenance of horses and driver is always at the charge of the person for whose service the hire is made. This change in the arrangements would, therefore, not authorize the throwing out of a single item of maintenance of horses, board of driver, and similar things; and the daily hire of a carriage with two horses, besides this maintenance, is habitually $5. As for the tents, the rule of the War Department determines the price, by the deduction of twenty cents per day from the pay of an officer occupying a tent belonging to the government; which would, therefore, form the least legal price; though the tents used in the Coast Survey are necessarily all larger and costlier, and might be expected to be paid higher in consequence.

No. 16. If none of the articles, quoted in the oppositions of the Fourth Auditor, as rejected, are admitted as public property, then—

1. The inventory given in, upon the late call of the Navy Department, contains many articles that would belong to F. R. H., and this call for an inventory was absolutely useless and idle.

2. As they were absolutely indispensable for the Coast Survey, during the whole time, according to the tenor of the Fourth Auditor's letter, with full authority, the hire is to be paid for them for the whole time: a prompt decision is required, that the bills may be made up for them. But it must be repeated here, that F. R. H. is bound, in *duty* to the charge in his hands, to oppose such a measure.

No. 17. When F. R. H. took up the Coast Survey, in 1816, he asked Mr. Dallas, then Secretary of the Treasury, if it was required that he should live in Washington; which Mr. Dallas said was not necessary. F. R. H. answered, therefore, that in this case he would always live near the work—moving as it proceeded—as this would economize much time and travelling expenses. So he chose Newark, N. J., and lived there in the middle of his work in 1816 and 1817. However, while he was there, hard at work in the preparation for a report upon his labors, *managements in Washington* procured the revocation, or rather *alteration*, of the law for the Coast Survey, so as *to exclude him from the work;* by which, it was worse than suspended until 1832. This occurred only about three weeks before the fully satisfactory report could

have been delivered. Principally upon this ground, to prevent a similar misfortune to the work, it was requested of F. R. H. in 1832, when the Coast Survey was again put into activity under him, that he should live in Washington; which, besides, was needed for the winter, to attend also to the Weights and Measures concern, which remain equally in his charge. Hence arises the necessity to travel every fall with some instruments, books, journals, &c. to Washington, and with a similar equipment every spring to the field-work.

No. 18. This objection is altogether erroneous, and can only be grounded upon ignorance of the real state of things. The $1,500 allowed for personal expenses, does not cover above one half of the actual increase of personal expenditures occasioned by F. R. H.'s constant absence from his family, and unavoidable moving life; most generally even reduced to a miserable mode of living, at great expenses, on account of the remoteness of the stations from places wherefrom a more comfortable living could be derived.

Experience has proved this: F. R. H. having lost, since 1832, by sacrifices provided by his own means, upwards of $4,000. However, in any case or way of travelling, it is evident by the documents that he would always be entitled to every stage or steam-boat fare, because his transportation with personal baggage is, and must necessarily be, at public expense; while, on the other side, his expenditures for living are equally evidently part of the expenses that he has to pay.

No. 19. F. R. H. would consider himself acting highly improper, if he were to intrust the more delicate instruments, the journals of the work, and such like objects, to any one of the habitual transportation means of this country. The proof of this has been administered fully in the very journey objected to by the Fourth Auditor. Thus, during the summer, F. R. H. had, as often, lent one of his trunks for keeping and transporting the journals of the work, important documents, and such like things; finding it his duty, as always in any move, not to leave the journals of the work, and the more delicate instruments, from under his personal care, the carriage was entirely filled with these objects, leaving only a seat for himself and room for a trunk, that he may travel with for this very necessary care. His own trunk, which had contained the journals, &c. in the field, was then used to convey his winter clothing, blankets, private manuscripts, and other objects of value of different kinds, which was with some of the heavier part of the apparatus, not instruments for the survey, forwarded by the transportation-line to Philadelphia—there *this very trunk was stolen from the wharf*, in the charge of the Baltimore line, during the moment that Mr. M'Donald, who was carrying the transfer, was receiving the bill of lading in the office. The thieves of course destroyed the manuscripts, scattered other things, which they could not use. A proportional compass, the only thing of the government's property that had been in it, F. R. H. purchased

back from the *instrument-maker* (*Young*), as one of the vouchers proves. Of the other subjects, belonging all to F. R. H., only a small part was returned to him, by the Mayor of Philadelphia, in whose court the facts are recorded. What would have been the consequence for the Coast Survey, and what would the Fourth Auditor have said, if the trunk had contained the journals as before, and as advised by him to transport the effects? The loss of F. R. H.'s property amounted to near $300. Who will compensate him for it?

No. 20. The facts as above stated, far from showing that the carriage and horses, thence also a driver, were not needed in Washington, or for the travelling there, in the Coast Survey work, shows the *absolute necessity* of their employ for that purpose; and such must be the case, as long as the establishment of the work exists, and the presence of the chief in Washington during winter is required; because, unless the stock of instruments is in many respects doubled, so as to leave one set in the neighborhood of the field-work, while another is at Washington, they must be moved to the places where they are needed—the most valuable part in the carriage under the eyes of the chief, and only the coarser utensils and baggage can be sent by other means; *and positively never otherwise but under the care of two persons* belonging to the party: as it has been proved by the above, that *one is not sufficient* for the absolutely required security, with which F. R. H. shall never dispense as long as the objects remain under his charge; and he herewith *positively refuses* to act otherwise, unless *a positive order from the Department to that effect*, in which the *responsible person is nominally indicated* to him, where he can claim the objects again, and that he himself be *formally discharged* from all responsibility whatsoever. It cannot even be conceived, that it should be expected that F. R. H. should every year twice be obliged to expose himself to losses, which the government would never indemnify, and which he cannot afford. And after all, it remains to be said,—what shall become of all the journals, that contain the results of the work?

No. 21. As for rail-roads, F. R. H. will never put an actual instrument upon any rail-road, unless *a positive order to that effect, relieving him from all responsibility;* because he has no reason to expect instruments, so conveyed, back again in a serviceable state. He has obtained the proof of it at the first outset of the instruments from Washington in 1832, upon the rail-road between Frenchtown and New Castle. The motion upon rail-roads is the most detrimental possible to instruments; by the short and constant jarrings the screws of the instruments are made loose; even common carriers' wagons are preferable, because the slower motion is not so detrimental; though also these are to be avoided, if ever possible, but are at all times inadmissible for moving the instruments from station to station.

No. 22. The own pleasure and convenience of F. R. H., here alluded to, cannot, as proved by the above, be any other than the proper and

sure performance *of his duty towards the work*, and the public property under his charge; if it is intended for any thing else, it is as *misused as improper*. He can herewith give the positive assurance, that he would by far prefer to be able to travel with the ease of an idle traveller, with only a light trunk, that he could with ease carry in his own hands, that it may not be stolen from him.

No. 23. The style of this part of the letter is such as F. R. H. will never imitate; but the accusations of *prevarication*, by *illegitimate employ* of the objects under his charge, is unquestionably a subject that must be cleared up by the investigation which he requests, and which it is due to him *by principles of justice to establish immediately;* so much the more, as the case must unavoidably occur in a short time again, in the regular course of the work. The following may be added to clear up this point:

1. During the winter, the stabling and shed at Brooklyn, opposite New York, where the smaller carriage was left, were burnt down, the smaller carriage was saved with difficulty; and if all had been there, particularly without an attendant on purpose, as is all over intimated, it is much more than likely by all accounts of the fire, that the horses and all would have been burnt up.

2. It was found improper, as stated, to venture the transportation needed in any other way than with the carriage, and under the care of F. R. H.; and as contrary to all economy to leave this indispensable means behind at useless and higher expense, they not being needed at that time in New York, and to hire others at a still much higher price, as above proved.

3. The price asked for horse-keeping in New York would have exceeded that underway in travelling; and that which was paid in Washington during winter *is twenty-five per cent less* than that at New York. Compare the different bills.

4. The four horses (purchased according to the positive authorization in the contract of 1832, which sanctioned the propositions of F. R. H., made at that time) cost $385. As well in New York as in Washington, it was acknowledged that they were quite a bargain, and of best quality in all respects, as the proposition required them. Immediately, the first spring, a gentleman in New York offered for the one pair another pair, which were esteemed very good, and $300 over. F. R. H. not considering the transaction in itself neither of his resort nor proper, the exchange was refused.

5. A team of good and true horses, as requested by the sanctioned propositions of F. R. H., and as all these purchases have always proved hitherto, being of very great value for the necessary safety of the instruments, it would certainly be improper, and contrary to all economy, to sell such a team at the low price at which horses are in the fall, to be obliged to purchase an indifferent set at higher price, and in haste in the spring, when it is absolutely impossible to go to work without them.

6. As for a driver kept with the horses, it is too well known that, with the care habitual in livery stables, without inspection, it is not proper to loose the eye over horses and carriage; such a man was, therefore, absolutely necessary, and the cheapest in wages was selected.

The denomination of *sub-driver* is unknown to any person employed in the Coast Survey work. No titles of any kind are exchanged among the party. But the first driver that was engaged was considered as for the carriage containing the main instruments; and the second engaged (not sub) driver for the second conveyance. It is often necessary to have a third, and even a fourth, without for that establishing any rank or titles.

7. The services of the first engaged driver were indeed such as rendered him the principal one; he is the man who procured the purchase of the horses; and he performs always more valuable services besides, as placing signals, procuring provisions, and such like.

During the measurement of the base upon Fire Island beach, he performed the whole time the service of a captain of a sloop, daily crossing the bay to get the letters from the post-office on the main shore, procuring and conveying the necessary provisions, and numberless other necessaries for the work, without which the work in a place so entirely cut off from all communication, would have been impossible, there being no habitual means of communication between the place and the villages, and nothing upon the beach itself but bushes and sand. He was engaged during the short recess of the field-work last winter, in part, in again procuring a pair of very good horses; and for that, as well as being at hand for the service of the assistants in secondary triangulation, he was left behind, and actually engaged with the assistants in their work.

No. 24. The manner in which this article of the sale of F. R. H.'s books is treated is such as he must *repel* as a highly improper attack upon his character, in consequence of which it must become one of the articles of *special investigation*, because it is thereby intimated as if he had made a double sale of the same books to the government. Notwithstanding he does not consider himself bound to *give account to any man* upon the manner in which he disposes of his property, he has also no secrets, and therefore will place here the whole history of his library, of which much is contained already in former communications. F. R. H. had (as is still easily proveable), from the age of 16, in Europe, begun the selection of a scientific library, which, shortly before he left his native country, amounted to nearly 5,000 volumes; all the most valuable classical books in their branches, in diplomacy, history, law, mathematics, natural philosophy, and ancient classics; not a single common poet, novel, or such like ephemeral book, being in it. Intending to leave the country where the diplomatic and law part of his library applied to his occupations in public life, he sold that part of it, and came to this

country in 1805, with about 3,000 volumes of books of all the most select ancient and modern classical, in natural and mathematical sciences, a great number of them very scarce, and no more to be obtained, but accidentally, as he had the occasion for during the time of his studies in Paris, Göttingen, &c., and paying often $15 and more for a volume; all which can be proved by living witnesses in this country. Of the diplomatic part remaining, some were sold to the library of congress.

Besides that, he brought a number of instruments, standard weights and measures, which are now yet the only equally accurate and authentic ones in this country, whence they are employed by him as principal means for the comparisons of weights and measures, that have been presented by him in the report to congress upon that subject. (See the report itself, which was so highly approved in Europe and in this country.)

This attracted to him the men of science in Philadelphia, who shortly after selected him a member of the Philosophical Society there without his knowledge; these declared that such a valuable library and collection of instruments had never before come to this country (and it can be added, never since); they gave to the then President, Jefferson, information upon him, with a notice upon his former life, as proved by his documents, among which were the notices of the triangulation he had begun in Switzerland in 1791, and been interrupted by the Revolution.

This circumstance gave life to the idea that had been entertained then already for some years, particularly by President Jefferson and other eminent men of that time, to get, by means of F. R. H.'s experience, the so much needed work of the Coast Survey executed; wherefore he was spoken to, before the law itself was proposed that passed in 1807.

When in 1811 F. R. H. was sent to Europe for the procuring of instruments and books for the government, he also augmented his private collection; but finding it proper on his part to use the public funds intrusted to him only for the greater objects of immediate want for the Coast Survey works, he bought on government's account only the closest needed books of those times, as he also referred many smaller instruments to be procured later, when needed.

In selling what he called the remainder of his library, to the Military Academy at West Point, (the history of which transaction is even not very edifying,) it could not be expected that a man accustomed to books for his companions from childhood, would divest himself of the last book he had. It is besides evident that he, in such a case, will reserve by preference just such books that are the closest connected with his favorite occupation. In the present case, therefore, naturally just, the most valuable and most practical works for geodetical, astronomical, and similar purposes, were reserved.

Had not the Coast Survey been again intrusted to F. R. H., and had he not thought he could this time trust upon the stability of

the government in maintaining a measure, taken with proper reflection and consultation of past experience, he would never have thought of parting with these books for the benefit of the work. This is what is refused, and even tried to be turned into *suspicion against his character.*

So far, however, as the accounts are concerned, (the other part belongs to the called-for investigation,) this difficulty is fully settled. F. R. H. has returned the money, and will take back the books again. He will never more offer or sell them to the government, nor direct the purchase of a single book for government's account, as it is decided by the Fourth Auditor that the assistants of the Coast Survey shall not be provided with means of instruction in their functions.

If any man of science had read and compared the two catalogues which both are among the documents of the Coast Survey, that of the books received from West Point, and that of those transferred by F. R. H., he would immediately have seen the distinctly different character of the two collections, and that many of the books of F. R. Hassler's transfer were not even in existence at the time of the sale to West Point, many being presents from the scientific men and societies in Europe, and even from the Admiralty of England.

No. 25. The documents upon the transfer of the books from West Point must be among those of the department; if not, it is at least not proper that the Auditor should, before he asked for them, accuse F. R. H. of malversation in any part of that transaction; that these documents must be in full order, the Auditor must be able to conclude from the ultimate result that these books were actually delivered, as has also been the transportable transit, which was only borrowed from West Point for the use in the base-line, and will be soon returned, and the exchange of the observatory clock of Hardy against the transportable one of Brockbanks; all which were sanctioned by documents.

Nobody at West Point being fully acquainted with these books and instruments, their relative value, and the proper care that was needed in the transportation, &c., it was unavoidable that F. R. H. should go there himself to receive them; and as he is not engaged to lift and carry heavy boxes, it was most proper to take the men already enlisted in the Coast Survey work with him, to perform the unavoidable manual labor connected with it, and even a trustworthy more intelligent assistant to direct their manual labor and care properly; these were not *attendants* upon F. R. H., who, it is well known, never has any *attendant*, except in case of sickness.

The steam-boat fare appears for F. R. H. only in going up; having given the objects in charge of Mr. Page, he returned later, alone, and the return fare will no where appear, though F. R. H. thinks that on principle he would have the right to charge it.

On this occasion it is to be remarked, the request for signing orders for the moving of an assistant from one part of the work

to the other has been complied with *for the present*, not to delay in any way the clearing of the accounts, but that they are inadmissible by the nature of the work, because it is absolutely necessary that the assistants move about in a great variety of ways, and so frequently, that such formalities, which can be proper only in military or naval movements, are *absolutely unfitting the work*, which is positively claimed and agreed upon as *not guided*, nor *guidable, by any of the common army or navy regulations.*

No. 26. As here the reproaches and accusations are said to be at an end, the protest of "no ill will," occasions necessarily the remark, that F. R. H. could not conceive from where any public officer in Washington could have any just or even only *plausible cause of ill will* against him. The questions pending are *questions of duty* on both sides. It is entirely inconceivable how they have been attempted to be all turned into attacks upon F. R. H., which he must, as an honest man, not only defend, but repel the attempts. It is to be hoped that they never would have been preferred, if the writer had had the slightest personal acquaintance with F. R. H., which he says he has not. But then it is so much the stronger to be objected, that any acquaintance should be introduced in such a manner, particularly when it is of public notoriety, that the man so attacked has been, since 1807, more or less in the employ of the government to full satisfaction, and that former attacks upon him have rebounded upon the assailants without redress.

It must be evident to the Fourth Auditor himself, that these cannot be suffered to sleep; and as the attack is made in a letter to another officer, whereby the *whole becomes public record*, F. R. H. must request a document or public record, by which all these accusations are positively revoked, to obtain which he has proposed *the immediate investigation of his whole conduct* in the business on which he is attacked, by men of proper impartiality and such acquirements as are necessary to qualify them to the task; when all his assistants, artificers, men, drivers, whatever they may be called, from 1816, '17, '18, '32, '33, and '34, can be properly called up to witness, and any other persons in any way acquainted with the subject and F. R. H.'s works.

No. 27. The Coast Survey is a public measure of great interest *and value to the nation*, and, in the very form in which it is now, has *passed the national councils twice*, and the approbation of all the Presidents since 1807—(see the letters of the Presidents Jefferson and Madison)—and of all who are properly qualified to judge upon it, both in this country and in Europe. It is not a measure taken for the private benefit of F. R. H., who has lost upwards of $15,000 by his work in it, besides the exertions of the best years of his life.

The menacing turn given to this article is therefore *applicable to the benefit of the nation.* If it should be intended to act upon fear in F. R. H. personally, it is proper to give here the information, that fear is a feeling which he never had, and to which therefore cannot be applied with him.

Under these circumstances, it is evidently the *duty* of every man in public office to forward, and not to impede, the work; this latter, however, is the only effect that the oppositions made to the present organization of the work can have, and actually have had, in various respects, as they have necessitated various disadvantageous alterations in the proper order of the work. The breaking up of the work from its present establishment would turn *into a disgrace for the nation and its administration*, while, on another side, it would, as to F. R. H., have the same effect which the first interruption has had, namely—to raise his credit and name still higher than he even aims at, as he has at all times undertaken the work principally from predilection for this kind of work, and in 1832 especially, because he knew the plans in view otherwise, which would really have been as disgraceful as unproductive, and immensely expensive. In respect to the economy of the arrangements in every individual part, as well as in the general, F. R. H. can with full security defy any man to make the work, with the character and results that belong to it, for the same amount of expenditures, particularly with ideas as inapplicable as those are that are exhibited in the letter of the Fourth Auditor; any reduction even of a single laborer or artificer at the time when he is used, a single horse or conveyance, a boat, or any such thing, would interrupt the chain of the work, and by delay create an additional useless expenditure of great amount. F. R. H. has to lament that the Secretary of the Navy, in his last tour through New York, has not honored the work (just the measurement of the base-line) with his visit, to which he was pressingly invited, as a means of showing to the public the attention of the government to the work, as of public importance. It was expected that such an attention would contribute to the greater security of the signals, so indispensable for the unmolested progress of the work. Their frequent disturbance is often an impediment and a disagreeable expense, on account of the otherwise unnecessary travelling to replace them, so that the effect from that side would have tended to an actual economy.

For the effect of an interruption in respect to economy, F. R. H. must refer the Fourth Auditor to the documents in his own office, proving the effect of the first, obtained in a manner as well known to F. R. H. as to other persons, and upon which one of the acknowledged experienced naval officers in this line, now dead, wrote to F. R. H. "it is time that the nation should know that it has been deprived of $500,000, for which not one map can be shown." Of the accounts of Felsh, and what was connected with his doings, documents cannot fail in the Fourth Auditor's office, or in the Navy Department in general. The ultimate result of this and other trials in the Navy Department is summed up in one of the reports of the Department to Congress, in the words—"Nor can such Survey be made without the aid of the means contemplated by the act of 1807," which was therefore renewed in 1832.

Felsh

If the chronometric plan, so called by a speech, printed as held in Congress (a direct impossibility), had been adopted in 1832, the expense of fifty chronometers, three or four steam-boats, a number of other vessels, each manned with sixty men and six officers, with all equipments as contemplated, it would, before this time, have cost upwards of $100,000; and every man of science in this branch could aver and *prove*, by mathematical principles, that not any two points could, within many years, have been determined ultimately, and within such limits of accuracy, as are absolutely required, if the work shall be worth any thing. The honor that *this would have given for that amount of money, the nation certainly* does not claim for.

The works of one year, made by F. R. H. and his assistants, are extant, and stand for ever honorably maintainable before the scientific world and the country at large, covering a pretty considerable and interesting part of the coast: the full report, with five maps, handed in by him, make documental proof of this, and Congress will certainly approve the results, when presented with the next presidential message, as the President said he would do, requesting an additional report for next month, which it is yet expected it will be possible to render, notwithstanding the interruption caused by the operations of the Fourth Auditor.

Thus, conscious of honest and careful transactions, and of the results produced, F. R. H. *requests positively the investigation*, which has already been repeatedly stated. It must be remembered that all that is done in such works, and in relation to them, by any person whosoever, is done before the whole civilized world, who has a *right* to know all about it; the history of the country records it as facts for instruction or warning for future times; no secrets can be in it under any form whatsoever; therefore every man has to mind his character in it.

No. 28. F. R. H. had given into the Treasury Department, at the beginning in 1832, several more detailed propositions, defining nearer the connections and particulars needed, some of which are referred to in the letter of the Treasury Department of 9th August, 1832, in the same manner as, in 1810, preceding letters had been referred to as *guiding principles*. But accessary circumstances, that could be maintained, and ought to have remained foreign to these transactions, besides the very natural want of insight into all the details of an arrangement that is not devoid of complication, if it is not simply given in trust to the man who understands it. Provided that these nearer determinations were considered as in a great measure superfluous; and F. R. H. was merely furnished with the necessary papers, and, *without any funds from the government*, he began the work upon his private funds of $2,100, that were afterwards refunded to him, though not without loss. This was the only occasion on which he rendered an account himself upon the public expenditures of the Coast Survey, and without the least difficulty: these very accounts contain the

main items now attempted to be rejected by the Fourth Auditor, by means of the refusal of their unavoidable accessaries.

The whole of the accounting concerns, and all that relates to his instructions, passed always through the Treasury Department, secretaries, and accounting officers, and all with that confidence and conviction which the long transactions of F. R. H. with the Department, under so varied circumstances, had produced and authorized; and verbal agreements, even, were on both sides equally respected and equally valid; as, for instance, when F. R. H. left Washington in the spring, 1833, many subjects were pending with the Treasury Department, both verbally and in writing, when the conflagration of the Treasury Department happened; the time for F. R. H.'s departure to the work becoming pressing, Mr. M'Lane said to him, in the yet unestablished rooms rented for the Department, in the presence of several persons, "You may only go, and consider all that you have proposed as approved." Upon this it was certainly also proper for F. R. H. to consider all settled upon the footing as before, and with the specialties that had been spoken of, which are just of those now attempted to be attacked by the Fourth Auditor; and these dispositions are so much more the legal rule to this day, as during the winter, 1833 to '34, not a single word was exchanged upon any subject whatever between F. R. H. and the Secretary of the Treasury, who never admitted him to even a conversation, and the Secretary of the Navy, on the transfer of the *commission* to him, positively declared that he made no alterations.

Only under such mutual confidence and trust, can a work of science be carried on with honor under a government, the members of a government being seldom actually men of science. As soon as questions of *power*, *authority*, and such like come up into it, *they lead directly to the destruction of the aim that a nation may need in the establishment of the work.* All arrangements must subsist, and the accounts passed as before, because *no alteration in the contract* has been made; this is the only legal mode of proceeding now. The decisions of the Secretary of the Navy as to the past have been pressed twice *without effect.* A nearer specification of F. R. H.'s contract is, of course, equally desirable on both sides, if it is found necessary to guard against the accounting officers finding faults with every minutia that they do not understand. In this F. R. H. will undoubtedly have the right to say his word, and he pledges himself herewith—that he will cheerfully accede to any thing tending to the advantage *and honor of the nation* in the trust in his hands, as he will with equal freedom, and with good reasons given for it, reject all that will be contrary to this *fundamental aim of all public transactions;* and he may certainly claim some attention in this respect, after an experience of upwards of forty years, and previous appropriate studies. Upon this already two competent judges have decided in writing, namely—Ex-Presidents Jefferson and Madison, under

whose administration F. R. H. has done all that ever has been done in the Coast Survey.

No. 29. The assistance promised in this article is *the only thing* that the Fourth Auditor ought to have done in this subject, besides informing himself properly, by the documents and all the many means of information within his reach, (especially Mr. Dickens, who, as Under-Secretary of the Treasury, was present at all the transactions since 1832, and is well acquainted with all the preceding facts,) upon what is proper or improper in the case; for every action of a man ought to be grounded upon *positive knowledge:* and upon that he would not have found a single item in Capt. Swift's accounts otherwise, but in every respect well grounded and authorized, and particularly not have *attacked* the character of F. R. H. A paper lying in the Navy Department, entitled "Principal Dates of the Coast Survey," was to be read fully first; then its clue followed in procuring the documents that would not have failed, in conjunction with accounts passed in the Treasury Department grounded upon them, to convince the Fourth Auditor that all these attacks were groundless. Further information is also to be found in the continuation of it, sent into the Navy Department with the letter of 26th March, 1834.

With this it is hoped F. R. H. can dismiss, once for all, this subject, as unpleasant as contrary to all economy and progress in the Coast Survey work, by the very untimely interruption of it to which it necessitates, when already the delay occasioned by the necessity of informing the Secretary of the Navy upon all that relates to the work had curtailed the time of this year's campaign last spring so much, that the base measurement, to be finished before the season interrupted all operation, required the greatest exertion.

The treating of these so highly painful, *useless, and even improper* objections, has taken more time than will be needed to make the pleasant report upon the works of last summer, which will stand forever in the history of science and of this country, as they will contain the account of the first accurate base-line measured upon the northern continent of America, and the largest, probably also the most remarkable, that ever was measured. It remains, therefore, with the Fourth Auditor to decide, whether next to it shall stand his name as actor towards the disgraceful interruption or *destruction* of its utility for his native land, or not.

F. R. HASSLER.

Head and Horns Station, upon Fire Island Beach, near the East End of the Base Line of the Coast Survey,
15th October, 1834.

Remarks of F. R. Hassler upon the Rejected Vouchers in the Accounts of Capt. Wm. H. Swift, as accounting officer for the public expenditures of the Coast Survey, for the first quarter of 1834.

Voucher No. 7. The suspended items here alluded to not being mentioned, details cannot be entered into. It is supposed the answer will be included by some part of the answer to the Fourth Auditor's letter.

Voucher No. 8. The use of the words *authority* and *power* is highly ill applied every where to F. R. H. He is committed with the superintendence of the work and his share in the actual work. As such he has the *duty* to do all to the best furtherance of the work. It is impossible that the temporary use, employment, or placing of any man, for a function that is to be filled instantly, should depend upon a correspondence with Washington, during which the work would be interrupted, the time when the object could be accomplished pass away, and the work itself be postponed for a whole year, like the example quoted by F. R. H. in his letter to the Secretary of the Navy, of Sept. 27th, 1834.

Vouchers Nos. 9 and 10. As this is referred to the letter, it will also be found answered in the remarks upon it.

Voucher No. 11. This enters evidently under No. 8. It might just as well be said, "The work must go on lame and bad," as to make such objections. The economy so much recommended would be offended by it in the most egregious manner, as every day lost naturally implies the expense of the whole establishment of that day, or at least of the part connected with the necessary assistance in question: and as neither the government nor F. R. H. has the *power* or *authority* to make any man work for nothing, these temporary helps must be paid. Slaves, who are compelled to work without pay, cannot be used in this work. It must be observed here, that this all proves the statement made by F. R. H. at the first onset, in 1816, and in the letter to the Secretary of the Navy of 9th August, 1834, that no persons in the offices in Washington, nor any one not present at the work, can be a judge of the propriety of an expenditure in the field; there the circumstances of the moment imperiously command the measures to be taken at the moment, therefore allow no time for any reference whatever. The general investigation provoked by the letter to the Navy Department will besides clear up this subject like all others.

Voucher No. 16 is answered in its proper place as positively sanctioned and authorized long before the Coast Survey came in the Navy Department, therefore a part of the establishment contracted for as the Navy Department received it, and is by contract bound to maintain until new agreements should be made.

Voucher No. 23 answered by the positive directions given F. R. H. to procure such means of conveyance as he may find most advan-

tageous. They are all positively sanctioned repeatedly by the documents in the hands of F. R. H., if they are not among the documents of the Department. As may be, they were burned up in the conflagration of the Treasury. Copies can be furnished.

Voucher No. 29, being referred to the Auditor's letter, will be found answered there.

Voucher No. 31. The conclusions drawn in respect to Peter Murphy are entirely distorted. He was needed present in New York; liable to be called as driver, or manual help, alternately, by either of the two assistants engaged in the secondary triangulation, and has been employed in that way, though the instruments were deposited in the custom-house, and said to be hoped to be safe. This in fact relates only to the safety from fire and similar accidents. That they were not safe against the rain even, has been proved, when the roof of the custom-house was blown off just over the place where they were deposited. Instruments and apparatus are often needed between times, for which it is proper to have a person at the place who knows the different parts, and to whom they can be written for. So far went the care put in a man, at the wages of a laborer, for the time in which Peter was not actively engaged as driver, not to employ an assistant for it at a higher expense, as these were besides all engaged in more important works. In this, like in many places quoted, the decision is made by the circumstances that necessitate a measure, and cannot be decided in Washington. Such detailed authorizations as are here requested to be obtained are an absolutely inadmissible distinctions. The accounting officer has to deal with free men, who have the right to decide on the price of their labor, and he must in each case do the best he can, and they must be capable and trustworthy; thence they are generally at higher prices than men whose defects would be an actual detriment to the work.

Voucher No. 30. This whole statement is entirely erroneous, the facts stand very different.

Mc Donnel, or in fact any man as *artificer*, is positively made a condition in the original contract of 1816, by the sanctioning of the details of the proposed plans, in which this is positively requested, and the modes proposed for their execution. And in 1832, by reference to them and the papers of F. R. H. given in upon that subject, and referred to in the letter of the Treasury Department, without such help it would be necessary to go to some neighboring town, to have made, by the loss of at least two days, what by such a man on hand is made in one half-hour on the spot, for immediate use. It would be proper for the accounting officers, who intend making objections of that nature, to come and be present at the works of one station. They would see that all the hands, artificers, assistants, &c., are actually in constant activity, each in his line, and that the omission of one would break the chain of the necessary works.

Names are nothing in the business but to distinguish the nature of each one's work; while the question of *recognising any name*

is pressed like as if it was the question of a foreign ambassador. As for Mc Donnel's actual business in going to Washington, it is explained in the answers to the letter of the Fourth Auditor. And F. R. H. declares herewith as *positively as upon the rail-road* conveyance, that considering it his *duty* to care for the security of the public property intrusted to him, he has never intrusted, *and will never intrust*, to any conveyance, *any essential part of this property, without that it be accompanied by some trusty person of the party.* As Mc Donnel is one of the most trusty of the party of the laborers (or, if better liked, artificers), and at a lower price than an assistant, he was selected instead of an assistant. That such was his duty lies in the vouchers positively. If it is *positively requested* of F. R. H., that he shall leave the valuable property intrusted to his charge, instruments and other implements of the nicer work, the journals, and such things, to the chances of loss or spoiling, he herewith requests a *positive order* to that *effect, by which he must be discharged of all responsibility from that side, and this responsibility positively taken upon the charge of the Department, or the accounting officer distinctly named, that he may know where to reclaim the objects again*, as the result would be at one day or other the loss of the whole work. Nearer evidence the Auditors could only have obtained by personal presence, to which they are invited herewith for the future, if trust is not put for such trifles in a man to whom a work and property of so great value and importance is intrusted.

Voucher No. 34. Mr. Eakin, being a free citizen, is of course master of the price at which he will work in any case whatsoever. The sanctioning of the letter of F. R. H., that he shall be employed at a medium allowance between the first and second assistants, sanctions of course also the agreement with Mr. Eakin, upon a mean which, it is supposed, was approximately taken. The compensation of all assistants is therefore always previously determined, and the sanction of the proposition of F. R. H. in the appointment of Mr. Eakin implies the sanction of this consequence. This is evidently a previously obtained sanction. It is therefore rather with Mr. Eakin that this is to be settled. Besides, it must be here remarked upon nearer *specified distinctions* of the compensation of assistants, that the letter of F. R. H., stating that such a thing is to be done, and intended to be treated on the first possible opportunity, lies among the several unanswered, though highly important, letters of F. R. H., to the Navy Department, written of late. As for the journey of Mr. Eakin to come to the work at Washington, where he was needed, on account of the *second refusal of allowing* of Lieut. Mackay, who was in Washington then, and actually unemployed, necessitated the measure of calling him. The work could not be sent to him to Philadelphia.

Voucher No. 35. It is stated in its place, how improper it would be to leave four horses and carriage at the mercy of a livery stable without somebody to attend. The cheapest laborer was selected

for that; it was not even thought of, that such duty could be considered as proper to be performed by F. R. H. himself, whose duties are of a very different nature, and his time too costly and closely filled.

Vouchers Nos. 36 and 39. This is all in consequence of positive agreement and allowance, as often stated.

Last Paragraph. It cannot be expected that any honest man will mix, or, if he is accidentally already mixed, continue, in a service of accounting, where such drawbacks are thrown upon him really *without foundation*, merely because the Auditor is not in possession of the proper documents to assess a just judgment upon his accounts. Capt. Wm. H. Swift being so intimately acquainted with the nature of such works, and the propriety of even minute and economical arrangements and organization of the part falling to his charge, his retiring from it would be a great loss in every possible respect of economy and furtherance of the work; in fact it would disorganize the work, which otherwise was such as certainly never any work has been made with such economy and celerity in *this country since its existence.* If, therefore, any objections, of whatever kind they may be, are *made* or *maintained, it is absolutely demanded* by F. R. H., upon the ground of common justice which requires it of the Department, that a public and impartial investigation of the whole shall be established under men who understand the nature of such works, and the habits of the country, that may have reference to it.

F. R. HASSLER.

15th October, 1834.

Remarks of F. R. Hassler upon the Rejected Vouchers in the Accounts of Capt. Wm. H. Swift, as accounting officer for the Coast Survey expenditures of the second quarter of 1834.

Voucher No. 1. The documental history of the Coast Survey must lie with the work, thence that purchase was proper; but F. R. H. will be willing to take this book or pamphlet upon his private account.

Voucher No. 2. A book for instruction which it is proper to furnish the assistants with.

Voucher No. 4. Books sold by F. R. H. will be taken back. The money has already been returned. See remarks upon the Fourth Auditor's letter.

Voucher No. 6. This volume contained the description of the means and methods used and to be used in the Coast Survey; published by F. R. Hassler. It was thought proper to purchase it for the instruction of the assistants; but the superior judgment of the Fourth Auditor, who does not know the book, and decides that

the assistants shall remain ignorant of these things, is admitted, (however only for this article,) and therefore also the deduction of this item. However, in general, books are as necessary provision for the scientific part of the work as bread for the laborers.

Voucher No. 11, S. V. No. 3 to 20. These horses were for the use of the transportation of Mr. Ferguson's instruments, placing signals, &c. It was found that the hire of horses came so high, that this purchase, as well as later that of a conveyance, was a great economy, as it had been found before for the main conveyance of the instruments, and therefore had been authorized by the Treasury Department in 1816. These horses and conveyance are employed every day either for transportation or for going out in placing signals or stations. It cannot be expected that the chief, or any of the assistants, shall carry the large signals, stone cases, and instruments, of from 50 to 150 pounds weight, upon their backs, by which alone the dear hire or cheaper purchase of horses and carriages could be avoided.

Voucher No. 11, S. V. No. 22. It is not possible to avoid the necessity here and there to open views to signals. The assessment of the damages would cost more than the damage itself. It is most economical, and therefore preferable, to settle such trifles amicably with the persons suffering, or rather admitting the damage, which is generally done with his previous leave; this is therefore a mere unavoidable current of expense: small, if treated as we do; large by three or four fold, if it has to pass through the formality of appraising, &c. If not managed in the way we do, it would soon prove to be a means of great imposition and damage by appraisers, agreeing to take advantage of the public, or United States as they call it, which would be evidently a useless expense; and if not so friendly settled, there is no security to be expected for the signals that are indispensable for the Survey, nor could in many cases the station be occupied with the instruments without paying some damage to the owner of the land. The same is for No. 14. S. V. No. 12.

Voucher No. 14, S. V. No. 1 to end. Even when horses are hired, it is the habit, in this part of the country, that their maintenance and that of the driver is at the charge of the person to whose service or employment they are hired, so that all these items would have to be paid *in any case*, and they have been admitted in every case in the very accounts where these are rejected. The items thereto relating show evidently the far greater economy in having the carriage and horses in property; and in case the mere hire would be insisted upon, it would be the duty of F. R. Hassler to press strongly its impropriety.

Voucher No. 17. It can in no case be admitted to let instruments travel without some one of the party to attend to them, therefore I directed Mr. Page to perform that duty when the box apparatus, consisting of a number of boxes, needed for this summer's campaign, was to be transported to New York from Washington, where it had been idle since 1819.

Vouchers Nos. 19, 20, 23, S. V. No. 1 to 12, answered at the proper place in the remarks upon the Fourth Auditor's letter.

Voucher No. 23, S. V. No. 13, answered by the connection of it with what relates to the artificers; positively requested and granted at first; and what relates to the necessary means of conveyance.

For Vouchers Nos. 21, 28, 29, and 34, see page 19.

Vouchers Nos. 42 and 48. It was agreed, as Mr. M'Lane and Mr. Dickins can testify, that the gradual procuring of instruments, which the bad state or total loss of those that I had procured in 1815 had necessitated, would best be done by gradually procuring them, as I had done in 1816 and '17, with various such things, with which it was thought proper not to load the bill made in Europe, in order to make the better use of the funds there for the main instruments. It was left to my direction in 1815 and '17 as already had been in 1811, that of altering or augmenting the general collection, when I was sent to Europe for the purpose of procuring the first collection, which has always been considered the best that ever left England. It was with views that I was authorized by the letter of the Navy Department of the 14th April, 1834, to dispose of instruments no more serviceable, and to supply them by serviceable ones.

The theodolite here in question is exactly authorized by this letter, as it is to supply in secondary triangulations the place of the one given off to Mr. Tolcot, or that ceded to the Maryland Survey; it is an excellent instrument, entirely new, of best workmanship, of one foot diameter. I procured it for a price, the double of which could not purchase it in this country; and if it is refused, I am willing to keep it, and will easily be able to dispose of it at a much enhanced price, only I must add, that in that case I have no instrument fit for my use, and also none for the absolutely necessary replacing of that in hands of Mr. Ferguson, which cannot serve long more, as is proved by my account given of it in the letter to the Secretary of the Navy. An immediate answer is required evidently, as it implies the stoppage of an important part of the work in this very moment.

Vouchers Nos. 45 to 51 are all repetitions that have been answered by the general statement in the remarks upon the letter of the Fourth Auditor.

Voucher No. 55. Mr. Eakin, being neither in the army nor in the navy, has, as a free man, the right to agree for the compensation of his services; the general principle which I stated, and which is quoted in the letter of the Fourth Auditor, is all that I have to say about it. It is therefore to be settled with him. Only one observation I have to make in all such cases, namely, that any gentleman of army or navy engaging in the work, on leaving it, keeps his emoluments and station, while a civilian engaged in it, on leaving it, loses all emoluments and station. This difference justice requires to compensate to him, at least in part, by such a compensation as may leave him, if possible, something in hand,

if he should leave the employment, or if the work was broken up. The assimilation under equal capacity is therefore inadmissible, and in any case no decision made to the disadvantage of such a person can have a retractive effect; the past forms an irrevocable legal claim for him.

Mr. Eakin had been over winter engaged in Washington in drawing and calculating for the five maps which accompany my report; when finished, he had necessarily to move to New York for the field-work in the natural course of the works; there appeared therefore as little need of a special order as for the moving from one station to the other.

Voucher No. 58. Midshipman Dahlgren, having been appointed as assistant, was directed by me to join Mr. Ferguson as second assistant.

Voucher No. 60, answered in its proper place.

Voucher No. 61. When I made the first agreement for the Coast Survey with the Treasury Department, I requested a number of men, "for the most part artificers," and it was granted; when, in 1832, the Treasury Department, upon conferring with the War Department, concluded, that instead of soldiers, which it was thought would not answer, I should hire such manual assistance as I should find appropriate. This principle had of course to remain in the selection of them. We would be stopped every day if we had not such men with us at the isolated places where our stations naturally are. In these transactions Col. Abert was often consulted; he will therefore be so much the more able to clear up the ideas upon these subjects, as besides he was the accounting officer in the Survey in 1816, '17, and '18. His testimony is therefore here referred to.

Voucher No. 63. The same was in respect to tents, the accounts of the army tents. The necessity of having them for the Survey of more durable and of good quality, and in many respects of a special shape, decided that I should procure them, such as they would be needed. In fact the army tents could not serve in the case. (Ask again Col. Abert.)

Vouchers Nos. 66 and 69, answered in proper place.

Voucher No. 70. The assistance of Lieut. Mackay, who, being acquainted with the locality of my triangulation, would have been the best assistant during last winter, having been refused to me, I was obliged to call Mr. Renard for that service from New York to Washington. When the second triangulation began again (as by my report), I directed him back to that work about New York, and called Mr. Eakin to Washington. This voyage, as well as that of Mr. Eakin, was therefore in the regular course of moving from work to work.

Voucher No. 71 et seq. All these being referred to, the Auditor's letter will also be found answered there; and upon the amount thrown out, the observations made to the end of the first quarter apply so much more forcibly to the second, as it was certainly *the duty* of the Auditor to warn before, if he thought himself in any way

authorized to raise difficulties upon subjects that were at all times before admitted as correct. He was informed of this by the letter of the accounting officer accompanying the first quarterly account that was sent to his office. His silence then could not be construed otherwise but as an approbation; and to say the least, his objections now are in every possible respect by far too late.

F. R. HASSLER.

[Omitted in their place.]

Voucher No. 21, S. V. 6. Bookbinding is necessary when the books are obtained unbound, as was the case with the whole of the books received from England. Upon the request made by the State Department, according to the proposition upon the Treasury Department, had allowed me to procure what I should find useful and proper.

Vouchers Nos. 28 and 29. Mr. Page was employed, and had incidental expenses at West Point according to the agreement, which is evident from the documents as explained in the remarks upon the Fourth Auditor's letter. This enters in current expense of the necessary arrangements for the work, and the care for the instruments and other property belonging to the United States; for it will be found that it was the question of even delicate instruments in the case.

Voucher No. 34. Being blankets for the additional men in camp upon the Long Island sea-shore, it is inconceivable how they can be objected. They belong directly to the authority allowed to me even by the Auditor, to provide for provisions and necessary comforts of the party.

East end of the Base Line upon Fire Island Beach, Long Island, 15th October, 1834.

MOST HONORED SIR:—Captain William H. Swift, accounting officer of the Coast Survey, has handed to me a letter of the Fourth Auditor, and two schedules of suspended vouchers of accounts for public expenditures in the Coast Survey, with such a string of violent and unjust accusations against me, that I was obliged to answer them positively by a series of remarks, hereto joined, that speak for themselves; and I must request your attentive perusal of them, though they may appear to you long. I have, besides, the reference to my two last letters to you, and former documents, to add here.

1 That it is a great detriment, therefore directly contrary to all economy in the Coast Survey work, which these objections purport to aim at, that I must give my time to such a subject, at the very moment when, having notwithstanding my sickness finished the

base-line, the most remarkable ever measured, I was going to take in hand the report upon the works since May last, according to the request of the President, in due time to be joined to the message, at the opening of Congress.

2 The impediments which these objections lay in the way of the work, from all sides, are so evident that I need not point them out; that therefore they must be relieved immediately is evident, and I must request that you will do this by the ways you may find most proper, which I will not presume to describe. I have only to state that the views which I have prescribed in my letter of the 27th September, 1834, must be kept in principle. I have stated them from the beginning, and they were always observed before.

3 In relation to the theodolite, especially as it is now the only one serviceable, I must request immediate special decision, as the refusal of it precludes the work of the present moment in this respect, and I must take up other work, which could, with propriety, be made later; the season is so far advanced now, that a delay will absolutely make that part of the work impossible this year, if not immediately decided.

4 If my explanations are rejected, and the *accusations* thrown out *against my character* are not *positively revoked* by a document of at least equal publicity as that in which they were preferred, I request you will *immediately order and despatch men of proper acquirements and impartiality to make the necessary investigations about my whole conduct* in this work that I have called for in my remarks. This investigation is as necessary for the future arrangements as for the past. If the objections are not all simply withdrawn, the sale of my books excepted, which I will no more sell, it is my duty towards my character, my family, and the nation, who I know, by its well informed public, takes an interest in that work as useful as honorably conducted, to provoke the full public investigation.

5 The attacks upon my character made in the letter of the Fourth Auditor, addressed to another public officer, and therefore *recorded* among the documents of your Department, are such as no honest man can bear: they must be *revoked*, or *publicly investigated*. Nothing has ever been farther away from the estimation of my character by the public of this country, and of Europe, than such accusations of *prevarication* as I am thereby charged with. No man whosoever has a right to attack and insult another man's character without positive proof; so much the less, when he must himself confess that he does not know him; and when this is done in a public document, it must be *publicly cleared up*.

6 To facilitate, however, the explanations, and prevent the greater mischief of a protracted correspondence, I direct Capt. Swift to go to Washington, to give to you such verbal information as you may desire, or to any other person whom you may direct him to. Notwithstanding, this move is a very disagreeable one for me, and not without considerable inconvenience; I must request, therefore, also,

that he may be heard and expedited with as much celerity as possible.

I must take the liberty to add, that a decisive answer is necessary by the first fortnight of November, directed to me at *West Hills, Huntingdon Township, Long Island;* because, in default of it, the work cannot possibly proceed a step further.

I have the honor to be, with perfect esteem and respect,

Most honored Sir, your obedient servant,

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

West Hills, Huntingdon Township, Oct. 27, 1834.

MOST HONORED SIR:—By my letter from Fire Island Beach, you were informed of my sickness, produced by my exertions in my work at that place, so contrary to my health.

The violence and injustice, as well as the manner, of the attacks of the Fourth Auditor upon my character, increased this state, so that ever since, and now yet, I am only dragging along the grave, without much prospect of bettering.

It is not astonishing that I did not, in such a state, *read in detail* all the documents over, as I was too conscious of having always acted with full rectitude, and not in any way outside of the limits granted to me; because these were, from the very first moment, the *absolute conditions which I made to mix in the work*—not out of ambition, but because I know now, and always knew, that the arrangements which I proposed were *the only ones leading to a proper and honorable execution of the task intrusted to me.* I join here documents. It was therefore only the day after Capt. Swift had left me that I read the details herewith added, and sent to you in order to correct the copies, before giving them to the printer; as I find it becomes necessary for me to have the principal documents printed, which I intend to press as much as possible.

I must press here again the *absolute necessity* of a thorough and proper investigation of the whole Coast Survey concerns, by proper competent persons, not only for me, but equally as much as a *duty to the nation.*

I have the honor to be, with perfect respect and esteem,

Most honored Sir, your obedient servant,

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Addition to Article 1st of the Remarks of F. R. H. upon the Fourth Auditor's Letter of October, 1834.

Under date of 12th July, 1816, F. R. Hassler sent to the Treasury Department "Articles of Engagement," determining the general principles of arrangement of the work. These stipulate, among other things, under letter C, No. 3 (as assistance), "twelve men of said corps, for the most part artificers, with a corporal or sergeant;" and No. 4, "one large baggage wagon, with four horses, or two smaller ones, as he may require, with the necessary drivers to them."

No. 5. "Two saddle-horses," after letter D has stated, "that the accounting officer shall make the public expenditures, under F. R. H.'s order." (Under letter E it says)—"The following are to be considered as expenses of a public nature." (Under these are besides others.)

No. 2. "Such additions to the collection of instruments and books as may be found necessary by Mr. Hassler in the progress of the work, as well to complete the collection from time to time, as to furnish a sufficient number of them for the detail surveyors."

No. 4. "The preparation of the stations for convenience of observation, and the securing of them for future utility." Of this paper the letter of Treasury Department of 3d August, 1816, says positively:

Article 7. "That if at any time it should become necessary to explain the nature and extent of your employment and engagement, your communications to this Department, *and particularly the articles* submitted by you on the 12th July, 1816, will be resorted to."

The above articles are therefore legal authorizations, granted, or what they may be called *directly applicable to the present case;* they sanction evidently:

1. The hire of artificers.
2. The possession of conveyances, horses, &c., as it was found that no baggage wagons were on hand fit for the purposes of the Survey, whence the carriages for the instruments were afterwards sanctioned.
3. Instead of the two saddle-horses, separate, only a saddle was bought, and a carriage-horse was used when needed, because it was experienced that in most cases the smaller carriage was necessary, in order to convey, at the same time, signals and such things.
4. F. R. H. is *positively authorized* to order, of his own *authority* (if it is pleased so to call the execution of his duty), all the purchases of instruments and books that *he* finds appropriate; thence the theodolite, books, &c. are all sanctioned.
5. The necessary measures for preparing the stations, signals, and their necessary protection, &c. are also given to his charge; thence all the damage concerns therefrom arising are intrusted to him, to make the best adapted to the circumstances.

It is also *positively agreed by this Article* 7, that the work does not stand under the rules of office, nor the navy nor army regulations, as it is distinctly guarded against by the letter of the 11th June, 1816, which is one of the communications referred to. The letter of the Treasury Department, of the 9th August, 1832, in saying, that the engagement shall be upon the same footing as made in 1816, confirms these articles of agreement proposed then, as much as they were by the letter of the Treasury Department of 1816; therefore also, now, all and every one of the articles therein stated are valid to this day.

It is therefore evident, that with these decided authorizations, F. R. H. had no need of new special ones, and that he has acted in every thing according to *contract*.

He therefore had no need of applying for any special sanction; and he had naturally to suppose that all these documents were known to the Department, as no call for documents was made of him, and not even the two letters answered that had reference to the difficulties which appeared to arise, and which were intended to call forth nearer explanations.

F. R. HASSLER.

Please to tell Mr. Dickerson, Secretary of the Navy, upon his not wishing me to come to Washington in winter, what follows:

1 Being charged also with the weights and measures, I am obliged by my contract to come to Washington.

2 That there is an office attached to this part of my work, which serves at the same time for the Coast Survey.

3 That not taking advantage of this office leads unavoidably to *the useless expense* of hiring an office in New York, where it will cost a great deal more.

4 That after having been obliged by former desires of the Treasury Department to locate myself in Washington, and thence having increased great personal expenses, it is injustice direct now to expel me from my family now in Washington all the year round.

5 I pretend even so much sacrifice cannot be exacted from me in any form whatsoever.

6 The expenses to which this constant living at a distance from my home necessitate are so great, that $7,000 per annum would not compensate it.

7 It is therefore not even within rightful pretensions to lay such heavy expenses upon me.

8 The measure is in all respects contrary to the progress and proper economy of the work.

9 I could consider this proposition as intended to keep me away, in order to destroy the work during my absence, like Mr. Crawford and Felsh, &c., did in 1818 with success, just because I was absent,

a thing which I think far from the intention and desire of the
10 Secretary of the Navy.

In 1818, Mr. Dickerson, then in the Senate, told me himself he wished I had been in Washington to prevent the breaking up of
11 the work.

I am sure if I am not in Washington this winter, the most dis-
12 honorable breaking up of the work will take place.

This constant vacillation in the views of the Departments puts the greatest impediments and loss of time in the work. It inter-
13 rupts completely its regular course.

Time is money, by old proverb, so is all loss of time in the Coast Survey; particularly that now occasioned by the Fourth Auditor's letter is a very great actual loss of money, particularly coming added to the loss in the spring, occasioned by the transfer of the Coast Survey to the Navy Department; the two, clipping
14 this year's campaign at both ends, act very badly.

The means to my work of this winter are in Washington. I
15 could most likely hardly do the work elsewhere.

In fact, my not going to Washington would stop the work.

F. R. HASSLER.

West Hills, 5th Nov. 1834.

NAVY DEPARTMENT,
November 6th, 1834.

DEAR SIR:—Soon after my return from my tour of inspection of the Navy Yards at New York, Boston, and Portsmouth, your letter of the 27th September was put into my hands; in which, you urge a settlement of your accounts. As this was not my business, I spoke to the Fourth Auditor, whose duty it was, and begged him to give the subject as early a consideration as he could. He informed me he had already considered it, and found much difficulty as to many of the charges; some of which he mentioned to me. At the same time, he mentioned to me, that he should communicate to you the reasons why certain items in your accounts could not be allowed; and he subsequently told me that he had done so. It is true, that I could have obtained from him a statement of all those difficulties, and have conveyed them to you; but this would have involved me in a correspondence that did not belong to me, and I thought it much better that he should communicate to you or to your agent directly all the difficulties of the case; which he was disposed to do, without any prompting on my part. I find that, on the 7th of October, this communication was made very much in detail to your agent, Captain W. H. Swift; to all of which you have replied, in your voluminous remarks upon this letter, which were delivered to me on the 1st instant by Captain Swift; and which, notwithstanding their great length, I have read with the

greatest care. So far however as they relate to the settlement of your accounts, they address themselves much more properly to the Fourth Auditor than to myself.

I must here inform you, that the Fourth Auditor is the proper accounting officer of such accounts. I have no control over him. He is not an officer of the Navy Department, but of the Treasury Department, although his office is in the same building, and he settles the accounts of this Department. I will not attempt to control an officer over whom I have no power.

Captain Swift is still here settling his accounts with the Fourth Auditor; and when it has been in my power to remove difficulties, by my friendly interference, I have done it with the greatest cheerfulness, as Captain Swift will inform you; and I think most of the difficulties are obviated. In all this, however, Mr. Kendall is governed by his own opinions of what is right, and not by mine.

You say that formerly your accounts for the expenses of the Coast Survey passed, at the Treasury Department, without objections or alterations, because the whole was understood; and you think those passages of the accounts, ought to be the guide to the Auditor who may now, or in future, have to pass these accounts. But the Fourth Auditor, as you perceive by his letter of the 7th of October, will not be governed by these precedents; and he is certainly to judge for himself, as to the principles upon which his highly responsible duties are to be performed; and, as you see by his letter, he will suffer no one to judge for him.

Although your accounts passed, as you state, without objections or alterations in the Treasury Department, they created no little dissatisfaction in Congress; and, I can assure you, caused the discontinuance of the work in 1818; and I much fear, that a similar course will again produce a similar result. You think that the law suspending the operations of the Coast Survey in 1818, was owing to the intrigues of certain persons opposed to the work. I do not think this was the case. I was very anxious that the work should proceed; and, without any correspondence with you, endeavored to prevent the passage of the law which suspended it; but in all my conversation with those members of Congress who were for suspending the work, I found no one who offered any other reason for such suspension, than the charges and expense of the work, which they thought unreasonable. In truth, they were not willing to pay what is absolutely required for the accomplishment of so great a work, by men of competent science to complete it.

I think it a great misfortune that the work was discontinued in 1818; as it may be considered as nearly a total loss of all the money that had previously been expended upon it. And I regret extremely, that your work should be interrupted at this time with the difficulties in your accounts.

I doubt not, that if you could proceed without any interruption, you could complete the work in a manner highly useful to the country and honorable to yourself. In fact, that your whole Survey of the Coast would correspond, in point of accuracy, with the admirable base-

line which you have already established; and I am not without hope, that your expenses may be so regulated that your accounts may pass without difficulty; but that must depend upon the accounting officer and yourself.

In your letter to me of the 15th October, received the first of this month by the hands of Captain Swift, you say that if your explanations are rejected, and the accusations thrown up against your character by the letter of the Fourth Auditor to Captain Swift, are not positively revoked by a document of at least equal publicity, as that in which they were preferred, you *request that I will immediately order and despatch men of proper acquirements and impartiality* to make the necessary investigations about your whole conduct in this work. And you further state, that the attacks upon your character, in the letter of the Fourth Auditor, addressed to another public officer, and therefore recorded among the documents of the Navy Department, are such as no honest man can bear,—*they must be revoked or publicly investigated.*

In answer to this, I must inform you that I have no authority to order or direct the Fourth Auditor to revoke any thing that he has written or said upon your accounts; nor have I power to order or despatch men to make the investigation you require. You are mistaken when you state, that the letter of Mr. Kendall is recorded among the documents of the Navy Department. In fact I never saw it, nor knew its contents, until I received the copy, on the 1st instant, which you sent to me. Its publicity is confined very much, I believe, to yourself, Captain Swift, Mr. Kendall, and myself.

If Mr. Kendall, in his reasons against your charges, meant to throw the slightest imputation upon your moral character, I think he owes it to you to state that the facts do not warrant such an imputation. But I cannot suppose he had any such intention.

From my very long acquaintance with you, I can say that I have the most entire confidence in your integrity, and in your zeal in performing any duty you may undertake; and as to your science and capacity for completing the great work you are engaged in, all men of science in this country, as well as Europe, will answer for you.

If the points between you and the Fourth Auditor are to become a matter of controversy and correspondence, I cannot consent to be implicated in it. But all correspondence upon the progress of the work, and other circumstances coming under my superintendence, I will attend to cheerfully, however onerous it may be.

There is one part of your private letter of the 30th ultimo, which it is my duty to notice. You complain that your work upon Weights and Measures should be continued, without additional compensation; but state that this very condition you considered as the means of remedying the evil; that this remedy you positively reserved in your letter of acceptance, of the 12th of August, 1832. I was much at a loss for your meaning in this part of your letter; but concluded, that you relied upon some reserved right to bring a charge against the government for continuing your work on Weights and Measures, over and above your salary and allowance for personal expenses.

I looked into your letter of acceptance, in which you use the following language:—

"The diminution of the allowance for my personal expenses, from what they had been rated at in my first appointment, in 1816, is not such, that within the limits of such estimations made before hand, its effect could be distinctly foreseen. I could only say, that while I was in activity in the work, in 1817, my annual expenses in my absence from home amounted to about $2,000. What effect the now somewhat change of the price of every thing may have in this, is of course impossible to foretell; therefore, this is so much less an objection with me, as in any case, I am certain it is not the intention of the government to put me to pecuniary loss; and that therefore, in case it should be found inadequate, this part may be easily modified to the exigencies of unforeseen circumstances.

"I shall attend also to the standarding off the Weights and Measures, in which I have hitherto been engaged, &c."

I take this to be nothing more than a right reserved, and which could not have been denied to you, of making application for an order to increase your allowance for your personal expenses. But if you consider it a reserved right, under which you may hereafter bring charges against the government for your personal expenses, over and above the established allowance, without a previous extension of such allowance, or a reserved right under which you may make an extra charge for continuing your work upon Weights and Measures, it ought to be explicitly known; as certainly nothing is further from the views of the officers of the government, who have had the regulation of this subject.

The transfer of the superintendence of the Coast Survey to the Navy Department, made no alteration as to your accounts, except that they are referred to the Fourth Auditor and Second Comptroller, instead of the First Auditor and First Comptroller, in the Treasury Department. Your accounts belong precisely as much to the Treasury Department as ever.

It would have afforded me great pleasure to visit you at your station, near your base-line, when I was in New York last summer; but I had not the time. I hurried back to this place, with all the despatch in my power, where I found my business accumulated upon me, in consequence of my absence, and in consequence of the late transfer of duties to my Department; so that I am absolutely oppressed with the multifarious duties to which my attention is called.

I am with great respect and esteem,

Your obedient and humble servant,

MAHLON DICKERSON.

FERDINAND R. HASSLER, Esq., Surveyor of the United States Coast, Fire Island Beach, opposite Patchogue, Post Office, New York.

West Hills, Nov. 15, 1834.

DEAR SIR:—Your very amicable favor of the 6th inst. reached me yesterday, after having gone back to New York, so that my express did no more find it in Patchogue. I am in every respect much obliged to you for your kind feelings and dispositions towards me, your testimony to my character, and your interest in the work committed to my charge, as much as I was painfully affected by the intermezzo that had been thrown on it by the Fourth Auditor, not understanding the nature of my *contract* with the government, which has been calculated with great care, both by myself and the different Secretaries of the Treasury, who signed them, for the real benefit and advancement of the work; and I am much obliged to you for having taken full cognizance of my remarks to the Fourth Auditor's letter. I hope with you, that the documents now communicated will settle all well, and not deprive me of the means of executing my task with propriety, if it is intended to continue my services in it; as it is proper that all should be considered from that side, and not as a personal affair for me. You know, that in this respect I have only earned my economical ruin, beyond recovery, and the honor of having with these sacrifices presented works that are, as Mr. Jefferson expressed, "honorable to this country."

I would therefore not further abuse your time, and refer all to the pleasure of a conversation with you, if it was not necessary that some of the explanations should be written down for recurrence, when the questions come to be treated. I will try to be as brief as I can in the following remarks, and touch only the principal points:

1. As I have at all times refused to mix in the money concerns of the Coast Survey, otherwise than to order the object to be procured, or the works to be done; so that in fact these accounts are not *my accounts.* I am never in correspondence with any Auditor, and must communicate only with the head of the Department; all is to be decided by the *contracts,* the *documents* they refer to, and the subsequent letters which circumstances occasioned, which it will be found contain a fully *connected system,* calculated for the best advancement of the work, but which no man unacquainted with the absolute requisites of the work can expect to see into by a first glance, so much the less as it was necessary for the proper progress of the work, to make stipulations not habitual in any of the ordinary forms in either naval or military regulations; and for this, the example of all the works of that nature made in Europe decided; as not one instance exists of such works being actually made under similar forms. I must, therefore, of course be as willing to give any informatian desired, as unwilling to admit any charges; and that not with reference to myself, but as *duty towards the charge* in my hands.

2. I should have wished exceedingly that all had been decided, or at least your letter had been received, before the delivery of my additional report, which I did purposely not send until your call for it. I could in duty to myself in connection with the work, not omit to state the loss of time which I had been put to by the transfer of the work to the Navy Department, in consequence of the circumstances stated

31; the fact is, that it has cost three months of my personal work for the Survey itself, because the task that fell upon me from that side could not be performed by any body but myself, and the unexpected check attacked my health very seriously, both in March last, as Mr. Woodbury observed himself, and now of late; for the same sensibility which renders a man capable to execute a work of that nature, acts in such a case unfavorably back upon his health. The attacks made against me formerly from that side, by saying even in congress that I had worked ten years, and produced so little, &c., when, as you know well, I had not been at the work more than one single campaign, obliges me to have these facts, that impede my progress, documented in due time, just as much as the progress itself; for there remains always an improper impression behind, even from the most untrue, or even improbable statements. It can therefore not be taken ill of me, if I stick thus near to the truth in my statements; and you will find it not done in a manner to offend, which in no case I shall ever do. On another hand also, I will rather retire from the work than be engaged in it under a kind of constant warfare, which would produce a kind of sourness on all sides, vitally detrimental to the work itself.

3. I know too well how the interruption of the Coast Survey in 1818 was produced; that the excuse for expensiveness was given to the members, who had been engaged in the procuring of the recall of the law of 1807, I know also; but I know as well that not a single detail document of accounts was investigated, and that as the documents prove, and proved to you at the time, all the returns to the surplus funds that had occurred during the interval between the law of 1807 and the beginning of the work in 1816, even an expense of $750 paid to Mr. Brigs as a gratuity for similar and not so much work as I had done before my being appointed, without any pay or demand for it, were placed upon the statement as my expenses; so that under all the circumstances, this excuse has not the least weight.

I know it was promised by Mr. Felsh, that he would make something much cheaper; but upon the results I must again refer you to the accounts of his expeditions, which must be in the Fourth Auditor's office, on one side, and to the production of the work obtained, on the other; their comparison will show the economy, or better, loss which the nation has earned by it; and I can impossibly be frightened by neither this comparison, nor any menace whatsoever held out to me from that side.

The more any reasonable man whosoever will become acquainted with my arrangements, the more he will find how secure I stand against all reproaches; and whoever would not inquire properly, would also not listen to the most convincing proofs, so that all exertions and regard whatsoever to his opinion would be useless; it can therefore not be mended.

4. The investigation which I requested, and which you consider yourself not authorized to establish, would, however, in case the opposition to the execution of the conditions of the contract should be insisted upon, be the only means to settle the question; as I hope neither you nor any man would intend to condemn me unheard, in

the case of a *contract*, when I only claim the execution of its *stipulations*, which contain nothing but the *absolutely necessary means* for the execution of my task.

5. Secrets are impossible in a republican government, therefore also the accusations thrown out against me by the Fourth Auditor cannot be a secret, or remain one: his letter to Captain Swift must by the necessary order of a public officer be recorded among the documents of his office; and there, as I said, must also be deposited the revocation of the attacks upon my character, which the Fourth Auditor has made; and you are certainly sensible that there is a wide difference between the suspension of items of an account, that can be cleared up by *documents*, and the accusations of *prevarication* thrown out against me in the said letter, particularly at the parts noted as such in my remarks. *The manner* in which the items *are* hereafter *admitted*, will either decide the retraction, which will constitute my satisfaction, by these being equally *recorded among the documents*, and communicated to Captain Swift, *as proved authorized by the documents*, or whether any thing further is required. I have upon that therefore only to state, 1st. That it is far beneath me to enter into any epistolary controversy with any man upon any such points as attacks upon my character; documents will prove it. 2d. That I am by this attack absolutely put out of all regard for consequences. Having by my too great sacrifices for the Coast Survey, been placed so as to have nothing more to save but my honor, to leave to my destitute family, nothing can deter me from defending this last possession.

6. The reserve in the letter of acceptance against the too low rating of my *allowance for personal expenses*, you have in part rightly understood, in considering it not as a pretension to hand in or claim a separate account for expenses; this my old acquaintance with forms of public business could not let me think; my reserve I thought to have fully expressed by the words, *that it could easily be mended;* namely, that I reserved *to put this allowance into question* for proper alteration.

But you misunderstood my reference to the Weights and Measures; as a remedy for that, the following statement, which I believe to have made, for the most part at least, to Mr. Woodbury, will clear you up my ideas upon the subject, as it is necessary that it should be to shelter me from the reproach of either pickering or imposing, as I have so wrongfully been reproached with after the first interruption.

From the beginning my compensation for work was always rated at $3,000, free of all expenses; and at that rate it is yet below that of a good clerk in any of the departments, who works six hours six days in the week, while I work from twelve to sixteen hours seven days o the week; that is, the proportion of working time is as 36 to 98 in a mean; this I do, both because such was always my habit when on business, and because the works of the nature I was engaged in with the government are absolutely impossible within mere so-called office hours, and without such extra exertions; they absolutely require this long continuance of work, if any results shall be obtained within such limits of time as is desirable, and as is yet curtailed by the too

overrated expectations of people who are unacquainted with the numberless details and alterations that they require.

Therefore, when I was engaged in the Weights and Measures concerns, the Secretary of the Treasury, who had been personally witness of my work, had not the least hesitation to place my compensation for that work also at $3,000, free of all expenses, when, after I had worked a long time, I left it to his discretion to stipulate my compensation: nor had the President himself any in confirming it, who had also visited my work.

I accepted the superaddition of the arduous task of the Coast Survey, with a mere request of a proper allowance for the increase of expenditures against a home living which this would occasion, and as well known from mere predilection for that kind of work.

The $2,000 allowed to me on that score by the first contract of 1816, did actually not bear more than my personal expenses in my absence from home, and left me still all the damages and extras unavoidably consequent upon the complete impossibility of minding any of the necessary economical concerns of my family, as I stated in that part of my letter which you quote.

I have stated to you what has occasioned the proposition of the diminution made in 1832, and why, notwithstanding this conviction of an actual loss, I accepted even the reduction of this item to $1,500, namely, to show by my work that my demand for more was just, and that it was worth the attention of the government. Experience has proved to me, by the pecuniary losses of about $4,000 since August, 1832, that far from a diminution, my increased personal expenditures amounted to $3,000, leaving me therefore in fact a compensation of no more than $1,500, for which it is impossible to get a man capable to do such works, live decently, and devote so much time to it, depriving him entirely from all attention for his domestic concerns or other sources of emolument. Nearer details would lead in too much length. I refer them for verbal communication.

My reference of this amendment to the Weights and Measures for the necessary amelioration is grounded upon the following: It stands indeed singular in the letter of the Treasury Department, that I should have charge of a work without any compensation; this admits very easily a charge, and my desire and intentions in this respect agreed in the general ideas and views with your own, upon the economical considerations that might be used to mislead Congress a second time, as you will see by the following; it will besides also inform you of the nature and bearings of my works in this line, which appear not to be known to you.

The Weight and Measure concern is principally intended for the necessary, by law decreed, uniformity in the collection of duties in the custom-houses; it is fully authorized by the laws, and an unavoidable accessroy of the custom expenditures, to which it is charged, and paid by drafts upon some one or other of the custom houses; there it is in some measure lost, and at all events entirely insensible.

The present want of regularity in the custom-houses has been proved already by Mr. Adams' report, to which is still to be added that

all comparisons and reductions relating to foreign weights, measures, and coins, are without any rule whatsoever, authorized by government. To remedy these defects, three things are required:

1st. The comparisons of what could be obtained by public standards, and custom-house weights and measures. This is the part that I have reported upon, and in which I could include but a too scant part of foreign weights and measures, because they were not at hand.

2d. The comparisons of foreign standards of weights and measures and coins with those of our country. This required the calling in of authentic standards and regulations from all the nations with which the commerce is connected. With a view to procure these by the means of the legations and consuls abroad, I gave to the State Department a detailed and reasoned list upon the requisites. No circular having been made to that effect in time, I was directed, though not even in writing, to procure these means by my private, principally scientific, connections; and I thus have directed all over, except Spain, Turkey, and Egypt, and I expect daily some results; only minor things have as yet arrived. The comparisons that will result from this collection will be valuable; and being authenticated by the government's adoption, will regulate once for all this part of the custom-house business. It is so much more needed, as since the new French system of weights and measures, all governments of Europe have new regulated their systems of weights and measures, and coins; and these are not yet recorded but in a few books, that are hardly to be found in this country, and at all events are not particularly referred to it.

3d. The construction of a set of standards for each of the principal custom houses, and even it was intended to make a steady establishment to furnish all the weights and measures to those custom-houses from Washington. It must be expected that from such an establishment all the states would be furnished with standards, as they are now individually busy legislating upon this subject, and can therefore easily be brought to a concurrence with the general government, to whom at all events the regulations of the custom-houses belong; and upon custom-house weights and measures the most of the mercantile transactions are based; it will therefore be the best means to introduce uniformity all over the country, without difficulty or objection. It is even said that the question upon the constitutionality of all these state legislations is to come up in congress this winter.

To obtain this aim by an establishment in Washington, in order that no state might consider itself as receiving its standards from another state, and reject it on that account, an agreement was made with the administration of the arsenal at Washington, and funds furnished by the Treasury Department, to establish a furnace, and to get workmen to execute the castings and rough work. I had furnished patterns and dimensions for the works, and my then assistant in that work was directed and furnished with means to bring the standards to nearest adjustments before my final work; a task with which he was well acquainted and practised upon. But the arsenal failed to perform, the patterns and dimensions were lost, and my assistant has

left the country. It lies therefore not to my charge that no actual standards were as yet finally made, as I expected last winter to find ready for my work on coming to Washington. I have also ordered brass for this purpose from Calcutta and from the Grisons, which may be soon expected.

Thus you see I have in fact united what was united in France, namely, the main triangulation of the country, and the weights and measures; they are indeed connected together by the philosophical means, principles, the acting and working men, and implements (in many parts) which they equally require. I had even brought from my mission for the Coast Survey instruments, the principal means by which I was enabled to make the comparisons, rendered account of in my report; as also the most valuable standards were those that I had brought as my private property in 1805, on coming to this country; and if I can properly organize the whole, I shall be able to present results in both, cheaper and sooner than could be obtained (with proper accuracy) by any other means that I see disposable.

This union has produced in France the happiest results, which I could detail if it was not drawing me into too much length, and is recorded in the volumes of the *Base Métrique;* it has proved the high civilization of the public of France, that all that was peaceably executed during the times of the greatest turmoiling and rioting after the revolution; it has shown that the turmoiling and rioting in a community have no claim to be reckoned among its public; for these works, with all their publicly useful consequences, stand, while all the results of the turmoils and riots are reduced to null. The value of weight and measure work I thought, therefore, could well afford, and without appearance, and even being felt, the addition of $1,500, as I had at the very first outset contemplated, in order to leave to the special appropriation of the Coast Survey, the charge of only the $4,500, and still obtain both aims in the most satisfactory manner.

The President, to whom I had spoken upon that subject with this view, promised to give it a due consideration; but it appears not to have been explained to him sufficiently, and was probably not properly understood by Mr. Taney, having never had an opportunity to speak with him,—so the President refused; therefore I was obliged to call upon the Navy Department, where the Coast Survey had been just then transferred, as you see by the letter which you quote.

You will see by the full account into which I have been obliged to enter (notwithstanding I would have better liked to write to you only a short letter), that also this part has its details and arrangements more extensive, at the same time that it is proper for the aim of each in good results, is also the most economical that can be made.

I will cheerfully give all my exertions to these works, and be able to show satisfactory results by the arrangements at my disposal; but my sacrifices, as stated to you, deprive me of the means to meet more losses, if it were even proper for me to employ them any further to add new sacrifices; this must therefore be prevented by such an augmentation as the present state of things requires. If no attention can be paid to my request, my duty towards my family steps in, and

obliges me to ask as a favor that I may devote myself to the Weights and Measures alone, under the contract made for that object, where all these expenses are avoided for me.

It is therefore this, that I would request of the President this winter, and to which I am so much the more inclined, as my age (is 65) and my state of health make a more quiet life very desirable for me and my family; my defence of the Coast Survey is the result of my interest for this valuable work, and it must in no way whatsoever be referred to me personally, or my personal economy.

With this fair and nearly full statement, you will be properly informed upon the bearing of what I said in reference to the Weight and Measure concerns.

All the union of circumstances now existing gives me so much more to regret the loss of the satisfaction of your visit, while I was engaged at the measurement of the base-line, as perhaps conversations, and even production of documents, might then have informed you so as to have prevented the voluminous correspondence that has taken most all of my time since several weeks.

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
Nov. 20th, 1834.

SIR:—I have received your letter of the 11th instant, containing some statements as to the estimate of the appropriations wanted for the Coast Survey for the coming year. I am sorry it is not more definite; but I perceive there was difficulty in making it more so.

Your letter was also accompanied by a report of the Survey of the Coast, in addition to that of the 17th of May last, containing an account of the progress of the work during the summer and until November instant, with a detailed map of the locality of the base-line, a sketch of the triangles around Great South Bay, upon Long Island, and a sketch of the triangles in Connecticut and New York states.

This report, with the maps and sketches, I have submitted to the President, who directs that the same, together with the report of the 17th May, be submitted to Congress at the commencement of the approaching session. This will be done, and I hope will be satisfactory to them, as in my opinion the work done is highly creditable to yourself and the officers under you.

I am with respect, &c.

MAHLON DICKERSON.

FREDERICK R. HASSLER, Esq., New York.

West Hills, December 3d, 1834.

MOST HONORED SIR:—Your favors of the 20th, 27th, and 28th ultimo, reached me duly. I had delayed for a short time to answer the first, which required not a pressing answer, because we were so near the close of our work upon this station, and that I expected by every mail to receive the ultimate withdrawal of the difficulties put in the accounting concerns, and thereby in the progress of the work, in the Fourth Auditor's office.

Now it becomes necessary for me to act, and of course, exactly upon the same principles of my contract that have hitherto always guided me, and which I know to be the most advantageous for the proper advancement of the work, therefore the most economical.

I am glad that the general statement, relating to the necessary appropriation, has been sufficiently satisfactory; as particularly in the absence of Captain Swift, who has the details of the accounts, it was utterly impossible to make it more detailed. You will easily perceive, that the experience of about two years more would likely furnish the data to know very nearly the average amount of each of the different parts of the work; whence the number of each intended to put in activity in the coming year, will present the final estimate.

Your expression of satisfaction, upon the works presented by my report, is gratifying to us all. I have no doubt that the reports will also be satisfactory to Congress, which has by accessory circumstances been hitherto deprived of seeing any of the results of my work.

We have been well favored by the weather, in the observation of the Solar Eclipse of the 30th ultimo, though even the day before appeared to menace its total loss.

I observed $\left\{\begin{array}{lrrr} \text{Beginning} & 1h. & 09' & 53.68'' \\ \text{End} & 3 & 45 & 18.65 \end{array}\right\}$ Mean solar time.

The latitude and longitude of this station, as given by the preliminary calculations of the triangulation, and deduced from the longitude of New York, were assumed.

Latitude, 40° 48′ 47.2″

Longitude, 4*h* 53′ 52.7″ West of Greenwich.

This observation closed the main work of this station; and we are engaged now in making the arrangements for the winter.

Mr. Ferguson has this day left here for his home, Albany, with the journals, and other means necessary to make the secondary calculations of the times, latitudes, and azimuths, hitherto observed.

Lieut. Thomas R. Gedney has left here to put up his vessel at the Navy Yard, New York, as the season was too inclement for further works of the sounding in Great South Bay.

Mr. Blunt continues the secondary triangulation upon this Island, for as long as the weather will allow it; and so will Mr. Renard continue in the topographical details around Great South Bay, where he and Lieut. Gedney had hitherto worked in accordance, and mutual assistance. But probably neither of them will be able to continue the work much longer.

I have yet several arrangements to make in New York, where I should be happy to receive, during the time that I shall be detained there (about a week), any information that you might think proper to give to me before my arrival at Washington; where I shall make, during the winter, the comparisons still necessary for the different elements of the reduction of the base-line, the calculations of the reductions themselves, and of the main triangulation, as grounded upon this new measured base-line.

I shall also call to me there, after that, such of my assistants as I shall find necessary to make the reductions of all the results upon paper, to serve for the introduction of the detail topography; for which I intend to organize for the next summer as many parties as the appropriation that will be made will allow. For all this the means lie partly in Washington, and the rest I bring with me; and I shall, by my presence there, be able to show to yourself and the President, who likes to get insight into the work as it progresses, the sketches of the work to be executed; and be able, by my presence, to give any explanations that may be desirable.

I have the honor to be, with perfect respect and esteem,

Most honored Sir, your obedient servant,

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Thus proceeding exactly as I did last year. Without this move, no report would have been possible last spring; and so could there be none made next spring without it now; nor could the plotting be done, which is necessary to set the topographical operations in activity next spring.

New York, December 16th, 1834.

MOST HONORED SIR:—The proposition of your report, that direction might be given for the Coast Survey to determine the latitude and longitude of all the light-houses, &c., having been referred to the Committee of Commerce in Congress, it appears to be my duty to mention to you, what I thought my earliest plans of operation had fully explained long ago; namely, that this very determination of latitude and longitude of the light-houses is always the result of the calculations, as well as that of every triangle-point whatsoever in the whole survey. I join here, for your nearer information, the diagram of the works hitherto made; in which, I marked by a red dot the light-houses within its limits already so determined. In the maps handed to you in the Navy Department, as well as in this diagram, the points are brought to paper according to this very *calculation of their latitude and longitude.* Of course, therefore, I have the full register of all these determinations in numbers on hand, and they will in proper time be published as a matter of course.

Not only that, but in the detail topographical surveys, the height, locality, kind of the light, whether steady or revolving, &c., within which time; besides all the particulars that may be of interest to the navigation in relation to them, will be carefully recorded. This will, therefore, in proper time form a descriptive register of all the light-houses, floating lights, buoys, &c. You see by this, that what is requested and to be treated by the Committee of Commerce, is already in full operation, and no measure nor resolution needed; which would, on the contrary, convey a wrong impression upon the nature of the Coast Survey works, for people not acquainted with its principles.

I see also a call for the detail survey and soundings of the Passaic and Newark Bay. You know by the maps, that this is fully included within the triangulation that I had made in 1817, and it will, therefore, only depend on the amount of the appropriation which Congress will make this session, whether it will be possible to comprehend this part among the detail topographical surveys that are to be executed next summer. Several calls of similar nature have been communicated to me last year, which all were dropped on my giving the information analogous to what I state here. Any special acting upon them would lay so much more impediment in the way of the rapid progress in which I have brought the Coast Survey work at present; which will present all in its proper connections, with an accuracy far superior, and far more valuable, than the detail acting upon them can produce. Besides that, these become directly a useless expense, on account of their becoming mere inferior duplicates; as in the general work of the Coast Survey, nothing of all that can be omitted.

When I come to Washington, I will have the honor to enter with you into nearer details. Any decision upon either of the two questions herewith touched, would indicate a want of insight into the nature of the work now in progress of successful execution, which it is desirable that Congress should not be let into.

I am, &c.
F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Treasury.

NAVY DEPARTMENT,
December 30th, 1834.

SIR:—In answer to your letter of the 7th instant, I have to state, that you may send two of the men employed on the Survey, who reside at Washington, to take charge of the instruments and books, as mentioned in your letter, and bring them to this place by the transportation-line.

I am very respectfully,
MAHLON DICKERSON.

WM. H. SWIFT, Capt. Top. Engineers, New York.

Baltimore, January 19, 1835.

SIR:—The state of my health, and the extreme severity of the weather, did not allow me to leave New York in the week that I had mentioned in my letter of the 26th December last; I left, though sick, the 10th inst., the first somewhat milder day. In Philadelphia I was so unwell as to have to stay one day over, to recover a little; though sick, I continued my journey to Baltimore, wrapped up all the way in my bedding, to lie over again until enabled to finish my journey, having at all events something to transact in relation to the junction of the survey of Maryland with the Coast Survey.

You are sufficiently informed of the, if not total, still too great interruption of the work of the Coast Survey, which has been occasioned by the suspension of all accounts for now one whole year, by the Fourth Auditor, in consequence of which Capt. W. H. Swift, as accounting officer of the work, has refused to me any payments for such expenses as are absolutely required for the works of this winter, and preparatory to the works of next spring, already by my letter of the 27th September, 1834.

I took the liberty to inform you of the damage that would be occasioned by the delay; no decision having been received by me since, it remains to me only to state to you that the damage has been very great during all these three months passed in silence upon these vital subjects, by the necessarily crippled state of the work. I had reason to believe that my remarks upon the letter to Capt. Swift by the Fourth Auditor of last October, were *fully satisfactory*, so as the withdrawal of all his opposition gives cause sufficient for your action in favor of the proper progress of the work.

I am now under the painful necessity to mention to you, that until all the opposition made to the continuance of the proper functions of accounting officer of the Coast Survey is withdrawn, so as to allow him to act under my contract and under my orders within a fortnight, the state of things will be such that four months of the next campaign will be almost totally lost.

The pecuniary damage thereby incurred will exceed ten thousand dollars, nearly half of which is actually now lost by this state of things.

If you have given to Captain Swift any orders to me unknown, you would have greatly obliged me by at least a hint of information that I might have acted accordingly; you can easily judge that this state of suspense, and the painful situation in which it places me as reward for the great exertions and sacrifices that I have made for the laborious, highly useful, and necessary national work that has been intrusted to my charge, does not allow me to recover my health, from the natural fact that a man capable to execute such a work must be constitutionally a man of delicate feelings and sensibility.

I hope, therefore, that on my arrival in Washington I shall have the satisfaction to see all difficulties levelled, and therefore be able to proceed again properly with the work myself, in the necessary long calculations of which you are informed by my reports, and my assistants according to the orders which I shall then be able to give to them.

I join here a copy of the principal documents needed to introduce properly in the organization of the work, which I stated to you that I would have printed, to save in future the numerous copying of them which has been so time-robbing lately; in this form they will be perused so much easier, and not be subject to be partially lost or mislaid; the loss of all the documents before 1833 by the conflagration of the Treasury Department appeared to me to make this measure so much more desirable. I pray you will give them your attention. I had hoped and intended to present them to you personally before this time, but for my sickness; you will observe that I have purposely omitted the last documents referring to the question now pending, and which I hope to be settled soon. I aimed only at those that must guide in this settlement.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington.

Washington City, January 22, 1835.

SIR:—Last evening I arrived here with the carriage and the four horses belonging to it; I have brought, therefore, the journals and documents, with some smaller instruments and implements of this winter's work.

You are informed by several of my last letters that my state of health would not allow me to travel, even by any of the common conveyances (as the Fourth Auditor insinuated), particularly in this season. I must remind that by article sixth of the articles of August 6th, 1832, confirmed by the letter of the Treasury Department of 9th August, 1832, I have in so doing acted entirely within the positively intended limits of my contract or authorization, and for the best of the work. I have of course also a driver with me, and I am sorry to add an attendant on account of my low state of health, leaving me the strength to supply all the attendance upon the objects I have to convey; however, if it should be considered of sufficiently high importance to make any objections against his pay, he may be at my private expense, as in no case I would have done without him.

The four horses that were used last summer by Messrs. Ferguson and Blunt in the secondary triangulation, have been placed by Capt. Swift, not by my order, upon a *so called cheap board*, on Long Island, where in consequence they will be deprived, during about two or three months, or even less, that they may not be wanted in the field-work, of the required food in grain, which, however, after their severe service all summer, they stand much in need of.

The consequence of it will be, that when they will be needed, their strength will not be such as to enable them to render the required service; upon which it must be remarked, that in order to execute the

work at a station of the secondary triangulation, it is necessary to be upon the point at a certain early hour, morning or evening, when the illumination fits for the work; if the point is not attained at that time, the work of the day is lost, and another day must be chosen among the subsequent favorable days, that may delay perhaps for some time; therefore, speed and strength of the horses is a requisite of the service; and if the horses are not able, the loss of time, therefore, in money, exceeds by far, nay, tenfold, the amount of their proper winter food.

F. R. HASSLER.

Hon. MAHLON DICKERSON, *Secretary of the Navy,*
Washington.

NAVY DEPARTMENT,
January 23d, 1835.

SIR:—In answer to your letter of the 19th instant, dated at Baltimore, I have to state my regret, that any delay in the Coast Survey should take place in consequence of the difficulties on the part of the Fourth Auditor to pass your accounts. But the letters heretofore written to you, have sufficiently apprised you that the Fourth Auditor, in the objections to your accounts, is not under my control. If you can so explain them as to satisfy him, I shall be glad.

I have given no directions to Captain Swift, which it was not my intention he should communicate to you. The enclosed is a copy of a letter I sent to him, and in which I authorized him to send two of the men employed on the Survey, who reside at Washington, to take charge of the instruments and books necessary to be sent to this place, and to bring them by the transportation-line.

In your letter, of the 22d instant, you inform me of your arrival in Washington, with a carriage, four horses, &c.; and you remind me, that by article sixth of the articles of agreement of the 6th August, 1832, you have acted within the limits of the contract, &c., and you wish my special orders as to the disposition of said horses and carriage. To which I must reply, that I have no orders to give upon the subject.

It will be for the Fourth Auditor to put the proper construction upon the 6th article of the agreement to which you allude. This is his business, and not mine.

From the objections he has already made to your accounts, you may easily judge whether they would apply or not to the course you have now taken. I only hope you will be able to regulate your expenses, so as to conform to the rules by which he thinks he ought to be governed.

I am with great respect,
Your obedient humble servant,
MAHLON DICKERSON.

F. R. HASSLER, Esq., Surveyor of United States Coast,
Washington City.

Washington City, January 24th, 1835.

SIR:—Though I hope this day my health, and the good weather, will allow me to have the honor to see you, I take the liberty to join here some letters to some assistants on the Coast Survey, upon business, with the request you would oblige me by making them free, as has been done last winter in the Navy Department, to avoid postage; which, for my part, has always as yet been left as a personal expense, not wishing to make much doings about trifles.

I received just now also your favor of the 23d instant, in which you speak of my accounts. I have always stated, as you find, (page 5, at the bottom, of the documents that I sent to you,) "that I should be relieved from all accounting concerns." I have, therefore, also not to pay any attention to, nor receive, directions in that respect from the accounting officers.

I consider, therefore, the expressions of your letters, in relation to the subjects of my letter of the 22d instant, as approbation of my measures, and expressing your coincidence with my views.

I have brought with me 300 copies of the diagram of the Coast Survey work; which I am ready to deliver, for the use of the members of both Houses of Congress, wherever you will please to direct me; and I wish to receive your orders in respect to them. If more are needed, they can soon be struck off, as the plate is also here.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
January 24th, 1835.

SIR:—In your letter of yesterday, which I received this morning, you say that you consider the expressions in my letter, in relation to the subjects of yours of the 22d instant, as approbatory of your measures, and as expressing my coincidence with your views. If this relates to any thing respecting your accounts and your expenses, on which you and the Fourth Auditor differ, you were certainly mistaken; as upon these subjects I expressed no opinion.

As it respects the 300 copies of your diagram of the Coast Survey, I should like to know the expense of them, before any order is made as to their distribution.

I believe an arrangement may be made with the printers of the documents, to which they belong, to receive them, and to have them bound up with the documents.

I think Gales & Seaton would willingly pay for them, and as many

more copies as they may want. The expense would then be included in their charge for printing the documents.

I am with great respect, your obedient servant,

MAHLON DICKERSON.

FERDINAND R. HASSLER, Esq., Washington.

Washington City, February 2d, 1835.

SIR:—Upon your request, that I might state to you what is needed for the works of the Coast Survey for this year, I must take the liberty to repeat to you the absolute impossibility of a detailed statement of the many things of minor value (pecuniary), in comparison to their needfulness, utility, nay absolute necessity.

By the organization that I have established for the work, I can obtain all the means to procure or produce them at the cheapest possible rate, and under my own inspection; therefore appropriated to their intended purpose, provided no impediments are laid in the way of the execution of my directions by my accounting officer. I must, therefore, for the whole, state to you the general desire, that you would please to honor me with the same confidence that was given to me by Presidents Jefferson, Madison, and Jackson,—the Secretaries of the Treasury, Dallas, M'Lane, Woodbury, and other gentlemen in office until now, and which was therefore secured to me by contract.

By this I was always authorized to provide, without any detailed requisitions, for all such things as are not of great money account, or relating to the great character of the general organization; as procuring books or smaller instruments, as such like; hiring men; directing assistants or others in the movements of their work, as well as my own movements, by the simple direction given to each, and to the accounting officer as to the payment of the expenses thereby incurred; as stipulated by the articles under D and E of my special articles of agreement of 12th July, 1816, confirmed by the letter of the Treasury Department of 3d August, 1816, the articles 5 and 6 of the articles presented to the Treasury Department under 6th August, 1832, and the letter from the Treasury Department of 9th August, 1832, which confirms all the preceding arrangements; that, therefore, also the accounts of Capt. Swift, now pending for a whole year, be passed, as duly authorized in the same manner as all the preceding ones passed in the Treasury Department, in order that he may be enabled to continue his functions properly, and the work no longer be crippled and disturbed, but be allowed to progress successfully, as it has done heretofore under the Treasury Department. Nothing was intended to be changed in the organization, in transferring to the Navy Department the correspondence with me upon the work.

Whenever great expenses or considerable measures in the organiza-

tion of my arrangements should occur, I shall have the honor to make to you the proper proposition, with all the particulars needed to ground upon, and obtain your concurrence in my views, as I always did in the Treasury Department.

The confidence which I herewith request I have always requested, and hitherto obtained, and is only such as should properly be considered as naturally placed in a man to whom a work of the nature and character of the Survey of the Coast is intrusted; for if he should not deserve this minor confidence, he certainly also would not deserve the greater; for without the means it gives, the work becomes impossible. I am besides very conscious of never having given the least reason for this withdrawal of that confidence which I have hitherto enjoyed.

If the slightest doubt is entertained of the correctness of my former actions in the Coast Survey, and the claims that I put up in this letter, I repeat my request that a proper impartial investigation be established by the President, as you do not find yourself sufficiently authorized for it. The accounting officers of your Department having made themselves adverse party to me, in the explanation of my contract with the government, I can on no consideration whatsoever admit them at the same time as authority to decide between them and me.

I am sorry to be obliged to repeat here also my request that the allowance for personal expenses in the contract, and upon which I immediately made the proper remarks in my acceptation of the 12th August, 1832, be increased from $1,500 to $3,000, which is the actual amount to which these expenses lead me and have led me every year since 1832. In consequence of this low allowance I have come so much in debt, that it will be out of my power to leave here without relief being given to my situation from that side; and the allowance of $1,500 addition since the 2d August, 1832, will only approximately compensate my losses.

I had proposed as the best means to that aim, to make this allowance upon the score of my works for the weights and measures, and hydrometers. In your proposition, which I take the liberty to request you to make to the President for this augmentation, you may equally present this view with its consequences well known to you (by my letters of the 12th January and 22d May, 1834), to which the letter of the Navy Department of 23d May promises to give attention. As I have done in the weights and measures all that could be done under the circumstances, during all that time, I think this reference would be fairly applied. I take the liberty to request your earliest attention and action to both the subjects of this letter, that I may be able to come again in due activity, and be relieved of the anxiety of suspense, and my sickness, which is the effect of it. I should now be able to give my attention to the calculations for the result of the base-line undividedly, as it requires at least six millions of figures to obtain about ten figures, which will form the result; there is not too much time left for the work before the reopening of the season, and the accessory decisions now pending are highly detrimental. As soon as these objects will be decided, I shall present to you the nearer views upon the particulars of the organization of the campaign of this year, which it is

of course impossible to do before the decision upon the above all-overwhelming questions is decidedly taken.

I have the honor to be,

With perfect respect and esteem,

Your obedient servant,

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy.

Washington City, 5th February, 1835.

EXCELLENT SIR:—Upon your kind invitation, I take the liberty to present to you herewith the subjects of difficulty in my works for the Coast Survey.

1st. I am working according to a contract, approved by you, which had received its practical execution in the Treasury Department. So that I was enabled to give to this work the intended proper permanently useful and honorable execution.

You had *no intention to alter any thing in the previous organization* of the work, and the agreement with me, by the transfer to the Navy Department, as you stated to me in answer to my apprehensions of its consequences.

By the contract I am authorized to order all that is necessary for the execution of the work; and the accounting officer has to make the expenditures therefrom arising, and render account upon them to the Department.

This trust I must necessarily have, because it is impossible at a distance, as I am always, from the seat of government, to enter into any delaying correspondence, upon every individual subject, which can impossibly be judged of with propriety by any person not present at the work.

The man to whom a trust of the nature of the Coast Survey is confided, *must necessarily be supposed trust-worthy for all the accessory* parts that constitute his means to execute his trust; just like a general in the field could not apply to the war department for special authorization for every minutia that he may have to order in execution of a general operation agreed upon, and committed to his execution.

In opposition to these principles and the contract, the accounts of the accounting officer of the Coast Survey have been suspended in the Navy Department now for a whole year, and he cannot obey my directions, because it is maintained that I am not authorized to give them, though this is positively decided by the few lines of the contract, which, with the extracts of the documents herewith enclosed, I have marked by pencil lines in the margin.

Every small minutia is attempted to be governed from here, by measures that would in every case be detrimental to the work, and increase the expenses immensely, under the pretence of delusive economy.

The discussion of these trifles has taken up most of my time since last October, and therefore has extremely retarded my work, and occasioned a waste of time, and consequently of money, worse than useless.

I take the liberty to request only the continuance of the trust which has always been laid on me by yourself, the Presidents Jefferson and Madison, under whom the work was first begun, and the Secretaries of the Treasury who acted under your and their name; that therefore the accounts of the Coast Survey shall be passed according to the precedents given by the Treasury Department, whose accounting officers had the proper knowledge of the contract and its import.

2d. When in 1832, under your authorization, the contract was renewed with me by the Treasury Department for the Coast Survey, and the works for the weights and measures, and hydrometers, jointly, the allowance for my personal expenses, which shall not appear in the public accounts, was reduced from $2,000, which it had been rated at in 1816, to $1,500 annually.

Against it I stated immediately, in my acceptation of the 12th August, 1832, that it would prove insufficient, but that it could easily be bettered at a future period, as the government would certainly not wish to put me in pecuniary loss. I had no doubt that, on showing to you the nature and quality of the work, you would certainly grant to me the augmentation, indispensable to enable me to meet these expenses, and do the work.

Experience has proved to me, that the personal expenses falling upon me amount to $3,000 annually, by the constantly travelling life, and the high expenses it occasions, even under the greatest economy, and the consequent complete absorption of my time, precluding me from all possibility of minding my domestic economy.

I have, therefore, been thrown into debts since the 2d of August, 1832, by my advances upon that score, for $1,500 annually, now amounting to about $4,000 in all.

My request in this respect is, that you would be so good as to authorize this allowance for my personal expenses to be increased from $1,500 to $3,000 annually, which is its real amount, and therefore no increase of compensation proper. If ever possible to date from the 2d August, 1832, when I began the double work of the Coast Survey, and the weights, measures, and hydrometers, to enable me to free myself, that I may go on entirely devoted to my works, free of pecuniary embarrassment.

I hope your favorable consideration and decision of these subjects will enable me to render the service that it will be my pride to render; and which you, as well as I, and the enlightened part of our fellow-citizens, consider of great and permanent value for the country.

I am sorry that it was impossible for me to present to you these subjects so briefly as a due regard to the sparing of your time would have made desirable.

I have the honor to be, with perfect respect and esteem, excellent sir,

Your obedient servant,

F. R. HASSLER.

His Excellency, ANDREW JACKSON, President of the U. S.

The Consiaerations which make an increase of the appropriation proposed for the Survey of the Coast for the present year desirable and very advantageous, are the following:

1. It is evident by the maps of the triangulations accompanying my reports, and by the printed diagram of them, that the principal triangulations extend from Neversink till to Newhaven, over all the country that is to be surveyed for that work within that extent, comprehending the whole of the New York and Rariton bays, the part of the state of New York reaching the sea-shore, including Long Island and the Long Island Sound to the same extent, a great part of Connecticut, the approach and entrance of the port of New York, all parts very important for the navigation, as proved by the quantity of wrecks on the south shore of Long Island and Sandy Hook.

2. The secondary triangulations have also been executed over all that ground, with the small exceptions of the part of Long Island between Fire Island Beach and Gravesend Beach, and in New Jersey from the base-line measured in 1817 to the Neversink.

3. These parts can and, if the appropriation admits it, will be finished during the next spring, as the secondary triangulation can always begin earlier in the season than the principal one, and all is ready for it.

4. There is by this such an extent of country fully ready for the tertiary work, that is the *topographical survey* and the soundings which produce the maps with the full accuracy aimed at, that will require to employ as many parties upon them as can possibly be obtained; if it were possible, as many as would execute it all within the year, but so many could not be obtained.

5. These works it is proper and most economical to make immediately, while all the signals of the primary and secondary triangulations are yet standing, the localities of the stations and their aim yet fresh in recollection, and while the operators in the secondary triangulation are yet in the neighborhood; because, if delayed, the signals lost, the localities out of recollection, and the persons who made the secondary triangulation not within reach, to be consulted in case of need, it will take more time to the operators in the topographical and soundings parties to find up again the chain of connections, their relations, and the organizations intended for their part, than to do the work itself; notwithstanding that all these things are fully in the calculations, but may be much obliterated in the land.

6. It is thence a great economy in the actual laying out of the money, as well as in the acceleration of the work, and in its accuracy, that these completing works be set in activity the next season; at any later time the expenses would be at least double, to produce the same work; and the longer these results are delayed that apply so directly to the safety of the navigation, the more shipwrecks will occur; as annually now there is more property lost in the short distance of the Fire Island Beach of Long Island, where the base was measured last summer, than the whole Coast Survey costs annually.

7. I have set in activity last fall, in the neighborhood of the base-line, the topographical survey and the soundings of the Great South Bay, simultaneously directing Lieut. Gedney and Mr. Renard to work parallel to one another—as might be called in one another's hands—while the operator in the second triangulation and myself were near, to give any assistance needed. More and far better work has been produced by that method, during the work-time before the season stopped it, than has ever been done heretofore in similar works; and so I wish to continue in future, if ever possible.

8. The experience of last year has proved that the $30,000 appropriated for it, and proposed again for this year, could not reach farther than to maintain the establishment in its present extent, without warranting any augmentation; therefore that it would exclude from reaching the advantages above stated, which are so desirable, and evidently so much more economical, that they are actually a very great saving of money.

9. The next session of Congress will be what is called a long session: the appropriations are always made near the end of the session; thence any appropriations now made must last at least fifteen months; it must therefore, in any case, be larger than last year's appropriation, if the work shall not be interrupted for want of means beside the extension.

10. The stoppage of the work by the exhaustion of the appropriation before a new one could be reached, would be excessively detrimental, as well to the work itself as in pecuniary respects; so that I could not venture to extend the work so that what I consider proper and economical, without seeing before me the means of meeting the expenses.

11. It is evident from the above that I could not execute my duty, which I wish to do to the greatest advantage, as I properly should, if no augmentation was made for the present year.

12. These considerations determined the President to direct me to make the proposition to the Chairman of the Naval Committees for an increase of $30,000 in the appropriation.

13. The addition of $30,000, as proposed, is, as near as previously calculable by the present data, what will be required to put in activity the number of topographical surveys and soundings parties that will be required this year to meet the highly desirable aim deduced above.

14. The additional parties would be about five or more for the topographical work, and two or three more for the soundings. Upon that it must be observed, that proportionally to their extent, these detail works are always more expensive than the large triangulations, without which, however, they are of no avail. These experiences have not yet been made in this country; but are well known to the practical men in these branches in Europe, where similar systems have been carried all over every country.

15. Proper reflections will show that a numerical estimate of money cannot be made of every individual part, and therefore of a number of such parts, as would warrant any judicious man to name any specific sum for them; no such work having as yet been done in this

country. Some experience is absolutely required, to be able to attempt such an estimate with propriety. I hope, by the well calculated arrangements that I have made, the desirable results will be obtained at the least expense possible, and that by next year the regular estimation of every particular part will become possible.

F. R. HASSLER.

Washington City, Feb. 17, 1835.

Washington City, February 28th, 1835.

SIR:—This morning I received from Capt. Swift, accounting officer of the Coast Survey, a new list of suspended items in the Coast Survey expenditures. That this was as unexpected as deeply painful to me, while assurances were held out that these unfortunate attacks and delays should be relieved, you may well feel yourself, as every man of feeling would.

This is already a result of the delay in the execution of the directions of the President to inquire into the subjects of my last letter to him, the letter of the Fourth Auditor being of the 17th instant, several days after the President's directions were given.

I must take the liberty to advert again to the irreparable harm that is done to me by this, as a reward for my great exertions and sacrifices, and to the work of the Coast Survey itself. Though your Department has much business, I must take the liberty to claim that this should be considered as a business of the Department, though I had at first proposed that the Coast Survey would best be placed under the State Department, as having the least details, &c.—(See p. 73, Art. 9, of the printed documents.)

I join here the proper remarks upon the rejected items, with a copy of them.

I have the honor, &c.

Your obedient servant,

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Remarks upon Suspended Items of the Coast Survey Accounts, contained in the communication of the Fourth Auditor, of the 17th February, 1835, *to Capt. W. H. Swift, accounting officer of the Coast Survey.*

To No. 1 (in margin). My voyage to Washington with the carriage and what is habitually to be conveyed in it in that case is as in-

dispensable as any of the moves between stations; without it no report can be expected upon the most important parts of the Coast Survey, because the works of reducing the results to paper, in plotting, calculating, &c., without which the surveys in the field remain without results, can only be made in a regular office at Washington, which will become even extensive as the work progresses. I stipulated, therefore, in the articles of agreement of August, 1832, Art. 6 (printed documents, p. 83), that *I should have the sole and free disposition of the carriages and other means of conveyance*, &c.; thence also the accounting officer of the Treasury Department never hesitated to allow such expenses, as proved by the accounts passed by the First Auditor under the 4th May, and Comptroller under 6th May, 1833, and others.

No. 2. The transportation of the government instruments, and the baggage even of the whole company, is expressly stipulated as public expenses, by the Art. under D, No. 5, (p. 8 of printed documents): the means and best mode of their safe transportation are positively referred to my judgment; without this no security can be obtained; loss irreparable would occur. The loss of the apparatus for weights and measures, shipwrecked in 1832, is an example, and the late loss of a Georgetown packet for New York confirms the propriety of rejecting this mode, as well as the transportation-lines, without special guard.

No. 3. The man necessarily required to take care of the horses over winter must, of course, have his wages. It was always allowed in the Treasury Department as a matter of course.

No. 4. If the merit of the work is considered, this pamphlet might well be refused, as it actually does not grace the public documents of Congress, (in which it will however shortly be reprinted again,) according to the judgment of all men of science that have seen it; the data contained therein were, however, proper to collect in the documents of the Coast Survey.

N. B. All the items above were expended while the Coast Survey was yet under the Treasury Department; and therefore, according to the rules adopted there, the Navy Department had not the work at that time.

No. 5 is answered under Nos. 1 and 2 completely, unless it should have been intended to prohibit the measurement of the base-line; the means for which Mr. Page was directed to bring to the place where they were used from Washington, where they had been in a garret since 1820.

No. 6. The cause of rejecting one day's horse-feeding is occult to me.

Nos. 7, 8, 9. My voyage to New York, and that of Mr. Page, in charge of the base-measuring apparatus, scale, &c. were indispensable, *if the work was to go on at all.* The transportation is positively at public expense, for instruments, baggage, assistants, and myself, grounded upon the same articles of agreement as Nos. 1 and 2; no change of contract has been made. The binding of books brings a small alteration, on account of those books returned, belonging to me, by the refusal of the sale, which will be settled

between Capt. Swift and myself, when the voucher can be compared with the number of volumes of each lot.

No. 10. All the men are engaged with the condition of being boarded; if not in camp, the board must be paid otherwise. Bancroft's can make no exception; he was engaged, and actually employed, in the same works as any of the others.

No. 11. To refuse a medicine-chest to about twenty persons, working at a great distance from all connections, in exposures dangerous to health—!?!

It is not refused to a vessel: our exposure is exactly the same. Every surveying party of the War Department has one, without asking in any way for it, and its expense passes as a matter of course.

F. R. HASSLER.

Washington City, 27th Feb. 1835.

Washington City, March 20th, 1835.

SIR:—When the work of the Coast Survey was put in activity again, in 1832, I proposed that it should be placed under the State Department, which has the least details of any Department of Government. (See printed document, page 73, § 9.)

When it was transferred to the Navy Department, I foresaw all the difficulties of delay which have occurred, and which I know will occur yet after these, by the constant interference of the not delayable dispositions for the work with other pressing business of the Navy Department, which will always occur.

Therefore, I take the liberty to propose to you, that (as hinted in my last) you would please, at the same time that you propose to the President the granting of my requests, expressed in my letter to him of the 5th February last, also to propose to him to return to my first proposition to lay this work in the State Department; the reasons for it are the following:—

1. The Coast Survey must, in any case whatsoever, be made under a special contract, as made with me in 1816 and '32.

2. This contract must, by the nature of the work itself, be different in almost every point from the habits of office of either the Navy or the War Department, and grounded upon the principles of that contract which I have now.

3. This difference between the habits of the Navy and War Department and the requisites of the work, will at all times increase the labor of either one of these Departments much more than it would do it in another Department of the Government, who are constantly acting under a greater variety of contracts.

4. It was in foresight of these facts, that at both times at the beginning of this work, it was not placed neither in the War nor Navy Department.

5. The remark that was made on the occasion of the transfer to the Navy Department, that it would alleviate in the ordering of the Navy officers, who may be needed, was fully regulated and eased in 1816, by the simple communication of the contract made with me by the Treasury Department to the War and Navy Departments, with the request that the Department would comply with my requests, when I should apply for the assistance of any officers or other objects, needed for the work, as much as the service would admit of. The same could be done now, and would ease and advance the work very much.

6. You may therefore with full propriety, by the above proposition to the President, relieve yourself from this additional trouble of your Department.

7. On your presenting these considerations to the President, I have no doubt but he will sanction the transfer; and the State Department will no doubt be willing to accept the trust upon these same considerations, as also from the conviction of the great utility and permanent value of the work.

8. It is in general very desirable for the progress of the work, that the Department, under which it is to be carried on, should have time to pay nearer attention to the variety of propositions which it naturally occasions; besides, that much of the means to conduct it must be procured from abroad, in which the State Department has always hitherto lent its assistance.

Every delay that my work meets with is very painful to me. The President, and the members of Congress whom I meet, show always great interest that the work should progress with all that rapidity which lies equally in my wishes and arrangements, and for which I make every possible exertion; besides, that is appropriated to a well calculated economy—the delays are actually more expensive than the work itself.

I have the honor to be, with respect and esteem,

Sir, your obedient servant,

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Washington City, March 21st, 1835.

SIR:—Captain Swift has informed me that the accounting concerns, so long hanging, have been settled by you, except those items that refer to my journey to and from Washington, which you intended to refuse, as improper, and throw the expense of them upon me; it becomes therefore necessary for me to address you herewith in explanation of this part, although it lies already fully in the documents already printed, and in others.

1. In making these journeys, both last winter and this winter, I have acted according to the unavoidable exigencies of the work, according to the most strict economy in it, and to the conditions of my contract, as quoted to you already in my letter of the 22d January last.

2. What was done here the former winter, and also this winter, could never have been done any where else, without incurring an useless expense of at least one thousand dollars each time.

3. It would have been unavoidable to hire an expensive office elsewhere, and to bring there, *from here*, all the means to do the work, which would have occasioned such delays as would have lost the whole, or the greatest part, of the time of winter.

4. These objects needed, and which were on hand here without extra expense, are the following, viz.

(A.) The books from the library for the Coast Survey, which contain the scientific data indispensable for the calculations to ground the work and its projection upon it.

(B.) A number of copies of the mathematical tables, indispensable, by means of which the special tables for our particular use were to be calculated according to the principles that I apply.

(C.) All the implements of drawing and projecting, which besides were, for the most part, my private property, lent to the work, or used up in it.

(D.) A large pine table, for drawing and projecting, which the Topographical Bureau was so good as to lend to me, while a new table, made any where, and ever so well, would not have been of any use, on account of the loss of shape and shrinking of new worked wood.

(E.) The standards for the adjustment of the bars for measuring the base-line, and the tools purposely prepared for it in London, necessary both for the final adjustment last year, and the indispensable comparisons, as well last winter before the measurement, as this winter after it, together with the means and the appendages to it.

(F.) The bars themselves, butting pieces, and other appendages.

5. My letters to the Navy Department of the 22d and 26th March, 1834 (printed documents, page 128, before and after), show to you that three of my assistants were here at work with me last winter, none of whom could have done any thing in the work without my guidance every day, as they can attest to you; you see there also the special employment of each.

6. The journeys of the assistants have never been objected to: how can it be that mine, so indispensable, should be objectionable!—This personal distinction!—Wherefrom can it arise?

7. The results of the winter 1833–34 were, besides the theoretical calculations and the preparation of every thing that was needed for the next field campaign, for which I made also use of my assistant in the weight and measure works, as stated to the Secretary of the Treasury:

(A.) The report of last May, with all that was required to enable to render that general account of the work, from its beginning in 1816.

(B.) The five maps that accompanied this report, with all the calculations for the projections, reductions, &c.

(C.) The nearer sketches of the work of the last campaign. The two, A and B, you have yourself presented to Congress, and I had hitherto considered you fully acquainted with their worth, and the works they required. All this would have been impossible without my presence here.

8. My letter of the 26th March, 1834, shows that the assistants who thus worked with me here were Lieut. Bell, of the navy, Mr. Eakin, from Philadelphia, and Mr. Renard, from New York; if, therefore, any doubt should exist with you upon my veracity in my statements and the propriety of my arrangements and actions, please to call in these gentlemen as witnesses, and ask also Colonel Abert and Capt. Swift, who are here present, and equally acquainted with the facts.

9. This winter I called Mr. Renard to me here, and the works that he and I did were equally not possible to do elsewhere; the results are—besides the calculations for the base-line, which the too extensive and perplexing correspondence, that falls upon me all the time, has not yet left me the time to finish—the great number of projections preparatory to the field-work of the topographical and naval part, of which I showed to you and to the President the map of assemblage, which shows considerable work; and the work of Lieut. Gedney, of the navy, which he has presented to you; and the second indispensable comparison of the bars and the thermometers used in the base measurement occupied me personally also some time. The report which I shall make, before I leave this for the field-work, will give an account of all.

10. As the works of the other assistants are not put in question, I may pass over that with the simple remark, that I gave them works to do at their homes to avoid travelling expenses.

11. It is in general absolutely indispensable to establish a steady central office for the work, to be united every winter here in Washington, as is plentifully proved by the Topographical Bureau, and other similar offices already here. This part cannot follow the field-work as it progresses, without several thousand dollars useless expenses every year. The Coast Survey, though begun near New York, will not remain there, but stretch east and south all along the coast.

12. The most proper and central place for such an office is certainly Washington; it lies therefore in the intention, as well of the President as of the agreements made with me, that it should be so.

13. You know well that in 1818, my absence was taken advantage of to destroy the work, and to occasion the great losses that have been the consequence of it, besides all the discredit. You yourself wished then that I had been here in time to give the informa-

tions that would have prevented that mischief, which Mr. Crawford's saying (afterwards) "I am sorry," did not however mend.

14. Finally, I must take the liberty to request, that you would please to state to me the facts of wrongs that you suppose me to have committed in my work, upon which you ground the mistrust in my veracity and arrangements, and the accusations which so evidently are exhibited in your dispositions against me, that I may, as I can so very easily, exculpate myself properly before you and the public, before whom ultimately all these transactions must fully appear. For it must appear singular, that after a work of such importance and magnitude, and supposing such a variety of requisites, has been intrusted to a man, that such great distrust should be put in him in *trifles*, as those that were in question all this time. The principle can be no other but *that he who is intrusted with the whole guidance of the work, must also be trustworthy for the details, if the trust is not entirely wrong placed.*

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Washington, March 23d, 1835.

SIR:—In answer to your letter received yesterday, respecting the disposition that has been made of the money appropriated for the Survey of the Coast, I have to state, that the following transcript of a memorandum made by the Clerk of the Treasury Department, who is charged with keeping the account of the Coast Survey appropriation, exhibits all the money that has been drawn from the Treasury between May, 1834, and February, 1835.

Drawn by Capt. Swift.		Drawn by the Navy Agents.	
1834, May	$5000 00	1834, Sept. Paulding,	$3350 00
July	7000 00	Oct.	96 44
November	6000 00	„ Paulding	1000 00
1835, February	6000 00	„ same	780 00
		Dec. same	700 00
		„ same	531 00
		1835, Jan. same	300 00
		Feb. same	500 00
	$24,000 00		$7,257 44

The balance in the Treasury to the credit of the Coast Survey, on March 1st, 1835, was $36,710.20.

Yours very respectfully,

W. H. SWIFT.

Capt. Top. Eng. and Disbursing Officer.

To F. R. HASSLER, Esq.
Superintendent of the U. S. Coast Survey.

Washington City, March 24th, 1835.

SIR:—To form proper plans for the field operations of the coming campaign, I requested Capt. Swift to take the information which I had need of upon the amount of appropriation that stands to the credit of the Coast Survey for this year.

His information showed, that the navy agent in New York drew from the funds of the Coast Survey appropriation the amount of $7,257.44, for the purchase and outfit of the vessel furnished by the Navy Department to Lieut. Gedney for his sounding operations.

This item curtails the appropriation in an unexpected and very unfavorable manner, so as to prevent me from taking such measures as the work properly requires, in its present state, to proceed in the order necessary to take advantage of the triangulation and arrangements that I had contemplated and prepared for, and disturbs the proper economy of the work. It prohibits me entirely to call for any more vessels for the soundings in Long Island Sound, which ought to have been made this season.

I must take the liberty to remark upon this, that this arrangement is entirely against the principles upon which the work was planned and carried on; that it was always contemplated, from the very first establishment of the Coast Survey, that all such vessels, with their full equipment, should be furnished by and at the expense of the Navy Department, without any charge to the Coast Survey appropriation, in consideration that the employment of officers of the navy was an advantageous exercise for them, as much so as any of the voyages to foreign naval stations, and particularly instructive for them in the knowledge of our coasts, and in hydographical operations, which they have otherwise no occasion to acquire, without special arrangements and consequent expenses.

The Coast Survey appropriation was never calculated so as to cover these expenses, and therefore the loading of it with them amounts to a certain stop of the work this year, after a very short time, or a crippling of the whole operations; as I have already stated to you that the appropriation proposed by you needed an augmentation to enable the Coast Survey works to progress properly to that extent which would be desirable and most advantageous.

You would oblige me very much by any measure that you may find best adapted to relieve the work from the impediment thus laid in the way of its proper progress, as well for the above sum charged already as for any other that might and would occur this year, or hereafter, if not special regulations are made for the prevention of similar occurrences in future. If that could not be done, I should, as stated once already, have to keep within the limits of the means left besides, which would be far less advantageous.

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Washington City, April 11th, 1835.

SIR:—Lieutenant Gedney will leave here in a few days, to continue his work of sounding in the Great South Bay, and on the south shore of Long Island.

I take the liberty to request that you will please to detail Lieutenant George S. Blake to accompany him, that he may become acquainted with the nature and details of the works; as I should like to apply for his services in a similar sounding expedition, as soon as the work for the Long Island Sound will be fully prepared, which will be very soon, and as the means will be on hand to procure a vessel, &c. At present the placing of the expense of purchase and fitting out of the vessel of Lieutenant Gedney, upon the account of the Coast Survey appropriation, cuts off these means.

According to the original plan, these expenses, as well as all those of officers of navy or army, in pay, rations, and all other allowances and emoluments of their rank in active service, were to be fully paid by the Department from which they emanate, without any charge to the Coast Survey; and their services in this work were to be ranked fully as any other service in their own Department. This understanding and arrangement was made at the time upon mature reflection, of which the grounds were mentioned in my former letters.

Thence the Coast Survey appropriation was never calculated to bear any of these expenses, as you may be informed by the Treasury Department. You can easily calculate it yourself from the amount asked; for it would, and will at all events now, not reach to one half of the work which the proper prosecution of it to creditable and economical advantage would dictate, in the state in which it is at present, and which I had therefore contemplated and prepared for. I am obliged to state to you in due time, that this state of things, and the deviation from the adopted system, will have an extremely deleterious effect upon the whole work for a number of years to come, as you can easily see; that the preparations and arrangements which I should now make, and cannot make, on account of the accounting officer,

therefrom resulting, are not depending entirely on means at command, but are for a great part even to be procured from abroad, where the time is entirely out of our command; so that it will remain long uncertain even, whether the necessary means can be obtained in due time or not. Please to favor me with an answer.

I have the honor to be, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Upon Lieutenant Gedney's request of funds, I wrote the 12th April, 1835, as follows:

I have of course not the least objection against Lieutenant Gedney getting the money necessary for his sounding expedition. But I must observe, that according to the arrangements made with me for the Coast Survey, these expenses were intended to be paid by the Navy Department, without any charge to the Coast Survey appropriation, which has never been calculated to bear them; therefore it should not come out of the funds under charge of Capt. Wm. H. Swift, as accounting officer for the Coast Survey. (See articles of agreement of 12th July, 1816. § K, No. 1, printed Documents, page 9.)

F. R. HASSLER.

Washington City, March 29th, 1835.

SIR:—From New York, and by letters from Messrs. Troughton and Simms in London, I am informed of the arrival of four sextants of seven-inch radius (to complete the six ordered, of which two were received last fall), and a theodolite of eighteen inches diameter, all being parts of the various objects that had been ordered the year before the last, by authorization of and arrangement with the Treasury Department, on account of which a draft for £600 has been sent to them. The sextants have been deposited in the custom-house of New York, with the other instruments, and the theodolite will be placed there the same. Mr. Blunt takes the proper arrangements for this.

The theodolite for the main triangulation is again promised for the coming spring, and it is announced that a balance will then be due upon the whole amount of the bill, compared with the money sent to them; this will therefore then form an item to be paid by the accounting officer arising from dispositions taken, and authorizations given, in 1832 and '33 (as already evident from the money given on account), to activate again the Coast Survey; the state of the instruments remaining from the former collection had made these dispositions indispensable.

I have, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Washington City, April 14th, 1835.

EXCELLENT SIR:—Upon your kind invitation to state to you, in a laconic exposition, the present difficulties in the Coast Survey, I have the honor to state:

1. The Coast Survey work goes on without the slightest delay; as well I as all my assistants are duly and assiduously at work, each in his part, in the house and in the field; thence there can be no reproach against any one of us from that side.

2. The stoppage of a number of items in the accounts of Capt. Wm. H. Swift, as accounting officer of the Coast Survey, prevents me from the due ordering of such measures as I am duly authorized by contract, and as are absolutely required for the proper progress of the work this summer.

3. The Navy Department has taken out of the appropriation for the Coast Survey the payment of the vessel used by Lieutenant Gedney last campaign, and ordered the expenses for the coming one to come out of the same.

4. The Coast Survey expenditures were always intended to be relieved from all such expenditures, by their being referred in the Navy Department to the *general* naval appropriation, as evident by the very letter of the agreement with me of 12th July, 1816, under Article K, No. 1 (printed Documents, page 9).

5. The appropriation for the Coast Survey was never calculated to bear these expenses. It is in all cases now too small to bear them, and even to give to the work of this year the proper extent, which I had contemplated and prepared for.

6. The work would therefore be stopped entirely for want of funds, about next September, by the expenses improperly laid upon the Coast Survey, and those which would follow upon the same principles.

7. Against such consequences it is my duty to warn in due time, and to press the maintenance of the very original plan, which I had always relied upon, in all arrangements.

8. It is therefore only required,

1st. That the accounts be passed according to my contract, as stated to you before.

2d. That the Coast Survey fund be not laden with expenditures that it was never calculated to bear.

9. These impediments are evidently neither from my assistants nor from myself, and I have only to pray to remove them.

10. Please, sir, to cause my letters to the Navy Department to be laid before you, to see the facts documented.

I have the honor, &c.

F. R. HASSLER.

His Excellency, ANDREW JACKSON, President of the U. S.

Washington City, April 16th, 1835.

SIR:—The conversation which I had the pleasure to have with you yesterday on the occasion of the President of the United States having stated to me, that I was accused of delaying the work of the Coast Survey, showing to me that many of the features of the arrangements for this work were not familiar to you, I must lay aside for a while the calculations for the base-line, to renew the informations upon them.

1. The agreements and engagements, as articulated before the letters of appointment, as well as these letters themselves, which confirm them, nominally and distinctly, have always been considered as *a positive contract*, by every person acquainted with them; they were intended for that, and have been so; they have been stated as *positive contract* by the President of the United States himself, in his own hand-writing, directed to the Treasury Department.
2. These articles of agreement, and the confirming letters of the Treasury Department, contain the *stipulations* and the *authorizations* given to me, that are necessary for me *to enable me to execute my task;* and I dare to assert that not the least alteration can be made, without destroying the proper course and useful execution of the work; the habitual army and navy regulations, in minute details, cannot be applied to it.
3. The law of 1818, having produced the effect well-known, has proved the above; and the law of 1832 has positively reinstated the same principles which the Secretaries of the Treasury have taken for their letters of appointment in 1816, and in 1832; and I should consider any alteration in these principles as much in contradiction with the contract as if I was to refuse to work.
4. The articles of engagement of 12th July, 1816, under letter D, state positively those expenditures that shall be made *under my orders;* and under letter E, enumerate specialities, of what is to be considered as public expenditure. They contain under Art. 2 the positive authorization for such additions to the collection of instruments and books as may be *found necessary by Mr. Hassler* in the progress of the work, as well to complete the collection from time to time, as to furnish a sufficient number of them for the use of the detail surveys. No. 5, the transportation of all the instruments and the baggage of the company. (See printed Documents, page 8.)
5. The Article 6 of the "*Articles of Agreement between the Treasury Department and F. R. Hassler,*" is positively stating, "He will have the sole and free disposition of the carriage or other means of conveyance, and other objects or implements appertaining to the equipment for this work." (Printed Documents, page 83.) In the same manner, Article 5 gives to me the dispositions relating to the assistants; and therefore, if by my general signature to the schedule of the accounting officer, I approve of

the expenses incurred by their move in the work, it is fully proved that these moves were made upon my direction, and therefore the consequences of them are to pass the accounts as fully authorized.

6. These principles and quotations you will find to embrace the whole of the objections ever made by the Fourth Auditor to the accounts of Capt. Wm. H. Swift, as accounting officer, and to prove them therefore fully unfounded.

7. No ambitious views of *power* are my aim, but I must maintain those *means* that are *indispensable for me or any man* to make the work intrusted to my charge. It is evident now, as it was to the Treasury Department when these stipulations were made, that every detail requisition of mine would, by its wording, lead to difficulties which the general expressions avoid.

8. Any ordering about instruments, &c., not done by the chief of such work, and therefore unavoidably showing a want of sufficient knowledge of the subject, would unavoidably prove a failure, and I would be laden with the consequences and disputes on all sides—a situation not to be borne by any man. See upon that my letter in the War Department, upon a consultation with me about instruments and apparatus to be procured for West Point, about eight or nine years ago. It is therefore impossible for me to consider this request of special requisitions as any thing else but a means to bring me into greater difficulties, which is directly contrary to the benefit of the work.

9. I am sorry to be obliged to add to this, that as I had this trust most decidedly until the last difficulties, I am compelled to the request that you would please to state the *facts* of my *malversation*, upon which you can ground such a withdrawal of the trust laid in me, as will *positively destroy the work;* stating also, if you please, the ground upon which the accusation of my delaying the work is intended to be *rested in facts.*

10. I am obliged now to enter into some detail parts, which in fact I think should be understood by themselves, and the nature of the work. My travelling to Washington, as well as that of such assistants as I may need, is necessary every year; at the place of government the work *must centre;* the field-work will not always be in the neighborhood of New York; in a few years it would be hoped to come, in part at least, near Washington; should then again the house-work of plotting and calculating be transferred every fall to New York?—what is the intention?

11. Every topographical survey of a few miles in the War Department has an office here; shall the Coast Survey, the most extensive of all, be without an office? Where shall it be? As it must necessarily be permanent, and easily accessible for the government, it can be nowhere else but here.

12. The President knows the necessity of such an office here, has expressed it last year, and this winter I had a conversation with him upon the manner of providing for it; any other measure would introduce a useless yearly expense of about $2,000; the

refusal of this office I would have to consider as a preparation for destroying the work, exactly like in 1818.

13. Upon your proposition to place the schooner Experiment in the Coast Survey, I must repeat that it is inadmissible: because, 1. It draws too much water for the bays and shoals in which it would have to serve; 2. It is not sea-worthy for the soundings in the open sea, where the necessary observations require much more steadiness than it has; 3. It requires a fully disproportionate complement of men to work the vessel; it would therefore need a double complement of officers, which would impede the regularity of the observations, and often even render them impossible.

14. If other suitable vessels are not in the navy, the following choice of means presents itself: either the use of a revenue cutter of small size, or the hire of a private vessel, which can be had at $150 per month.

15. I cannot omit to observe, that the campaign of this year will present considerable difficulties, as it will be exceedingly crippled in comparison of what it ought to be. By the economy which I had put in all the operations of last year, I had, with foresight of the events which I knew well would come this year, economized about $18,000 from the last year's appropriation. My proposition of $40,000 for the present year was to give me a disposable fund of $55,000, which this year fully required, and even more, to work to the best advantage. Your reducing my demand to $30,000, and the taking out of the Survey fund about $10,000 for the vessel of Lieutenant Gedney, and its expenses, reduces the disposable means below $35,000 (see note below); this sum will have to be managed so as to last until about August, 1836, on account of the next *long session* of Congress, the appropriations being always made at the end of the session; so it must in reality bear the outfit of two years, which certainly you did yourself not contemplate, but which I knew and adverted to in my letters to you, and therefore also I pressed in due time an augmentation, which I am very sorry you did not support.

16. It remains to me only yet to state, that the time for a final decision upon the various requests of my letters, since last fall, becomes pressing; though the weather is not yet fit for the large triangulation, on account of the haze of the atmosphere, peculiar to the spring in this country; the secondary parties are in activity, and I ought to be able to direct the whole organization of the summer's campaign, which I cannot, by the present uncertainty of my means, and of what may be admitted in the accounts, or not. In respect to this part, your simple statement, "that it shall be as it was under the Treasury Department," under which the work proceeded prosperously, would settle the whole.

17. I must request again that you will please to give the earliest consideration possible to the Article 2d of my letter to the President of the United States of 5th February, and to my letter to you of the same date, in respect to the arrangements in my compensation necessary to enable me to go into the field this spring,

and to the establishment of the impartial investigation of my conduct, if the least reproach is intended to be laid upon me.

I take the liberty to request that you will please to favor me with an early answer.

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NOTE. Expenses of the vessel of Lieutenant Gedney, drawn from the appropriation for the Coast Survey by the Naval Agent of New York—viz:

1834,	Sept.	$3,350 00
	Oct.	96 44
	"	1,000 00
	"	780 00
	Dec.	700 00
	"	531 00
1835,	Jan.	300 00
	Feb.	500 00
	Total,	$7,257 44
Advance to Lt. Gedney for this year's expense,		2,000 00
	Total now,	$9,257 44

I join here a copy of the printed Documents, and an abstract, marked with pencil at the places principally to be referred to.

NAVY DEPARTMENT,
April 17th, 1835.

SIR:—In answer to the letter of Mr. Hassler of the 14th inst., which you have referred to me, and in which he complains that "the Navy Department has taken out of the appropriation for the Coast Survey the payment of the vessel used by Lieutenant Gedney in the last campaign, and ordered the expenses of the coming one to come out of the same, I have to observe, that it was deemed necessary last summer to purchase a small schooner for the purposes of the Coast Survey, which was not wanted for the purposes of the Navy, and therefore not chargeable to any navy appropriation. It cost $3,300; which sum, together with some necessary equipments, was charged to the appropriation of the Coast Survey.

There are certain other incidental expenses, connected with the duties assigned to Lieutenant Gedney, not necessary for any purposes of the Navy, and which can only be charged to the appropriation for

the Coast Survey, as expenses for pilotage, travelling expenses of naval officers from station to station, expenses for buoys, boat hire, for wood, &c. It will also be necessary to purchase for the same service two small boats, which may cost $30 each; two watches, which may cost $45 each; two tents, which may cost $10 each; and some other articles of less value: the whole of which expenses for the present year, Lieutenant Gedney estimated at $2,000. Mr. Hassler says that "the Coast Survey expenditures were always intended to be relieved from all such expenditures by their being referred in the Navy to the general naval appropriations, as is evident by the agreement with me of the the 12th of July, 1816, under Article K, No. 1 (printed Documents, page 9).

By reference to this Document, which Mr. Hassler calls an agreement with him, it will be found to be a paper headed "Articles of Agreement between the Treasury Department of the United States, and F. R. Hassler, relative to the Survey of the Coast of the United States, dated July 12th, 1816," signed by Mr. Hassler, but not by the Secretary of the Treasury, or any other person on the part of the United States. But if referred to as matter of explanation, it affords no pretence for charging the expenses of which Mr. Hassler complains, either to the military or naval appropriations, or for opposing the arrangements of the Secretary of the Navy to pay these expenses out of the appropriation for the Coast Survey.

In the letter of the Secretary of the Treasury of the 9th of August, 1832, and under which Mr. Hassler now acts, it is stated that "the expenses of the persons in the military and naval service employed in the Survey, *which are chargeable to military and naval appropriations*, will be defrayed by the officers of the respective Departments, and accounted for under the direction of the Departments." This regulation is strictly observed. The expenses of such persons *chargeable to military and naval appropriations*, are not charged to the appropriation for the Coast Survey; but their extra allowances, in consequence of services on the Coast Survey, are chargeable to the appropriation for that Survey.

Lieutenant Gedney, with one servant, eight passed midshipman, and eighteen men under him, are paid out of the navy appropriations all they are entitled to under these appropriations, amounting in all to about $13,500 a year.

The same regulations are observed as to officers of the army engaged, or to be engaged, on the Survey.

The letter of the Secretary of the Treasury of the 9th of August, 1832, does not authorize the charge of any of the expenses of the Coast Survey to military or naval appropriations, except so much as may arise from the employment of persons in the military or naval service: of course it does not include any of the charges to which Mr. Hassler objects.

If under the arrangements to defray these expenses from the appropriation for the Coast Survey, the accounting officers of the Treasury shall deem it their duty to pass the accounts, there can be no reasonable doubt but that it is right in principle. If, however, this view of

the case does not meet their approbation, I shall be glad to receive and to be governed by your instruction on the subject.

I have the honor, &c.

MAHLON DICKERSON.

To the PRESIDENT of the United States.

Upon the back of this report is written, in the President's hand, "I have with attention examined the within report, and have come to this conclusion: that all those extra allowances for the service of the military and naval officers on the Coast Survey, as stated by the Secretary of the Navy, must be paid out of the appropriation for the Survey of the Coast. This being the only appropriation out of which it can be paid, all appropriations being specific, must be applied to the object for which the appropriation was made.

"A. J."

Washington City, April 17th, 1835.

MOST EXCELLENT SIR:—Please to accept my sincere thanks for your kindness in communicating to me the report of the Navy Department, and your decision upon the part of my letter to you relating to the payment of vessels employed in the Coast Survey.

I should have been very glad, for the benefit of the work, that your decision could have been otherwise. I must take the liberty to join here, by extract, that part of my last letter to the Navy Department which relates to that particular subject.

I take the liberty to renew my instances that the subjects of my earlier letter to you and to the Navy Department, of the 5th February last, which refer to very vital parts of the work, might be reported upon and carefully considered, as you have given them to the Secretary of the Navy and Treasury, and the Fourth Auditor, jointly under investigation.

I have the honor, &c.

F. R. HASSLER.

His Excellency, ANDREW JACKSON, President of the U. S.

NAVY DEPARTMENT,
April 20th, 1835.

SIR:—In answer to your letter of the 16th instant, I have to observe that I stated to the President, what I had previously stated to you, that I considered the field-work of the Coast Survey was much

in advance of the necessary calculations for that work, inasmuch as we were not yet furnished with a report of the exact length of the base-line; whether sufficient time has been allowed for completing these calculations for this line I have not attempted to decide, although you have assured me that they would soon be finished, and that your report upon the result would be made before you leave this place for the approaching campaign on the Survey. You now say you "must lay aside for a while the calculations for the base-line to renew the information upon them." I regret that any circumstance should render a further postponement necessary in the final report upon the base-line. Yet I doubt not that the necessity of renewing the information upon those calculations affords satisfactory reasons for this delay. Nor do I doubt but the calculations will be renewed as soon as may be, and a report made upon the length of the base-line, corrected by all the calculations necessary for that purpose, which I am sensible require great labor and time. I think this the more necessary, as it appears to me that not a line of all your triangulations can be accurately calculated until this is done.

The subjects of the 2d, 3d, 4th, 5th, 6th, and 7th sections of your letter are embraced in your letters to the President, or in the correspondence with the Fourth Auditor, and not requiring my answer.

In your 8th and 9th sections you complain of a request made that you should make special requisitions for the instruments, apparatus, &c.; and you say that it is impossible for you to consider this request of *special requisitions* as any thing else but a means of bringing you into greater difficulties, which is directly contrary to the benefit of the work; and you call upon me to state the facts of your malversation, upon which I ground a withdrawal of the trust laid in you as will positively destroy the work.

It is true I have requested you to furnish a statement of the instruments, books, apparatus, &c. necessary to be procured for the Survey, particularly such as must be imported from abroad, that an order for them might receive the sanction of this Department. This has been done, not from any distrust in you, but to save you from the trouble of having your accounts suspended by the accounting officers of the Treasury, and because such requisitions had heretofore been made by you.

I did it to save myself from endless correspondence upon the subject of your accounts, which was extremely oppressive to me. I have accused you of no malversation, nor suspected you of any.

You say the schooner Experiment is inadmissible in the Coast Survey, because it draws too much water, &c. This schooner is expected in the harbor of New York in a few days; Lieut. Gedney thinks she will answer the purposes of the Survey in the Sound. I think it probable he may be mistaken. The question will be referred to naval gentlemen, and if the schooner is not fit for the service, she will not be put upon it. If we are obliged to purchase another schooner, or hire a vessel for the purposes of the Survey, it will make further drafts necessary upon the Coast Survey appropriation.

As to the question of your compensation, it is not for me alone to decide: when it is decided, you shall know the result.

I am very respectfully, &c.

MAHLON DICKERSON.

FERDINAND R. HASSLER, Esq., Superintendant of the United States Coast Survey, Washington.

The following series of Notes, Remarks, and Notices, were handed to Mr. Dickerson, Secretary of the Navy, in an interview on the 20th and 21st April, 1835.

A.—GENERAL REMARKS.

It is a misfortune that there is not another chief party in the Survey in another part of the coast, as I proposed originally, that a comparison might be made of the expenses of the work, between the two. I would certainly not be subject to such unjust accusations as are now made against me.

I shall always consider the agreement with me as a *positive contract*, as *the President of the United States declared it to be.* It contains the stipulation of the means needed, and to be granted, equally as well as I grant my exertions and work; equally obligatory on both parties.

The President wishes me to show as many maps next winter as possible.

I had laid out my plans to produce from twelve to twenty this year.

The Secretary of the Navy said I extend the secondary parts, which are those that produce them, too far.

There has been $\frac{2}{5}$ of the appropriation, that I had calculated upon, missed, by the diminution of my first demand, and by the loading with the naval part the appropriation, which had not been calculated to bear them.

It is my duty to state that publicly in due time, that no more may be expected of me than is possible, with the means left to me.

The junction of the Maryland Survey with the Coast Survey is to be minded immediately on my leaving here. My intentions would be, to join Mr. Alexander in Baltimore, to reconnoitre in the neighborhood, through the state till to Pennsylvania, and further. This junction will be a great economy, because the State of Maryland will pay the se-

condary and topographical part of the survey. See letter of the Navy Department, April 3d, 1834 (printed documents, p. 138).

The state of the appropriation now prohibits completely the use of any other vessel than that of Lieut. Gedney.

In 1811 I was intrusted with the whole purchase of the instruments, and all other necessaries for the work, in Europe, with a credit upon me personally of £3,000. I executed the trust to full satisfaction, and came back with the instruments a creditor of the government for about $10,500, though I had been left two years in London without my compensation. I am no worse man now, than I was at that time. Why, then, can I not be trusted with the disbursement of a few hundred dollars with the same propriety as I did it then?

Ask, upon all the subjects that might be put in question, all my assistants, and the men that were engaged now lately in the work, and the assistants of 1817, as Col. Abert, Major M'Neil, and even Baker, one of the men in the War Department, who was then with me.

Do not cast sentence upon the work and myself without an investigation impartial on all points: this is due even to a criminal; why should I be sentenced without it?

The first winter, 1832–33, a difficulty was raised against the work by wishing to introduce an inadmissible way of ruling over it. The second winter, '33–34, the work was transferred to the Navy Department, where its features were unknown, from the Treasury Department, where they were well known, and the work had gone on prosperously. Now this winter, 1834–35, every feature of the work is attacked, which must unavoidably lead to its destruction, if not given up.

B.—Notes.

There must be more trust put in me, if the (really great) work of the Coast Survey shall succeed, than commonly in a lieutenant of engineers. The restrictions attempted to be put upon me put this confidence below that given to such a lieutenant.

These lieutenants make only general requisitions for a certain sum of money for incidental expenses, which comprehend all that relates to instruments, books, &c.

My contract indeed requires no more, even with the exception of the large instruments, for which I always have asked, and would always ask, the approbation of the Department under which the Coast Survey may stand.

This subjection is a complete anomaly among all the works of that

nature ever made *in this world;* for the chiefs of such works have always had the full-free choice of their means.

If I yield, it will be very little to the credit of the government, but much to my own; as every man knowing such works will consider it a sacrifice on my part for the good and valuable work in which I am engaged: I can therefore give way without detriment to my character; but the government cannot exact it without such a sacrifice. It is, I know, meant to degrade me; but it turns the direct opposite way. It is made under the pretence of economy; and it will cost twenty times more than I could get the things for.

It is intended to make me throw away the work; but I am able to stand it, and shall not give way; my means are greater.

The Coast Survey Law exists since the presidency of Mr. Jefferson; it went into activity with me every time it was begun, and even with my private means every spring till to the present, when I have no more the means to make any sacrifices.

It must by its nature last longer than the present administration; it can therefore afford to make sacrifices to it. Later times and posterity level all these trifling inequalities, which appear now so high, because we stand too near to them.

By the arrangements which I have made, I procure the secondary instruments, which I am fully authorized for, at one-third, and even lower, of what the government can obtain them, let it use its best means,—and in quality adequate, which it cannot. Where lies the propriety and economy to deprive me of these means, and to incur that loss to the nation?

It is ultimately the interest of the nation which is to be considered in the case; and not the little paltry arrangements, habits, momentaneous views, and personal convenience, &c.

The cheaper the Coast Survey can be presented, the more it will be supported by short-sighted men, who are always more numerous than men of enlarged mind.

It was my plan, the wish of the Presidents Jefferson and Madison, and all the Secretaries under them, who had the direction of the work, to alleviate the work as much as possible, by the other means of the government, on account of its great national importance, and the disadvantageous accessories, which it was well known, in 1807 even, that it would have to go through.

Notwithstanding the degraded position in which it is intended to place me by the restrictions, I shall know how to keep up my superiority among the assistants, by superior means than those which it is

intended to deprive me of, and which are made use of to deprive me of the honorable standing, and the proofs of public confidence, which a chief of such a work must necessarily have.

I fear neither the task which I have undertaken, nor any of the difficulties that may be raised against me.

I am old; I have not much more of the physical of this world to claim; all attempts to deprive me of the moral and creditable share of a man in this world, according to his situation, will certainly prove abortive. Money is my servant; I am not the slave of money, which is the worst master that a man can come under.

To punish my family by misery for the honesty of their father is—1. an injustice—2. an unsuccessful attempt. From such transactions arise the great blame which posterity bestows upon actions of power disregarding the principles of justice and propriety.

Weakness, which gives way to such momentaneous circumstances and accessory influences, can never claim the restitution which is unavoidably made to strength of character, good moral qualities, intentions, and abilities. Weak men are always the dupes of designing men.

C.—About Assistants.

Each assistant must have one quarter of his stated emoluments added whenever he is chief of a secondary expedition in triangulation or topography; because this increases their expenses to that amount.

Mr. Ferguson had that granted to him at the very outset; it is equally just to grant it to all the others.

The assistants are:

Captain W. H. Swift, of the Topographical Engineers, accounting officer for the Coast Survey. The deduction of the per centage for his responsibility in disbursing should, I think, not take place, as it is in consequence of a special stipulation of the Treasury Department.

Mr. James Ferguson. His situation was made properly by the dispositions of the Treasury Department on his entering, in 1833.

Mr. Edmund Blunt, jr., is employed exactly like Mr. Ferguson, but had not yet received the additional allowance as Mr. Ferguson, which it is therefore proper to make to him, as he might be obliged to leave the work, on account of direct pecuniary loss, and it would be detrimental to the work to lose him.

Lieutenant Mackay is said to be ordered to join, as you informed me; Mr. Eakin of Philadelphia is now directed to join Mr. Renard, until I can lay out a topographical work for him separate; then he will need equally one fourth of his compensation to be added. Mr. Renard: he has been as chief of a topographical party already last fall, and is now again; it will be equally necessary to augment his com-

pensation for one fourth, like the others. Lieutenant Gedney and Midshipmen Dahlgren and Page are under the regulations of their respective corps on navy regulations.

Messrs. Ferguson and Blunt need each a secondary assistant to write the angles at their observations, and other services of the kind. For want of other assistants we were in the habit of providing them temporarily by hiring persons purposely for it.

It is necessary to make the augmentation for the assistants mentioned above now; to regulate it immediately at the opening of the campaign.

D.—Upon Special Requisitions.

They are not habitual in this kind of works, with any other officer under government; nor even in any other country.

Even the lieutenants sent out for smaller surveys make no special requisitions; they are always comprehended *under the general denomination of contingencies.* Inquire of Colonel Abert, Topographical Bureau, and others.

Lieutenant Gedney, one of my assistants, has had granted these objects under the very same denomination, and the money advanced for them a few days ago.

This will appear evident from the list I hand herewith, and the accounts of any officer past or future.

I cannot vouch that the list herewith contains all, as it is impossible to recollect or calculate beforehand, all the smaller incidental items.

The whole of what I state in the list will amount to about $400 to $500, in the extreme, if I procure it; and I am sure the government must pay $600 or $700 for it.

To give such errands to booksellers, bankers, &c., has been the very reason why the objects were never got of good quality by government.

If I have not the free disposition of the means for the work, it must undoubtedly *be interrupted every year.* Last fall the measurement of the base-line would have been *directly interrupted, if I had obeyed the interdiction of hiring artificers made by the Fourth Auditor's refusal; not half a day could we have worked after.*

E.—Articles Needed.

From Paris, which I must especially order, if they shall be of a serviceable kind:

Paper for mapping; pencils of Conti; China ink; Colors especially prepared for maps; scales of whole and half metres; *Connoisances de Tems*, all since 1834; telescopes for plane-table alidades; telescopes for the detail survey parties; Astronomical Tables; the Milan Ephemeris, as many as can be got; Logarithmic Tables; needles, for dip, declination, and oscillation.

From London:

Babbage's Tables, can be sent by Troughton or Dr. Tiarks.

The payment of Troughton's account must be provided for.

There are things ordered which will come only in a year, perhaps later. The large instrument and bill may come in spring or summer.

Spirit-levels of different sizes, one dozen; 5 parallel plates of glass.

From Germany:

The Berlin Ephemeris; the newest tables of Bessel; Zach Astronomical Correspondence; Schumacher's Astronomical Journal, continued.

To be made under my direction, and appearing only as materials, part of which is making:

Three full plane-table and chair equipments for topography; six barometers (I must fill them myself); tubes to carry them in, stands, and all appurtenances; 4 three-armed large protractors, one of them to be made out of a circle on hand; eight beam compasses of various sizes; some speaking horns for the topographical surveyors; tin tubes for the maps.

If it is intended to get these articles, or any one of them, otherwise but by my means, I shall consider myself entirely free from responsibility, and bound not to admit in the bills of the accounting officer those of them which do not fit.

It no latitude is left to me in all these things, there is no possibility of getting the articles in due time.

Artists do not keep such things as we need ready on hand. They must be waited for one, often two and three, years.

I state only the wants as far as I can just remember. I make no positive requisition, because I know it would be found fault with the result in the accounts; I leave it therefore entirely to the option of the Secretary of the Navy, to do whatever he pleases, and I shall do what I can with the means I may have, stating the facts in my reports.

The state of Massachusetts has instruments from the Coast Survey, which it should pay for; having them already so long, and they being likely no more fit for use if returned.

The old two-foot theodolite, which has proved as no more fit for service in its present state, must be sent to London, if possible, to be given in payment upon instruments and articles to be ordered there hereafter.

F.—About the Accounts.

These must be fully passed, as *authorized by contract*, such as understood by the Treasury Department; the whole was incurred under the arrangement still existing, and therefore valid.

Inquire of Mr. McLane, Secretary of the Treasury at the time, and of Mr. Dickins, then under-secretary.

I cannot bear the losses thus attempted to be laid upon me, and would therefore be obliged to leave the work if the refusal is persisted in.

All and *every former year*, I went to the work *defraying the first public expenses by my private means;* this was well known to Mr. Woodbury last spring, and can be proved enough, as I had to borrow the money for it.

It was agreed, on starting the work again in 1832, that I should supply gradually all the articles needed, and they would be passed in the accounts accordingly, and so they always passed before.

G.—My Coming to Washington.

This is indispensably necessary, as well as the establishment of an office here, that must form a permanent centre for the work.

My transportation is positively stated as at the expense of the government.

This journey falls always in the worst season of the year, when no steam-boat goes any more, and the roads are so bad that less than four horses cannot pull any load through.

No stage would take all the baggage that must necessarily travel with me. The journals become numerous, about fifty volumes folio now, and they must follow me constantly. Books are also indispensably required, unless they are procured quadruple; the same is with drawing implements, and smaller instruments, thereto appertaining.

Experience has proved to me that my health does not admit of this stage-travelling in bad season; I fell sick twice on the way before; and this winter I travelled even *in the carriage in my bed.*

The horses must be under the care of somebody of our party, if they shall not be abused.

Boarding in the country, so called, *is abusing horses*, and makes them incapable for the service in spring. In Washington the horses are kept one fourth cheaper than about New York.

I should consider it *an unwarrantable dereliction of duty* to send the journals, maps, and such like, by any common conveyance; see the example we had ourselves.

The field instruments never came here, since they were first moved off.

The intention to keep me away from here is directly destructive of the work, and would have destroyed it this winter, had I not come here.

H.—Upon my Allowance for Expenditure.

Its insufficiency has been sufficiently stated. It is impossible for a man, not present at the work, to judge of the consequences of the constantly moveable life, its great expenses, and the consequent complete impossibility of attending to the care of a family.

There can be no comparison made between it, and the position of a judge of the supreme court.

Under this expenditure must be comprehended all the difference between the living at home, and the consequences stated.

If I have to attend my private economy, it is impossible for me to give to the work itself my undivided attention, as it absolutely requires; and the loss upon the work is more than tenfold.

I have always hitherto sacrificed my private interest to that of the Coast Survey work.

I have exhausted my means, and can no further do it. I lost every year $1,500 in the work since 1832, and can now not move away from here without adequate relief.

The augmentation needed, as stated to the President, can easily be taken, for the greatest part at least, as compensation for my works in the Weights and Measures, where, in the custom-house expenses, to which this part of my works belongs, it is entirely insensible.

It cannot be thought to put me in actual emolument below my assistants, which now is actually the case.

If even I should once accidentally get something over what my scant and painful existence needs daily, I think I could claim it with right for it, as a partial reward for the great exertions and expenses that I had to make, to acquire the capability to do such a work.

I. *Series of Articles of Contracts and Letters, authorizing and deciding the points under discussion.*

PAGE.*	DATES.	SUBJECTS REFERRED TO.
8	1816, July 12th,	Specifies my authority to order expenses, Art. D and E.
9	—— —— ——	Excludes all the naval part under letter K.
10	—— Aug. 3d,	Confirms in § 7 the articles above quoted, as principles to be referred to in doubtful cases.
14	—— Nov. 30th,	Authorizes me for the choice of conveyance, &c.
83	1832, Aug. 6th,	§ 3d to 6th regulates conveyance, assistance, and decidedly gives to me the sole and free use of the carriage, and other such means.
84	—— —— ——	§ 9 and 10 stipulated the office expenses.
87	—— Aug. 9th,	Confirms all the preceding articles, and those of 1816, together with the arrangements then existing.
103	1833, April 12th,	Authorization to appoint the accounting officer, and to hire such a number of men as may be needed.
109	—— Sept. 2d,	Shows the difficulties of maintaining even signals.
138	1834, April 3d,	Authorizes the junction of the Maryland Survey, for which I must make the necessary reconnoitering on my first leaving here.
140	—— —— 14th,	Authorizes the sale of instruments, and the proceeds to apply to new ones.
155	—— May 22d,	States the unavoidable necessity of increase of my allowance for private expenses, like in earlier and later letters, and (page 156) that I borrowed money to be able to go to the field-work, which I have not yet been able to pay back.
160	—— Aug. 9th,	States the wants of the work, and the damages of interruption and delay of decision.
165	—— Sept. 27th,	Presses the decision upon the preceding letters, and states the consequent interruption of the work.

* Printed Documents.

Washington City, April 21st, 1835.

SIR:—This is to introduce to you Messrs. M'Donald and King, who have been engaged as artificers in the Coast Survey—the first, two campaigns—the second, the last campaign, according to your request. They will give to you, no doubt, all the information they possess about it.

I am happy that this first call of yours yesterday introduces a proper investigation of the many accusations started against my conduct in the Coast Survey, to misguide your judgment upon the work and myself.

I wish you would please to call for all my assistants and men that have been about me in the work.

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Washington City, April 21st, 1835.

Messrs. M'Donald and King, jun., Georgetown, D. C.:—Immediately after the reception of this, please to go to the Hon. the Secretary of the Navy; present to him the enclosed letter, and give to him, or to any other person whom he may direct you to, all the information upon the Coast Survey concerns that you are able to give.

Yours, &c.

F. R. HASSLER.

(Show also this letter.)

The day after, Mr. Dahlgren, midshipman, assistant in the Coast Survey, present for the calculations, was directed similarly to the Secretary of the Navy. All were there, and gave the information required. The Secretary of the Navy, however, requested that I should not, as I had offered by Mr. Dahlgren, direct any other assistants to come here to give further informations.

Washington City, April 21st, 1835.

SIR:—Your favor of yesterday requires only a few remarks, which I will here place indiscriminately and short.

In letters of mine of 18th December, 1817, and 3d April, 1818—(printed Documents, pages 15 and 16)—you find the principles upon which I was then already authorized to activate the secondary triangulations and the detail surveys.

The near coincidence of the results of the work of 1833, and even of the accurately measured base-line of last summer, have still increased this mathematical authorization.

The field-work must, by its nature, always be ahead of the calculations, which can only be grounded upon the results of it, after the two parts remain for years distant from one another. (See the accounts of all previous scientific surveys.)

I have also stated somewhere before, that preliminary calculations are always indispensable, and therefore always the natural precursors of the ultimate results; and when these prove so well as they have done in my work, satisfaction is the only expression that can with propriety be uttered upon them.

I have, as you know very well, frequently, this year past, been obliged to lay aside these calculations for a correspondence, which a proper trust in my arrangements would have prevented, and which, of course, delayed the work; all my assistants can testify this.

As you appear very anxious of knowing some results of the calculations of the base-line, before the regular report, which will be made after it is fully finished, I state to you here the two distances which form bases of the detail triangulations.

West end of base to 5200 metre mark = 5201,84777
" " Head and Horns station = 13059,0082

The final whole base-line between the two extreme monuments is now under calculation, to reduce the actually measured line to that between the monuments.

The whole of the difficulties of the Fourth Auditor having arisen from different views and explanations of the *wording* of my *contract*, you may easily conceive that detail special requisitions, which by their nature present far more scope for a varied explanation of wording, cannot otherwise but make one apprehensive of far more difficulties. Upon *trifles* difficulties generally arise; large things are more easily settled.

You will find, on comparison with the practice in the smaller surveying parties, that the whole of the articles, of which I have handed you a list, would there be included under the general denomination of contingencies. That I am, as evident by this, less trusted than a lieutenant of artillery or engineers, is not a feeling which you would ever reckon among the agreeable ones, as a reward for the extra exertions which my work requires.

I have given sufficient reasons why the *Experiment* can never serve in the Coast Survey; and I hope that no vessel whatsoever will be put on this service in direct opposition to my judgment, whatever may be the judgment of naval men.

Upon the question of increase (not of compensation, which was never disagreed upon, but) of my *allowance for personal expenditure*, I have given as fair a statement, to the President and to you, as upon any of the mathematical parts of the work: if it is believed, *the arrangements*, which are so easy, *will be made* in any of the ways which I have formerly proposed. The *unavoidable consequences of a refusal*, I have already stated to you, *lie entirely out of my control.*

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
April 27th, 1835.

SIR:—In your letter of 20th inst. you give a detail of articles needed for the Coast Survey, and which you prefer to purchase for yourself, and which in your letter of the 20th inst. you say will cost between $500 and $800. You will procure them in the best way you can, and have the accounts for the same regularly transmitted through the disbursing officer of the Coast Survey to the proper accounting officers of the Treasury Department.

It is not expected that you shall give a detail in advance of the articles you may want while at work on the Survey, nor of the other expenses it may be necessary to incur at such times, unless the same are of considerable amount; but all such articles procured, and all such expenses incurred, must be regularly accounted for: the accounts under the present arrangement must be submitted to the Fourth Auditor and to the Second Comptroller of the Treasury Department, who will decide whether the disbursements on these accounts are "such expenses of a public nature as may be properly chargeable to the appropriation for the Coast Survey," or not; and who, if they find them not so chargeable, will reject them.

The exercise of this power on the part of the accounting officers of the Treasury, to which you strongly object, and which may be, and often is, extremely inconvenient to those who have accounts to settle or duties to perform requiring expenditures, is so connected with the whole policy of our government, that it cannot be dispensed with in favor of any individual.

I am with great respect,

MAHLON DICKERSON.

F. R. HASSLER, Esq., Surveyor of United States Coast,
Washington City.

Washington City, April 29th, 1835.

SIR:—Your favor of the 27th, received this morning, placing the question upon detailed requisitions exactly upon the footing upon which I have treated it from the very beginning to this day, I have only to observe that not a single item of expenses has ever been ordered by me or incurred in the Coast Survey which has not passed the very routine of accounts which you mention, and which I had established at the very beginning in 1816.

As for the judgment of any accounting officer upon any such item, I suppose it will always be legal to show the reason why any item put in question by them should pass: this is certainly as much in the principles of the policy of the government of the United States as in that of any other government.

It remains to me only to call now your attention to the decision of the two other subjects yet under your consideration, relating to the suspended items of the accounts of Capt. W. H. Swift, and the more appropriated allowance for personal expenses, which have both been sufficiently discussed in my former letters.

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
April 30th, 1835.

SIR:—I wish you to inform me if any thing was done by you on the Weights and Measures in the winter of 1833–34, or during the last spring. You need not go into any detail; but a statement in general terms of the service performed will answer. I believe no report was made in 1834 upon this subject, and Governor Woodbury, not being in the Treasury Department in the winter, 1833–34, has no information on the subject.

I am, &c.

MAHLON DICKERSON.

F. R. HASSLER, Esq.

Washington City, April 30th, 1835.

SIR:—In answer to your favor of this day, required short, I have the honor to state, that in the winter of 1833–34 there was nothing

done in the Weights and Measures. The State Department had not even issued the circulars agreed upon for calling in the foreign standards; I was thereby obliged to write myself; my account to the Secretary of the Treasury upon these questions is full and detailed.

I have, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington.

NAVY DEPARTMENT,
April 30th, 1835.

SIR:—I wish to know whether you were informed, before your arrival at this place in the fall, 1833, that you would have nothing to do on the Weights and Measures, or whether you came here expecting to have some duties to perform on Weights and Measures, and discovered, after coming here, that the State Department had not written the circulars for calling in the foreign standards, by which a suspension was put to the business, and whether this circumstance did not impose duties upon you.

I wish also to know the date of your letter to the Secretary of the Treasury on the subject, and whether it was printed in our documents.

I am, &c.

MAHLON DICKERSON.

F. R. HASSLER, Esq.

Washington City, April 30th, 1835.

SIR:—Your second favor of this day contains several questions; I will answer briefly.

1. My absence in the field, in summer, 1833, made it of course impossible for me to know what had been done here in relation to the Weight and Measure works until I arrived again here, equally ready to act in any case, considering both works equally demanding my attention.

2. In former letters I have stated, that the circulars agreed upon with the State Department to collect the foreign weights and measures having not been made, I supplied this immediately by a private correspondence of some extent with men of science, taking advantage of every occasion that presented itself; the result has however, as yet, been only trifling in actual reception of the objects required.

3. I made of course also various other inquiries about the means that might be made disposable for the works of the Weights and Measures. I had samples of the necessary metal made by Mr. Hitz, who is now engaged in the work, &c.

4. The following of my letters to the Treasury Department relate to this subject in detail: one of 12th January, 1834 (printed Documents, page 120), containing the first and main exposition of the case; those of 4th August, 1834, 9th February, 1835, 21st September, 1835, contain nearer details; and you will easily recollect those addressed to you this winter, containing statements to the same effect.

I have, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington.

Third Report of F. R. Hassler, as Superintendent of the Survey of the Coast, upon the progress of that work, from November, 1834, *until May,* 1835.

It is proper that every spring and fall a regular report shall be made upon the works that have been executed since the last report, the state in which they are at the time, and the prospects or plans for the further prosecution or the measures to be taken; such as to make a full series of public documents upon the leading facts, to be laid before Congress, and for the information of the public in general. I therefore herewith present the same, as follows:

1. It has been stated in my report of November last, that, and in some measure now, the base-line, which shall serve as foundation for the whole work, has been measured. My own principal work during the winter just passed was, therefore, to make all the necessary and very extensive calculations, which this work required by its nature, to deduce the final results, as I have given the idea of it in my last report. All such calculations must necessarily be made at least double, and then be revised by comparison; my assistants, Captain Wm. H. Swift, of the Topographical Engineers, and passed midshipman John A. Dahlgren, of the Navy, assisted in turn to make these second calculations, which have just now been finished.

2. The peculiarly favorable locality of the base-line, besides the use of any one of its parts for the soundings of the sea-shore at which it lies, gave the opportunity to ground upon the measurement that has been made, three determined distances of different lengths, to serve, the two smaller ones for the secondary triangulation of the neighborhood, and the ultimate whole line for the large main triangulation. These three distances resulted, after all reductions, as follows:

	metre.	yards.	miles.
From the West End to 5200 metre mark =	5201,8478 =	5690,376	= 3,2336
" " " " " Head and Horns =	13059,0082 =	14285,440	= 8,1180
" " " " " East Monument =	14058,9870 =	15379,3286	= 8,7396

3. With the last distance all the main triangles are now calculating over again, as it is proper to do; and the results will be used for the introduction of all the triangle points upon the map projections that will be given to the topographical surveyors and the sounding expeditions, to fill up, in the same manner as has been shown by the works presented last winter, but upon a much larger scale.

4. These results would have been obtained much earlier, if the difficulties of mere form, which have been thrown in the way of the general progress of the work, had not obliged me to lay my work so frequently aside for the correspondence, to which these difficulties necessitated me to direct my attention.

5. The detail maps of that part of the topography and soundings of Great South Bay of Long Island, by Lieutenant Gedney and Mr. Renard, which have been executed during the about five weeks that it was possible to work at them last fall, comprehending a distance of upwards of eight miles in length, and about the same in breadth, have been shown in due time; and the same assistants who have produced them are now again in the field, in continuation of their work. These maps are however such as must be kept for the general stock of the results of the Coast Survey, of which they form the first beginning; they can therefore not be added to this report, as no duplicates are on hand.

6. To prepare for the further prosecution of the topographical and the naval part of the work, that give the final execution of the maps, Mr. Renard was here with me this winter, and made the projections of the different sheets that are to be distributed to the different parties to be filled up by their work, when the triangle points have been inserted into them from the calculations. A map of assemblage is joined herewith, which shows as well the principles upon which such works are to be distributed and ordered, as the great quantity of work for which the triangulations hitherto made have procured the elements.

7. The number of sheets of maps presented by this assemblage shows evidently how much could have been fully and finally executed; they are to the number of twenty-seven, and more are preparing by the secondary triangulations going on at this moment, which could have been all executed this year, if the means had been disposable to carry on the work, as the proper progress and the best economy in its prosecution would have made desirable.

8. But having, with these views and the knowledge that the next appropriation would likely be made only some time in summer 1836, spared from the last appropriation about $15,000, to employ them this year in the fulfilment of these proper plans, and expected from the last Congress an appropriation of $40,000, according to my estimate given in, I calculated all my plans upon the means of $55,000, thus apparently disposable; the appropriation, however, being only $30,000, and the payment of the vessel for the sounding expedition being laid upon the Coast Survey appropriation, to the amount of near $10,000, while before it had always been intended that these expenses should come out of the general navy appropriation, these circumstances reduced the funds upon which I had calculated, for about $20,000, be-

low the necessary means, so that the funds remaining available are reduced below $34,000, which is insufficient for the intended aim, and must be made use of to the best advantage within its reach.

9. During the time that I was thus engaged here, partly with my assistants, Mr. Ferguson recalculated the latitudes, azimuths, and other mixed astronomical observations, and Mr. Blunt recalculated the triangulation which he had made, upon the results communicated to him, of the base-line stated above, between base west and 5,200 metre mark. They are now both again occupied at the continuation of their respective triangulations; Mr. Ferguson in New Jersey, and Mr. Blunt upon the west part of Long Island.

10. I cannot omit to record it here, that the remainder of the appropriation stated in § 8 must now be necessarily stretched out, so as to defray the outfit of two years, namely, that of this whole year, and that of next spring, and therefore the works be so much restricted in their extent, that notwithstanding my actually executed preparations for the final mapping are great, the result possible to be presented will necessarily remain far behind what I had prepared for, and there will need the utmost indulgence and regard to the circumstances under which I labor, and which no exertions of mine, ever so great, can possibly overcome. I can only lament the disappointment of the public in general, in the expectations which I have observed that it had of this work, and my own, by the frustration of my hopes to answer these expectations. A later execution of these detail parts will become a great deal more expensive than they would have been if immediately now executed.

11. The junction of the survey of the coast of Maryland with the Coast Survey, which has been sanctioned last winter, must necessarily now be attended to this spring. The legislature of Maryland has made this winter permanent arrangements for its execution; and Mr. Alexander, who is charged with that task, expects me to meet him in Baltimore, to join in the necessary reconoissances for the projecting of a proper triangulation of that part of the country, and its junction with my executed triangulation near New York and its neighborhood.

12. This work of the map of Maryland being set in activity, and the state government paying the secondary triangulation and the topographical work, the Coast Survey will be made to proceed in two places, and thereby, it may be hoped, progress with so much more rapidity; but it is of course my task to attend to this junction as soon as I may be able to leave here in the spring.

13. This extension of the work in two directions, to enable me to employ a double series of secondary triangulation and detail surveys, was always in my plan, as stated long ago, on account of the acceleration which it naturally presents for the completion of the work in general.

14. To the unfavorable circumstances quoted above I must still add, that the large theodolite, ordered from Troughton and Simms in London, has not yet arrived, and may perhaps not arrive early enough to allow time to make all the observations that I had contemplated to make with it this year. The final execution of such an instrument

generally takes so much more time of the chief of the establishment himself than what might be thought, that they can never be expected at the time when he first promised to finish them, according to his own first expectations; this work partakes of the same changes from nature as the geodetic or astronomical observations, for which the instrument is intended, and is therefore as to time equally uncertain.

15. The old two-feet theodolite is in such a state (as already said) that it requires too great a waste of time to get by it results, ultimately inferior to what is required in the case; so that even the intermediate use of it would not be a proper employment of the time and expenses required. Before it can render the proper services again, it must be sent back to the maker in London; and I should propose rather to try to give it to him in part payment of the instruments ordered of him besides those received, and the great theodolite now expected, which I believe his well known liberal dispositions would incline him to admit.

16. Under the consideration of these circumstances, the most advantageous employment of my own exertions, in the work of the Coast Survey, is naturally the reconnoitering for the future extension of the triangulation both in Maryland and on the whole line till to the present triangulation, and even to the east of it, if the instrument expected should not arrive before the end of the first part; while my assistants would be engaged, as much as the means of the remaining Coast Survey appropriation will allow, in the prosecution of the secondary triangulation, the topographical and the sounding parts, to approach as near as possible to the results which I had flattered myself to present to the next Congress as the works of this year.

17. It is not here the place to make propositions for the detail organization of the work, but I may nevertheless state, that it is essential for the work itself, abstractly speaking, that I should have the proper liberty, stipulated and granted by my contracts, to take all the measures which my long experience and my presence in the work indicate to me; as it is impossible for any man not in that very situation, to form an adequate and appropriate judgment upon these measures, and the adaptation to circumstances.

18. The monuments placed at the two extremities of the base-line upon Fire Island beach, ought to be placed under some public guard, of some kind or other, in order to prevent that the tendency to mischief, or cupidity to get the stones, may not tend to their destruction; the importance of their preservation for future use is self-evident, and the expenses naturally and unavoidably attending the measurement of a base-line have given to them even a great pecuniary value, which it is desirable to preserve from loss.

19. The same reasons and consequent reasoning apply to the two points of Ruland's and West Hills, which form what is often called the "*mountain base-line*," and which lie in situations far less subject to accidental deterioration from accidents of nature than the two monuments near the sea-shore upon Fire Island beach.

20. It would be extremely desirable that some legal protection could be given to our signals in general during the work; as experience has proved, particularly in Connecticut, that they were subject to daily

injury, or even to be taken away; as the publication proves which I was obliged to make in September, 1833, but did not prevent it. This insecurity of the signals is not only a great annoyance to the work, but a considerable loss of time and money, by the frequent journeys for the replacement of the signals to which it necessitates; that certainty in our operations is very difficult to obtain under such uncertainty of the steadiness of our signals is evident by itself, and a remedy to it very desirable.

F. R. HASSLER.

Washington City, May 8th, 1835.

Map joined to this Report.

Map of assemblage for the topographical and sounding parts within the triangulation executed before 1835.

To the President of the United States.

The subscribers, to whom was referred the letter of Mr. Hassler of the 5th of February last, on the subject of the Coast Survey, have had the same under consideration, and beg leave to submit the following report:

Mr. Hassler complains that the accounts of the disbursing officer of the Coast Survey have been suspended in the Navy Department for a whole year; that in consequence, that officer cannot obey his instructions; that the discussions growing out of this circumstance have taken up most of his (Mr. Hassler's) time since October last; and therefore has extremely retarded the work, and occasioned a waste of time and money.

He requests that the accounts of the Coast Survey shall pass according to precedents established in settling the same in the Treasury Department, whose officers had the proper knowledge of the contract and its import.

He states further, that on a renewal of the contract of 1816 in the year 1832, the allowance for his personal expenses was reduced from $2,000 to $1,500 annually; that immediately on the acceptance of the contract on the 12th of August, 1832, he stated that it would prove insufficient, but that it could easily be bettered at a future period, as the government would certainly not wish to put him to pecuniary loss; that he had no doubt that on showing to the President the nature and quality of the work, he would grant to him the augmentation indispensable to enable him to meet these expenses, and to do the work.

He states that his personal expenses amount to $3,000 annually on the Survey by the constant travelling life, and high expenses it occasions, even under the greatest economy, that he has incurred debts on

this account since the 2d of August, 1832, at the rate of $1,500 a year, in all to the sum of $4,000. He therefore requests that his allowance for his personal expenses may be increased to the sum of $3,000 a year, in addition to his salary of a like sum, and that this increased allowance may be carried back to the 2d of August, 1832, when he began the double work of the Coast Survey and Weights and Measures and Hydrometers, to enable him to go on entirely devoted to his work, free of pecuniary embarrassment.

We must here observe that the difficulties as to the accounts of the Coast Survey have grown out of the irregularities of those accounts. Mr. Hassler entertains an opinion that by a positive contract with the government, all charges for the Coast Survey made by his order must be allowed in the accounts of the disbursing officer; and under the practical exercise of that opinion, the accounts of the disbursing officer have not been in conformity with the regulations of the Treasury Department, and have of course been suspended, and to this may be attributed all the delay and loss of time and money of which Mr. Hassler complains.

What Mr. Hassler is pleased to call positive contracts, under which he has superintended the Coast Survey, and is now superintending the same, are letters of appointment in 1816 and 1832, with specifications of the duties to be performed by him, and compensation for the same; and his acceptance of the appointments under the conditions prescribed.

So far as it respects his own emoluments while in service, the letters of appointment are considered in the nature of contracts, but do not give Mr. Hassler the right he claims of having his accounts under any regulations different from those of other accounts.

The office which Mr. Hassler holds as Superintendent of the Coast Survey is held at the will of the President, and may be discontinued at his pleasure.

It is true, that on the 12th of July, 1816, Mr. Hassler submitted to the Treasury Department a communication in writing, headed "Articles of Agreement between the Treasury Department of the U. S. and F. R. Hassler, relative to the Survey of the Coast of the U. S.," and which was signed by Mr. Hassler; but it is equally true, that it was not signed by the Secretary of the Treasury, nor was it intended to be.

On the 3d of August, 1816, the Secretary of the Treasury, in a letter to Mr. Hassler, prescribes the terms and conditions under which his services were engaged—not adopting Mr. Hassler's proposed agreement, but referring to it as explanatory of the extent of his employment and engagement, should it be necessary. This letter of appointment, as it was accepted, was considered as the commission under which Mr. Hassler acted in 1816 and 1817.

On the 6th of August, 1832, Mr. Hassler submitted to the Treasury Department another communication in writing "upon the Articles of Agreement between the Treasury Department of the U. S. and F. R. Hassler, relative to the Coast Survey of the U. S.," which is signed by Mr. Hassler, but not by the Secretary of the Treasury. This, therefore, is no contract.

On the 9th of August, 1832, the Secretary of the Treasury, by his letter to Mr. Hassler, appointed him Superintendent of the Coast Survey, specifying the terms upon which he was appointed, the duties he was to perform, and the compensation he was to receive. This, therefore, is to be considered the commission under which Mr. Hassler now acts.

These circumstances are thus distinctly stated, because Mr. Hassler in various communications refers to his own papers of the 12th of July, 1816, and of the 6th of August, 1832, as contracts upon which he grounds his claims.

In the letter of the Secretary of the Treasury to Mr. Hassler of the 9th of August, 1832, he says: "Funds will be placed from time to time, upon your requisition, in the hands of one of your assistants, to be disbursed for such expenses of a *public nature, as may be properly chargeable* to the appropriation for the Survey of the Coast; and he will render his accounts, approved by you, quarterly to the First Auditor." If Mr. Hassler considers that this clause, or any other one in his letters of appointment, gives him the right to decide without appeal that any accounts he may direct the disbursing officer to make upon this work, or any purchases he may think proper to make for the same, shall be considered as expenses of a public nature, chargeable to the appropriation for the Coast Survey, he is certainly mistaken.

These accounts are to undergo a careful examination by the accounting officers of the Treasury, and to be suspended or rejected when irregularly or improperly exhibited. If it had been intended to exempt them from such examination, and the exercise of such suspension and rejection, the exemption would have been distinctly stated. But no such exemption was intended; and in fact it was not in the power of the Secretary of the Treasury, nor even of the President of the U. S., to afford to Mr. Hassler's accounts, or the accounts of the disbursing officer of the Coast Survey, an exemption from the examining power of the accounting officers of the Treasury, or to dispense with the performance of the duties in such case which the laws require of them.

Mr. Hassler is equally mistaken if he considers all the expressions indicating the manner in which the work of the Coast Survey is to be conducted, found in the letters of the Secretary of the Treasury to him, of the 3d of August, 1816, or the 9th of August, 1832, or any others, as promises made in the nature of a contract. The Secretary of the Treasury, in his letter of the 9th of August, 1832, says to Mr. Hassler, that he is appointed under the superintendence of that Department to Survey the Coast. Yet this superintendence has since been transferred to the Navy Department. In the same letter it is stated that the accounts of the Survey shall be rendered to the First Auditor; by a new arrangement, they are to be rendered to the Fourth Auditor. These changes have been made without the consent of Mr. Hassler, and without the slightest infringement of any promise made to him. These do not affect the amount of labor to be performed by Mr. Hassler, nor the amount of his compensation. It is true that several items of the accounts of the disbursing officer of the Coast

Survey have been suspended by the Fourth Auditor of the Treasury Department, because, as rendered, they did not conform to the regulations of the Department. For instance, the accounts for field equipage, baggage-wagon, and horses, were suspended, because they were purchased by Mr. Hassler without authority.

Mr. M'Lane, in his letter to Mr. Hassler of the 9th August, 1832, states to him, that "in all other respects than those indicated by this letter, the terms and nature of your employment will be the same as were fixed by the letter addressed to you by this Department on the 3d August, 1816."

By a reference to that letter we find this article addressed to Mr. Hassler: "you *will be provided* with competent assistance of officers and men from the corps of engineers and from the navy, with tents and field equipage, *with* BAGGAGE WAGONS and horses, and you will have the free use of the public instruments and books for the purposes of the Survey." This absolutely precludes the idea that Mr. Hassler was to procure the assistance of officers and men for himself, or to purchase tents, equipage, wagons, or horses for the Survey.

It is true that afterwards, for certain reasons, further power as to the transportation of instruments, baggage, tools, &c. for the Survey was given to Mr. Hassler by a letter from Mr. Crawford of the 30th Nov. 1816. But this letter is not noticed by Mr. M'Lane in his letter of the 9th August, 1832. The Fourth Auditor, therefore, could find no authority under which Mr. Hassler made the purchase of a carriage and horses for the Survey. He therefore suspended the accounts for their purchase.

On an explanation, however, on the part of the disbursing officer, the Secretary of the Navy agreed that these articles thus purchased should be considered as belonging to the United States, and as regularly provided for the Survey. With this concession, which was satisfactory to the Fourth Auditor, most of the suspended items have been passed to the credit of the disbursing officer of the Coast Survey. But there are some items of the account suspended, in which the interference of the Secretary of the Navy cannot remove the difficulty. These are for charges made by Mr. Hassler for items which, in the opinion of the Fourth Auditor, ought to be considered as for his personal expenses, or so blended with them as not to be separated from them without great difficulty and without further explanation. The reasons for suspending these items are given in the paper hereto annexed by the Fourth Auditor.

As to Mr. Hassler's request "that the accounts of the Coast Survey shall pass according to precedents given by the Treasury Department, whose accounting officers had a proper knowledge of the contract and its import," it is to be observed, that these accounts are settled by the accounting officers of the Treasury now as they were formerly. They are now submitted to the Fourth Auditor and Second Comptroller; they were formerly submitted to the First Auditor and First Comptroller.

But these Auditors and Comptrollers are all equally the accounting officers of the Treasury Department.

If an item of accounts should be presented to the Fourth Auditor, it is his duty to allow it, if he thinks it just, and exhibited agreeably to regulations—even if there were no precedents for its admission—or even if there were precedents for its rejection or suspension under the decision of any Auditor; on the other hand, if he thinks it unjust, he will reject or suspend it, notwithstanding another Auditor may have admitted a similar charge.

If the First Auditor has admitted a charge against the United States on account of the Coast Survey which in fact should be considered as a part of Mr. Hassler's personal expenses, it affords a good reason for asking Mr. Hassler to return the money improperly received, but none for continuing the abuse.

The transportation of the instruments, books, and papers, from the places at which the surveys are made to Washington, every fall, and back again every spring, is attended with great delay, exposes the instruments to injury, and is, in our opinion, a needless expense, unless the same are brought here for other purposes than those of the Coast Survey. The calculations can as well be made in the neighborhood of the survey as in the District of Columbia. In 1816 and 1817, the calculations for the Survey were made at Newark, New Jersey, and not at the seat of government. As, however, Mr. Hassler is engaged in the work of Weights and Measures at this place, it is necessary to bring on with him at least a part of the instruments, books, and papers used in the Coast Survey; and whilst this necessity exists, the expense of removing such instruments, &c. should be charged to the appropriation for Weights and Measures, and not to that of the Coast Survey.

Under Mr. Hassler's appointment of 1832, his compensation was fixed at $4,500 a year; that is, a salary of $3,000, and an allowance of $1,500 for his personal expenses. Why Mr. Hassler's personal expenses should so far exceed those of other officers of the government, whose duties require that they should be constantly travelling, we cannot understand; and therefore cannot decide that they are inadequate, unless by personal expenses he includes those of his family, or the loss he sustains by neglecting his own private affairs. But his salary was meant as a provision for those; and they are certainly not to be considered among his personal expenses.

To enable Mr. Hassler to proceed with the Survey, a suspension of which would be a serious misfortune, we respectfully recommend that the accounts suspended previously to the 1st December last be passed to the credit of the disbursing officer of the Coast Survey, and that so much thereof as is not properly chargeable to the appropriation for the Coast Survey be charged to the appropriation for Weights and Measures; and that the allowance of $500 for one year, to commence on the first day of December last, be made to the Superintendent of the Survey, to cover all expenses of travelling and transporting instruments, books, &c. to and from Washington, not strictly chargeable to the appropriation for the Coast Survey, and that it be paid out of the money applicable to the subject of Weights and Measures.

This allowance is limited to one year, from a hope that in that time the work on Weights and Measures may be brought to a close.

All which is respectfully submitted.

LEVI WOODBURY.
MAHLON DICKERSON.
AMOS KENDALL.

May 5th, 1835.

Approved,—May 6th, 1835.
ANDREW JACKSON.

Mr. Hassler's Accounts.

Most of the difficulties in his accounts, of which Mr. Hassler complains, have been removed, and the suspended items long since passed to his credit. The suspensions were chiefly of two descriptions:—*first*, moneys paid for articles purchased for the Survey without competent authority:—*secondly*, moneys paid for charges which are considered in the light of Mr. Hassler's personal expenses.

The suspensions of the first class have been allowed, upon the sanction of the Secretary of the Navy to the purchases alluded to. The expenditures of the second class still remain suspended. They have grown out of a journey of Mr. Hassler to Washington City, in December, 1833, and his return in June, 1834, with the carriage and four horses, purchased by him for the Coast Survey. The views taken by the Fourth Auditor of these expenditures are as follows, viz.

1. Mr. Hassler has no public office in Washington connected with the Survey which made it necessary for him to come here.
2. He had no orders to come here by the head of the Department under which he acted.
3. It was travelling directly from the Coast Survey, instead of travelling to it, or in its execution.
4. It was not necessary to the preparation of his reports or drawings, which could be just as well executed in New York or in Connecticut.
5. It did not in any way facilitate or expedite his public duties. On the contrary, he had transported to Washington and back again many instruments and much baggage at a considerable expense; it occupied much time; it kept him at least five months from the scene of his operations; and it subjected the government to a charge of $48 per month for keeping the four horses in Washington, when, with proper management, they would have cost at the north not more than $20, besides other charges,—when the sole use to which the whole were applied during the five months, was to convey Mr. Hassler and his friends when they chose to ride for his own health or pleasure.

For these reasons, it was deemed by the Fourth Auditor that these expenditures could not be considered as incident to the Coast Survey, but must be treated as the personal expenses of Mr. Hassler. He supposed he did as much as he was authorized to do in allowing the keeping of the horses at Washington, on the ground that it would have been chargeable to the government had they been at any other place; but he did not think it right to allow the other expenses wholly produced by this journey, believing that Mr. Hassler, if he chooses to travel or ride with a carriage and attendants, should be content to pay the expenses himself, especially if the carriage and horses be furnished, repaired, and kept at the public charge.

The entire amount suspended is $412.25, with $5.64 commission thereon. Upwards of $50, and probably more than $150 of this sum will be allowed upon explanations which have been or will be given.

The disallowances on account of the journey to Washington will be less than $200.

NAVY DEPARTMENT,
May 8th, 1835.

SIR:—Your letter of the 5th of February last, addressed to the President of the United States, was referred to Mr. Woodbury, Mr. Dickerson, and Mr. Kendall, for a report on the subject. In pursuance of this reference, a report was prepared and submitted to the President, who has approved the same, and ordered that the accounts suspended previously to the first of December last be passed to the credit of the disbursing officer of the Coast Survey, and that so much thereof as is not chargeable to the appropriation for the Coast Survey, be charged to the appropriation for Weights and Measures; and that the allowance of five hundred dollars for one year, to commence on the first day of December last, be made to the Superintendent of the Survey, to cover all expenses of travelling and transporting instruments, books, &c., to and from Washington, not strictly chargeable to the appropriation for the Coast Survey, and that it be paid out of the money applicable to the subject of Weights and Measures.

That this order may be carried into effect, the proper instructions have this day been communicated to the Fourth Auditor of the Treasury.

I am, &c.

JOHN BOYLE,
Acting Secretary of the Navy.

F. R. HASSLER, Esq.

Washington City, May 12th, 1835.

SIR:—Your favor of the 8th instant, announcing me the decision of the gentlemen whom the President had directed to make a report upon various questions relating to the Coast Survey, reached me in due time; this answer was delayed by my desire to peruse first the report itself, for the communication of which I thank you, as the letter in itself is not fully intelligible to me, and leaves several questions undecided.

As the detailed report requires of me several remarks, I refer all that I may have to say in respect to the subjects in question to the communication which I shall shortly make to you. In order to have the proper and full meaning practically ascertained, I have been obliged to direct Captain Wm. H. Swift, as accounting officer for the Coast Survey, to come here to give and receive such explanations as will be required to ascertain the real meaning, before I should be in the case of going to the field again; as in the present state of the question I should really not know how to act.

It is for instance not within my means of finding out one reason why the term of an apparently intended change of arrangement in the accounting concerns, by a partition of expenses between the Coast Survey and the Weight and Measure works, should date from the middle of a quarterly account the 1st of December, 1834, at which time almost the whole of my assistants were united with me at West Hills station upon Long Island, having just the day before observed the solar eclipse, as my letter of that time proves. I had no idea that the eclipse, which I intended as a datum for the Survey, could furnish a special date for the accounting concerns.

I am now here engaged with the two assistants, Lieutenant Mackay and Midshipman Dahlgren, in the calculation of the whole series of triangles, from the accurately measured base-line of Fire Island beach, to introduce the results in the map projections, for the topographical and sounding parties, prepared here in the early part of the winter by Mr. Renard. As these works must occupy yet some time, the business relating to the accounts can be settled in the mean time with Captain Swift, when he arrives.

I have, &c.

F. R. HASSLER.

JOHN BOYLE, Esq., Acting Secretary of the Navy.

Washington City, May 12th, 1835.

SIR:—Your favor of the 8th instant communicates to me the granting to Mr. Blunt of the additional compensation, equalising him with Mr. Ferguson, which will be received by him by this time.

I must take the liberty to repeat here the request made some time ago, which has hitherto neither been answered nor treated in the report made to the President: that the principle be made a general one, that every assistant taking charge in chief of a secondary triangulation or topographical survey, be allowed one quarter of the compensation which he otherwise has over and above the same, as this is necessary to cover the unavoidable increase of expenditure to which he is thereby subjected.

The natural distribution of the work, which will gradually follow, according to my arrangements, will always show when this allowance shall commence, by my direction given to the assistant in the case, as well as to the accounting officer.

It would be of no use to oblige every assistant in his turn in the case, to make a separate application, and to necessitate in the Department a separate discussion and direction, as at all events the measure is unavoidable. The regular sequel of the works will always furnish the proofs, besides the accounts and my directions.

You will very much oblige me by communicating to me as early a direction upon that subject as possible; as one case is now, and several others will occur shortly, as evident by my report upon the Coast Survey work, and its present state, handed into the President of the United States. The measure which I thus claim is exactly the parallel of the allowance made to officers of the army or navy for travelling, though it is impossible to rate it by mileage.

I have the honor, &c.

F. R. HASSLER.

JOHN BOYLE, Esq., Acting Secretary of the Navy.

To His Excellency, ANDREW JACKSON, *President of the U. S.*

1. Though the report which has been presented to you under the 5th inst., upon the subject of the Survey of the Coast, would appear friendly in its general conclusions, it contains statements which cannot be grounded upon proper information, and are direct attacks upon my character, which is a property that every honest man will defend to the last.

2. Therefore I am sorry that from this circumstance I am obliged to present to you herewith the true state of the facts upon some of the most essential parts of it, though I will not touch upon every point, not to detain you; and because I know that it has always been the practice here, to present me as a man difficult to deal with, which is directly the opposite of my real disposition; while on another side, since the Coast Survey has been transferred to the Navy Department, it has been attempted to place me in a situation not supportable, and tending directly to the destruction of the work; for the report evidently lays in store the foundation

of new difficulties, which it is intended to raise next winter. I have therefore to lament that my first proposition of last November has not been regarded, which was, to establish an impartial investigation, by having persons understanding the subject and the various assistants, and even men employed in the work in any way, as well in 1817 as since 1832—then the erroneous statements upon which the accusations against me are grounded, would never have had any weight—therefore all the late difficulties would not have occurred, and I would not need now to say a word further upon it. I request, therefore, herewith again that such an impartial investigation be made. My letters contain full statements upon every leading point; as they seem disregarded, it would be useless to repeat them; the investigation will decide them upon documents, and upon the judgment of men of proper acquirements to judge with propriety.

At the head of each article I am obliged to quote the words of the report to which my remarks refer. Thus,

1. "And under the practical exercise of that opinion, the accounts of the disbursing officer have not been in conformity with the regulations of the Treasury Department, and have of course been suspended."

It is not the meaning of my claim that the accounts shall pass merely because I am authorized to order the objects forming the items; but their *propriety* for the benefit of the Coast Survey work *shall evidently make them pass.*

2. "To this may be attributed all the delay, and loss of time and money, of which Mr. Hassler complains."

This is evidently *different from the documented facts.* If I had obeyed the objections made in August, 1834 (printed Documents, p. 160), when the appointment of artificers was rejected under the pretence that I had no right to appoint any, the whole work would have been stopped on the very day, because the base-line could not have been measured. All discussions hitherto would have equally affected the progress of the work, if I had not maintained against it until now by the utmost exertions for the work, and even at the venture of new wrong accusations; because it would be actually impossible under the limitations that have been attempted.

3. "So far as respects his own emoluments while in service, these letters of appointment are considered in the nature of contracts."

A contract is valid in full in all its parts, and on both sides equally, or not at all. And this is the law throughout the civilized world. And even with reservation in the acceptance: so, for instance, I consider myself fully authorized to the claim for augmentation of the allowance for expenditure on the ground of my reservation, to call upon this amelioration if the allowance of $1,500 should not prove sufficient, as actually has been the case, in the words, "As in any case I am certain it is not the intention of the government to put me in pecuniary loss, and that therefore in case it should be found appropriate, this part may easily be modified to the exigency of unforeseen circumstances."

That this is the case now, facts unfortunately too strong have proved to me.

4. "That it was not signed by the Secretary of the Treasury, nor was it intended to be."

These articles are *positively sanctioned* by the letter of the Treasury Department, 3d August, 1816, which refers to them as the *deciding rule in all doubtful cases*, when it states that,

(Art. 7.) If at any time it should be necessary to "explain the nature and extent of your employment and engagement, your communications to this Department, and particularly the articles submitted by you on the 12th July, 1816, will be resorted to."

5. "On the 6th of August, 1832, Mr. Hassler submitted to the Treasury Department another communication in writing upon the articles of agreement between the Treasury Department of the United States and F. R. Hassler, relative to the Coast Survey of the United States, which is signed by Mr. Hassler, but not by the Secretary of the Treasury. This, therefore, is no contract."

"On the 9th of August, 1832, the Secretary of the Treasury, by his letter to Mr. Hassler, appointed him Superintendent of the Coast Survey, specifying the terms upon which he was appointed, the duties which he was to perform, and the compensation he was to receive. This, therefore, is to be considered the commission under which Mr. Hassler now acts."

All this is to be considered exactly the same as the Fourth Auditor's letter, the last sections of which are equally positive, and confirming my old and new articles of engagement. I can therefore in no way be mistaken in this—that the items of account are chargeable to the government if they are *covered by any of the articles of agreement*; and that they were all *indispensable for the work*, and performed in the most economical manner, every assistant at the work can testify. The judgment of no man not acquainted with, or present at, the work, can possibly be a guide in relation to them.

6. "When irregularly or improperly exhibited."

This *accusation* I must repel. I leave it to be decided by the *impartial investigation long claimed, and now again asked for.* If any such were noticed by the Fourth Auditor in the first account, it was his duty to notify it instantly, instead of which five quarterly accounts now stand back, remaining in equal uncertainty, *which is against all possible regularity of office.*

7. "Mr. Hassler is equally mistaken if he considers," &c. All this section enters under the predicament of the 4th and 5th. I cannot be mistaken in that—the inquiry will show it.

8. "These changes have been made without the consent of Mr. Hassler, and without the slightest infringement of any promise made to him."

But immediately upon these charges being made, I represented, *as it was my duty to do, that they would prove highly detrimental to the work, as has actually been the case.* Nothing decided me to continue the work but the friendly way in which the President of the United States desired me to continue, and *promised me his protection*

against difficulties. It was too evident to me then, as well as now, that when a work of so many important ramifications in its arrangements, and requiring *an intimate knowledge of its nature* and organization, and even scientific qualifications, should pass from persons conversant with it for nearly twenty years, to men entirely new in it, serious difficulties must result. The very instances quoted in the report are proofs of it, as they show that items were suspended in doubt, which had passed the Treasury Department offices nearly two years before, with full approbation. No certainty whatever could exist in the transactions with the government, if such ways were admissible, and they are *actually in opposition to law, and to positive legal decisions.*

9. "You will be provided with," &c.

This implies, and by the very manner of its expression can imply, nothing more than *what is provided shall be at the expense of the government.* (See the Article under D and E, printed Documents, p. 8.) Not only was this providing left to me, *as it is in all countries, and in any cases of work of this nature, left to the chief;* but it would actually be impossible for the government to provide these things with propriety under any other direction. In the outfit of 1816, I had all the stands, apparatus, carriages, &c., made under my direction, without any other mention on the part of the Treasury Department than the simple adoption by passing the accounts; so it had always been practised, and with great economical advantages. It is moreover singular *how all this can be quoted now again, after it has been fully settled, as well formerly as lately.*

10. "These are for charges made by Mr. Hassler for items which in the opinion of the Fourth Auditor ought to be considered as for his personal expenses."

Sufficient explanation has been given upon these so called *different items,* and much more may be added if necessary. *The investigation called for* upon them will exhibit this; and I must only add, that I never made myself any charges; they are all the charges of the accounting officer under my orders, excepting one instance, which occurred long ago, before the accounting officer was chosen, which is long ago passed and approved.

11. "If the First Auditor has admitted a charge against the United States on account of the Coast Survey which in fact should be considered as a part of Mr. Hassler's personal expenses, it affords a good reason for asking Mr. Hassler to return the money improperly received, but none for continuing the abuse."

I positively protest against this accusation of having received any money improperly, and therefore I cannot consent to return any. Besides, as I have sacrificed all I had, none could be got out of me by any means, legal or illegal. As to discussing the manner and rules of the different accounting officers, I hope it is not wished that I should say any thing except that I know it better than it is exposed in the Report.

12. "The transportation of the instruments, books, and papers, from the places at which the surveys are made, to Washington every fall,

and back again every spring, is attended with great delay, exposes the instruments to injury, and is in our opinion a needless expense, unless the same are brought here for other purposes than that of the Coast Survey."

This statement is *directly contrary to the fact*, and upon it I *repeat the request of an impartial investigation* by men of knowledge in the subject, and that all my assistants and even the men employed be examined upon it. *If this be not granted, the statement must rest under the charge of its being devoid of all truth, which I hereby record to be documented, as well as the charge itself; and whoever may have given such information* to the accounting officer or the Secretary, *has reported that which is not true.*

13. "In 1816 and 1817 the calculations for the Survey were made at Newark, New Jersey, and not at the seat of government."

I have already elsewhere stated the history of all that part. I took up *my home* at Newark in 1816. Now not only my home, but also an *office disposable without expense* for the Coast Survey are here in Washington, and $2,000 would not pay for an alteration in it. It was in 1832 desired that I should be here in the winter to be at hand to give information that might be required immediately, after the experience made in 1818 that the delay unavoidable by my distance from Washington occasioned the abolition of the work.

I therefore here again declare, as in my former correspondence, that such a difficulty laid in the way I must consider *as an indirect measure to abolish the Coast Survey, as in* 1818. It is besides a real curiosity why my coming to Washington is objected, while that of not one of my assistants has been objected to; when these, however, could never have proceeded one day in their work without my presence.

How will this reasoning stand when the work is near Washington, as the junction with the Maryland Survey, at which I shall work this summer, as stated in my report, is in activity; shall I move every thing from the neighborhood of Baltimore or Washington to New York, Connecticut, or Rhode Island?—or where? As the work increases, a permanent office here in Washington for the writing of its parts becomes *daily more necessary*, therefore *unavoidable*. Of what it is proper to transport, I consider that no man but myself can judge. The instruments used in the field have never been transported to Washington after they have once been taken away *from the place where they rested since* 1818. They were only *taken away gradually as they were needed*, thence arises the erroneous idea of their *travelling*. They were deposited in the public buildings, the loft of the custom-house in New York, and their number there has increased even this winter.

14. "And while the necessity exists, the expense of removing such instruments, &c. should be charged to the appropriation for Weights and Measures, and not to that of the Coast Survey."

The other objects, as journals, preliminary maps, plotting instruments, and such like, must be brought to Washington, where those objects required for the winter work are, the bulk or value of which makes them less transportable—where the library required for the work

is also at hand for the necessary use. This is so much less avoidable, as of all these implements there is not yet a supply on hand for more than one draughtsman. It is, of course, entirely indifferent to me to what appropriation, Department, &c. these expenses may be charged. I can only say in relation to them, that my compensation, even with the $500 *for this year, cannot bear them;* and that whenever the free use of carriage, horses, &c. for the *travelling which I know to be necessary in my works for the Coast Survey* is taken away from me, *I should consider it as a declaration that my services in the Coast Survey are intended to be dispensed with;* for I had stipulated this, (§ 6, printed Documents, page 83,) well knowing that the duty I had to perform, as well as my age, required this assistance.

15. "He alleges that his personal expenses amount to $3,000, &c."

I do not *allege. I state this exactly as I state any other result of the Coast Survey, and it is equally true. I know that every man who would try it would find it so. If I do not deserve trust in this assertion, neither must my mathematical results be trusted. It is a thing entirely out of my control, and I have said enough upon it before.*

To speak of my own pecuniary affairs is the most disagreeable of all things that could be laid upon me, (as I always despised money, which I have all my life-time found to do *harm or good without judgment and certainty of result.*) Details and comparisons upon this point would be easy, and could be made in number—those alleged are without any weight, because the circumstances are widely different. As an instance of this difference, I may quote that in my native country, Switzerland, where I made a similar work, I would undertake exactly the same works and conditions as I have in the Coast Survey for $1,200 annually, live with far greater ease and comfort, than $6,000 are capable of producing in this country: in that work *such things are altogether local, and depending upon circumstances which no person can judge of who is not in the case himself.*

The travelling expenses which this work occasions are widely different from all others, as every officer of government can testify who has been upon works in any way similar.

16. "Unless by personal expenses he includes those of his family."

This is evidently only thrown in as a useless by-word; if fitting an official report, I will not decide.

17. "To enable Mr. Hassler to proceed with the Survey, a suspension of which would be a serious misfortune, we respectfully recommend, &c."

With these views of *procuring the advantage of an accurate Survey of our Coast to my adopted country, the United States,* I have spared no exertions since 1806, when it first was proposed to me. By the various unfortunate changes of views that the work has undergone, and to which I have always been a sacrifice as now, I have lost about $16,000 in it, which I certainly can consider as a fully sufficient share on my part to promote the public good in this line, to which I have added my full exertions for more than ten years, the best of my life. I worked in the combination of the means for it long before I

had the least compensation, *without ever thinking of asking any for my previous works, like others received.* Any disposition whatsoever, taken from any source that will be found proper, that will enable me to continue the field operations after the close of the calculations now indispensably to be made here, is, of course, equally acceptable to me. I have nothing to say upon that, but that while last year I was yet able to borrow $1,100 to go on with the work, as proved by my letter of 22d May, 1834, (printed Documents, page 156,) I am now unable to do the same thing, because this debt, instead of being reimbursed, has been increased, and for its payment I am entirely deprived of all means; and all persons present with me can be witness that I have lived in all respects free from any extravagance, or even ease, the most part of the time. I hope that *this simple statement of facts* will be sufficient to excuse all that I say upon the painful subject of my personal and economical concerns in the decisions made, or about to be made, upon the whole.

It may be considered as a peculiarity of this report, that after having heaped upon one another so many reasonings, guided by deluding and wrong statements, (how got is the question,) it finishes by demolishing, itself, all its own superstructure, finding the ground not tenable. I would therefore very gladly have passed over the whole with full ease, if the *aspersions* made *against my character* were not such as to need *positive removal* in the manner I have stated, both in § 12 above and in the answer to the statements of the Fourth Auditor hereafter. It necessitated repetitions on my part, which, to any reader of the previous documents, must prove an annoyance as it has proved to me.

My request of an investigation upon the whole subject of the accusation contained in this report is equally a *duty towards the gentlemen who have been misled by erroneous statements as towards me,* who am by them laid under accusations against which I must protest; and I hope it will this time not be refused, as it is evident that the granting of it before would have avoided the difficulties and the great useless trouble given to the President since last November, when *I first asked* for it. Against such a refusal I guard myself by the positive statement here of their being devoid of correctness of statement. I must so much the more insist upon it, as it is evident that they are intended to be reproduced next fall, if I should remain in the work without these questions being cleared up.

Answer of F. R. Hassler to the Notes of the Fourth Auditor upon the Accounts of the Accounting Officer for the Survey of the Coast, appended to the Report of 5th May, 1835, *made to the President of the United States by the Commission appointed for that purpose.*

As it is admitted in relation to the first class of items suspended in the accounts, that they are settled by the decision given in conformity

to the contracts made with me, it would be as useless for me to enter again into that question as it was to treat them in the remarks of the Fourth Auditor.

The various articles upon the second class of suspended items, it becomes, unfortunately, necessary to answer in full, in the order of their numbers; because the reasons given by the Fourth Auditor contain *aspersions against my character, which I must repel*, thus:

To 1st. This article is *contrary to fact*, as really the public office procured in time for the Weights and Measures in Washington, from the beginning of the Coast Survey, was always intended and understood to be at the same time the office where the work of the Coast Survey should centre, that I might be at hand when any information should be needed, &c. Besides that, if no such office was here, it would occasion a yearly useless expense of about $2,000 to establish it temporarily every year near the work as it progresses.

To 2d. I am positively the master of my movements in the work, as well by contract as by the nature of the work. *I alone can judge of the propriety of my moving in the work, by knowing where my duty and the state of the work requires me, and where the means to it lie. I alone can decide which occasions the least movement and the least expense.* No special orders *were ever required in this respect, nor can they be admitted;* this is the first instance *since ever such surveys were made*, either in this or any other country, that such requiring of orders was even mentioned as referring to the chief of a work of this nature.

To 3d, 4th, 5th, until "it occupies much time," (which is too long to quote, and will be seen in the report.) All these *statements and expressions*, besides denoting the *most complete ignorance of the nature and requisites of the work of the Coast Survey*, cannot otherwise but be grounded upon *informations having no foundation whatsoever in truth in any part, as upon them the decisions and unjust aspersions of my character are grounded*,—I request again the impartial full inquiry upon them, that I have often requested before; that the persons insinuating such assertions be called to light; that they be heard in comparison with my assistants and any other persons having a real knowledge of the principles upon which *I must conduct the work, if the result shall be good*, and such who may otherwise have a real knowledge of the facts to which they refer, and possess the scientific acquirements to qualify them as judges in the case; *that they all be heard fully, and all facts properly averred and written down in regular form of process.* If this *investigation should not be granted*, I lay those expressions under the *positive charge of untruth, to be documented by this* in the file of the Department, to *counteract the untrue accusations which they contain.*

The statement that the horses would have cost no more than $20 per month will prove itself erroneous by the accounts, unless it is intended to let the horses perish by abuse, &c.: what is here requested is *in all respects improper*, as I have stated before. The horses and conveyance or carriage have been made use of even for actual Coast Survey work in Washington. I requested, with full knowledge of all

the circumstances in my agreement of 6th August, 1832, (§ 6, page 83, of the printed Documents,) "He will have the sole and free disposition of the carriage," &c. which is sanctioned by the Treasury Department's letter of 9th August, 1832, (page 87.) As for the *littleness* of the reproach of my having sometimes, when worn out by working all day, and late in the nights, taken a little exercise, and perhaps even not alone, in the carriage with the horses that were standing idle, and required themselves some exercise to keep in health, I think it cannot be expected that I should *notice it more than by a slight shrug of the shoulders:* it can also not be expected that, at my age, I should make all the moving about, which my works require, on foot, as my strength would not admit of it.

The statement that the Fourth Auditor did not think it right "to allow the other expenses wholly produced by this journey, believing that Mr. H., if he chooses," &c. is fully answered by the above, as well as by the statements given before in my correspondence: as for the impossibility of my travelling otherwise than I do, in the season and under the circumstances under which I must travel, and my age, &c.; the investigation called for will quiet all that.

That I was kept here from 3d January to 29th of May, 1834, was solely due to the circumstance of Mr. Taney, then Secretary of the Treasury, never answering any of my letters, nor admitting me to a conversation; and after that, the transfer to the Navy Department on the 13th March, which *occasioned such a long correspondence,* that, instead of being able, as I expected, to leave Washington early in April, at which time all my work could have been finished, if the above two circumstances had not existed; I was detained by them until the time stated, and then even was obliged to *borrow money, upon my own credit, to pay as well the public as the private expenses to go to the field-work. All this happened before ever any account had been objected to; therefore, nothing of it can ever be attributed to my maintaining my position by contract, which was not disputed at that time.*

The President of the United States himself declared my agreement a positive contract.

In general, the ideas of distinction between the private and public expenses made by the Fourth Auditor I cannot share. I consider them as contrary to my contract, and the proper order and progress of the work: *as a contract to all intents and purposes in all the details, and obligatory on both sides,* I shall always consider my agreement with the government.

I am sure, for instance, the Fourth Auditor would admit the postages if I was to put them upon account, which, however, *I never did and never shall do,* though they amount to between one and two hundred dollars annually; but I consider that this will be covered by a proper allowance for expenditure, because I find it improper for me to make any declaration upon honor for two or three shillings a piece, as required in this case, in the common practice of army and navy. Whatever might be the ultimate disallowance in the accounts, I am forced to declare myself unable to pay it in any way whatsoever; also

this is settled by the decision that these accounts shall pass, and it presents only the curiosity of keeping up objections against me for the satisfaction of growing them up again.

The measure which I have announced to the Navy Department will best of all clear up the meaning of all these things.

F. R. HASSLER.

Washington City, May 14th, 1835.

Washington City, May 15th, 1835.

MOST HONORED SIR:—In your correspondence relating to the works for the construction of the Weight and Measure standards for the custom-houses, you expressed a willingness to make some proper allowance for my works in it, whenever there could be some actual works done. In conversation with the President of the United States the other day, he showed an equal willingness to sanction a proper allowance.

You know that this work requires now, on my part, considerable exertions and labor, and has done so since the beginning of last January, and that all my arrangements go on in a prosperous manner.

You know that the present works are made upon a proposition in Congress, providing especially for the payment of the expenses therefrom accruing, by referring them to the current expenses of the custom-houses. This arrangement is subsequent to my contract for the Coast Survey, in which it was formerly included, when the work was far less extensive than the work at present under my charge.

From this the change of circumstances, and the great increase of labor therefrom resulting, are fully evident; I have therefore no doubt but you will see the propriety of my receiving an adequate additional allowance for the additional labor. I take therefore the liberty to propose to you to allow to me $1,500 annually for these works, additional to my compensation and allowance for the Coast Survey, for as long as the two works may remain united under me.

If, however, an additional allowance of $500 annually is made permanently for the expenditures of the Coast Survey, then $1,000 will suffice to enable me to carry on the two works.

This allowance should begin with the 1st of January last, as well because my new work in the Weights and Measures began about that time, as in order to enable me to execute my works properly.

If this allowance should not be considered admissible in the manner stated, I take the liberty to request that you will consider me as devoting myself entirely and exclusively to the works for the Weights and Measures, at the rate of the allowance of $3,000 annually, as fixed for my works in the Weights and Measures, by the letter of the Treasury Department of the 30th April, 1831, and I shall then devote my exertions entirely to these works; because without the aid above

requested, which is in itself just in principle, not to load any man with work without compensation, it is impossible for me to continue any longer my exertions in both works, of which the Coast Survey leads me into expenses as unavoidable as impossible for me to bear, and I would therefore have to leave it.

It is well known to you that already last spring I was obliged to borrow money to enable me to leave here for the measurement of the base-line for the Coast Survey; since then, not only this debt is not paid, but it has been increased, and I am unable to move without that assistance.

Your earliest answer upon this deciding subject will oblige me, as unfortunately the whole of my situation towards the government depends now upon it.

I have the honor, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Treasury.

TREASURY DEPARTMENT,
May 16*th*, 1835.

SIR:—Yours of the 15th instant has been submitted to the President, and duly considered by him and this Department.

It is understood that a copy of the late report by the Secretary of the Navy, the Fourth Auditor, and the Secretary of the Treasury, concerning your compensation for attention to the Survey of the Coast, and the making of Weights and Measures, has been communicated to you, accompanied by the approval of the President.

All which remains, therefore, for the Department to do in regard to your claims, is to fulfil that report in respect to its recommendations on the subject of Weights and Measures; as the other subject is in charge of the Navy Department.

This it will proceed to do with great pleasure while you continue to superintend that subject.

But if, as intimated by your letter, and which would cause much regret, you should not continue your services in the Survey of the Coast, and expect to receive the same compensation, as a salary for the Weights and Measures alone, as you now receive for both objects, this Department is sorry to disappoint those expectations, but feels bound by the nature of the case and the views of the President to correct your impressions.

The making of the Weights, &c., in the present state of that subject and of the Survey, is of such subordinate importance, that it could not feel justified in allowing for attention to the former, not one half the amount now allowed for attention to both.

This, it is aware, would be an amount not deemed by yourself adequate to compensate for your whole time, nor is it proposed by the De-

partment as a reward for your *exclusive devotion* to the former subject alone.

That has not been contracted for heretofore, nor has it been desired, nor will it be necessary hereafter.

Under these circumstances, it is hoped that the addition made by the report before mentioned to your previous pay for both subjects, will prove satisfactory, and that you will continue to superintend both subjects till their completion.

But none of us feel justified in going beyond the recommendations contained in that report, coupled with the terms specified in the original contract.

With much consideration.

LEVI WOODBURY.

F. R. HASSLER, Esq., Washington City.

Washington City, May 16th, 1835.

MOST HONORED SIR:—Your answer of this day to my letter of yesterday, handed to you this morning, reached me immediately.

The report which you quote, as well as the decision taken upon it, I have carefully examined. Upon the first, I am sorry to be obliged to give to the President my statement of the real facts, and renew my request for a proper investigation, by hearing men conversant with the works of the Coast Survey and its principles; the second I have answered to the Navy Department some time ago, and requested the necessary explanations, as the wording of it could be considered as implying to load me personally with expenditures far above the allowance made, according as it may be interpreted or applied.

The Coast Survey appropriation, you know, should not be made to pay my works for the Weights and Measures, for which ample funds are authorized to be taken from the custom-house revenues. I thought, therefore, a compensation of my labors in this part would, with full propriety, come from these, as it cannot be expected to be done without compensation. In that case then, as I stated, I would have been enabled to carry on both works with my full energy and time.

Your refusal to coincide in this plan obliges me to relinquish the works of the Coast Survey, the expenses of which have brought my pecuniary affairs into such a situation as to preclude me from venturing into the field-work of it; for which also, by the arrangements of the report, there is no provision made. The circumstances thus produced leave me no other choice than to state to the President of the United States the resolutions to which I am compelled.

My compensation for the Weight and Measure works alone was fixed, as you know, at $3,000, which my work in it was thought well to deserve; and the works now to be performed in it by me will require the same labor and exertions.

In a general point of view, I should consider the forwarding of the friendly and just transactions between the citizens of a country, by a proper regulation of the Weights and Measures, as of about nearly equal value with the securing their property from loss by shipwreck by an accurate Survey of the Coast: the framers of the constitution found it sufficiently important to legislate upon it, and many citizens have shown the same views of it which I have just stated.

You consider it however of minor value, and propose to me only the half of what I now have—that is, I suppose, $2,500 annually; and you do not require me to give my whole time to that work, by which therefore I will be a gainer, and at all events avoid further losses, which I am unable to bear.

These conditions, though you yourself find them low, and I may therefore even hope to see bettered by time, are however such, that it becomes preferable for me, in a pecuniary point of view, and the necessary care for my family, to accept of them, rather than to continue in the Coast Survey, united to this work, without the separate pay for the Weight and Measure works, for which I have asked in my letter.

If therefore, as you state in your letter, it should not be found proper to alter any part of the decision, I will with no less cheerfulness than before attend to the duties which remain to me, and bring the Weight and Measure works to an honorable and permanently useful completion, however much I may regret the unfortunate issue of my long exertions, and the great sacrifices which I have made in the Coast Survey, which it is now out of my power to increase. You cannot otherwise but feel yourself the great relief there must be for me in the prospect of a situation deprived of the false appearance of being enviable, and in which I shall not be overladen with accusations and abuse, grounded upon unaverred statements, such as those of the report.

Money has never received my homage, nor will it ever receive it. Since I can recollect my principles of action, they have always remained the same, as you may find the same statement in my letter of the 11th June, 1816, (*printed Documents of the Coast Survey, page 5*, at the top,) and in that to Mr. Van Ness, commissioner for the boundary-line, of 9th May, 1819, which may be among the documents of the State Department.

I have the honor, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Treasury.

TREASURY DEPARTMENT,
May 18th, 1835.

SIR:—I am in the receipt of your letter of the 16th instant, and regret to learn from it that you propose to abandon the Survey of the Coast. But to prevent any misapprehension as to your compensation

for your future attention to the Weights and Measures alone, I would not only repeat the suggestion contained in my last letter, that in its present state it is deemed so subordinate a matter to the other, that I could pay *not* one half the amount allowed for both; but I would remind you, that nothing except the $500, &c. proposed in the late report has been recently paid, or promised, from the gross revenue on account of superintendence over the Weights and Measures alone. Adverting to these circumstances, and that very little of your time will be required as superintendent of the manufacture of the Weights and Measures, I do not feel justified in making any new contract with you on that subject, which shall oblige this Department to pay and to take from the gross revenue over $1,200 or $1,500 a-year for the general superintendence of only this subject. The small portion of your labors and time that may now be necessary for that purpose is all I can compensate, nor can I engage to pay even that sum, except to begin from the day the original contract, as to both subjects, may be abandoned or rescinded by you, and to end at the next session of Congress, when the whole matter can be submitted to its consideration for some new provision.

I deem it due in frankness to you, as well as in justice to the government, to guard against subsequent misapprehension and difficulty, to make this explicit statement before any new contract is closed, provided you have determined to proceed no further under the present contract.

I am, &c.

LEVI WOODBURY.

F. R. HASSLER, Esq., Washington City.

Washington City, May 18th, 1835.

MOST EXCELLENT SIR:—When I had last the pleasure to see you, I took the liberty to state to you, that the report presented to you on the 5th instant, upon my letter of the 5th February last, left me destitute of the means to go to the field-work in the Coast Survey, as I intended to do as soon as the calculations now making would be finished.

I proposed at the same time that this could be remedied by a proper compensation for my works in the Weight and Measure concerns; upon which you referred to the Secretary of the Treasury, as having full disposition of ample means for that purpose.

In fact, it cannot be expected that any of the expenses thereto required should be laid upon the Coast Survey appropriation, nor that the works which I have to perform could be done without any compensation; therefore, an adequate compensation should be made from that side directly.

The Secretary of the Treasury has however refused to accede to such an arrangement, and by that tacitly accepted the alternative which I was obliged to offer for the cases—that I should keep the

work for the Weights and Measures alone. I am therefore compelled to relinquish the works of the Coast Survey, to which I had intended to devote my life in future, as I have done so long, because I am deprived of the means to go again to the field-work of it.

Though, at the same time, the Secretary of the Treasury reduces my compensation below what it has been rated, (even contracted for,) when I had that work alone, I have accepted the proposition, which he finds himself too low, as the only means left to me to save at least that work of public utility.

I have still, for several weeks, work here; my time having been so much taken up by correspondence upon forms, leading to no result. I might therefore have delayed pressing the subject until the moment when the work would call me out positively. But I considered it a proper act of fairness on my part to press an early decision, to allow time for a proper investigation of the subject; and I have stated my situation fairly and fully in my correspondence with the Secretary of the Navy and of the Treasury.

I shall present to you my answer to the report handed in to you, with the request for a proper investigation, by hearing men of proper scientific and practical acquirements to qualify them as judges upon the subject, and all my assistants, &c., which will prove that no part of the unfortunate result can be charged to me, and that I can retire with a conscience free from all the reproaches and accusations thrown out against me in the report; but as my sacrifices are already too great, I am under the impossibility to increase them. Allow me yet to repeat even now, when all appears decided, to state my simple first ideas, by which all difficulties were intended to be avoided, and would have been so if adopted.

1. The personal expenditures which the Coast Survey necessitates can never be covered by the $1,500 allowed to me for them.

2. I took willingly upon me the additional charge and labor of the work for the Weights and Measures, to give by it an opportunity to make the necessary allowance of another $1,500 from the funds authorized to be employed for these expenses.

3. This was certainly the best mode fully authorized by law to make both works prosper, with the simple addition of extra expenses on my part, to which I am willing.

4. Thus the compensation of $4,500 for the Coast Survey could have subsisted, and $1,500 be given under the denomination of Weights and Measures.

5. Or the total allowance for the Coast Survey could have been put upon $5,000, as in 1816, and the only $1,000 added from the funds disposable for the Weight and Measure works.

It would be improper for me to enter into nearer details here; I can only recommend in the continuance of your kind and friendly dispositions, with high respect and esteem,

Excellent Sir,

Yours, &c.

F. R. HASSLER.

His Excellency, ANDREW JACKSON, President of the U. S.

Washington City, May 19th, 1835.

MOST HONORED SIR:—Your letter of yesterday, and some information upon new views in contemplation, relating to the two works in my hands, and of which I was informed last evening, present some new features, upon which I must have a conversation with the President of the United States; because they consist in some alteration of the plan which I had proposed to myself for this season, which, if it obtains the approbation of the President, will equally forward both works, and enable me to continue my services like heretofore until further arrangements, because by it I would be freed of the expenses which I have not the means to make; it would therefore remove the difficulties for this year, notwithstanding that I have sufficient reasons to apprehend that even greater difficulties will be raised next winter.

Your lowering my compensation for the Weights and Measures would not make any difference with me for the short time to which you limit it, as I know well the full truth of the statement which you have made of the anxiety of Congress—nay, I may say of the whole intelligent part of the nation—to have the regularity and security of the Weights and Measures properly established; and that in the next session of Congress your report upon that subject will without a doubt produce a proper arrangement for the full completion. In my judgment upon the absolute wants of the country, which I know well in this respect will produce it as certain, as I told to you last fall, that the subject would come before Congress last session; accustomed as I am since upwards of forty-nine years to observe the rate of going of public affairs, having always been more or less practically engaged in it, I having little fear of missing in my judgment upon such subjects.

The reduction to $1,500 annually would therefore in no way frighten me, particularly as I will rather take a small compensation in peace, which my fellow-citizens would consider should be higher, (as I have experienced many years ago,) than an apparently large one leaving me in debt at the end of the year, as the Coast Survey compensation has done hitherto, for about the same amount which you offer me for my work, and exciting the jealousy of ignorants in the work for which it is given. You may easily see how much I am supported in this judgment by the experience which you know that I am just now making.

The whole tendency of your letter goes, however, to the same aim to which I have devoted so much of my life and property, that I have certainly more interest in it than any other man can possibly have, namely, the preservation of the Coast Survey; I am therefore no less willing to bend to momentaneous circumstances in order to avoid their baneful influence, as much as lies in my means, but more I cannot. I will therefore leave the final decision upon your letter suspended until after such communications with the President, and the result which it may produce.

It remains to me, therefore, only here to make to you the statement of what I shall in time have the pleasure to show to you in result, that there

is not a little exertions, time, and labor, required to form an establishment which has never even been attempted in this country, and with the only four men in this country capable for it, and which in its result will produce more valuable consequences after it has served our purpose. To do that at the smallest expense of means and money cannot be done without more exertions than you appear willing to allow me for it.

I could indeed follow your idea to bestow but little time to it, were it possible with my character and ways of acting to bear to see a work under my care to go slow paced; but this being out of my character, I can assure you that all the time which remains to me, besides the tedious correspondence which you know I have to carry on here, in addition to that needed for the direction of my assistants in the Coast Survey, now in the field-work, and those present with me, has been well filled up by my attention to the proper organization and advancement of the establishment for the Weights and Measures, which I cannot help considering as of more importance than you seem to lay in it, besides that it is well known that the interest which the chief puts in any work decides also the exertions of his subordinates.

What I state to you here is free from all apprehensions whatever, because it refers to nothing but the subject of the work itself; I wish, therefore, you may consider it from that side only. In public business, I consider all reference to persons highly improper, in any other respect than that, if the man to whom a trust is given is worthy of it, and capable to execute it, a consequence of which I have always considered as unavoidably attached to it is, that he should receive a full and adequate compensation for his services. Wherever this is not the case, I have always found it compensated to the worthy man by the esteem of his fellow-citizens, just as much as that is the reverse in the opposite case.

I have the honor, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Treasury.

TREASURY DEPARTMENT,
May 20th, 1835.

SIR:—I am instructed by the President of the United States, in reply to your letter to him of the 18th instant concerning the Weights and Measures, to express his approbation that you continue to superintend that subject in connection with the Coast Survey, on the terms specified by the original contract, with the additional allowance recommended and approved in the report of the Secretaries of the Navy and Treasury, and Fourth Auditor, heretofore communicated to you.

But if you do not choose to proceed in the works on those terms, and abandon the Coast Survey, he approves of the terms proposed to you by the Secretary of the Treasury in his letter of the 18th instant,

for superintending the subject of Weights and Measures alone, at a compensation not to exceed $1,200 or $1,500, and limited as therein stated.

In respect to your memorial on the subject of the report of the Secretaries of the Navy and Treasury, and Fourth Auditor, before named, and asking for a new investigation, I am instructed to inform you that it cannot be had with propriety till the return of Governor Dickerson to this city; when, at any convenient moment, the memorial will be submitted to him and the other gentlemen for their reply; and a further investigation directed, if found to be necessary or proper, on seasonable notice of it given to yourself.

In the mean time, it is the wish of the President that both the works be prosecuted by you with all due despatch; or if you conclude not to pursue either on the terms before named, that you will communicate formally that fact to the Department which has the work in its charge, in order that steps may at once be taken to prevent, as far as practicable, any unavoidable delay or injury in completing both these important undertakings.

I am,

LEVI WOODBURY.

F. R. HASSLER, Esq., Washington City.

Washington City, May 21st, 1835.

MOST HONORED SIR:—Herewith I wish to answer shortly the different subjects of your letter of yesterday, received this afternoon.

1. Neither the works of the Coast Survey, nor those for the Weights and Measures, have been interrupted during the late circumstances for a moment more than was taken up by the correspondence which they occasioned; nor is there any interruption now, as far as my exertions can go.

2. At the very first appearance of any difficulties in the Coast Survey, in August and October, 1834, I requested immediately a proper investigation, by taking all the informations that might guide the Navy Department, for whom the whole subject was new, from persons acquainted with the work and its principles, the assistants as well in the works of 1817 as since 1832, and whoever might be competent for it; at that time the simplest inquiry would have been sufficient to avoid every letter that was since written upon these subjects; but my request was not answered, and the consequences cannot be attributed to me.

3. The Secretary of the Navy is now in New York, in the neighborhood of my assistants, that are engaged in the field-work; I hope he will by visiting them, as he was so good as to promise, get personal insight into the manner in which the works are carried on in the field, and the requisites which are needed for the most successful progress, and upon which my organization must be grounded. I wish very

much he may also get the opinions of men of proper scientific acquirements, to form a proper judgment in the case. I have not the least hesitation to abide by the result of such an investigation, or any other made grounded upon such principles; therefore also I await quietly any answer that may be given to my memorial reiterating the request of inquiry.

4. After all the sacrifices that I have made for the important work of the Survey of the Coast, it would certainly be as unwelcome to me to see them all lost, as it could be to any gentleman in the administration; every one of my requests were grounded upon principles leading to the most advantageous progress of the work; in whatever other light they may have been viewed, my intentions in making them have no share in it.

I have therefore concluded upon making such modifications in my arrangements of the work, as will enable me to make out with the allowance of $2,000 annually for my personal expenses for this year, and the time will prove that the granting of my request would have been an economy for the work, by the accelerations which I would have been enabled to give to it, which of course are only partially allowed by my present means.

These considerations, and not the slightest fear of going down to a reduced compensation of $1,500, only decide me to continue my services in both works now under my charge, jointly; and the results will show whether what I claimed would not have been deserved, and well employed.

5. It remains, therefore, to me only to claim the indulgence, that in judging upon the ultimate result which I shall be able to present, regard be paid to the means at my disposition, and that not what I wished to do, but what I could possibly do, be expected from me; notwithstanding, my exertions will be the same in any case.

I have, &c.

F. R. HASSLER.

Hon. LEVI WOODBURY, Secretary of the Treasury,
Washington.

Washington City, May 22d, 1835.

SIR:—The report which has been made to the President of the United States, in part under your signature, contains so many accusations against my conduct in the Coast Survey, that cannot be grounded upon true informations; that I have again requested the investigation, which I had requested of you last October; the decision upon it has been referred to your return.

I therefore take the liberty herewith to request that you would please to visit all my assistants that are now engaged in the field-work, and the soundings in your neighborhood, to take personal cognizance

of every thing, which will be so much towards the investigation which I requested. You will also oblige me by taking their opinion upon any subject that you may wish, and also the opinion of every man of proper scientific acquirements to qualify him as a judge in the case. Upon such an investigation I have rested the decision.

I have been requested, by a letter of yesterday, to continue my services in both works, the Coast Survey and the Weights and Measures, under the allowance for expenditures increased to $2,000 annually, and have by my answer promised to do whatever this allowance would enable me to do; the comparison of my report lately handed in to the President, and the result which I shall be able to present, will show the difference between that which I wished to do, and that which I shall be able to do, with the means at my disposal.

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
New York.

TREASURY DEPARTMENT,
June 3d, 1835.

SIR:—I hereby transmit you an order upon George Brent, Esq., Collector of the Customs for the District of Alexandria, for the sum of two hundred and fifty dollars, being the amount due you on the 31st ult., out of the allowance of $500 for one year from the 1st of December last, for the object stated in the report made to the President of the United States on the 5th ult., by the Secretaries of the Treasury and Navy, and Fourth Auditor, and by him approved.

I am, &c.

LEVI WOODBURY.

F. R. HASSLER, Esq., &c., Washington.

A List of Vouchers belonging to Capt. Wm. H. Swift's Accounts of the Coast Survey, for the year 1834, *and first quarter*, 1835, *disallowed, &c. by the Fourth Auditor of the Treasury in the settlement of the Account for the first quarter*, 1835.

Voucher No. 9, first quarter, 1834. F. R. Hassler, for travelling expenses from New York to Washington, in December, 1833; *disallowed* in a former settlement, being considered as a part of Mr. Hassler's "personal ex-

penses;" but, by report of Messrs. Woodbury, Dickerson, and Kendall, dated 5th May, 1835, filed herewith, made payable from the appropriations for the Weights and Measures $34 58

Voucher No. 35, first quarter, 1834. Jeptha Beancroft, for services as second driver, from 1st January to 31st March, 1834; *disallowed* in a former settlement, being considered as a part of Mr. Hassler's "personal expenses;" but, by the report aforesaid, made payable from the appropriation for Weights and Measures . . . 86 14

Voucher No. 20, second quarter, 1834. F. R. Hassler, for travelling expenses from Washington to New York, 10th June, 1834; *disallowed* in a former settlement, being considered as a part of Mr. Hassler's "personal expenses;" but, by the report aforesaid, made payable from the appropriation for Weights and Measures . . . 23 25

Voucher No. 21, second quarter, 1834, (sub-voucher 13.) F. R. Hassler, for horsekeeping, 2d June, 1834, while travelling from Washington to New York; *disallowed* in a former settlement; but, by the report aforesaid, made payable from the appropriation for Weights and Measures 12 50

Voucher No. 21, second quarter, 1834, (sub-voucher 14.) For horsekeeping, &c., 3d June, 1834, while travelling from Washington to New York; *disallowed* in a former settlement; but, by the report aforesaid, made payable from the appropriation for Weights and Measures . 10 00

Voucher No. 21, second quarter, 1834, (sub-voucher 17.) For horsekeeping, 7th June, 1834, while travelling from Washington to New York; *disallowed* in a former settlement; but, by the report aforesaid, made payable from the appropriation for Weights and Measures . . 10 13

Voucher No. 21, second quarter, 1834, (sub-voucher 18.) For freight of horses, &c., 9th June, 1834, while travelling from Washington to New York; *disallowed* in a former settlement; but, by the report aforesaid, made payable from the appropriation for Weights and Measures 9 00

Voucher No. 72, second quarter, 1834. Jeptha Beancroft, for services as second driver, from 1st April, &c. 1834; *disallowed* in a former settlement; but, by the report aforesaid, made payable from the appropriation for Weights and Measures 32 28

Voucher No. 9, first quarter, 1835. F. R. Hassler, for travelling expenses from New York to Washington, in Jan. 1835; *disallowed*, being considered as a part of Mr. Hassler's "personal expenses," the payment of which is considered as provided for in the report aforesaid . 51 70

Voucher No. 21, first quarter, 1835. T. Golding, for board of A. Hallenbeck, driver, in Washington, 2d March, 1835, being a part of Mr. Hassler's "personal expenses;" *disallowed*	$17 08
Vaucher No. 30, first quarter, 1835. T. Golding, for board of A. Hallenbeck, driver, in Washington, 2d March, 1835; *disallowed*	6 92
	$293 58

Amount disallowed in 1834, but made payable from the appropriation for Weights and Measures . . .	$220 31
Amount *disallowed* first quarter, 1835, still suspended .	75 70

F. R. HASSLER, Esq.,
Superintendent of the Coast Survey.

Washington, June 4th, 1835.

SIR:—Above, you have a statement of the accounts of the Coast Survey, disallowed by the Fourth Auditor in the settlement for the first quarter, 1835, viz.:

Amount *disallowed* in 1834, but made payable from the appropriation for Weights and Measures . . .	$220 31
Amount *disallowed* first quarter, 1835, still refused .	75 70

Respectfully,
W. H. SWIFT,
Capt. U. S. Top. Eng. and Disbursing Officer.

Washington City, June 4th, 1835.

SIR:—Captain Swift, accounting officer for the Survey of the Coast, has presented *and charged to me* a list of items disallowed in his accounts by the Fourth Auditor, which includes the whole of the journey from New York here, of last January, together with the pay and the board of the driver up to this day.

Thus, by indirect ways, the Fourth Auditor assumes the right to dictate my movements in the Coast Survey work, while certainly I am alone able to decide with propriety the place where my work requires my presence, as well as that of any of my assistants, (which latter has

never been denied me,) and I alone can therefore also judge of the proper arrangements for the progress of the work and the economy of its execution.

This interference is evidently inadmissible: by allowing such an assumption, the command of the whole would be under the Fourth Auditor, without whose consent it would become impossible to move, therefore to execute any part of the work.

For the present case, the effect of the measure is positively to deprive me of the means to execute what was stated in my last report upon the work—namely, to lay out the triangulation between here and New York, by taking away from my compensation and allowance the money by which I should pay my personal expenses. My intention was to commence this reconnoitring as soon as the calculations at which we are now engaged here are carried as far as is indispensable for the secondary works of this year.

My movements in the Coast Survey are at public expense, (as well as those of the assistants,) according to Art. E, No. 5, of the agreement of 12th July, 1816; Art. 6th of that of 6th August, 1832, and others. No alteration of these agreements has ever in any way been notified to me; against alterations made by the ejectment out of the accounts, I am obliged to *protest*, as fully unauthorized and entirely improper, because they utterly destroy the work.

The report of 5th May, and the letter to me of the 8th, grounded upon it, quotes positively only "expenses of travelling and transporting of instruments, books, &c. to and from Washington, not strictly chargeable to the appropriation for the Coast Survey," as capable to be put upon me for the additional allowance made. Now there was not the slightest thing transported with me here that was not *strictly necessary* for the Coast Survey work here, and therefore *all was strictly chargeable* to the Coast Survey; and without my coming here with them the work would actually have been interrupted; thence the whole of my movement here was indispensable, and all my arrangements fully proper, and directed in the most economical manner. The investigation will show that, which I have requested of the President, and I hope it will this time not be refused to make it in a proper and impartial manner.

Measures of the kind as introduced by the Fourth Auditor very much impede the progress of the work, and are extremely expensive: to attempt loading me with a small sum, which it is known I am not able to bear, causes a damage of about $10,000, by the crippled state in which it places the work. I have therefore also no doubt, that on the return of the Secretary of the Navy, probably better informed, by the communications which he has had the occasion to have with my assistants engaged in the field-work, will remedy these incongruities, and not leave the whole work at the mercy of an Auditor.

I have, &c.

F. R. HASSLER.

JOHN BOYLE, Esq., Acting Secretary of the Navy.

NAVY DEPARTMENT,
July 25th, 1835.

SIR:—I enclose for your information a copy of a letter this day addressed to Lieutenant George S. Blake, commanding the United States schooner Experiment.

I am, &c.
MAHLON DICKERSON.

F. R. HASSLER, Esq., Superintendent, &c.
Washington.

Washington City, July 26th, 1835.

SIR:—Your communication of the order to Lieutenant Blake to join the Coast Survey with the schooner Experiment, reached me to-day.

By this disposition an additional expense is thrown upon the Coast Survey appropriation, which it is not very likely to be able to bear, without more serious inconveniences on other sides, unless funds be provided by other means, which the President has lately decided to be inadmissible.

I must take the liberty to request that you will please to communicate to me how much of the appropriation for the Coast Survey will be taken away for the two naval expeditions, (the amount of which I have not the means to calculate,) in order that I may be able to estimate whether any and in case how much funds will remain disposable for the other parts of the work. It must be observed, that the secondary operations now in activity cannot be stopped, nor curtailed, without stopping the sounding operations completely and instantaneously; how much it would, on the contrary, have been desirable to extend them, I have stated to you long ago.

I shall do all I can, with my two assistants occupied with me here, to furnish means for your aim of employing the schooner Experiment; but your indulgence in respect to time is absolutely required, to make it at all possible. If I thus give way to your desire, I must take the liberty to request at the same time that the consequences which must follow this premature measure shall not be attributed to me in no way whatsoever, as it crosses my plans, arrangements, and distribution of means, which I had carefully calculated beforehand.

I had hoped that the request of my letter of the 21st April last "that no vessel should be put in the Coast Survey without my request," had been tacitly granted. Your measure must naturally lead to a stoppage of all sounding expeditions sometime next spring.

No vessel can do any work until the secondary and plane-table works on the shore are in some state of progress—(just like a vessel is built on land first, and then launched in the water.) For the north

part of the Long Island Sound, where you intend to employ the Experiment, I have lately fitted out one plane-table party, as shown to you; but as well for the opposite shore of Long Island as for the sounding expedition itself, much of the indispensable calculations and projections still remain to be done, before the completion of which, and the fitting out and putting in activity of this second party, the vessel would be of no service of any value.

I must take the liberty to press your decision upon the appointment of Hugo Dickins; as Mr. Renard, who co-operated on the land side with Lieut. Gedney, is much delayed by want of an assistant; and I have, in expectation of this measure, already ordered Mr. Livingston to join Mr. Eakin, who shall operate on the Connecticut shore, as stated above, and was therefore equally in want of an assistant.

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
July 31*st*, 1835.

SIR:—In answer to your letter of the 26th instant, I have to state that Lieut. Blake has been ordered to join the Coast Survey with the schooner Experiment, because last year you wanted two vessels to be engaged in soundings when we did not find it convenient to employ more than one, and because you have since frequently urged the employment of a second vessel.

In your letter to me of the 11th April last, you request that I will detail Lieut. G. S. Blake to accompany Lieut. Gedney, that he may become acquainted with the nature and details of the works, as you would like to apply for his services in a similar sounding expedition as soon as the works for the Long Island Sound will be *fully prepared, which will be very soon.*

As I knew we could not be very soon prepared to send an additional vessel upon this sounding expedition, I feared a detriment to the Survey, from what I knew to be an unavoidable delay; I urged the preparations, however, as much as I could, and am much surprised to find that you are not yet ready for Lieut. Blake and his crew, who now await your orders.

On the 27th instant, you put into my hands a memorandum in your hand-writing, but without your signature, in which you say that your journey to Washington last winter has been found to be proper in the necessary course of the work of the Coast Survey, and therefore also all the consequences of your stay here with the horses and the driver to take care of them: this has been the course that has been approved and always pursued in the work of the Coast Sur-

vey hitherto, and uniformly paid at public expense, according to the agreement made with you, as being the best advantage of the work. You further state, that it is proper that all the vouchers dependent on the above shall be admitted as duly authorized to be placed upon public account, as well those that have been presented as those that will be presented hereafter. Such is the purport of your memorandum; what was your object in placing it in my hands, I know not: as it includes subjects for the consideration of the proper accounting officers of the Treasury, and upon which you have been carrying on a dispute with them for more than a year.

If your intention is to draw an inference from my silence upon this subject, upon which I have heretofore fully expressed my opinion, that your statement and conclusions are to be considered as correct, and binding upon the Department, I have to state to you that I do not consider your coming here last winter with the carriage and horses as at all necessary to the Coast Survey; nor do I consider the keeping of them here with a driver during the winter as necessary to the Coast Survey; much less do I consider it necessary for the purpose of that Survey, to keep the carriage, horses, and driver here till this time in the summer.

I regret extremely that the business you are engaged in is such, that you have not been able to commence your operations in the field on the Coast Survey at an earlier date than this; more especially as early in the spring you urged the settlement of your accounts, that you might return to your duties upon the Survey. Those who are engaged in the Survey I believe are performing their duties with zeal and ability; I should suppose, however, the work would go on to more advantage under the immediate presence and direction of the Superintendent.

As to the expense of the two vessels engaged in the sounding, it is impossible to say. The Experiment will be less expensive than the Jersey, as we have not been under the necessity of purchasing the former. The officers will be paid from the naval appropriations, except so much as may be allowed as contingencies. Officers on pay should be employed on the Coast Survey where it can be done with advantage, as it relieves the appropriation for the Coast Survey, by the amount such officers receive from the army or navy appropriation.

I am, &c.

MAHLON DICKERSON.

F. R. HASSLER, Esq., &c.

Washington City, August 3d, 1835.

SIR:—Your misapprehension as to the time when a second vessel could be employed in the soundings is, I believe, fully explained by our correspondence.

The essential change in my plans, which necessarily followed the decision to load the Coast Survey appropriation with the naval expenditure, for which no provision was intended by it, must certainly be equally evident to you.

The memorandum given to you was what I thought proper for you to communicate to the Fourth Auditor, to put an end to his rejection of proper items in the accounts; reasons sufficiently full or legal for it are in my letter of the 4th June, upon which I am long ago anxious to get your answer. All the rest is to be decided by the result of the investigation by impartial and properly qualified gentlemen, which I have long claimed, and which I hope the justice of the President will not refuse to me, as I must be distinctly freed from the accusations of your report of the 5th May last.

So much more, as even the invitation of your last letter, in continuance of the same mistaken ideas, if complied with, would be a real stoppage of the proper progress of the work, and is besides impossible by the virtual interdiction of the Fourth Auditor of my moving from or to Washington, in the pursuit of the Coast Survey work.

Obliged to exceed the limits which I had intended to give to this letter, I will exceed it still by naming such gentlemen as I should think proper to make this investigation, besides the hearing of all my assistants, men, &c.

General Gratiot, Colonel Abert, Colonel Thayer, Major De Russy, Major McNeil, Commodore Morris, Lieutenant Bell, (navy,) and any other naval or engineer officer, having any practical knowledge; Professor Renwick, of New York; Mr. N. Bowditch, of Boston; Captain Lewis Brantz, Baltimore; John Vaughan, Esq., Philadelphia; Professor Bache, Philadelphia; among whom you may select, and to whom you may add entirely according to your option.

I have, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Washington City, August 17th, 1835.

SIR;—The enclosed extract of a letter from Mr. Ferguson corroborates the necessity, which I stated to you some time ago, of providing a safer place of deposit for the instruments in New York. I would have provided for it long ago, had not the non-observation of the stipulations of my contract for the Coast Survey, which gives me the necessary means to attend to my duties with propriety, obliged me to refrain from any measure which it might come into the head of the Fourth Auditor to *disallow*, without my being able to get from you the relief which I considered myself authorized to expect from you.

None of my propositions to you in favor of the intrinsic parts of the Coast Survey having as yet been answered, I am completely at a loss to do more than to give you this information as I received it.

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
August 20th, 1835.

SIR:—I have just had a conversation with the Collector of New York, Mr. Swartwout, who says that you may have the entire control of the room in which your instruments are placed in the Custom House, and that you, or any person you may appoint for the purpose, may have the key of the room, and that it will be delivered to such person. I think, therefore, you had better direct Mr. Ferguson to call for it, and then you will be sure your instruments will not be disturbed, unless by people you may permit to go into the room.

I am, &c.

MAHLON DICKERSON.

F. R. HASSLER, Esq., &c.

Washington City, Sept. 8th, 1835.

SIR:—Herewith I have the honor to hand to you the bills which brings the voucher for public expenditure, attempted to be laid upon me by the Fourth Auditor, up to the end of last month, the previous ones having been handed to you last Saturday. You will find that none of them includes any personal expense of mine, as I paid them always myself.

The total amount of the bills thus in your hands is $272; and if the same ways against me were applied to the further accounts, the whole amount to be incurred until the 1st December next would come to more than double that sum.

That with such pecuniary losses applied to me, and menaced, I can impossibly leave here for the reconnoitring, and laying out of the triangulation between the Maryland Survey and what I have done in the Coast Survey near New York, is self-evident; I have therefore to hope that, in the interest of the work as well as of justice, you will take the proper steps to relieve this unfortunate state of things. I refer besides to my (as yet unanswered) letter of the 4th of June last.

By my report of last May, you find that this reconnoitring is the work which devolves upon my personal exertions now, when the plotting will be finished that is required for the plane-table party that has to work south of Lieut. Blake, and in conjunction with him. The season is now peculiarly favorable for this work, though I would have gone earlier, if the difficulties under which the whole work labors had been relieved, and if the sending out of schooner Experiment had not necessitated a far greater extension of calculations and plotting than I had originally contemplated for this year.

It remains to me only to request that you will please to give me, as early as possible, a full and I hope satisfactory answer, that the work may not be delayed.

I have, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
Sept. 15th, 1835.

SIR:—The bills you left in my hands a few days since, together with the one enclosed in your letter of the 8th instant, I referred to the Fourth Auditor for examination, who has returned them to me as charges which are covered by the allowance of $500 specified in the report of the Secretary of the Treasury, the Secretary of the Navy, and the late Fourth Auditor, of the 6th May last to the President, and approved by him.

These bills, a part of them recited and a part not, are for expenses of the carriage, four horses, and a driver coming from the Coast Survey in the neighborhood of New York, since the 1st of December last, to this place, and the expenses of a driver of the carriage here, since your arrival, to the first of this month, amounting in all, according to your statement, to $272.

By the report of the 6th of May last, it was not contemplated to increase your salary of $3,000 a year, nor the allowance of $1,500 for your personal expenses; $4,500 being deemed a sufficient compensation for your services. But in order to resume the field-work of the Coast Survey, a delay of which, according to your representation, was very prejudicial to the public interest, it was recommended that the suspended accounts of the disbursing officer of the Survey should be passed; and in order to prevent any further trouble as to the disputed accounts, for a time at least, and to enable you without delay to return to the active duties of the Survey, it was further recommended "that the allowance of $500 for one year, to commence on the first day of December last, be made to the Superintendent of the Survey, to cover all expenses of travelling and transporting instruments, books,

&c, to and from Washington, not strictly chargeable to the appropriation for the Coast Survey; and that it be paid out of the money applicable to the subject of Weights and Measures."

There can be no doubt of the meaning of this report, or the object for which the allowance was made. It was thought a generous provision for all the expenses of the carriage, horses, and driver, from the time they last left the Coast Survey in the neighborhood of New York until they should return to it again: and the allowance should be applied strictly to the objects for which the report intended to provide.

I understand that soon after the report was made, a part of this allowance of $500 was paid to you to enable you to return to the Coast Survey, and that in all you have received of it $375, while the bills you have put into my hands amount to $272 (two of them without receipts amounting to $72); so that you have in your hands more money applicable to the payment of these bills than is sufficient for their discharge.

As, however, the account of Abraham Hallenbeck, driver of the carriage, commences on the first day of January last, and you did not leave the Survey for Washington until the 10th of that month, his wages for one third of a month, amounting to $6, should not be considered as coming under the allowance of $500. This item will be allowed to the disbursing officer if the proper charge shall be exhibited for allowance.

If you keep the money paid to you on account of the allowance made in the report of the 6th of May last, and refuse to apply it to the payment of the bills you have presented to me, you do not appropriate it to a purpose intended by those who intrusted you with it. If you apply the money agreeably to the express purpose for which it was placed in your hands, it is believed it will be amply sufficient to enable you to resume your duties upon the Coast Survey. The bills you left with me are delivered to Mr. Dahlgren for you.

I am, &c.

MAHLON DICKERSON.

F. R. Hassler, Esq., Washington City.

Washington City, Sept. 18th, 1835.

Sir:—Your favor of the 15th, received on the 16th instant, obliges me to give you some information.

First, I take the liberty to inform you more correctly upon the employ of the money received from the Treasury Department. I paid the $212 for the rejected vouchers, and their consequences by account with Capt. Swift, on the 5th June; and, oppressed by the circumstances, I went the same day to the Treasury Department to receive the $250 then due; I added to it $50 more, to send $300 to New York, to pay for debts made in consequence of my private expenses in the Coast Survey: the $125 of

the third quarter I had to forestall even for a similar payment. Now what is yet to come to me from that side the 1st December next, would indeed pay the mere journey to New York; but you know, by my report of the 8th May last, that my duty would not be to make such a simple journey, which would be a waste of my time; but that I should reconnoitre for the extension of the main triangulation, and placing the signals for it, from here until to my works south of New York; and this operation was always what I understood under my field-work of this year. The expenses of such reconnoitring are evidently much larger, and of a public nature, decidedly, by contract; in such works also my private expenses are considerable, as well known.

Therefore, without a positive order from you to make such a simple direct journey to New York, I should not consider myself warranted, by my duty to the work, to make it, though in the course of the necessary reconnoitring I shall of course also come there.

What you say with reference to the report of the 6th May, you are in possession of my answer of the 14th, and I hope the investigation, which you will no doubt ultimately find the best way to clear up the ideas upon the proper management of the work, and all my transactions in it, will show, that I have acted correctly, to the best advantage of the work, and with a liberality for which I confess I expected a similar return.

I have, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT.
Sept. 16*th*, 1835.

SIR:—The requisition for tables, desks, &c. signed by you, and left at this Department, although not directed to it, appears to me more properly to belong to the Treasury Department. In a conversation I have had with the Secretary of the Treasury, I find that his Department can more conveniently furnish the articles wanted than this Department can; I have therefore referred the requisition to the Secretary of the Treasury. I have sent you the copy of the letter you wanted by Mr. Alexander; the letter is from the Navy Department to J. H. Alexander and J. J. Ducatel, of 29th March, 1834.

I am,

MAHLON DICKERSON.

F. R. HASSLER, Esq., Washington City.

NAVY DEPARTMENT,
March 29th, 1834.

GENTLEMEN:—Your communication of the 27th instant has been received.

In respect to the co-operation proposed between you and Mr. Hassler in the Survey for the state of Maryland and that of the Coast of the United States, the President and this Department feel a strong disposition to oblige you as far as may be authorized by law, and as may be practicable without detriment to the public.

Mr. Hassler, therefore, is authorized to give and receive such reciprocal aid as will advance the Survey of the Coast, without any increase of expense to the United States, and to allow any instruments in his charge to be used on these surveys, under similar limitations and such stipulations as may fully secure the property and interest of the general government.

I am,

LEVI WOODBURY,
Secretary of the Treasury.

J. H. ALEXANDER,
J. J. DUCATEL, } Washington City.

Washington City, Sept 16th, 1835.

SIR:—Your favor of this day, referring to the list of articles required for the Coast Survey office, needs that I should explain how it came not to be in a more formal manner accompanied by a special letter of requisition.

You will recollect that upon conversation with you, relating to that subject, it was concluded that Mr. Dahlgren should come to your Department the day after, to see what might be on hand that could supply our wants. Returning the day after from the Navy Department, he stated that nothing appropriate had been found, and that only a list of the articles should be handed in. This was immediately done, as I was led to think that all the rest was understood, and no more than that was required of me.

I shall be glad to receive from the Treasury Department, to whom you refer, it by agreement with the Secretary of the Treasury, any directions upon the procuring of the articles required, or the articles themselves.

I have to thank you for the copy of the letter of the Navy Department of the 29th March, 1834, relating to the junction of the Maryland Survey.

I have, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
Sept. 17*th*, 1835.

SIR:—The Secretary of the Treasury has returned to me your requisition for furniture. The articles required are: "for projecting and drafting, three pine tables, 14 feet by 8, 15 by 10, and 10 by 6; four writing desks or tables, 18 chairs, two sets of furniture for fire-places, one book-case, one case for large maps, one ditto for journals and papers, one ditto for small instruments, one ditto for drawing implements." As some of these articles must be made under your immediate directions, it is better you should procure the whole; you will therefore cause the said articles to be made or purchased on the best terms you can, and the bills for the same, when presented, will be paid.

Respectfully,

M. DICKERSON.

F. R. HASSLER, Esq. Superintendent, &c., Washington.

NAVY DEPARTMENT,
Sept. 19*th*, 1835.

SIR:—As a wish has been expressed by Mr. Alexander, engineer for making the trigonometrical Survey of the state of Maryland, that certain points in that state should be selected that must necessarily be points in the great trigonometrical Survey of the Coast of the United States, you are requested to co-operate with Mr. Alexander in selecting such sites, if you have leisure to do it before your services are particularly wanted in continuing your series of primary triangles begun in New York. It is presumed that you need not be detained in Maryland more than two or three weeks.

I am, &c.

M. DICKERSON.

F. R. HASSLER, Esq., Washington City.

Washington City, Sept. 21*st*, 1835.

SIR:—Your favor of the 19th instant falls in with the agreement made last year by the Navy Department, with the approbation of the President, in relation to the junction of the Maryland Survey with the main triangulation of the Coast Survey.

The details lie in the documents of your Department; the nature of

this co-operation is explained in my letter of the 9th January, 1834, (printed Documents, page 117), and the directions given to me with that view in the letter of the Navy Department of 3d April, 1834, (printed Documents, page 138.)

I shall, as soon as possible, attend to your directions. The present state and nature of the Coast Survey work dictates the continuance of the same operations till to the end of my triangulation south of New York. The nature of the country will dictate the time required for each part, as well as for the whole of that operation.

I have, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
Sept. 24th, 1835.

SIR:—The enclosed letter from C. M. Eakin is referred to you for a report as to the facts of the case, and also for your opinion as to the propriety of the increased allowance requested.

I am, &c.

M. DICKERSON.

F. R. HASSLER, Esq., Washington City.

Washington City, Sept. 25th, 1835.

SIR:—Upon your favor of yesterday, communicating to me the request of Mr. Eakin for increase of compensation, I have to state:

1. Mr. C. M. Eakin is actually engaged as chief of a plane-table party in Connecticut, connecting with Lieut. Blake's sounding expedition, since a short time before Lieut. Blake took his station.

2. I have, at different times, and particularly in the notes handed to you under 20th April last, urged the propriety of establishing a general rule, that any assistant directed by me to go out *as chief* of a secondary party of any kind, should have one quarter of his compensation allowed to him, as a proper counterbalancing of the increase of expenditures which is thereby unavoidably occasioned to him.

3. I cannot omit stating here, that with equal propriety any officer of the army or navy, engaged in a similar manner, should, by the special arrangement as entered into originally in 1832, in stipulating for the Coast Survey, be allowed an equally corresponding addition, as it is decidedly necessary to make their compensation to relieve them from

distress. I cannot conceive that the law of last winter, prohibiting their receiving compensation for additional services, was ever intended to apply to the peculiar case of the Coast Survey.

4. The peculiar clause, excepting the travelling expenses (in my view), applies to them, as they are actually constantly travelling, as the journals of the work will prove incontrovertibly.

I have, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

NAVY DEPARTMENT,
Nov. 4th, 1835.

SIR:—I wish you to furnish me, as soon as it can conveniently be done, with an estimate of the amount of the appropriation which will be required for the Coast Survey for the year 1836.

I am yours, &c.

M. DICKERSON.

F. R. HASSLER, Esq. Superintendent of the Coast Survey.

NAVY DEPARTMENT,
Nov. 5th, 1835.

SIR:—I have to request of you a report of the progress made in the Coast Survey during the present season, to be laid before Congress at their approaching session.

I am with, &c.

M. DICKERSON.

F. R. HASSLER, Esq. Superintendent of the Coast Survey.

Philadelphia, Nov. 11th, 1835.

SIR:—Your two favors of the 4th and 5th inst. were handed to me by Mr. Vaughan, on my arrival this day.

I shall, with my report, also state the nearer particulars of the estimate of the appropriation to be proposed to Congress for the Coast

Survey, the amount of which, I have formerly mentioned to you, would probably be near $80,000, on account of the insufficiency of the last appropriation.

The circumstances known to you have delayed my report. I have noted down the different items of it; but the particular and detailed working out of it I shall make in New York, where I shall be in a short time. It will be forwarded to you as soon as possible, before the end of this month.

Mr. Alexander and I have traversed the country between Washington and Wilmington, west of Chesapeake Bay, in different directions, and placed signals for the Survey in proper places, in addition to those which Mr. Alexander had already placed.

If ever possible, I shall, on my return from New York, join him again, for the continuance of the same operations upon the eastern shore of the Chesapeake, and towards the Atlantic.

I have the honor to be, with perfect respect and esteem,
Sir, &c. &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy.

New York, Nov. 22d, 1835.

MOST HONORED SIR:—Herewith I have the honor to forward to you my fourth report upon the Coast Survey, containing also the detailed estimate for the next appropriation.

The map which is quoted in it is delayed, on account of some data of it not yet being given in by the assistants, who are not present here; it will, however, follow before the end of the month, early enough to be presented with the report. Mr. Renard, who is making it, is very expeditious in these kind of works.

I hope the whole will be satisfactory; and I have no doubt that, with the reasons and details given in the report, there will be no opposition in Congress for the appropriation which I have stated as necessary to raise the work to its proper standard of public utility and well calculated economical progress; for I have had the pleasure to find the work and its tendency every where well accredited and approved, by all well informed men, throughout the country which I have travelled in coming here.

I have the honor, &c.

F. R. HASSLER.

Hon. MAHLON DICKERSON, Secretary of the Navy,
Washington City.

Fourth Report of F. R. Hassler, as Superintendent of the Survey of the Coast, upon the Operations performed in that work, between the months of May and December, 1835, with an Estimate of the appropriation required for the next year's work.

1. My Report of last May, has shown how much work had been prepared, by the primary and secondary triangulation of the preceding year, the works of 1817, and all the works connected with them, and how these have been furnished with the most essential element of an accurate base-line.

2. The map of assemblage joined to my last Report, shows that near thirty maps were prepared, to be executed last summer, if the appropriation had allowed to carry on the topographical works with the activity which I had contemplated, and which it would have been most economical to make immediately.

3. My Report also stated the different direction which I was compelled to give to the work under the circumstances which I have there detailed, and I must take here the liberty to refer to it.

4. This effect was still increased by the ordering of the schooner Experiment, in the Coast Survey work, to a station for which the necessary previous calculations had been deferred, with a view to begin the soundings of Long Island Sound only next spring, as the state of the work, as well as of the appropriation, would naturally have dictated.

5. This circumstance necessitated me to stay in Washington, with two assistants, all engaged in executing the calculations and projections, upon which all the detail works and soundings connected with it had necessarily to be grounded.

6. However, this delay gave me also the facility to attend more closely to the construction of standards of Weights and Measures, which is equally my task as the Coast Survey, according to the letter of the Treasury Department of 9th August, 1832, and upon which I render a separate account to the Treasury Department, under which it stands.

7. The reconnoitring and placing of signals, for the junction of the Survey of Maryland with the Coast Survey, by which the work is intended to be brought so much the quicker to the Chesapeake, as was always contemplated, could, on account of those circumstances, not be entered upon until in October, when Mr. Alexander joined me in Washington, from whence we proceeded selecting stations, and placing signals, on both sides of the Potomac, and the western shore of the Chesapeake, until Philadelphia, when the press of time required me to go to New York, and I committed the further examination to some of the assistants in the Coast Survey.

8. The works performed by my assistants during the last season are as follows:

Captain Swift has extended the triangulation between Connecticut and Long Island, from New Haven, so far easterly as the main trian-

gulation would allow, besides his very laborious task of keeping the very extensive and complicated countability over the Coast Survey expenditures. He has not been favored enough by the weather to present a completed result, though he has done much work. There are only two triangles required, before a connected result can be presented. These works will then unite the work near New Haven with the eastern extremity of Long Island Sound, near the Rhode Island State line.

Mr. Ferguson has made the secondary triangulation, which is included in my main triangulation of 1817, covering all the inner Bay of New York, and the surrounding elevations of New York and New Jersey.

Mr. Blunt has extended his triangulation begun the year before, all over the part of Long Island west of the base-line and Ruland's hill.

These two gentlemen joined their works by several stations common to both.

Mr. Renard has continued the topographical works, which he had begun last fall, over the whole extent of Mr. Blunt's triangulation on Long Island, and a great part of the Bay of New York, until to the Neversinks, over an extent of about eighty miles of coast. In this course he has, besides, constantly worked jointly with Lieutenant Gedney, to furnish him with the necessary fixed points for his operations of soundings.

Lieutenant Gedney has finished the soundings which he had begun in great South Bay, and from thence continued westwardly along the Coast until the light-house of Sandy Hook, including all the offings and outer bar of the Bay of New York.

Mr. Eakin has finished the topographical detail survey, from the neighborhood of Black Rock, westwardly until Narroton, between the turnpike and the shore, always furnishing Lieut. Blake with determined points to ground his soundings upon.

Lieut. Blake has made the soundings of the shore of which Mr. Eakin made the topographical Survey, and was proceeding to the opposite southern shore, when the weather became so unfavorable, as to prevent his progress in the work there, because that part of the shore presented no safe enough harbor for his vessel.

Lieut. Mackey, after having assisted in Washington in the projecting and laying out of points for different detail and sounding Maps, proceeded to the north shore of Long Island, opposite to Lieut. Blake's station, which he left afterwards, as Lieut. Blake did not work in that neighborhood, to make with him a small addition to Mr. Eakin's work towards the east, over the neighborhood of Bridgeport.

Midshipman Dahlgren continued with me all the time that the calculations and plottings lasted, occupied at these calculations, and after that joined Mr. Ferguson in his secondary triangulation and the consequent calculations.

9. The Maps thus produced are, of course, all upon too large a scale to be presented with this report, and are to remain in the office of the Coast Survey, to be further worked out, and then to be employed, when the whole of the country between New York and Block Island,

or that neighborhood, will be finished, to be formed in proper, special, and general maps, over that whole part of the coast.

10. The copy of the map of assemblage here joined, exhibits the works of this year, by its comparison with that presented last spring, by the sketches of the country surveyed topographically, and the detail triangles of those parts, added this year; the intermediate previous secondary triangles presented last year, being expressly omitted, and only the main triangulation of that part preserved to show the connection.

11. It is now necessary to execute, if possible, in continued regular succession, all the topographical part of the country which is now covered by the primary and secondary triangulations, because the signals now standing present the proper facility and economy for the work, and also on account of the great chance of their being lost, by the want of respect paid to such public undertakings, and the consequently too frequent destruction of the signals, and even of the secret marks placed in the ground. It might be desirable that they could be properly protected by a special law, as that is the habit in Europe, where such, well secured, triangulations exist, and are still daily making, from Sicily till Lapony, and from Brest and Ireland to Turkey and Petersburg.

12. Having thus rendered account of the faithful exertions and works of my assistants, it would be improper for me to omit mentioning how painful it is for me to see those of my assistants who are connected with the army or the navy, deprived of that additional remuneration which was stipulated for them at the beginning of the work, and which the so much increased personal expenditure and labor, by their assistance in the Coast Survey, deserves, by the application to them of a law of Congress of last winter, which I cannot conceive ever having been intended to apply to the case in which they are, by the extra expenses unavoidable in the constant travelling-life which they have to lead; and particularly it can never have been intended by it to load an officer from one department with a heavy responsibility for countability upon funds under another department which has, in the common order of things, no control over him: if this difficulty cannot be overcome otherwise, I would like to suggest the proposition of a special law to that effect.

13. The increase of compensation granted to the civil chiefs of secondary parties, on account of the unavoidable increase of their expenses in these situations, has been very gratifying to me as well as to them. I considered it an unavoidable and proper act of justice, so much the more as, even with that, none of the assistants in general are paid as high as they would be for similar works, if in the employment of private companies of citizens.

14. In respect to myself, I do not like to do more than simply to state here the fact, that the allowance of $1,500 made to me for the personal expenses which unavoidably fall upon me in the Coast Survey, are entirely insufficient, as I had already in the beginning stated that they would likely prove (letter of 12th Aug., 1832, printed Documents, page 87). This amount does but scantily cover the half of the diffe-

rence between the life of a steady home and that which I have to lead in that work, which is of course what is to be compensated by this allowance. It is, besides, well known that the compensation of a chief engineer of a railroad or canal, is generally rated and paid at $6,000 per annum, and that many come much higher; though the requisite acquirements, labor, and responsibility, are by no means equal to what is required in the Coast Survey. That I have made great pecuniary sacrifices in this work, since as early as 1811, is well enough known to many persons. I may, therefore, also hope that this subject will receive a more adequate consideration.

15. The Fourth Auditor's refusal to admit in the accounts of the accounting officer, the whole of the expenses of certain operations unavoidably necessary for the work, has laid great impediments in the way of the work. An officer in that situation can impossibly have a just idea of the propriety of any operation in this work. In fact, none but the director of such a work is possessed of the data indispensable to assess a proper judgment upon the necessary operations, and the proper manner of performing them. By the measures of the Fourth Auditor, that officer would become the sole and full director of the work, which is entirely inadmissible. If the main direction of the work is intrusted to me, the minor consequences, and all the details of arrangements, must be understood as equally intrusted to me. I have of course, by that, been obliged to refrain from taking in proper time a variety of measures beneficial to the work, and fully within the limits of the stipulations of the contract under which I work for the Coast Survey. The loss produced by the delay of the work has been very great, I might say upwards of $10,000, under the fallacious appearance of trifling economy. I hope that also this difficulty will be levied, by the department maintaining the exact observance of the contract with me, and, if needed for better information, ordering the impartial investigation which I have so long claimed, in order that the department may be furnished with more accurate data to assess a just judgment.

16. I am sorry to be obliged to repeat here again, that the larger instrument with which the main triangulation is to be continued, has not yet arrived from London. I have lately again taken measures to press its forwarding, by means of our Chargé d'Affaires in London. I hope there will be no doubt of its arrival before the opening of the next campaign, when I shall make the most diligent and constant use of it: it is eminently calculated to accelerate the work by its superior arrangements and accuracy. However, if even it had been here, I could not have ventured to go in the field with it last summer, on account of the insufficiency of the appropriation to bear the expenses, after what had been applied for the expenditures of the two vessels employed in the soundings, as it would have caused the *stopping the whole work* for want of means.

17. My situation and the state of the two works of the Coast Survey and the construction of the Weight and Measure standards, which are equally under my charge, according to my contract with Government, have been considerably complicated by the separation of the Coast Survey from the Treasury Department. Both works are

equally in the interest of the commerce, and have no reference to the navy. The accurate Survey of the Coast is made with the view to protect the property afloat on vessels from shipwreck; and the regulation of the Weights and Measures, by establishing accurate standards, is to regulate the distributive justice in all commercial intercourse. The knowledge, and a part of the means, to be employed in the two works, are the same; so much so, that when I procured the instruments for the Coast Survey, I procured equally the standards, and part of the means which are now employed and indispensable for the Weights and Measures: the reunion of the works in the Treasury Department, would be a real advantage to both works.

18. With respect to the appropriation which it will be proper to propose to the session of Congress now opening, I am enabled to give more detailed information from the data which experience has furnished, than it was possible to give last year, and to which may be attributed the insufficiency of the last year's appropriation. For the most advantageous and economical advancement of the work, it is very desirable and necessary to avoid it this year, on account of the great detriment which would accrue to the work from it. The following are the results which are presented for the different items:—

1. The expenses of each party of secondary triangulation, have proved to be about $4,100 per annum: three parties have been annually engaged, and an equal number it is proper to employ next year; their amount will therefore be	$12,300 00
2. The annual expense of every topographical party, has been at the rate of $4,000: the next year it will be necessary, for the best advantage of the work, to have five parties; amounting to	20,000 00
3. By the amount drawn from last year's appropriation, by the Navy Agent in New York, it appears that the two vessels have cost, during the time they have been employed, $16,124 23; at which rate the same two vessels must be rated for next year at	20,000 00
4. The main triangulation, according to the experience in 1833, and the nature of the work and necessary persons and means to be employed, must be rated at	22,000 00
Instruments—telescopes, reflecting instruments, drawing implements of all kinds, books, and other similar articles ordered, and to be paid this year, and such as are still to be ordered, or constructed under my direction,	6,000 00
Field equipment—tents, stands, signals, and similar objects, to be procured or repaired, &c.,	3,000 00
Before the next appropriation will likely be made, there will probably be expenses incurred to be covered by it, to the amount of	4,000 00
Total,	$87,300 00

19. The paper which I handed in last winter had for its object, to show the regular appropriation which it would be most advantageous to make annually, for the proper, advantageous, and, as to the quantity of result, most economical prosecution of the work, which I estimated at $60,000 annually, unless it should be found proper, in the greater extension of the work, to make a proportionate increase.

20. The appropriation, which was only $30,000, was still very much reduced, by loading it with the item of the vessels, which had never before been taken into consideration, because it had always been intended to lay this expense upon the general naval appropriation. The deficit therefrom resulting is evidently the cause of the increased amount proposed above; and so are the expenses of the vessels now to be taken into account.

F. R. HASSLER.

New York, Nov. 22d, 1835.

Addition to page 68.

Montpelier, Feb. 11*th*, 1835.

DEAR SIR:—I have received your communication relating to the Survey of the Coast, and thank you for it. Finding that my great age, now within a few days of its eighty-fifth year, with a constitution and health severely crippled by disease, do not permit me to give the attention due to the printed Documents, I can only refer to my former letters for an expression of the sentiments and good wishes entertained for you, adding the hope that your accounts with the government will not fail of a satisfactory adjustment.

With friendly salutations,

JAMES MADISON.

Mr. HASSLER.

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27th Congress,
2d Session.

Doc. No. 28.

Ho. of Reps.
Treas. Dept.

COAST SURVEY.

LETTER

FROM

THE SECRETARY OF THE TREASURY,

TRANSMITTING

A report of F. R. Hassler, superintendent of the coast survey, showing the progress made therein up to the present time.

JANUARY 3, 1842.
Read, and laid upon the table.

TREASURY DEPARTMENT, *December* 30, 1841.

SIR: I have the honor to transmit, herewith, a report from F. R. Hassler, Esq., superintendent of the coast survey, showing the progress made in the work up to this time.

Though this report of the superintendent is chiefly confined to replies to the inquiries contained in the resolution of the House of Representatives of the 24th of June, yet, as it also exhibits the present condition and the extent to which the survey has been prosecuted, it is thought expedient to lay it before Congress, under the impression that it may supersede the necessity of submitting an annual report on the subject, as heretofore usual at the commencement of each regular session.

All the data in the possession of this Department, for answering the resolution mentioned, has been prepared, but that portion of it which calls for the "indirect expenditure upon the survey by reason of the employment therein of the public vessels and officers," has not yet been received from the appropriate department. It is, therefore, deemed advisable to await the receipt of this information before replying to the resolution. This information is expected in the course of a few days, when all the inquiries contained in the call will be immediately answered.

All which is respectfully submitted.

W. FORWARD,
Secretary of the Treasury.

Hon. JOHN WHITE,
Speaker Ho. of Reps.

STATION YARDS, NEWTOWN SQUARE,
Delaware Co., (Pa.,) December 9, 1841.

SIR: With the present I have the honor to transmit to you the answers to the questions made in Congress upon the state of the survey of the coast under my superintendence, which have been communicated to me by your Department, under date of 2d July, 1841, with the request: that I should answer what in them relates especially to the work.

I hope you will approve of the manner in which I have treated the different subjects; and I have no doubt that the account of the financial part of the questions, which are of the special domain of the Treasury Department, will complete to satisfy Congress upon every point: that may ever have laid in the view of the questions.

It will easily occur, that to render account upon the elementary scientific part of the work would be improper in a public document; the principles of the science, and the manner in which I have applied them to the work, I have published on the occasion of the interruption of the work of the survey in 1818, in full, though under the unavoidable supposition that the reader should possess the necessary mathematical elements, which can in no case constitute part of an account rendered of such a work. I have since introduced further particulars in their proper places in the yearly reports to Congress, and in other documents; the first is in *duplo* in the library of Congress, and the second must be supposed known to every member of Congress.

It is to be hoped that the attention excited by the call in Congress will induce the members of both Houses to visit the establishment for the work, which is so near the Capitol, to inspect personally whatever might be further desired by any one of them in particular, to satisfy himself fully upon the propriety of every part of the work, and the manner in which it is conducted, even if no special inspecting committee, or similar, should be established. By the nature of the work and the extent of the establishment, such a way of informing Congress, upon all, would appear most speedy and appropriate, as well as the most effectual.

In the habitual course always followed for the works of the coast survey, I would about this time have rendered account of the progress of this work since my report of last fall, and added to it the state of the works for the standards of weight and measure. But the intermittent fever, which has taken hold of me at this station, like it had previously in other places attacked several assistants, has hardly allowed me to make the few observations of angles which the very unfavorable weather would admit of. I am, by that circumstance, constrained to request that you will indulge me with the liberty to refer such a report to next spring, when I hope to be enabled to present with it, at the same time, standards of the liquid capacity measures, which I hope to have ready for delivery at that time.

In the answers to the questions of Congress, the actual state of the work at this time is, of course, comprehended, so that it will fully supply the place of any special yearly report that I might be able to make.

Since several years that the organization of the coast survey has been in regular course and progress, the appropriation granted by Congress for the same has been $100,000, which has proved most appropriate, and therefore most economical in its result in the adequate advancement of the work.

I take, therefore, the liberty to suggest that the same amount of $100,000

be requested from Congress for the expenses of the coast survey work for the coming year, and I have no doubt but the insight given into the state of the work and its organization will support the proposition with full weight.

Perhaps you may find proper to join to this report, also, my first letter addressed to the Treasury Department immediately on receiving the direction for the answers to the questions proposed by Congress.

I have the honor to be, with perfect respect, your obedient servant,

F. R. HASSLER.

The Hon. WALTER FORWARD,
Secretary of the Treasury.

Questions of the resolution of Congress of June 24, 1841, relating to the survey of the coast of the United States, with the answers to the same, by F. R. HASSLER.

Ques. 1. "The progress which shall have been made in the survey of the coast."

The works of the survey of the coast cover now upwards of 11,000 square miles, with primary and secondary triangulation, topography, and soundings; from the east end of Rhode Island to the neighborhood of the Chesapeake and Cape May.

This is evidently a great progress for the time that the work has as yet lasted; particularly if it be considered that every thing was to *be created*—even the ability of the assistants, they being at first new in the business. It is actually *much more than has ever been done in any similar work before;* for it must be recorded: that since the first law of 1807, nineteen years were entirely unproductive for the work, by postponement and interruption; five years were used in procuring the necessary instruments, and in preparations, as before that time there was not a single instrument, in this country applicable to such a work. Only ten years were employed in the actual work; of which the two first, 1816 and 1817, were rendered useless, and the expenses made became a bill of loss, by the overthrow of the work in 1818; so that the whole work now producible is the result of hardly about eight years actual work.

The gradual progress, year for year, has always been presented by my reports, once, and often twice, sent in to Congress by the Treasury Department, and printed every year, in which I stated all that was occurring and of interest.

The aim of the coast survey is, and has always been considered to be, by all the successive administrations since its existence, to furnish, with the fullest accuracy possible, all the geographical, topographical, and hydrographical data that may in any way be needed for the navigation and the defence of the coast, in their generality, and to the extent of the country in the rear of the coast, to which the valleys extend: that empty their waters into the Atlantic, and are thus separated from it by some chain of mountains, or what may be called the nearest chains of elevations separating the interior from the coasting countries; and that this work should also furnish the elements to any future map of the country desired, as it is by its nature so extensive, and so situated, as to furnish the elements of maps of all the States. In fact, some States have already united in the work, to extend these elements to the advantage of an accurate map of these States.

Ques. 2. "Number, location, and length of the several base lines measured for the triangulation."

In the works of 1817, two base lines had been measured preliminarily, in order to ascertain within certain limits the accuracy of the unit upon which the detail works, to be enclosed within them, might be grounded. One in English neighborhood, in the State of New Jersey, of 5,87209 miles, and one upon Gravesend beach, on Long island, of 4,81952 miles. Since the re beginning of the work a base line was measured, in September, 1834, upon Fire-island beach, on Long island, of 8,7396 miles at the level of the sea, with the apparatus thereto destined, with microscopes of double focus, and in all respects so as I have described it in my *papers upon various subjects relating to the survey of the coast.* (Transactions of the American Philosophical Society, vol. 2, new series.) This base line serves now to the work as fully accurate unit; its being within the limits of the tide, dispensed of course to reduce it to the level of the sea. The numerical details and calculations are recorded in several folio volumes, containing some millions of figures, open for inspection to any man, but too long to transcribe here. For nearer accounts, see principal documents of the survey of the coast, vol. 1, page 17, seq.; letter to the Secretary of the Treasury, April, 1818, and report upon the coast survey, May, 1835, printed documents, vol. 2, p. 103.

Ques. 3. "The number of the stations occupied therefor, (namely, the triangulation.")

The stations occupied in 1817 were 11, forming the elements of 124 triangles. At that time I was alone in the work. Since 1833, the primary triangulation has occupied over 20 stations. The secondary triangulation has several hundred stations. In the tertiary and plane-table works the number of stations is much greater. These details can best be inspected, or inquired into, in the office of the coast survey itself.

It is here only proper to remark, that the reducing of the primary triangles to the smallest number is one of the great requisites for the accuracy of such a work. To bring the irregular shape of the country into the most advantageous regular mathematical figures, which is the requisite of an accurate survey, is what makes the strongest call upon the science and ability of the operator; therefore its value and labor cannot be judged by the *quantity*, but by the *quality alone*, which, to judge of, requires the same insight into the mathematical and physical sciences as the execution of the operation itself. The success in all these things depends not only upon the instruments and labor of the observer, but still more upon the perfection of the *methods* devised for the work. In this respect I have the favorable unanimous judgment of the most eminent men of science in Europe, distinctly expressed in publications, (see documents, vol. 1, pp. 55, 59, seq.,) so that in fact the speciality of my *methods* are not only *publicly known*, but even publicly *judged*, and *approved*, long ago.

Ques. 4. "The observations made for and the corections applied to the same, (namely the triangles.")

This would require to copy the journals of the observations which contain the reductions, and those of the results; both exhibit the application of the principles implied, as I have exposed them in the memoirs of the Philosophical Society above quoted; they must evidently be inspected in the office, in the about 180 folio volumes which contain them. It would be very ill-placed to repeat again here mathematical elements already fully ex-

posed, because this paper is official, and the proper authority must be supposed in full possession of the means to judge upon them by their known simple scientific principles, these principles being contained in the elementary works on mathematics.

Ques. 5. "The astronomical observations made for the determination of latitude and longitude."

Upon this question it must be at first observed that the ultimate clause of the renewed coast-survey law of 1832 has cut off the most favorable means by the phrase—"provided, that nothing in this act, or the act hereby revived, shall be construed to authorize the construction or maintenance of a permanent astronomical observatory." This proviso forms an unfortunate limitation of the work. The disadvantage therefrom arising for the acceleration and easing of the accuracy, by the determination of ever-standing points of reference for the whole work, is too evident for men acquainted with its scientific requisites to need being treated here.

That the very object prohibited by this clause must unavoidably, however, once be established in this country, is easily seen, as it is one of the requisite tools for a nation having a navy; if done early enough to let the coast survey enjoy the benefit of it, the expense would be comparatively trifling, and immediately recovered by the advantages arising from it in this *national work* of the survey.

Circumstances have not yet allowed to supply this absence fully, nor is it the time, as yet, nor appropriate, nor *possible* in the state of the work within the present limits of it, to do more than what has been done, namely, the following:

1st In 1833 and 1834, the first years of the new operations in the coast survey, observations for latitude with the sun, and with stars, were made upon every station of the main triangulation, with an astronomical repeating circle of 18 inches diameter, and with 10-inch reflecting circles, upon my own plan of construction, which is such as to compensate all the errors reflecting instruments may be subject to. At several of these stations, also, azimuths were observed with the sun.

2d. A special station was made in 1838 upon Weazel mountain, near Paterson, N. J., for latitudes and azimuths; and a solar eclipse, occurring just at that time, gave occasion for an observation of longitude at the same place.

3d. Every solar eclipse that has occurred during the time the work has as yet lasted, has been observed at some one of the survey stations.

It is well known that all those results are to be united, in due time, with those of future times, into one general result, by means of the primary triangulation; while the results obtained hitherto, being for the immediate use of the geographical works of the survey *only*, must be preserved within it until this union into a regular system is accomplished. It would be highly *improper* to give them to the public earlier, as well according to good principles of science, required in the work, as in obedience to a positive, and very proper prohibition, stipulated by Government in my original contract of 1816, confirmed in 1832.

The results of the coast survey constitute a property of the nation at large, which it acquires by the labor and expense bestowed upon the work for which compensation will, in proper time, be obtained by the *authentic publication* of the results. All interference of private publications are directly *unjust*, and *derogatory to the lawfully acquired property* of the

nation, and *the ultimate proper utility* of the work. The garbled publications, which would be occasioned by partial communications, would interfere with very unjustly, if not destroy entirely, the advantages of the future authentic publication of the work in its appropriate connexion, turning the public expense into profit for the private pockets of single individuals, having no exclusive claims to its benefit; and the *public* would be *deluded* by being presented with results falsely set up as *authentic*. It is self-evident that none but the maps published by *authority*, as results of such a work, either deserve, or will ever obtain, the confidence which is an indispensable requisite in the estimation of the public. The Government that undertakes such a work takes by that act the *engagement* towards the public to provide such maps as shall deserve full and exclusive confidence; therefore, also, it must *discountenance* all that might have any tendency to occasion *doubts*. These considerations were made by all the Governments of Europe which have executed such works. They have followed, in full, all the principles here exposed. It is a very essential consideration for the public *security*, *aimed at* by the work, to prevent all possible abuse.

The map of New York, now in progress of execution, and engraving, will contain as much of these geographical data as belong to the part of the country which it represents, and so will, successively, every future publication within its limits. Whatever nearer particulars might be desired in this respect must be seen in the journals at the office, as the details would be by far too long for these answers. All this lies in the nature of the subject, and cannot be otherwise.

By a regular triangulation, the latitudes and longitudes of every one of the points of the survey are determined with infinitely more accuracy from a few certain, and expressly made, astronomical stations, by means of the geodetical elements obtained by the triangulation, than by the direct celestial observations, which might be made cursorily at these points themselves; in fact, such results are *not admissible* in the comparison. Therefore, also, this has always been the mode of proceeding, where no permanent observatory could be referred to, as the best principles in fact require.

Ques. 6. "The work done by each corps employed in the service."

The survey works are distributed by myself to the best advantage of the work, according to the time, situation, and capacity of the assistants, at any given period, in proportion and succession as they are wanted, and not according to districts or localities. The works are contained in—

32 folio volumes of my own observations and results;

90 folio volumes and cahiers of the assistants;

30 or 40 cahiers, folio, of calculations, and tables, &c.—and upwards of 100 journals, of all sizes, of naval and tidal observations, soundings, and observations thereto belonging. To this I might be allowed to add—

17 volumes of documents of correspondence, and upon subjects of the administration of the work; and about 20 volumes of journals, calculations, and documents relating to the works for the construction of standards of weights and measures;

140 maps; and

80 charts of original works of the different assistants, upon different scales, from $\frac{1}{5000}$ to $\frac{1}{50000}$;

2 register maps, upon a scale of $\frac{1}{100000}$, keep account of all these works, and serve as guides to select the original maps of any part of the work, of which an abstract, or the execution of a map for publication or otherwise,

may be desired. These two maps exhibit the works done upon the 11,000 square miles collected together; the one has 10 feet length by 4 feet breadth; the other, 5 feet length by 4 feet breadth;

4 sketch maps, showing the present state of the triangulation, and of the topography and soundings; and three or four similar ones, showing the state of the works at each preceding year. A number of triangle sketches, and preliminary reductions of the charts and maps, for the use of the register maps, &c. The map of New York is executed double, in manuscript, besides the engraving.

Regular registers of all the journals and maps keep up, to every time of return from the field work, the account of the whole work; they are constantly open in the office for inspection, as well as the works themselves.

Notwithstanding I am so well aware that also the elevation above the level of the sea of the principal station points should be determined, that in 1817 (when I was quite alone) I had begun it, I have been obliged to omit the prosecution of this interesting subject, because of the more urgent call for the geographical and topographical part of the work, and the augmentation of the expenses which would naturally attach to it. The stations being well secured, so that they can be found in future, and the distances exactly known, this datum of the detail geography of the country can be ascertained at any future time.

Ques. 7. "A description of the charts published, if any."

Whenever a special map has been called for, as extract of the works of the coast survey, it has been immediately given; so have been—

The harbor of Bridgeport and its neighborhood;

The harbor of New Haven and its neighborhood;

The bay of Newark and its neighborhood.

These were presented to Congress, and published in the documents of Congress.

Other extracts have been delivered in manuscript, whenever desired and authorized, to different public offices, and otherwise.

The map of New York is known to be in a state of considerable forwardness; it will contain about 1,170 square miles of the work. The engraving has been begun.

After that map is finished, it will be possible to proceed to a regular succession of publications, east and south of that place, provided the regular order and progress of the work be allowed to proceed *in all respects as it is now organized.*

Ques. 8. "The amount of money expended from time to time since its commencement."

The first appropriation, made in 1807, returned nearly untouched to the *surplus fund.* In a similar manner was the next *following* appropriation *returned*, because, under the expectation of war with England, the actual work was always postponed.

After my plans for the work of the survey had been discussed and approved, only the late Professor Patterson, of Philadelphia, and I, were directed by the President to agree, by correspondence, upon the instruments, &c.

In 1811, I was sent to London to procure the instruments for the survey of the coast, to be constructed upon my plans, previously presented to the Secretary of the Treasury and to the late Professor Patterson, and by them approved. During my stay in London, the appropriation was suffered to expire, and I was left in London two years upon my own private

means, as also for about one year yet after my return, to no small private economical damage.

In 1816, new appropriations were made; of which, however, only about $13,500 were used for the work; besides that, the balances due to me and for the instruments were paid, and the whole remainder, of about $50,600 was transferred to the War Department, to enable it to continue the work; as the amendment of the law in 1818 admitted it; but, no action having taken place upon that, the whole of that sum, with the exception of a few trifling expenses, consequent upon the delivery of the instruments, returned again to the surplus fund. The statement of the Treasury Department, handed in to the Senate at the beginning of 1818, exhibits:

Total amount of appropriation - - - -	$183,725 39
Remaining - - - - - - -	50,595 39
Thence, apparent appropriation - - - -	133,130 00
Of this was returned to the surplus fund - - -	79.004 32
Whence, total expenses for instruments, work, pay, outfits, &c.	54,125 18

By which, and by the statement just made, it is evident that for about $40,000 the instruments and objects of that kind were on hand. The accounts with the Treasury Department and the volumes of printed documents may be consulted for nearer details.

The amendment of the coast survey law of 1818, giving liberty to the Navy or War Department to continue the work, it appears that there was something of that kind attempted by the Navy Department; by what means of appropriation, or otherwise, I cannot say; only the fact is proved by the statement of the report of the Navy Department of 1828, which says: "Nor can such surveys be made without the aid of the means contemplated by the act of 10th February, 1807, to provide for surveying the coast of the United States."

The Treasury Department has applied to the Navy Department for the information upon this point.

The appropriations made for the coast survey, since its being taken up again, are as follows:

In 1832 - - - - -	$20,000
1833 - - - - -	20,000
1834 - - - - -	30,000
1835 - - - - -	30,000
1836 - - - - -	80,000
1837 - - - - -	60,000
1838 - - - - -	90,000
1839 - - - - -	90,000
1840 - - - - -	100,000
1841 - - - - -	100,000
Total - - -	620,000

It must be remarked here: that, in conformity with my original request, always adhered to, the money for expenditures does not pass through my hands, but all expenses are made, and attended to, by an accounting officer appointed upon my proposition, like all other assistants, and selected from among them, who renders account directly to the Treasury Department.

Ques. 9. "What sums have been appropriated for the purchase of instruments and books?"

The original amount expended for instruments procured for the first establishment of the coast survey, as stated in the preceding section, is about $40,000. Since the recommencement of the work, in 1832, various sums have of course been expended, as well to repair the losses which the collection had suffered during the interval, from 1818 to 1832, as for the necessary extensions which the progress of such a work always requires.

On another hand, many instruments have been at different times given off to the Departments of War, Navy, and State, and also to the *State of Massachusetts*, for their use; because they could be got much better and quicker from this collection, and from the workshop which is attached to the coast survey, as an *absolute requisite*, that the work may not be stopped in its progress.

The details of these transactions must be collected from the accounts rendered by the accounting officer of the coast survey to the Treasury Department; they would fit only an accessory document, to be made by the Treasury Department or the accounting officer, as voucher to these assertions.

Regular inventories have at all times been kept of the instruments, books, vessels, and all other property belonging to the coast survey, which can be produced, and inspected in the office at any minute.

It is to be observed that a considerable amount of actual property exists in the coast survey establishment, which forms in fact an unexpended capital; five vessels, numerous boats, instruments, clocks, chronometers, books, tables, chairs, tools, tents, and in general all the implements necessary in the office and in the field, besides the full equipment of the vessels, &c. Some of these latter have been returned to the Treasury Department, and their amount is still due to the coast-survey fund. An abstract of an inventory of the property in hand is joined herewith, the amount of which exceeds, certainly, $120,000.

Ques. 10. "The names of all persons employed upon the coast survey, distinguishing such as may have been of the army or navy, together with their salaries, or other compensation."

The *qualifications* are what is of interest in the work; and these are not attached to any names, or class of men. In some parts of the work, the *personel* must be, by its nature, somewhat variable.

My compensation is fixed at $3,000 per annum, and for the personal expenses which are occasioned by the work $3,000. The compensations of the principal assistants are also calculated with a view to compensating the personal expenses to which their functions subject them; all other persons employed receive their board, or a weekly allowance for the same, according to the greater convenience of the work, additional to their pay.

Every quarterly account rendered by the accounting officer gives, of course, the fullest information in this respect. This part will therefore be answered by the Treasury Department.

Ques. 11. "By whom appointed to the service."

This question has been *decided* from the very beginning until this day, always equally, *by the nature of the subject*, by the law of 1807, and by the *contract* I entered into for the work with the Government.

The nature of the subject and the work dictate distinctly that the chief, or (so called) superintendent, of the work shall have the selection of the proper persons needed for his assistance in any way whatever, he being

the best judge of their *fitness* as to the *qualifications* required in any given case; and that no assistant, or other persons to be employed, can be introduced into the work by any other ways or means. It is, therefore, upon the superintendent's *proposition* that the assistants are appointed.

The original law of 1807 gives the execution of the work directly into the hands of the President of the United States; thence he can give it (what is in parliamentary style called) in commission to whomever he pleases; the renewed law of 1832 confirms this. Upon that principle all successive Presidents have acted. The survey being made in the interest of *commerce* principally, the Presidents have at all times given it in commission to the Secretary of the *Treasury*—this Department being, in fact, the only one fitted for the good success of the work; for many reasons. The attempts made to place the work under the Navy Department proved signal failures, as documents fully show, in which the causes and incidental situations of the subjects relating thereto are sufficiently deduced, and to which I therefore refer.

Upon the proposition of the superintendent for any appointment involving a yearly compensation over 1,000 dollars, the Secretary of the Treasury, to whom the proposition is addressed by the superintendent, refers to the President, who decides finally upon it. Temporary appointments, or such as do not exceed $1,000 annually, are at the free, final disposition of the superintendent.

Ques. 12. "Exhibiting as well the direct appropriations for the survey of the coast, as the indirect expenditures upon it, by reason of the employment thereon of public vessels and officers."

There are no indirect expenditures by the employment of public vessels or such like. All the vessels employed belong to the coast-survey fund, and are kept in repair by the same. Even last winter the Navy Department had the loan of one of them, and returned it without having kept it in proper repair.

As for the employment of officers of the navy, it is proper here to refer simply, and positively, to those officers employed in the coast survey, to state: whether they do not find, from their experience, that the navy is indebted to the coast survey, and not the coast survey to the navy. This was one of the circumstances aimed at, and sufficiently discussed at different times in the documents, to which it is always proper to refer.

These officers receive an additional pay from the coast-survey funds, but from the navy nothing different from any other service in which they might otherwise be engaged. The naval part of the work is of course the smallest division of the work, as the naval operations have nothing to do with the direct determination of any distances. These are furnished by the triangulation and the topographical work, with the latter of which they work simultaneously, as much as circumstances will permit, getting their guiding points from it to apply to the determination of their points of sounding.

Ques. 13. "The probable length of time required to complete the survey."

It would be highly improper to answer this question by *direct numbers*. It was made to me by the President in 1835. I answered it by stating this, and entering into particulars about the state of the coast survey, its variable chances in locality, weather, &c., and upon my methods of proceeding, with the view both to accuracy and celerity, and to the *best forwarding* of the work. The ultimate answer of the President was, "that is right; that will accelerate the work," as stated in its proper place in the

printed documents. That such is the only way of treating this question is evident by nature, and by the scientific principles which must guide the work, if it shall be led to an *honorable* and *permanently useful result*, as is enjoined *by the law*, and by all instructions. Assiduity, patience, and perseverance, will bring the work along and to completion as fast as its nature and the disposable means will admit; and positive numbers are not appropriate to state beforehand.

The above statements are already contained in the printed documents. I beg leave, therefore, to refer to this previous treatment of that subject, and to state the following, with a view to clear up the ideas of any inquirer, viz:

With the advancement of the mathematical and physical sciences, the means of acceleration of any work grounded upon them also increase; but still, without such time as is appropriate to the extent of a work, nothing is possible. The coast of the United States is about 3,000 miles long; with its inward bays, large navigable rivers, &c., it will present at least triple that length; and a certain breadth inland must always be surveyed with it, as the aim of the work dictates. The part of the coast now executed being from east of Rhode Island to about Cape Henlopen and the Chesapeake bay, an approximate judgment might be cast upon the question, from the relative extent of the work now executed to the whole, of which it presents no inconsiderable proportion, provided it would be possible to ascertain beforehand the exact nature of the coast yet to be surveyed, and all possible circumstances, the weather, the impediments, &c. But these things being impossible to be known, the judgment would be more than vague.

Ques. 14. "The probable amount of money required to complete the survey of the coast in the mode heretofore pursued."

This is answered in a great measure by the preceding answer upon the time, as from it depends much of the determination of the expenditure. All that is needed for a full answer is, that the whole work is in every way contrived, and carried on, in all its parts, in the most economical manner possible; and that the proper investigation and inquiry that can be made, *and I should like would be made*, comparatively to any other works, would certainly show that never so much valuable work of that kind has been obtained, in any country, and under any known arrangement, as there has been obtained, in the same time, at a proportionally equal expense, as in this survey of the coast of the United States, under the *present organization and administration of that work.*

The results of the coast survey will furnish, for the future, regular systematic data to ground any detail surveys upon, that might be needed, thereby avoiding the double expenses hitherto so frequently occurring, from the Engineer and Navy Departments acting disconnectedly, thereby, of course, doubling the expense, and, I might say, often even *the doubts.*

The coast survey has far more than paid its expenses up to this time, by the advantages which it has procured to two of the principal ports of the country, New York and Philadelphia, the accurate knowledge of which has made known advantages in their navigation superior to those hitherto known, which no operations of surveying, so frequently carried on in those waters, have been able to determine, because they were not sufficiently well grounded upon systematic principles, and upon properly connected operations.

Ques. 15. "With the suggestion of any other mode of surveying the same."

This does not belong to me to answer by any particular discussion, but that both the mathematical principles which must guide the work positively dictate the mode pursued, and that the experience made between 1818 and 1832 has distinctly proved, in this country, that no other mode, nor even fashion, can lead to a result; notwithstanding that in 1832, and even now again, it has been attempted to speak, and even write, about a (so called) chronometric survey, which the science does not know, as chronometers give only detached determinations, and no *survey*, which latter implies a connected series of operations.

I hope to be dispensed from discussing this question; but I allow myself, instead of it, to present the examples of other countries. The surveys made in Europe, of sufficient note to apply to them the mathematical and physical sciences, which are, in principle, to be applied, and without which *success is directly impossible*, were all begun in the last century upon similar plans of triangulation; varied as they all are in the methods and mode of the detail execution, they all agree in that principle.

Austria began already, after the times of Cassini and Liesganig, (1768,) using the triangles of Liesganig, made for the determination of degrees of the meridian, in Austria and in Hungary, as the primary mathematical elements of her future maps.

Russia began under Catharine II, and has since constantly either taken up at different points or extended the triangulations successively made, with always more perfection of men of science. Now, these triangulations form a fully connected series from north of the arctic circle to south of Dorpat. The work goes now on, with a great abundance of means, as well in persons as money, for the topographical and hydrographical parts, to which the triangles give the foundation, principally around the Baltic.

Sweden has similarly taken advantage of the trigonometrical operations of Svanberg, in Lapland, for a measurement of a degree of the meridian begun in 1801, for its maps and the charts of its coast.

Denmark began, under Bugge, before 1784, for its peninsula; and not many years ago the part of Holstein was triangulated, in conjunction with Hanover.

The kingdom of Hanover has been triangulated by Professor Gauss.

Prussia, having taken advantage of the extension of the French triangulation in Germany over its present Rhenish provinces, has not only extended this triangulation over a great part of its dominions, but has added new measurements of degrees all over, until lately, Mr. Bessel, astronomer royal of Königsberg, joined these works with those of Russia just quoted. All these works have been, and are still, used as elements for the geographical, topographical, and hydrographical surveys of the country.

Swabia was triangulated by my university friend, Professor Bohuenberger, of Tübingen, and I accompanied him, in 1795, in the junction of his triangles with mine in Switzerland.

The operations of the triangulation of Bavaria are well known and fully described.

All the States of Germany have either made triangulations upon their own base lines, independent of the French triangulations, which were constantly carried on in the rear of the French armies, during the whole of their campaigns, from 1791 onwards, or used these very triangulations;

and the different States have grounded upon them the maps of their countries.

The same is the case with Italy, where the triangulations of Boscovich, Beccaria, Zach, Nouet, the joint Austrian, French, and Sardinian commission, and others, from before the French revolution, during the same, and since, have been, and are, constantly used as foundation to any maps or charts that are constructed.

Naples and Sicily proceeded in the same manner; and the whole was executed *without any naval officers* being employed in it.

In 1791 I had already begun myself in Switzerland a similar operation, by the measurement of a base line of about 7½ miles long, upon which some triangles were grounded. The several subsequent revolutions interrupted the work, but it was taken up again repeatedly, by me and others, upon the same plan, and with these *my* very same *first elements*. According to the latest accounts, the topography has now been completed. It was the notice of that work of mine, which came to this country about the time of my arrival, in 1805, which occasioned first the proposition to me to do the same here: thence the law of 1807, and the call for plans of operation, of which mine, now proceeded upon, was selected from among thirteen, by the unanimous vote of a special committee assembled in Philadelphia, and by the President himself. (See the historical part of the printed documents, vol. 1.)

France began its first map, after the triangulation of Cassini, in the early part of the last century. The defects which this work presented in its detail execution, which was not made with the care now used, and the improvements of the sciences that progressed rapidly after those times, produced first in 1786 the triangulation to join the observatories of Paris and Greenwich, under Cassini, the third in France, and General Roy in England. Immediately upon it followed the decision of measuring 12 degrees of the meridian, to serve equally as a base to the establishment of standards of weight and measure, upon an unit of length derived from the quadrant of the meridian of the earth, and by the most accurate principles of natural philosophy, applied to the capacity, measures, and the weights.

Only after these works had passed the ordeal of approbation of the men of science sent from all the continental nations of Europe, assembled in Paris in 1800, (England alone refusing to take a share in a *scientific useful aim*, while it employed its arms and treasures to the destruction of the continent of Europe,) the French, as well as the foreign members of this scientific convention, reporting jointly and unanimously—only then, the accurate elements thus obtained were decided to be applied to the construction of a new map of France and to the charts of its coast.

When all the interior that had been done by the triangulation and the topographical works, which always must form the base of the hydrographic operations, had been executed, the western coast was begun in 1816, and account rendered of it in 1829. The coast of the Mediterranean, so far as hitherto known, is not yet finished; but, during the whole of the wars of the Revolution, the triangulations whose bases laid in the French works were carried on as their armies proceeded.

England grounded the first starting of its survey upon the very base line measured in 1789 by General Roy, on the occasion of the junction of the observatories, mentioned above, and has continued it ever since upon the same plan. Several volumes of the work are extant, but the whole is

not yet completed. About the year 1818, according to English accounts of that time, upon the part of the work in Ireland, "above 600 persons, of different conditions, were and are continually employed," &c. According to later verbal accounts, the work goes on now from Dublin, south, towards Cork.

In the East Indies, the English began already, in 1800, trigonometrical surveys, upon which the topographical and hydrographical details are grounded and carried on, like all the rest, upon the same principles as the survey of this country now is, but with immensely greater expenses, and a *personel* far more numerous. The work is proceeding now always upon the same plans and principles, having been extended many degrees of latitude north in new territories, under Lambdon, Everet, &c.

Europe is covered with well-connected series of triangulations, from the south of Sicily to past the north polar circle; from Ireland, through England, France, Germany, to the interior of Russia; from Bordeaux to the frontier of Turkey, and in all the intermediate parts: so that no map need be, nor actually is, attempted without the elements of these triangulations. The works which I have made in Switzerland are included in this series.

These facts give an idea of the labor required to produce such a work as will stand the test of *public scrutiny*, be honorable and useful to the country in which it is performed, and which therefore shall, as I am ordered to make it, be *permanently useful and honorable* to the country. That any other mode of proceeding would dishonor the country, and foil the aim of usefulness entirely, is too well known to need any discussion.

The mathematical theory, which, it will never be doubted, must be applied to such works, is therefore fully supported by the imperious fact, that all surveys whatever, of any note, were made by triangulations, as the only possible mode of operating, *capable* to lead to a result.

Notwithstanding that in this country the work is to be done with reference to views which in science would be called at least over-precipitate, (that is, the results of maps and charts are to be attended to at the same time as the elements are obtained, upon which they must necessarily be grounded,) this is not to be taken as an authorization to dispense with the principles, without which nothing at all is obtainable in that line, that could be considered as warrantable result; and it *cannot be* supposed that it would be approved by the American nation, if such a work, undertaken in this country, was to remain behind the similar works of all other nations, and to be recorded in history as in arrear of the present state of scientific civilization.

If, therefore, in the state of the country and the nature of the demand upon the work, it cannot begin by the determination of degrees of the earth's surface, upon which all the works of that nature are now habitually grounded, the work would, however, be positively shamed out of the annals of the science, and of such works, unless its results could be used, in future proper time, according to any future desire or exigency, to contribute their proper share to the determination of the figure of the earth *in this country*. This very last result will form one of the principal means for its ultimate proof, and credit for accuracy.

The coast survey, to yield the desired and indispensable accuracy and permanent utility, must partake in full of the character of all the works quoted, and exceed them, where possible, in various points, and in accuracy, as instances could be found in the work, by the approbation which

the means and principles employed have met with in Europe, from the most eminent men of science, who have practised in such works.

By entering into the details of this part of the subject, many interesting scientific remarks might be made, which circumstances evidently prohibit here to touch. I have, in its proper place, in my reports printed by Congress, stated what, in this point of view, refers to the Mason and Dixon meridian line, which has been so unsuccessfully tried to be applied as an element to such scientific determinations.

All this answers certainly, also, the question of the probable time that may be required for the completion of the work so fully as to reduce it to the simple statement, that the more impediments there will be laid in the way of the work, the longer it must last, supposing even that it be not entirely destroyed, and the whole undertaking become what is called "a bill of loss for the nation," by attempting to *prescribe* details and *modes of proceeding unscientific*, or distracting the work from its proper course, as former experience has proved.

Ques. 16. "Which shall have for its object the acquisition of the greatest amount of useful information in the shortest time, and at the least expense."

This object cannot be attained by any other mode than that now employed in the coast survey—in no way whatsoever.

Cases are where the economy of a few hundred dollars claimed, or aimed at, has occasioned the loss of some millions of money, years of time, and has caused many disagreements.

It might apparently be fair to claim for the coast survey work, in its present organization, the habitual advice, "Let well alone."

It is easy, by misapprehended views of a scientific subject, investigated with certain predetermined aims, views, opinions, etc., to draw conclusions directly contrary to truth. Such are the ideas which would pretend to determine, almost instantaneously, the latitudes and longitudes of places with sextants and chronometers, when geographical determinations are to be made with that accuracy, which decides certainty. We have the experience of centuries, and of our days equally, proving what a long series of observations, with means far superior to small sextants and chronometers, have been, and are still, required to obtain accuracy in any way only comparable with what a few triangles will put out of doubt within smaller limits than a man (suppose the observer with his sextant) needs to move upon in his sextant operations; and these few triangles are quicker made, and their accuracy is proved in every step with the fullest certainty. Such illusions are instantly dispelled by the knowledge of the scientific principles implied in such works.

It is known, by my reports, that, in addition to the works of the coast survey, I have, during the very same time, also brought the construction of uniform standards of weight and measure for the whole Union to a considerably advanced state, in far less time than similar works have been obtained in any country whatsoever, of far less extent than the United States.

The two works, requiring similar application of mathematical and physical science, and even similar mechanical means, are assisting each other mutually, and therefore serve as acceleration, the one to the other. It is, besides, well known that in France, also, they were grounded upon the

same principles—so much so, as to call the account of the measurement of the twelve degrees of the meridian, "*the base of the metric system.*"

Whatever would act inimical to the coast survey would act equally inimical to this, so highly important and much desired public work.

F. R. HASSLER.

To the Hon. WALTER FORWARD,
Secretary of the Treasury, Washington.

STATION YARDS IN NEWTOWN SQUARE,
Delaware county, (Pa.,) December 2, 1841.

List of instruments belonging to the United States coast survey.

1 30-inch theodolite. Troughton & Simms.
1 24-inch theodolite. Troughton.
1 18-inch repeating circle, with 2-feet telescope. Troughton.
1 18-inch theodolite. Simms.
1 18-inch theodolite. Made in office.
1 12-inch repeating theodolite, with vertical circle. Troughton.
1 12-inch repeating theodolite. (Lent to the State of Massachusetts.)
1 10-inch theodolite. Richer.
1 9-inch theodolite. Made in office.
1 24-inch vertical circle. Troughton & Simms. Brass stand to the same, made in office.
3 repeating reflecting circles, with brass stands, horizon, and mercury flasks.
1 repeating reflecting circle, without stand.
1 5-feet observatory transit instrument. Troughton.
1 5-feet observatory transit instrument. (Lent to the Navy Department.)
1 small transit instrument and stand. Made in office.
15 sextants.
1 transportable clock of Brookbank.
1 astronomical clock of Hardy.
5 box chronometers.
12 watches.
1 three-hundredth second watch.
4 mounted barometers of F. R. Hassler.
4 mounted barometers. (Lent to the State Department.)
1 mounted barometer. (Lent to the War Department.)
1 reflecting telescope of Troughton.
1 6-feet telescope. Dollond.
1 5-feet telescope. ditto.
1 4 $\frac{3}{4}$-feet telescope. Tully.
1 3½-feet telescope. Dollond.
1 3½-feet telescope. Troughton. (Lent to the War Department.)
4 3½-feet telescopes. Frauenhofer & Utzschneider.
4 2½-feet telescopes. Frauenhofer & Utzschneider.
5 pocket telescopes.
7 large heliotropes, with brass stands.
4 small heliotropes.
14 thermometers.

10 large alhidades.
2 small alhidades.
6 complete plane tables.
3 brass motion works for plane tables.
1 brass rule of Schenck's alhidade, with magnetic needle.
1 large azimuth compass, 1 foot needle, and telescope.
1 compass, with telescope, needle, and stand.
2 compasses, with telescopes.
1 small compass, with prismatic readings.
2 2-arm protractors.
2 3-arm protractors.
1 brass circular protractor.
1 small steel protractor.
1 58-inch German silver beam compass.
1 56-inch brass beam compass.
1 32-inch brass beam compass.
1 32-inch graduated brass beam compass.
21 beam compasses of different sizes and metals.
3 steel rulers of 8 feet length.
9 steel rulers of 5 feet length.
1 brass ruler of 5 feet length.
5 steel rulers of 3½ feet length.
2 steel rulers of 2½ feet length.
12 metre scales of brass and German silver.
11 metre chains.
5 graduated triangles.
12 triangles of different sizes, brass and steel.
1 30-inch dividing plate of Bird.
1 new tracing apparatus. Made in office.
3 parallel brass ruling instruments. Made in office.
12 boxes of mathematical drawing instruments.
1 82-inch scale of Troughton, divided on silver, with microscopic comparateur.
1 scale beam and grain weights of Troughton.
1 brass metre of Lenoir.
1 iron metre of Lenoir.
1 iron toise of Lenoir.
2 subdivided kilogrammes.
2 litres modeles.
4 micrometer microscopes, with reflectors.
1 double wire micrometer of Dollond.
1 level tryer, with micrometer screws.
2 micrometer screws.
2 large artificial horizons.
3 small artificial horizons.
1 box with mounted levels.
1 box with unmounted levels.
1 box with parallel glasses.
1 box with dark glasses, sextant mirrors, lenses, reading glasses, and sets of dark glasses.
1 rectangular level arrangement from Brookbank's clock.

1 vertical circle, telescope, &c., of broken repeating circle, from which an instrument is now being constructed in the office.

The base apparatus consists of—
2 boxes with microscopes.
2 boxes with brass and steel motion works.
2 boxes with iron bars.
1 box with thermometers.
1 box with wooden legs for the microscopes.
1 long wood bar, box, and base plank.
2 large brass sectors with levels.
12 large wooden stands with screws.

There belongs to the coast survey a library of a few hundred volumes of valuable mathematical and astronomical works, a number of which are very rare; all classical in their kind.

The following vessels belong to the coast survey:
Brig Washington, with 4 boats.
Schooner Jersey, with 4 boats.
Schooner Gallatin, with 3 boats.
Schooner Nautilus, with 3 boats.
Schooner Vanderbilt, with 1 boat.
The plane table parties have 5 boats in use.
The different land parties have in use 60 tents of different sizes.
Every party has the necessary carpenter tools.

For the triangulation parties there are—
6 instrument carriages.
1 1-horse wagon.
8 horses.

The instrument maker's shop has—
1 large turning lathe, cast-iron frame, wheels, &c.
1 turning lathe, with cast-iron shears, wheels, &c.
1 small turning lathe, with cast-iron shears, wheels, &c.
1 watch maker's turning bench, with all necessary implements and tools.

The artificer's shop has a carpenter's bench, with all the necessary tools.

In the office rooms there are—
12 drawing tables, of different sizes.
9 writing tables and desk.
5 bookcases.
Stands, chairs, washstands, fenders, shovels and tongs.

27th Congress,
3d Session.

Rep. No. 43.

Ho. of Reps.

COAST SURVEY.

January 12, 1843.
Laid upon the table.

Mr. Mallory, from the Select Committee on the Coast Survey, reported in part the following proceedings, in obedience to the resolution of the House of Representatives, 2d session 27th Congress, February 19, 1842, viz:

CONGRESS OF THE UNITED STATES.

In the House of Representatives United States,
February 19, 1842.

On motion of Mr. Mallory,

Ordered, That the letter of the Secretary of the Treasury laid before the House on the 3d of January, transmitting a report of F. R. Hassler, superintendent of the coast survey, showing the progress made in that work, and the report from the Secretary of the Treasury laid before the House on the 31st of January, 1842, in relation to the expenditures on account of the survey of the coast, be referred to a select committee.

Mr. Mallory,
Mr. Wise,
Mr. Cushing,
Mr. Aycrigg, and
Mr. Holmes,
were appointed said committee.

Attest: M. S. CLARKE, *Clerk*.

The committee, thus organized, instructed the chairman to request the attendance of Mr. F. R. Hassler, and such of his assistants as the superintendent might designate.

On motion of Mr. Cushing, it was further

Resolved, That the chairman be directed to address a letter, in the name of the committee, to the President of the United States, requesting him (if compatible, in his judgment, with the public service) to communicate to the committee the following information, viz:

1. A list of all persons, other than officers of the navy and army, employed in the coast survey, from its commencement to the present time, the order or orders under which they were employed, and the amount of compensation, regular and extra, paid to each.

2. A list of all such persons who hold, or have held, other civil appointments, and their pay and emoluments under such other civil appointment, held during their employment in the coast survey, with the time and orders for their appointment and pay.

3. A list of all officers of the navy employed in the coast survey, their navy pay during their service in the coast survey, and the additional pay of each on the coast survey.

4. A list of all officers of the army employed in the coast survey, their

army pay and emoluments, in dollars and cents, whilst so employed, and the additional pay of each for service in the coast survey.

5. The time when and the authority under which all appointments and allowances of pay, regular, extra, or for arrearages, in the coast survey, were made.

And, on motion of Mr. Wise, that the President be requested to cause the proper Department to answer—

1. Whether a part of the topographical corps of the army can be detached for the purpose of the coast survey.

2. Whether the expense of the service of the coast survey will probably be reduced by detaching a part of the topographical corps.

3. Whether the expense of the service of the coast survey will probably be reduced by employing other persons than officers of the army and navy to perform the duties which they are now employed to perform in the coast survey.

In compliance with this resolution, the above interrogatories were transmitted to the President of the United States, with the letter hereunto annexed :

House of Representatives, *March* 12, 1842.

Sir : I have the honor to enclose to you the within resolutions of a select committee of the House of Representatives on the subject of the coast survey.

The committee decided to address these resolutions to you, in consideration of the fact that the act of Congress authorizing the survey placed it under your direct and immediate control.

I beg leave to add, that, if consistent with your views, it would be acceptable to the committee to receive the information called for by either of the resolutions, so soon as it shall be ready, without waiting for the other.

I am, with the highest respect,

F. MALLORY, *Chairman.*

To the President.

Upon the motion of Mr. Wise, it was

Resolved, That the committee would proceed in the following order of inquiry :

1. The progress which has been made in the survey of the coast.

2. The number, location, and length, of the several base lines measured for the triangulation.

3. The number of stations occupied for triangulation.

4. The observations made for, and the corrections applied to, the triangulations.

5. The astronomical observations made for the determination of latitude and longitude.

6. The work done by each corps employed in the service.

7. A description of the charts published, if any.

8. The amount of money expended, from time to time, since the commencement of the work.

9. The sums appropriated for instruments and books.

10. The names of all persons employed, distinguishing such as were of the army or navy, together with their salaries or other compensation.

11. By whom appointed.

12. The direct appropriations for the survey, and the indirect expenditures upon it, by reason of the employment thereon of public vessels and officers.

13. The probable length of time required to complete the survey.

14. The probable amount of money required to complete the same in the mode heretofore pursued.

15. Any other mode of survey which shall have for its object the acquisition of the greatest amount of information in the shortest time, and at the least expense.

THURSDAY, *March* 17, 1842.

Present: Mr. Mallory, Mr. Wise, Mr. Holmes, Mr. Aycrigg.

Mr. Hassler appeared before the committee, agreeably to the request of the chairman, made by order of the committee at former meeting.

Examination of F. R. Hassler.

1. Question by Mr. Mallory. Have you deviated in any way from the original plan adopted in 1807?

Answer. Not in the least.

2. Question by same. Is not the work now conducted on a more extended plan than was originally intended, and does it not embrace objects not originally contemplated by the Government?

Answer. Not in the least.

3. Question by same. Is it intended that the present coast survey shall furnish the necessary data for the measurement of an arc of the meridian or a parallel of latitude?

Answer. No.

4. Question by same. Is there any necessary connexion between such measurement and a hydrographic survey of the coast?

Answer. No.

5. Question by same. Could an arc of the meridian or parallel of latitude be measured with more facility, expedition, and economy, if disconnected from all other objects?

Answer. Yes.

6. Question by Mr. Aycrigg. You refer in your report (Doc. No. 28) to a number of volumes in which the work is contained; is the work in those volumes reduced?

Answer. They are reduced.

7. Question by Mr. Mallory. Where are these papers kept?

Answer. In my office.

8. Question by same. Are they safe from fire?

Answer. Yes.

9. Question by same. Are there any duplicates of these papers?

Answer. Some; of the greater part.

10. Question by same. Of what papers are there duplicates?

Answer. Of all, except the last year's work.

11. Question by Mr. Aycrigg. Is the Government in possession of any of the data, or are they in your possession?

Answer. They are in the office—a house rented by the Treasury Department—and under the care of persons in the employment of Government.

12. Question by Mr. Mallory. Whom do you mean when you say "persons in the employment of Government?"

Answer. Myself and my assistants.

13. Question by same. Suppose the house should be burnt, and papers destroyed, would not Government sustain great loss?

Answer. Yes; but I conceive the house completely safe, proper measures being taken to guard against fire. The houses have been slated with this view.

14. Question by same. Have any other maps or charts been published, besides those of New Haven, Newark, and Bridgeport?

Answer. No other.

The hour of 12 having arrived, the committee adjourned to meet on this day week.

THURSDAY, *March* 24, 1842.

Examination of Mr. Hassler continued.

At subsequent meeting of the committee, the following questions were propounded to Mr. Hassler by various members of the committee, whose answers were as stated:

1. Question. Have any maps been prepared and completed, so as to be ready for publication, other than the three published; and if so, what?

Answer. Yes: 1. A complete map of New York harbor is engraving. 2 A partial map of the entrance of New York has been prepared and delivered to the Auditor for the light-house bureau. 3. One of the Thames river, in Connecticut, nearly ready for delivery, on order of the Secretary. 4. One for the Topographical bureau, for the site of fortifications of the entrance of New York harbor, at Sandy Hook. 5. One of the north shore of Long Island sound, at New London, called for by the Secretary of the Treasury. The four last named were prepared for the offices.

2. Question. Is either of the eight maps above named so far correct and complete in itself as to be of any utility in and for the localities to which it applies?

Answer. To be sure; each is complete, and of use in itself.

3. Question. Are these all on the same scale, or otherwise?

Answer. They are not all on the same scale, but some larger and some smaller, according to the purpose for which they were respectively intended.

4. Question. Is there any objection to the publication of definite and successive parts of the work as they may be completed, as the map of New York now in the engraver's hands?

Answer. No, not in the least, so soon as the engraving is finished.

5. Question. Is it necessary to complete the survey of Delaware bay before it can be practicable to publish a chart of Long Island sound?

Answer. No.

6. Question. Is there any objection to the publication of the work connected with the maps as they are published?

Answer. *No; it is proper to publish the data on which the chart is constructed*, in order to verify its correctness, and as a guide for the use of it.

7. Question. Has the work of mensuration and triangulation connected with the maps of Bridgeport, New Haven, and Newark, been published with them?

Answer. No.

8. Question. Has any part of the mensuration of the survey, and of the other scientific elements of the work, been published?

Answer. No.

9. Question. Has any systematically full part of the work between two base lines and two astronomical stations been completed as yet?

Answer. No; the locality of the coast hitherto surveyed has not permitted it.

10. Question. Where is your furthest eastwardly astronomical station on the coast?

Answer. Mount Carmel, near New Haven.

11. Question. Where is your next astronomical station, proceeding southwestwardly?

Answer. Tashua, near Bridgeport.

12. Question. Where your next?

Answer. West Hill, on Long Island.

13. Question. Where the next?

Answer. Buttermilk Hill, near Tarrytown, New York.

14. Question. Any other?

Answer. Yes; Weasel Mount, near Paterson, New Jersey, and none southwest of that.

15. Question. How many base lines have been measured in the survey?

Answer. Two in 1817 and one in 1834.

16. Question. Between what points is the base line measured in 1834?

Answer. On the beach at Fire Island light-house, Long Island; and the line measured is eight and three-quarters miles in length, running eastwardly from the light-house.

17. Question. Where are the base lines of 1817?

Answer. One in English Neighborhood, New Jersey, and the other at Gravesend beach, Long Island.

18. Question. Has any use been made of the two last-named base lines in the work of the survey?

Answer. Yes; for the beginning, in 1833.

19. Question. What objection is there to publishing the details and mathematical elements of the work, as completed, from Point Judith to New York harbor?

Answer. The main triangulation has not been completed so far as Point Judith, but only the secondary. The main triangulation has been completed only between Friar's Head, opposite New Haven, and Mount Carmel, in Connecticut, eastwardly, and Mount Holly, New Jersey, and Yards, (Newton township, near Philadelphia,) southwestwardly. The secondary triangulation has been completed from Point Judith to Cape Henlopen, on the coast, and from New York across to the head of the Chesapeake.

20. Question. What reason is there for concealing from the public the elements of the work between Friar's Head and Mount Holly?

Answer. None.

21. Question. Has it been published?

Answer. No; it is not proper.

22. Question. Why is it not proper?

Answer. Because it will introduce imitations of the work, to the detriment of its validity.

23. Question. Imitations by whom?

Answer. By common chart sellers, or others.

24. Question. How is the survey injured by individuals publishing charts copied from those of the survey?

Answer. Because the maps would not be official.

25. Question. Would not the publication of the data with the maps enable scientific men to judge of the accuracy of the work?

Answer. Of course.

26. Question. Would not the withholding of the data until the completion of the survey enable the operator to force results?

Answer. No; in the manner in which the work is carried on it cannot be.

27. Question. Can scientific men judge of the accuracy of the work unless the mathematical elements of it be published?

Answer. No.

28. Question. Have the mathematical elements of the charts of Bridgeport, New Haven, and Newark, been published?

Answer. No; that will come into the general account.

29. Question. When do you propose to publish such a general account?

Answer. So soon as I shall have reached the verification base on the Chesapeake.

30. Question. When do you expect to reach that point?

Answer. In a few years.

31. Question. When do you expect to complete the Delaware?

Answer. If I can get out in season, by the end of this year.

32. Question. What prevents your getting out in season?

Answer. The want of money, nearly all the appropriation having been expended.

33. Question. Does the work on the weights and measures occupy any of your time, which might be appropriated to the survey?

Answer. No. It does not take any of my time.

34. Question. How much of your time is devoted personally to the coast survey?

Answer. All the time, except the inspection and reporting on the weights and measures.

35. Question. How much time does it take to inspect and report upon the weights and measures?

Answer. About half an hour in the morning and half an hour in the afternoon of the day, but not of each day. This is only while I am in the office. I am generally in the field from the middle of May to that of December; sometimes I am in the field to the end of December.

36. Question. At what time in the spring do the different corps start on their duties?

Answer. Generally in April, remaining until the middle or end of November.

37. Question. Did you lose part of a year last year; and if so, why?

Answer. I lost the most of last year's work, in order to answer the resolution of the House of Representatives on the coast survey of June 24, 1841, and by the fever which seized me in October.

38. Question. At what time did you take the field last year, and how much of your time did the resolution occupy?

Answer. I did not take the field until the middle of September. The resolution occupied me three or four weeks. I was also detained to make a report on weights and measures.

39. Question. Is the work in the office now in such a state of forward-

ness as not to interfere with the commencement of the field work this year, so soon as the season will permit the work to go on?

Answer. Not in the least.

40. Question. Why is not the main triangulation up with the secondary?

Answer. On account of the difficulty of finding suitable elevations on both sides of the Delaware.

41. Question. Who conducts the main triangulation?

Answer. I myself, according to positive stipulation.

42. Question. Why is not the main triangulation carried as far eastward as the secondary?

Answer. Because it was not needed.

43. Question. When will it be needed?

Answer. So soon as the junction is made with the base line on the Chesapeake.

44. Question. When that junction is made, do you propose to suspend the work south, and go back east, or to have two parties?

Answer. When the junction is made, while the secondary triangulation goes on south, I shall continue the primary triangulation east.

45. Question. Cannot the main triangulation be carried on except under your immediate personal supervision?

Answer. Not in the present state of things.

46. Question. Why not?

Answer. Because there is no body to do it, and the circumstances are contrary.

47. Question. Is there nobody else attached to the survey who can do it?

Answer. Not now.

48. Question. What are the contrary circumstances spoken of?

Answer. Want of money; that is, of a larger appropriation.

49. Question. Must the main triangulation be suspended eastward until you can take it up personally?

Answer. In the present state of things, yes.

50. Question. In what portion of the field work have you been personally employed the last year?

Answer. At Yards, behind Philadelphia.

51. Question. Where the year before?

Answer. Willow Grove and Mount Holly.

52. Question. Where do you propose to employ yourself on the field work the present year?

Answer. South of Yards and of Mount Holly, on both sides of the Delaware.

53. Question. What is the precise duty or part of the work performed by you at Yards and at Mount Holly?

Answer. Measuring the angles of the main triangulation.

54. Question. How many assistants were there in the party in which you operated last year?

Answer. None. I did the work alone; that is, I did the mathematical work alone.

55. Question. Is there any person in the coast survey competent to take charge of and continue the work, if you should cease to do it?

Answer. Not as yet.

56. Question. Do you mean to be understood that without your personal

superintendence the work would cease, and that no man can take it up, continue, and complete it?

Answer. Not honorably.

57. Question. Is there any profound secret in the mensuration of triangles and the making of astronomical observations, known to you alone of all mankind?

Answer. Science is a public thing, but it requires study to be perfect in it.

58. Question. Is there any person in the survey who is pursuing such a line of observation and study as to be in the way of learning to measure triangles and take observations, hereafter, in your stead?

Answer. I give them all instruction which they will accept.

59. Question. Does no one in the survey but you measure triangles or take observations?

Answer. Every one of the principal assistants take the secondary triangles.

60. Question. What difference is there in the mathematical elements of primary and of secondary triangles?

Answer. The larger triangles require more attention to the figure of the earth and to the mathematical elements arising from it.

61. Question. Does geodesy apply to the main triangulation and not to the secondary?

Answer. More especially, but not exclusively.

62. Question. How long will it take to finish the work along the whole coast of the United States, going on at the rate of time and appropriation heretofore used?

Answer. That nobody can say, in either one way or another.

63. Question. What is the whole extent of the general coast, from Passamaquoddy to the Sabine, not including rivers?

Answer. I cannot tell.

64. Question. What proportion of the entire coast of the United States has thus far been surveyed?

Answer. I cannot say.

65. Question. You have said that the latitude and longitude of Cape Hatteras was erroneous in the charts. How did you ascertain it?

Answer. By having attempted to make a union of the Northern and Southern maps, which join at that place, in 1828.

66. Question. How long before the survey will reach Cape Hatteras?

Answer. It is impossible to say—it is too vague a guess.

67. Question. Have you any personal knowledge of the location of the Southern coast?

Answer. I have never been any further south than Norfolk.

68. Question. You have said that it was difficult to find suitable elevation on both sides of the Delaware, which cause prevented the main triangulation from keeping up with the secondary, (No. 40:) how do you propose to obviate similar difficulties on the flat coast of the South?

Answer. By care and assiduity, and by the methods used on the Jersey sea coast.

69. Question. Is that work on the Jersey sea coast a primary or a secondary triangulation?

Answer. It is secondary triangulation.

70. Question. What is the peculiarity of the methods used on the Jersey sea coast, where there is a deficiency of natural elevations?

Answer. By adapting the triangulation to any locality which may be found favorable.

71. Question. You do not specify any of the means you propose to recur to at the South, in the absence of natural elevations. Do you decline to state what they are?

Answer. No.

72. Question. What are they, then?

Answer. By mixed astronomical and geodetical observations.

73. Question. Why were not such means used to overcome the impediments to the completion of the main triangulation on the Delaware?

Answer. Because they would not apply with propriety. There are better means.

74. Question. What are those better means?

Answer. By meeting those localities by triangulation from the south side of the locality.

75. Question. You say that the peculiar methods by which you propose to overcome the difficulties on the Southern coast are mixed astronomical and geodetical observations; are not such the general means used every where in the survey?

Answer. The means of both are different in the two cases.

76. Question. What is the object of the second base line?

Answer. The verification of the whole work, which is in the system of all such works.

77. Question. If the object be to verify the survey, and suppose it does not agree, what is the consequence?

Answer. That the error, if any, is to be investigated.

78. Question. It is stated in one of your reports that the survey extends over 11,000 square miles; is that mapped?

Answer. Yes, to be sure.

79. Question. What benefit results to navigation by having all the details of the topography of the country?

Answer. There is no more topography in the maps than what is necessary for that object.

80. Question. Cannot a portion of the topography be dispensed with without detriment to the object of a knowledge of the coast for navigation?

Answer. Not to that extent to which it is carried now. I could not dispense with any of the topography as it is now done.

81. Question. Do not the hydrographical parties have to wait for those engaged on the topography?

Answer. They cannot go six inches without it, but they do not wait; the topographical part has always been ahead.

82. Question. What distance from the coast have they carried the soundings?

Answer. Until they were out of sight of land; I mean the points given to them as guides. Those points are made to be seen as far as possible. We elevate signals thirty feet, or more.

The committee wish you to state the time each year, since the recommencement of the work in 1832, at which you have taken the field, and also the time each party has commenced its work; also, the whole number of months occupied by yourself in making the main triangulation.

83. Question. You have sounded from Point Judith to Egg Harbor, along the coast; have those soundings been extended as far out as you intend?

Answer. They are complete for the detailed maps, but they have not been carried out so far as I intend.

84. Question. How much further do you intend to carry the soundings?

Answer. To the Gulf stream.

85. Question. What will be the probable time required to extend the soundings, with the same force now employed, so far as you intend?

Answer. As this kind of work is to be done by astronomical observations, it depends entirely on the weather.

86. Question. Where are these astronomical observations to be made?

Answer. Of course, on board the ship or sounding vessel, according to special instructions given to Lieutenant Gedney, in writing, last summer.

87. Question by Mr. Wise. For the present, is it necessary, in order to carry the survey south, to extend the soundings to the Gulf stream? And, ultimately, will the survey of the coast not be complete without extending the soundings to the Gulf stream?

Answer. No, to the first clause of the question. As to the second clause, I answer, that the survey is, in that respect, ad libitum.

88. Question by Mr. Wise. By your answer to the second clause, am I to understand you as saying that the Government may carry the survey as far out into the ocean as it chooses, but that the survey, as far as it goes, wherever it stops, will be complete?

Answer. Yes.

89. Question by Mr. Mallory. Do you propose this or the next year to carry on these deep soundings, by employing any of your present force?

Answer. Whenever any fit vessel is disposable, without otherwise impeding the work.

90. Question by Mr. Mallory. Is it probable that any such vessel will be disposable for that purpose during this or the next year?

Answer. It is likely, but it depends on the weather.

91. Question. Of how many points in the United States have the latitude and longitude been ascertained and verified in the course of the survey?

Answer. The calculation of the triangles in my work gives, in ultimate result, the latitude and longitude of each point of the triangle, primary and secondary, according to my special form of the work.

92. Question. Of the points of latitude and longitude thus determined, how many have been made public?

Answer. None; because it is not yet the proper time.

93. Question. Have you determined the latitude and longitude of any points on the coast; and if any, how many and what?

Answer. I have ascertained the latitude and longitude of points on the coast as well as inland, according as the triangle fell.

94. Question. Why have not these important points on the coast, thus determined, been made public?

Answer. The time of the publication is when the general account of triangulation is given, before which it will be of no use.

95. Question. Did the French, in the triangulation of their country, use mixed geodetical and astronomical observations?

Answer. Not in the form in which I have stated in the first part of my written explanation.

96. Question. Do you regard the survey as a great scientific enterprise,

embracing delicate problems of geodetic research, beyond what is necessary to an accurate but rapid survey of the coast for nautical purposes?

Answer. There is not a single movement in all I do which is not necessary for the honorable and faithful execution of the work.

97. Question. Is it intended as the basis of a topographical, military, and statistical survey of the whole United States?

Answer. That is the Government's business, and not mine.

98. Question. Is the survey conducted now with a view to any such ultimate purposes?

Answer. That is not given in any charges by the Government; therefore I do nothing with it.

99. Question. Was not the secondary triangulation along the Jersey shore found to be sufficiently accurate?

Answer. Yes.

100. Question. Was not the main triangulation through New Jersey made with a view to the topographical survey of that State?

Answer. No.

101. Question. Cannot the survey of the bays and rivers be postponed, without injury to the general work, till the survey of the coast proper is completed?

Answer. It is impossible, because no accuracy could be got for the coast.

102. Question. How many plates are now in the hands of the engraver?

Answer. Of actual copperplates, two.

103. Question. Do these contain the whole map you are now getting ready for publication?

Answer. No; the map of New York harbor will cover eight such plates.

104. Question. Why are not more preparing for publication?

Answer. They are in work; in a few days we can cut off a few more.

105. Question. How many engravers have you in employ?

Answer. Two; I would have more if I had the money.

106. Question. How long have these two been employed, and at what salary?

Answer. Since last January or December; one at $1,800, and the other at $1,300, per annum.

107. Question. Where did you procure the copper for the above engraving, and where the engravers?

Answer. The copperplates used were procured from Keim, in Philadelphia; the engravers from Hamburg, because they were the best, and best recommended.

108. Question. Cannot American engravers put on copper all map engraving which can be put on paper?

Answer. No.

109. Question. What is the ordinary amount of error in transferring from paper to copper?

Answer. In the way in which I do it there shall be none.

110. Question. Have the grossest errors in the position of places, stated in one of your reports to have been ascertained by you during the survey, been pointed out by you, for public information?

Answer. They have not yet been made public, but will be when the works relating to those places are published.

111. Question. Are the measures in the survey taken in French metres? If so, why?

Answer. Yes, because it is the only absolute standard; but the results are given in yards and metres both.

112. Question. In what parts of yards?

Answer. In decimal parts only.

113. Question. What reason is there why all the *data* must remain in your office?

Answer. Because they are in daily use there.

114. Question. Have you any reason to believe that the surveys made by Captains Gedney, Wilkes, and Glynn, are not sufficiently accurate for the purposes of navigation?

Answer. I know nothing in regard to them.

115. Question. Did the British officers survey the North sea after the same manner that you are now surveying the coast of the United States?

Answer. I am entirely unacquainted with what they did; there is nothing of it published.

116. Question. You stated in your printed report that you had accomplished more in a shorter time, and at less expense, than had been done in any other work of a similar kind; with what works do you make this comparison?

Answer. The English general survey of England, Ireland, and Scotland; the French survey of the inland and coast of France.

117. Question. How many hours per day do your subordinate parties work in the field, in favorable weather?

Answer. As many as possible.

118. Question. Are there any data to ascertain how many hours?

Answer. They keep an account, and will answer as to this.

119. Question. Does this survey employ the whole extent of your mathematical knowledge?

Answer. No.

120. Question. Do you think that, under the most favorable circumstances, and with continuance of a yearly appropriation of $100,000, the survey of the coast can be completed in twenty years?

Answer. Perhaps. The progress is slower at first, and the means increase as the work proceeds.

Questions by the committee. At what time has Mr. Hassler taken the field each year, since 1832? At what time each party? How many months in all has Mr. Hassler been employed in the main triangulation?

Times of going to the field work, and returning from it, each year.

In 1832.

September 25. Having received the instruments, I left Washington the 26th September, at 8 o'clock, A. M., to reconnoitre for the continuance of my works of 1817, towards the east of it; returned to Washington the 31st January, 1833, in the evening.

1833.

April 5th. Left Washington for the first beginning of actual primary triangulation; returned to Washington the 3d January, 1834, in the evening.

1834.

After having finished all the preparations and comparisons for the measurement of the base line, I left the 29th May, at 9 o'clock, A. M., having made also stations; returned 21st January, 1835, in the evening.

1835.

There being much calculation to be made, and many arrangements for the organization of the parties, the State of Maryland having offered an arrangement, to join the survey of that State with that of the coast survey, I went out only at different intervals, to reconnoitre the country in Maryland, and until Washington, and the outer bays, accompanied by Mr. J. H. Alexander, of Baltimore, until late in the fall and winter.

1836.

The present office was established. I left 17th August, and returned the 8th January, 1837.

1837.

I left Washington 4th June, and returned 5th January, 1838.

1838.

I left Washington July 19th, and returned 24th December, 1838.

1839.

I left Washington the 9th June, and returned the 5th January, 1840.

1840.

I left Washington the 17th September, 1840, and arrived again at Washington the 20th January, 1841.

1841.

I left Washington 29th August, 1841, and returned 22d December, 1841.

This enumeration shows how the office work has increased since the beginning, when the elements for it were first to be collected in the field. In the progressed state of the work, the calculations, making of projections, to take to the field for the topographic and hydrographic works, their plotting, and working out, &c., require as much, and in most cases even more, work in the office than out of doors, so that indeed the going out for the field work is considered a real relief from the harder and tedious works of the office.

For the time of the going out or returning of the assistants, for their part of the work, they must be called up themselves individually; it is easily comprehended that they depend entirely on the favorable or unfavorable season for the going out as well as for the return.

F. R. HASSLER.

WASHINGTON CITY, *March* 30, 1842.

APRIL 15, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

James Ferguson examined.

1. Question How long have you been employed in the coast survey? Answer. Since 10th May, 1833.

2. Question. In what capacity ?

Answer. As a principal assistant; one of the three principal assistants.

3. Question. What particular part of the duty do you at present perform ?

Answer. Making the secondary triangulation.

4. Question. Who makes the primary ?

Answer. Mr. Hassler.

5. Question. Is there any essential difference in the scientific principles of the primary and the secondary triangulation ; and if so, what ?

Answer. The primary requires an instrument of great power, and of nicer graduation ; there is no other difference. There is no difference in the mathematical elements.

6. Question. Cannot any scientific person, who is competent in and well practised in the secondary triangulation, perform the primary ?

Answer. The primary requires more mathematical knowledge than the secondary, and greater knowledge of practical means ; but to the whole question, I answer, yes.

7. Question. If Mr. Hassler should die, must the survey stop, for want of any person in the survey, or in the country, to take it up and carry it on ?

Answer. No.

8. Question. Which has proceeded furthest in advance, the primary or the secondary triangulation ?

Answer. The secondary. I add, that the secondary is necessarily imperfect, inasmuch as it depends on the primary for its verification.

9. Question. If the primary had preceded the secondary, might not the latter have been verified as it proceeded ?

Answer. Certainly.

10. Question. Why has the primary been allowed to remain in arrears of the secondary triangulation ?

Answer. I cannot say.

11. Question. Is not the secondary triangulation sufficiently accurate for all practical purposes in the publication of a map of the work so far as it has gone ?

Answer. Yes; for all practical purposes.

12. Question. From what point to what point on the coast have the secondary triangulation and the hydrographical survey been completed ?

Answer. The secondary triangulation has been completed from Point Judith, including the sound and both sides of Long Island, to Cape May, covering both shores of New Jersey, and including the whole of the Delaware on both sides; and it also crosses the peninsula to the Chesapeake, where it is now in progress, but not yet completed. I refer to the officers engaged in the hydrographical work for answer as to that part of the question.

13. Question. Do you expect that any perceptible error in the secondary triangulation will be detected by the further progress of the primary ?

Answer. I should think the maximum error would not exceed five feet in the whole distance. This I infer from the work already verified, where the error proved to be no greater than this. I refer in this to my own work; but the other may be, for aught I know, more accurate still.

14. Question. Did you use the main triangulation as the basis of your work (the secondary triangulation) when you commenced ?

Answer. Yes.

15. Question. Do you not in fact proceed in the secondary triangulation at present in the same manner as in the primary?

Answer. The only difference is the difference of the instruments.

16. Question. You have exhibited to the committee abstracts of the whole work on the coast, from Point Judith to Cape May; what objection is there to the publication of those abstracts?

Answer. The first objection is, that no base of verification has yet been measured; the second is, that we are uncertain as to the difference in any meridian in this country and any in Europe, to a minute and a half in longitude; and the third is, that we have not yet determined the ellipticity of the earth.

17. Question. Is either of those things necessary to give practical utility to the soundings and distances in particular bays or harbors?

Answer. Perhaps not; but the superintendent will of course take care of his character as a man of science.

18. Question. In your opinion, ought the practical use of the work, by its publication, to mariners, to be deferred indefinitely, for the supposed purpose of allowing the superintendent to take care of his character as a man of science?

Answer. No.

19. Question. Has the character of the superintendent as a man of science suffered by the publication of the charts of New Haven and Bridgeport, and Newark bay?

Answer. No.

20. Question. If not, what injury would it do to his character as a man of science to publish a chart of New York harbor?

Answer. None; such a map is now in the engraver's hands, for publication.

21. Question. What injury, by the publication of charts of the whole coast, from Point Judith to the Delaware?

Answer. If it were practicable, none.

22. Question. Do you furnish the points of observation to the sounding parties yourselves?

Answer. They are ascertained by us, reported to Mr. Hassler, and by him furnished to the sounding parties.

23. Question. Do you reduce your own observations?

Answer. Yes, certainly.

24. Question. Have you been engaged in Maryland in 1835?

Answer. No; I came in Maryland in 1839.

25. Question. Was any body else engaged in Maryland in 1835?

Answer. Only Mr. Hassler, with Mr. James H. Alexander, as a mere reconnoissance.

26. Question. Has there been any difficulty in procuring suitable points for observation as far as the main triangulation has proceeded?

Answer. Yes; since we entered the valley of the Delaware.

27. Question. Where first?

Answer. At Mount Rose, near Princeton, in New Jersey; some in opening the line from Newtown; then at Willow Grove and at Stony Hill; some difficulty in connecting Mount Holly with the point below; a good deal at Yards. These obstructions could not have occupied more than five months.

28. Question. When is it you propose to measure a base of verification?

Answer: It is spoken of for this year.

29. Question. Why has it not been done sooner?

Answer. The work has not been sufficiently advanced. It has been thought desirable to obtain such a line on the Chesapeake.

30. Question. What is the present condition of the place of the original base line?

Answer. I have not been there since 1836. Then the beach was considerably washed, but the points were undisturbed. Now, I understand, the beach is changed, and the base in danger; but the elements of it will be preserved by the mountain base, inland from the original base.

31. Question. Will a minute and a half's difference between the European and American meridians show on ordinary maps?

Answer. Yes; it would be about a mile.

32. Question. Why has not this difference, in the course of the ten years since the resumption of the survey, been ascertained?

Answer. I cannot answer that. We have observed eclipses of the sun. We have made no other observations for the longitude.

33. Question. Have the observations thus made been reduced?

Answer. Yes, and calculated. I add, that, if we had considered it a sine qua non to determine the longitude, the time occupied in this way might have retarded the other work.

34. Question. But you have previously said that the want of the determination of this fact was one of the objections to publishing any part of the work.

Answer. I said it was an objection, but I did not mean to be understood as saying that it was an insuperable objection.

35. Question. Is the absence of a base of verification any insuperable objection to the publication of the work along Long Island sound?

Answer. I think not. I say no.

36. Question: Is the survey engaged now in measuring an arc of a great circle of the earth, with a view to ascertain its ellipticity?

Answer. That will be one result of the survey, and a very important one, in a scientific point of view.

37. Question. When will that result be reached?

Answer. It should await the measurement of the base of verification.

38. Question. Is it necessary to have measured such an arc, and verified the ellipticity of the earth, before it is possible to publish a map, for practical purposes of navigation, of Long Island sound?

Answer. I think not.

39. Question. Where are the results of the work, so far as completed, now kept?

Answer. In the depot of the survey, at Washington.

40. Question. Are they in duplicate?

Answer. Some; not all. The primary triangulation is all in duplicate. Of the secondary, mine is not. As to the rest, I do not know.

41. Question. Of that which is in duplicate, are both parts kept at the depot?

Answer. Yes.

42. Question. Several of the public buildings at Washington have from time to time been destroyed by fire; is the depot a fire-proof building?

Answer. No; it is not.

43. Question. If the results and other matters in the depot should be destroyed by fire, must not the work be done over again?

Answer. Yes. Precautions have been taken to enable the speedy removal of the papers, if the building take fire, by their being in cases on the ground floor.

44. Question. Of the work in duplicate, why is not one copy deposited for safe keeping in the Treasury Department?

Answer. I do not know.

45. Question. Is all the work in such a state that, if Mr. Hassler should die suddenly, it may be used, and reduced or calculated immediately by others?

Answer. Yes.

FRIDAY EVENING, *April* 15.

Examination of Mr. Ferguson continued.

Present: Mr. Cushing and Mr. Aycrigg.

[NOTE.—To make the evidence more distinct, from question No. 46 to question No. 74, it must be observed, that the statement after No. 74, (marked A,) the statement marked "to be annexed to Mr. Ferguson's evidence," and the statement marked "to be annexed to Mr. Ferguson's testimony," together with the chart of Newark bay, referred to in question No. 48, were presented at the beginning of this meeting; the statements having been previously prepared, in writing, by Mr. Ferguson, in answer to questions put to him by the committee at the previous meeting.]

46. Question. Is there any substantial and adequate reason why the mathematical elements of the work should not be published as parts of it are completed?

Answer. No other but that it will require time to put them in order.

47. Question. At what time in each season do you take the field?

Answer. This is stated in the schedule annexed, and marked A.

48. Question. There is shown by you a published chart of Newark bay, purporting to be an extract from the United States coast survey; is there any meridian on the map? (Annexed, and marked B.)

Answer. No.

49. Question. Is the latitude or longitude of any part of it given?

Answer. No.

50. Question. What is the length of Newark bay, as stated in this map, from Shuter's island to the confluence of the Passaic and Hackensack rivers?

Answer. It is, by the scale of the map, five miles and eighty-two-hundredths. But the scale is an erroneous one, and was not published or verified by the superintendent. The actual distance between the two points specified is five miles and six hundred and twenty-three thousandths, obtained by me by measuring on the original topographical map.

51. Question. Please to inspect the map of Newark bay, which is now shown to you, marked C.

Answer. It appears to be the same map, engraved from the same plate as B; but the scale is different, and is at the same time erroneous. It seems to be written $\frac{1}{20000}$ instead of $\frac{1}{10000}$, or erroneous in the proportion of 2 to 1, or about that.

52. Question. If the chart of New York, or any part of the coast, be

published, do you apprehend any dangerous error would be introduced by map sellers?

Answer. If published without care, there would, undoubtedly.

53. Question. Is it considered judicious to suppress the results of the survey, through fear that, if published, map sellers may make errors in copying the maps for sale?

Answer. No.

54. Question. Is the survey of any practical use, unless published?

Answer. Yes; in the experience acquired by the officers of the navy and others engaged on the survey. I am not aware of any other.

55. Question. Do you understand the proper uses of the survey to be confined to the instruction thus acquired by the officers engaged in it?

Answer. No; the uses are a knowledge of the coast for commerce and navigation, and a communication of it by a publication of the maps.

56. Question. Can the survey be of any practical use to the country at large, without the publication of charts and maps?

Answer. Certainly not.

57. Question. Where are the instruments used by you repaired?

Answer. At different places, but generally at the office of the survey here.

58. Question. Have you had any difficulty in procuring repairs at other places?

Answer. I have scarcely ever had occasion for repairs; I should think not exceeding five dollars in amount since 1833, when I entered the survey. All my instruments are of European manufacture. They are good instruments.

59. Question. What necessity is there of plane-table parties, except near the coast?

Answer. No absolute necessity, except for the secondary triangulation near the coast.

60. Question. How far in from the coast have plane-table parties gone on the survey?

Answer. I cannot say precisely. They are carried on by Mr. Gerdes, Mr. Sands, Mr. Boyd, Mr. Dickens, and Mr. Werner.

61. Question. Do the plane-table parties require much science?

Answer. They require practical skill.

62. Question. When a secondary triangulation precedes the primary, is it not a second without a first?

Answer. Technically, it is.

63. Question. Is it not working wrong end foremost for a secondary to precede a primary triangulation?

Answer. I think not, because the secondary loses none of its accuracy by the primary following it.

64. Question. Can you ascertain what the errors of the secondary are until you have the primary?

Answer. No.

65. Question. How are your distances measured?

Answer. In French metres. It is not the standard of the country, but it is the standard best authenticated, and best known in geodetic operations. Our standard is the English yard. The foot is the most common measure used in this country, both for scientific and practical purposes.

66. Question. Is the metre in common use in this country in any way?

Answer. No.

67. Question. Is it not as easy to convert yard measure into metres as metre measure into yards?

Answer. It is the same thing.

68. Question. In that case, what benefit is there in having the work of the survey in metres?

Answer. None but what I have given before.

69. Question. What is the standard used in the English survey?

Answer. Either the English yard or foot.

70. Question. What is the object of the proposed second base line?

Answer. To verify the work.

71. Question. Cannot the work proceed north and south at the same time?

Answer. Not at present, without a larger appropriation and more persons; at least, that is my opinion.

72. Question. Have you a general knowledge of the configuration of the coast?

Answer. Yes, to Cape Henry.

73. Question. On what part of the coast, north or south, can the work be carried on most easily?

Answer. At the north, by reason of the nature of the coast.

74. Question. Of how many points on the coast has the survey ascertained the latitude and longitude?

Answer. I should think my own points were five hundred; and, altogether, a thousand.

A.

Year.	Time of taking field.	Time of going home.
1833	May 10	December 28.
1834	February 20	December 3.
1835	April 6	January 10, 1836.
1836	May 1	December 9.
1837	April 25	November 25.
1838	May 20	November 19.
1839	April 15	November 29.
1840*	June 16	December 22.
1841	February 15	December 12.

It must be understood that these dates are given from recollection, and can only be relied on as accurate within a day or two.

*This year I was detained longer from field work, to calculate triangles necessary for the map of New York.

Number of stations made in each year.

In 1833 - - - - -	24
In 1834 - - - - -	64
In 1835 - - - - -	26
In 1836 - - - - -	28
In 1837 - - - - -	13
In 1838 - - - - -	10
In 1839 - - - - -	15
In 1840 - - - - -	16
In 1841 - - - - -	7
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[To be annexed to Mr. Ferguson's evidence.]

To the question of the committee, "What is the distance between Shuter's island and the point at the confluence of the Passaic and Hackensack rivers, and what the mean width of the bay of Newark?" Mr. Ferguson answers:

That the distance between the above points is 5.623 statute miles, and the mean width of the bay of Newark 1.37 mile.

That on a map of the said bay, printed at the request of the collector of Newark, the distance between Shuter's island and the point between the Hackensack and Passaic is 5.82 statute miles; but that this map has an erroneous scale attached to it, and was not published or verified by the superintendent of the survey. The map appears conformable to the original of the survey, but the scale given for it is incorrect.

To the question of the committee, "How many points were determined in 1833 in the main triangulation, and what distance were they apart; what extent of country did they cover; what number in 1834, 1835, 1836, 1837, 1838, 1839, 1840, and 1841; and what extent of country do they cover?" Mr. Ferguson answers:

That the part of the question *as to the distances "apart"* is answered by giving, in the following schedule, the length of the longest and shortest lines of the survey each year; that it is difficult to divide the works of successive years from each other; and that the computations are given in gross in square statute miles, presuming that the committee merely wished an approximate and comparable estimate.

In 1833, length of longest line, miles	41.3	Square miles covered, 1,350
length of shortest line, miles	7.2	
In 1834, 1835, and 1836, though other stations were occupied, the primary triangulation did not cover any additional space.		
In 1837, length of longest line, miles	20.69	Square miles, 318
length of shortest line, miles	8.73	
In 1838, length of longest line, miles	38.41	Square miles, 300
length of shortest line, miles	23.29	
In 1839, length of longest line, miles	31.00	Square miles, 1,070
length of shortest line, miles	10.93	
In 1840, length of longest line, miles	18.51	Square miles, 209
length of shortest line, miles	12.30	

In 1841, length of longest line, miles	- 31.02	Square miles,	330
length of shortest line, miles	- 17.07		
Square miles covered by whole primary triangulation			3,577

It is but fair, and perhaps also necessary, to state to the committee that the effect of the primary triangulation, in the progress of the survey, is not properly estimated by the number of square miles within the polygon which it makes, but by the quantity of secondary triangulation for which it afforded the bases. In this view of the subject, the number of square miles covered in each year would be much increased.

[To be annexed to Mr. Ferguson's testimony.]

1833—Buttermilk.
Round.
Bald.
Tashua.
Mount Carmel.
Ruland.
West Hills.
1834—Base measured.
1835—Reconnoissance in Maryland.
1836—West Hills.
1837—Ruland.
East base.
West base.
Harrow.
1838—Weasel.
Springfield.
1839—Beacon Hill.
Disborough.
Stony Hill.
Mount Rose.
Newtown.
Willow Grove.
1840—Willow Grove.*
Mount Holly.
1841—Yard.

NEWARK, *April* 18, 1842.

DEAR SIR: Your letter of the 16th I received this morning. I am not in possession of any map of Newark bay furnished from the coast survey. A short time after that survey was completed, I addressed the Secretary of the Treasury, requesting such a copy, for reasons then mentioned; he referred my letter to Mr. Hassler, who replied, that the coast survey being a public work and property, such extracts should not be given except upon call of Congress; and such work being under his charge and responsibility, he should be called upon by the proper Department, &c. I very much regretted that it could not be furnished, as our vessels were subject to repeated accidents and delays, by reason of the shoals, which could have been avoided by such information. I presume that Mr. H. would be willing to facilitate any mode you may take to procure such extract, as he expressed himself to me.

I am, dear sir, very respectfully, your obedient servant,

ARCHER GIFFORD.

Hon. JOHN. B. AYCRIGG.

* The station of Willow Grove was occupied both in 1839 and 1840.

FRIDAY EVENING, *April* 15, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

Examination of Mr. Blunt.

1. Question. Do you know any sufficient reason why maps and other results of the survey should be withheld from the public knowledge?

Answer. None, when they are in sufficiently complete state to be useful to navigators.

2. Question. Is any part of the survey sufficiently complete for that now?

Answer. Yes.

3. Question. How much?

Answer. New York harbor is being reduced for the engravers. Long Island sound is capable of being reduced from Point Judith to New York. The outer coast is already complete, so far as expressed, from Montauk point to Great Egg Harbor, I believe, with exception of off-shore soundings.

4. Question. How far inland from the coast has any part of the work been carried?

Answer. I am unable to say, except in regard to the secondary triangulation, which I have in part conducted. I am one of the principal assistants.

5. Question. Are you acquainted with hydrographical surveys in England?

Answer. Yes.

6. Question. Do they publish results as soon as ascertained?

Answer. They are published in sheets so soon as completed, to be useful to navigation.

7. Question. Can copies or information be obtained by individuals?

Answer. Yes; I have known copies to be obtained repeatedly for my brother, who is a chart seller; as from the Thunder and from the Blossom.

8. Question. Does the hydrographical office in England derive any profit from the sale of the charts?

Answer. I think £200 or £300 per annum. The charts are published under the direction of the Admiralty, with the seal of the Admiralty to authenticate them.

9. Question. Have you applied at any time, as an individual, to the hydrographic office?

Answer. Captain Beaufort offered to give me personally any information I desired. This was when I was a private individual, before being connected with the survey.

10. Question. In your opinion, could the work be extended north and south at the same time?

Answer. It might, with more force; and with the present force, if the line of verification were not to be measured. We can proceed more rapidly at the north than at the south with the triangulation.

11. Question. In going south, do you apprehend any difficulty in the hydrographical part of the work, as distinct from the topographical? Cannot the mere coast survey be prosecuted without leaving the coast and going inland?

Answer. No.

12. Question. How do you propose to survey the coast of Virginia?

Answer. By carrying a series of triangles down the Chesapeake bay, and

by extending them up or down the valleys of the rivers, as circumstances will allow.

13. Question. What natural elevations have you in lower Virginia?

Answer. None of any consequence.

14. Question. What do you propose to use as a substitute?

Answer. Artificial elevations and signals.

15. Question. In what way do you propose to triangulate the region of Dismal Swamp, and similar regions of country?

Answer. I have no knowledge in regard to that region.

16. Question. Are we not greatly deficient in knowledge of soundings in Buzzard's bay, Nantucket shoals, Cape Cod, and Massachusetts bay?

Answer. Yes.

17. Question. Is not a knowledge of those soundings of the greatest importance to navigation?

Answer. Yes; it is more wanted there than any where else. More tonnage passes. Most vessels from Europe, for New York and Philadelphia, come between the Gulf stream and Nantucket shoals, in addition to the navigation north of Cape Cod. Most of the coasting trade comes through the Vineyard.

18. Question. What amount of work or repairs have you had done in the office here to instruments?

Answer. Nothing but the mounting of one telescope, which came from Europe without a stand. I have had no difficulty in obtaining repairs elsewhere, if needed.

19. Question. Should you think it necessary to have a mechanician with you in the field?

Answer. To measure the base line it might be desirable; not otherwise.

20. Question. Was any copper imported for the engraving from Vienna?

Answer. Yes.

21. Question. Was it used?

Answer. No.

22. Question. Why not?

Answer. It was not considered suitable.

23. Question. Can good copper for engraving be procured in this country?

Answer. Yes.

24. Question. Have you had any practice as an engraver?

Answer. Yes.

25. Question. Can impressions be taken from a plate in an unfinished state, to show the progress of the work?

Answer. Yes.

26. Question. Can impressions be taken from the plates now engraving in the survey?

Answer. Yes, without injury to them.

27. Question. How long will it take to furnish the eight plates of the harbor of New York, with the present force, at the rate it now goes on?

Answer. I cannot state by conjecture. I should think about three years.

28. Question. Is it not possible to have the work done accurately and more rapidly than at present, if more hands were put on the work?

Answer. Yes.

29. Question. Is it necessary to have a workshop for the repair of instruments at the office?

Answer. I am not able to say. There are some instruments for which it is convenient.

30. Question. In what time could the New York map be finished?

Answer. There might be an engraver for each plate.

31. Question. Of what use are the plane tables, so far as regards navigation?

Answer. I do not consider it of any use to extend the survey any further back than the slope of the hills at the head of navigation.

32. Question. Are the plane tables further back?

Answer. I do not know how far back. I presume they are.

33. Question. What is the signification of the words "primary triangulation?"

Answer. They signify the main series of triangles on which any work to be surveyed is based, extending as far as possible throughout the work.

34. Question. What is a secondary triangulation?

Answer. It is a series commenced within the primary triangles, extending in whole or in part through the same, and dependent on the primary series.

35. Question. Is it possible for a series of secondary triangles to exist where there are no primary ones?

Answer. No.

36. Question. Is not the use of secondary triangles for plane-table parties to furnish detailed points?

Answer. Yes.

37. Question. If in any work there be but one series of triangles, does any such fact exist as primary and secondary?

Answer. No.

38. Question. When you commenced, was not the secondary triangulation intended to be, as the name imports, secondary to and within a primary triangulation?

Answer. Yes.

39. Question. Is it so now?

Answer. East of New Haven I have extended a main triangulation to Newport, and filled up the same with a secondary series of triangles.

40. Question. Is the main triangulation determined by Mr. Hassler, and ending at Yards and Mount Holly, of the same nature as the main or as the secondary triangulation by you, east of New Haven?

Answer. The same as the main triangulation by me, east of New Haven.

APRIL 30, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

Examination of Captain Swift.

1. Question. Are you employed in the coast survey; and if so, in what capacity, and since what time?

Answer. As an assistant, since 4th April, 1833. I am also the disbursing agent, since about 2d July, in the same year.

2. Question. Will you furnish to the committee an exhibit of the expenditure on the survey for the years 1841 and 1842; say of the appropriation of March, 1841, classifying the same so as to show the amoun

expended on the maritime, and the amount on the land part of the work; the amount on the primary and secondary triangulation, and on the plane tables; the amount for salaries, and for expenditure at the bureau; and in the same way of any and all other conveniently specified classes of expenditure?

Answer. The answer is annexed in the papers marked A 1 and A 2.

3. Question. Will you furnish to the committee a copy of a printed pamphlet on the coast survey, distributed among the members of the House in February last?

Answer. The pamphlet is annexed, (marked B.)

4. Question. Is there any sufficient reason for suppressing or omitting to publish the results of the survey as thus far ascertained, and as the same may continue to be obtained?

Answer. No, I think not.

5. Question. May not maps of specific completed parts of the survey be published, while the work is in progress on other parts of the coast?

Answer. Yes.

6. Question. Of how large a part of the coast is the survey now so far completed that such maps might be published?

Answer. The whole of Long Island sound, including both sides of Long Island, New York harbor, and a portion of the northern part of New Jersey, coast and interior.

7. Question. Might not the soundings, position of headlands, and the like, of all so much of the coast, be now published?

Answer. Yes.

8. Question. Is there any sufficient reason for withholding from Congress the mathematical elements of the survey, so far as completed?

Answer. No.

9. Question. In whose possession are those facts and *data* at this time?

Answer. They are at the office in Washington, so far as completed, and except so far as parts of the work now in progress are in the hands of the assistants.

10. Question. Are there duplicates of the observations, measurements, and other unpublished elements of the survey?

Answer. There are of parts, but I think not of the whole.

11. Question. Are the elements of the base line, and of other primary and essential parts of the work, in such form and situation as to be secure from loss by fire or otherwise, and be capable of being handed over to and understood by any competent successor of Mr. Hassler?

Answer. All this is in duplicate in the office, accessible to the assistants, and susceptible of being understood and used by them. No part of this has been published except the final result of the base measurement. The details have not been published. The papers are subject to the hazard of fire; but not more so, and perhaps less, than in some other buildings in Washington.

12. Question. Is there any objection to depositing one of the duplicates in each case in the safes of the Treasury Department?

Answer. No.

13. Question. Would not this be proper, to guard against accidents?

Answer. It certainly would add to the security.

14. Question. In what way are the principal duties of the survey subdivided between the superintendent and his assistants?

Answer. The duties of Mr. Hassler, in addition to the general supervision of the work, are the main triangulation, while the assistants are employed in the secondary triangulation and detailed surveys.

15. Question. Is the main triangulation in arrears of the secondary; and if so, why?

Answer. It is. I am not aware of the reason, except the illness of Mr. Hassler, and his inability to do it, caused thereby.

16. Question. Cannot that work be performed by one of his assistants?

Answer. Yes.

17. Question. How long has Mr. Hassler been so ill as not to be able to attend to that work?

Answer. It was in October of last year that he became ill. He was also ill the preceding year, in September.

18. Question. What prevented his taking the field and performing the work in the spring and summer of those two years?

Answer. I am unable to say.

19. Question. What sum is allowed to Mr. Hassler, annually, for expenses, exclusive of compensation?

Answer. Salary $3,000, and expenses $3,000.

20. Question. For what expenses is this $3,000 designed? Is it for personal expenses?

Answer. I suppose it is the expenses of living.

21. Question. Is he paid for other expenses when he goes into the field?

Answer. He is furnished with an instrument carriage and horses for the instruments and himself, and a baggage wagon besides, for instruments, at the public expense.

22. Question. Is it the same carriage which he is accustomed to use in Washington?

Answer. Yes.

23. Question. Are horses and men paid at the public expense for the carriage and wagon through the year?

Answer. Yes; four horses, one permanent driver, and one other man, who also assists about the office.

24. Question. Please to specify, in the answer to the 2d question, the whole of the expenditures on these carriages, horses, and men, as are of the classes of expenditures therein referred to.

Answer. It is contained in the paper annexed, and marked A.

25. Question. What are the precise duties performed by Mr. Hassler during the chief part of the year, in which he remains at Washington?

Answer. The weights and measures, and the computation of his own field work, and occasional general computation.

26. Question. Do not the assistants reduce and compute their own work?

Answer. Yes.

SATURDAY, *May* 13.

Present: Mr. Mallory, Mr. Cushing.

Continuation of the examination of Captain Swift.

27. Question. Do you wish to add any explanation to the papers now produced in answer to the 1st question, and marked A 1 and A 2?

Answer. In comparing the accounts in the papers marked A 1 and A 2, and in the printed sheet B, there is a discrepancy in the sums, assigned to

the secondary triangulation and plane-table parties, respectively. The manuscript (marked A 1 and A 2) is the later and correct statement, the statement in B being an approximate estimate, made up before the complete settlement of the accounts.

28. Question. Does the whole amount expended pass through your hands, and how is it drawn from the Treasury, and on what vouchers paid?

Answer. All the expenditure for work on shore passes through my hands, also the per diem allowance of the officers on board the vessels, and the extra compensation of the lieutenant commandant; but the other payments, in the hydrographical part of the work, do not pass through my hands, being made by the commander of the vessels. The money expended by me is received by me from the Treasury, on requisition made by me on the Department. All the disbursements, except for salaries, &c., fixed at the Treasury Department, are made under the authority of Mr. Hassler.

29. Question. Who prescribes the number of subordinate persons to be employed, and the amount of miscellaneous expenses to be incurred?

Answer. The assistant in charge of each party, subject to the control of the disbursing officer.

30. Question. Who appoints the persons employed in the survey?

Answer. Mr. Hassler.

31. Question. Who fixes their compensation?

Answer. If below $1,000, Mr. Hassler; if more, it is referred to the Department. Such is the practice, so far as I know.

32. Question. Is it necessary to have an instrument maker's shop in the survey?

Answer. I think it is both economical and convenient. An amount of work was done there the last year fully equal to the cost of maintaining the shop.

33. Question. Cannot some portion of the topography of the survey be dispensed with without detriment to the hydrographic part of the work?

Answer. I conceive that the plane-table survey is useful, but it may not be necessary for any hydrographical object that it should be so far extended.

34. Question. What, then, is it useful for?

Answer. I do not know any thing, except that it contributes to a more exact knowledge of the topography of the country adjacent to the coast.

A 1.

Statement of the expenditures made for the survey of the coast of the United States, and for engraving the chart of the harbor of New York, during the year 1841 *and a part of* 1842.

Amount expended by Captain W. H. Swift, from 1st January, 1841, to 31st December, 1841 - - - - -	$80,639 13	
Amount expended by Commander Thomas R. Gedney, 17th May, 1841, to 31st March, 1842 - - - - -	9,162 42	
Amount expended by Lieut. Commandant Geo. S. Blake, 11th March, 1841, to 28th February, 1842 - - - -	4,766 77	
		$94,568 32

Details of the expenditures.

For the main triangulation, including the compensation of the superintendent, the heliotropers, and hands employed therein, and all incidental expenses, except horses, wagons, and harness, and repairs of same, and pay and subsistence of driver - - -	$9,289 87	
For horse keeping, (4 horses,) repairs of one instrument carriage, one wagon, harness, and pay and subsistence of driver - - -	1,445 98	
		$10,735 85
For the secondary triangulation, including the compensation of the assistants, heliotropers, and hands employed therein, and all incidental expenses, except horses and wagons, harness, and repairs of ditto - - - -	20,656 14	
For horses, horse keeping, repairs of wagons, and harness, pay and subsistence of 2 drivers, (3 wagons and 5 horses) - - -	2,160 74	
		22,816 88
For the plane-table surveys, including the compensation of the assistants and the hands employed therein, and all incidental expenses -		17,212 29
For the hydrographic surveys: Amount paid by Capt. Swift to the naval assistants, for the authorized allowance of $627 per annum to the lieut. commandants, and of $1 per day to the lieutenants and passed midshipmen -	8,644 94	
For amount paid by Commander T. R. Gedney, from 17th May, 1841, to 31st March, 1842, for repairs of 2 vessels, sails, boats, pilotage, and incidental expenses, (Washington and Jersey)	9,162 42	
For amount paid by Lieut. Com't G. S. Blake, for same from 11th March, 1841, to February 28, 1842, (schooners Gallatin and Nautilus) -	4,766.77	
		22,574 13
For expenses of the coast survey office, including rent, fuel, lights, and attendance - - - - -		1,999 17
For expenses of the instrument maker's shop, including the compensation of the persons employed therein, and the cost of tools and materials purchased for same - -		2,318 11
For compensation and expenses of the persons employed in engraving the chart of the harbor of New York - -		2,011 14
For the *general expenses* of the work, including the compensation of all assistants and others not embraced in the preceding schedule, and all purchases and expenditures not specified in same - - - - - -		14,900 75
		94,568 32

W. H. SWIFT,
Disbursing Officer Coast Survey.

WASHINGTON, *May* 4, 1842.

A 2.

List of all persons employed in the survey of the coast of the United States on the 1st April, 1842, *and the annual compensation paid to them by Captain W. H. Swift, disbursing officer, from the appropriation therefor, made March,* 1841.

F. R. Hassler, superintendent, $3,000 salary, $3,000 expenses	$6,000 00
Captain W. H. Swift, assistant and disbursing officer, 2½ per cent. upon disbursements - - - - -	1,908 60
James Ferguson, assistant - - - - -	4,000 00
Edmund Blunt, do - - - - -	4,000 00
Lt. Thomas J. Page, do - - - - -	500 00
C. M. Eakin do - - - - -	3,000 00
Charles Renard, do - - - - -	3,000 00
W. M. Boyce, do - - - - -	2,000 00
J. J. S. Hassler, do - - - - -	2,000 00
John Farley, do - - - - -	2,000 00
Lt. B. F. Sands, do - - - - -	
Thomas W. Werner, do - - - - -	1,500 00
H. L. Dickens, do - - - - -	1,500 00
F. H. Gerdes, do - - - - -	1,500 00
Samuel Hein, clerk, $1,000 per annum, $4 per week for board in Washington - - - - - -	1,208 00
William Windeman, instrument maker, $800 per annum, $4 per week board in Washington - - - -	1,008 00
Thomas McDonald, artificer and heliotroper, $600 per annum; and $4 per week for board in Washington - -	808 00
Selman Seibert, engraver - - - - -	1,800 00
Albert Rolle, do - - - - -	1,300 00
Ludolf Muller, calculator and heliotroper, $800 per annum, and $4 per week for board in Washington - -	1,008 00
C. F. Flint, copyist (of calculations) and heliotroper, $600 per annum, and $4 per week for board - - -	808 00
W. Jacobi, employed in the instrument maker's shop, and heliotroper, $2 50 per working day - - - -	782 50
Samuel Schmid, copyist (of calculations) and heliotroper, $300 per annum, and $4 per week for board in Washington -	508 00
Gustavus Windeman, heliotroper and filer in the instrument maker's shop, $300 per annum, and $4 per week board -	508 00
H. L. Whiting, draughtsman and heliotroper, $300 per annum, and $4 per week for board - - - -	508 00
Edward Sweeney, driver, (main triangulation,) $18 per month, and $4 per week for board in Washington - -	404 00
William Greason, messenger, $18 per month, and $4 per week for board in Washington - - - - -	404 00
Christopher Kuft, fire maker, watchman, &c., $18 per month, and $4 per week for board in Washington - -	404 00
George Kangnau, fire maker, watchman, &c., (temporarily employed since 1st January, 1842,) $18 per month, and $4 per week for board in Washington.	

Hydrographic surveys.

Commander Thomas R. Gedney.	
Lieutenant Commandant G. S. Blake - - -	$627 00
Lieutenant G. M. Bache - - - - -	365 00
Lieutenant J. K. Mitchell - - - - -	365 00
Lieutenant H. S. Stellingen - - - - -	365 00
Lieutenant John M. Dale - - - - -	365 00
Lieutenant E. G. Parrott - - - - -	365 00
Passed Midshipman H. H. Lewis - - - -	365 00
Passed Midshipman W. A. Bartlett - - - -	365 00

W. H. SWIFT,
Disbursing Officer Coast Survey.

WASHINGTON, *May* 4, 1842.

When an assistant or other person attached to the work is ordered by the superintendent from one place to another on public duty, the actual amount paid for railroad, steamboat, or stage fare, is refunded to the person incurring such expense.

W. H. SWIFT.

B.

Remarks upon the survey of the coast of the United States.

1. The law authorizing the survey of the coast was passed February 10, 1807.

2. Circular letters were addressed by the Treasury Department to various scientific men in the United States, asking for a plan of operations. Thirteen such were received, and submitted to a committee of learned men in Philadelphia, with the late Professor Patterson at their head. After full consideration, the plan proposed by Mr. Hassler was adopted.

3. From the passage of the law until 1811, no active steps were taken, in consequence, principally, of the unsettled state of the country.

4. In August, 1811, Mr. Hassler was sent to England to procure instruments, in accordance with the plan proposed by him in 1807. These instruments had all to be *constructed;* and, for the purpose of superintending the same, he remained in England until 1815, at which time he returned to the United States, with all the instruments and appendages requisite for the work. The war, want of remittances for payment of the instruments purchased, the difficulty of procuring suitable artists to construct the same, &c., conspired to protract his stay in England nearly two years beyond the time which he had allotted to this part of his labor.

5. In August, 1816, Mr. Hassler was appointed to superintend the survey of the coast, under the law of 1807. The necessary preparations for the work, including reconnoitring, &c., consumed the time between August, 1816, and April, 1817. At that period a proper locality for a base line was discovered in New Jersey, and in July of the same year the actual triangulation was commenced.

6. April 14, 1818, that part of the law which authorized the employ-

ment of persons other than those belonging to the army and navy was *repealed*, and thus was Mr. Hassler's connexion with the coast survey closed.

7. Up to this period, the whole amount expended for the work was $55,634; of this amount, $37,549 had been expended for instruments and the expenses of procuring the same, leaving about $18,000 for the cost of the survey, equipment for the field, &c.

8. In 1819, Mr. Hassler presented to the American Philosophical Society of Philadelphia his papers upon the coast survey, describing the method and means by which it had been designed to conduct the work, together with full descriptions of the instruments, with drawings of same, examples of the journals of observations, &c. These papers were published by the society, in their volume of Transactions for 1825, and are now in the Library of Congress; they contain much valuable and interesting information upon the subject. They were reviewed by the principal astronomers of Europe—Bessel, Struve, Schumacher, Ferrusac, Francoeur, Krusenstern, &c.—all uniting in the opinion that the plan of Mr. Hassler was of the first order, and that the instruments were in every manner adapted to the purpose for which they were designed. In 1832 a distinguished astronomer of France, now employed by the Government of the United States, declared that the instruments planned by Mr. Hassler for the coast survey, and executed under his eye, were, when constructed, *twenty years in advance of the science of Europe.*

9. In 1827, the survey of the coast, after a lapse of ten years, again excited public attention. The Secretary of the Navy, (Mr. Southard,) in describing certain surveys which had been made by naval officers for an especial purpose, stated in his annual report that "the time within which it was supposed desirable to make them, [the surveys,] and the means granted by the appropriation, did not permit them to be so made as to furnish perfect surveys and charts of those harbors; *nor can such surveys be made without the aid of the means contemplated by the act of* 10*th February*, 1807, *to provide for surveying the coast of the United States.*"

In 1828, the Committee on Naval Affairs addressed a letter to the Secretary of the Navy, (Mr. Southard,) asking information in reference to the survey of the coast, to wit: whether it ought to be made; the best plan for making it; what progress had heretofore been made, &c. In reply, he proceeds to say, after referring to a list of maps and charts: "Of the whole of the maps and charts in possession of the Government, it may be remarked that they do not furnish a satisfactory survey of the coast, for the following reasons:

"1. They exhibit detached parts, unconnected with each other.

"2. Are generally confined to the shore, and do not extend sufficiently far into the ocean.

"3. Were many of them made by incompetent men, with incompetent means.

"4. They were governed by no fixed and certain principles or guides, in ascertaining the latitude and longitude of the principal points and positions.

"5. They do not embrace the whole coast.

"*For these and other reasons they are unsafe, and, in many instances, useless and pernicious.*"

10. In answer to the question, "Whether, in the opinion of the Department, such survey ought to be made?" the Secretary replies: "Upon this point no doubt is entertained. It is called for by regard to our commercial

and naval interests, and to our means of national defence. I do not understand that you require a statement in detail of the reasons for this opinion; they will readily suggest themselves to every mind."

11. July 10, 1832, the law of 1807 was revived, and the employment of such "astronomers and other persons" as the President should deem proper was again authorized.

12. At the request of the Treasury Department, Mr. Hassler submitted a plan of operations for the work, being, in fact, the same which he had proposed in 1816. On the 9th August, of same year, he was again appointed to the survey, and to carry into effect the law of July 10. Prior to this period he had been employed by the Treasury Department in making comparisons of the various weights and measures in use at the several custom-houses, with a view to the construction of uniform standards of the same for the Union.

13. The two works, of the coast survey and that of the construction of standard weights and measures, being, by their nature, intimately connected, and the means of accomplishing each being in many instances the same, Mr. Hassler was charged by the Treasury Department with the execution of both; and, since the period referred to, the two works have received his whole attention.

14. Since 1832 the survey of the coast has been diligently prosecuted. The remainder of the season, between August and December of that year, was employed in reconnoitring and other preparations; and early in the following year (1833) the triangulation was recommenced, and has been making steady progress from that time to the present. In 1834 a new base line was measured on Long Island, and the secondary triangulation, hydrographical work, and plane-table surveys, have also been in active progress, *pari passu*.

15. By the official statement of the Secretary of the Treasury, (Doc. 57, H. R., Jan. 31, 1842,) it will be seen that the aggregate amount expended from 1808 to 30th June, 1841, is $512,731 68; of this sum, by the same statement,* $33,723 05 has been expended for the purchase of "instruments, books, and repairs of instruments." This, with various sums expended for 5 surveying vessels, 20 boats, with all the requisite accompaniments, and the necessary equipment for the several parties engaged in the secondary triangulation and plane-table work, makes a gross sum which exceeds $120,000, for objects of a *permanent* nature, now the property of the coast survey. This would reduce the amount expended upon the work itself to $392,731 68; if to this sum be added the whole amount of the estimate of the Secretary of the Navy, for difference between shore pay and sea pay of the officers, and for pay and rations of the crews of the several vessels, from 1834 to 1841, ($114,584,) we shall have a total sum expended of $507,315 68, for about 11 years of actual work, or about $46,000 per annum.

16. When the operations of the coast survey, under Mr. Hassler, were suspended in 1818, by the repeal of a portion of the law, the system which he had adopted was also suspended, and thenceforward detached portions of the coast were assigned for survey to naval officers, from time to time. Indeed, this same system, which was condemned so thoroughly by Mr.

* There is an error in this part of the Register's statement; for the *original* collection of instruments cost $37,549, and additional instruments have since been procured.

Southard in 1828, and for which the sound reasons quoted from his report, at the 4th page of this paper, were given, is still pursued—at what expense exactly we have not the means of stating. An approximate estimate may be formed, however, from the following facts: The direct expenditures, as exhibited by the printed statements in the office of the Register of the Treasury, from 1818 to 1841, are $63,520 20; the incidental or indirect expenditures do not appear, but perhaps an idea of the extent of the same may be formed upon the following data: In 1832, $5,000 were appropriated for the survey of Narragansett bay, in Rhode Island. There were employed in this work, 1 post captain, 3 lieutenants, 5 passed midshipmen, and 18 seamen, for one season, say six months. This appropriation of $5,000 is nearly $\frac{1}{13}$th of the whole amount of *direct* expenditures. Adopting the same principles in computing the cost of the work chargeable to the naval establishment, which the Secretary of the Navy adopted in stating $114,584 as the amount properly chargeable to the coast survey, for difference between sea and shore pay, and subsistence of officers, and pay and rations of seamen, we shall have a gross sum, for six months, of upwards of $4,000. Therefore, for every $5,000 expended directly for the work, we should add $4,000; and this, for the $63,520 20, amounts to $50,800. It may be inferred, also, that nothing is included in the above $63,520 20 for purchase or repairs of vessels, equipment, &c., these being provided, as usual, in the general expenses of the naval establishment; on the contrary, both purchases and repairs of vessels, boats, furniture, &c., is chargeable upon the coast survey fund, for all which now belongs to the work. Here, then, we have a sum of $114,320 as the cost of some detached surveys of portions of the coast. Surveys of this nature, and those which are executed upon proper principles, are so unlike in character that they do not admit of comparison.

We proceed now to state briefly the principles upon which the survey of the coast is conducted.

The principle upon which the survey of the coast is conducted is, essentially, that which is known as the trigonometric method. By the relations which subsist between the sides and angles of a triangle, we are enabled, from certain known data, previously determined by actual measurement, to compute certain other parts which are unknown. For example: in a given triangle, by measuring one of the sides and the angles, the two remaining sides can be determined by computation. These computed sides then serve as bases for other triangles, and subsequently, by measuring the angles *alone* in the triangles thus formed, the work is extended *ad libitum*. This is called a triangulation, and may be made upon any part of the earth's surface upon which a line of a given extent can be measured.

A triangulation may be complete in itself, and, when the necessary corrections have been made for the figure of the earth, the actual distance between two points can be accurately determined. But this, alone, is not all that is required; it is necessary to ascertain the true position of the district or country triangulated upon the earth's surface—that is to say, its latitude and its longitude. The first of these is independent, it being simply its distance from the equator; while the second is not independent, but refers to the position of some other point on the earth's surface, and under another meridian. This latter place, or meridian, may be assumed at will; and the question then to be determined is simply the difference *in time* between the two places of observation; and this being converted into de-

grees constitutes the longitude, or rather the difference of longitude between two places.

For these determinations, observations upon the heavenly bodies must be resorted to. It is not necessary, however, that celestial observations should be made at every point determined by the triangulation; on the contrary, a few well-determined positions, ascertained by a long series of observations, often repeated, are sufficient, the connexion between the same being determined by the triangulation; hence the survey of the coast, as now conducted, is made by combined or mixed geodetic and astronomical observations.

Here, then, is the essential difference between a survey by triangulation and astronomical determinations, or even the so called "chronometric survey," (a misnomer, by the way, for it is not a *survey*.) One consists in a *connected* work, carried on upon the earth's surface, and made by means of an uninterrupted series of triangles; while the other is composed of a collection of observations upon the celestial bodies, made at detached points, each place of observation being independent of the other. In the first method the connexion is complete, while in the others there is no connexion whatever.

To the question, whether the mode of making the survey of the coast by triangulation is better than any other, it may be said to be the *only* truly correct method which can be pursued. It is the only method by which a *connexion* in the work can be preserved. Of its accuracy the proofs are continually before the observer, and an error need not be extended beyond a single triangle. The three angles are measured in every principal triangle of the work; and, as this is all the *measurement* which takes place after the base is determined, it is obvious that the observer has his proofs of correctness continually at hand. There can be no *cooking* of observations, as is sometimes practised in astronomical determinations.

An idea of the exceeding accuracy attainable in works of the nature referred to may be formed by referring to the account of the measurement made by the French astronomers of the arc of the meridian between Dunkirk and Cabrera, for the determination of the figure of the earth, being 12 degrees of latitude in extent. After a great number of triangles had been measured, and an extent of about 500 miles upon the meridian determined, (between Melun and Perpignan,) a base of *verification*, as it is denominated, was measured at Perpignan. This verification consisted in *measuring* with the greatest accuracy one of the sides of a triangle in the series, which had been previously determined by computation from the original base. The difference between this computed side and the actual measurement was less than 2 feet.*

In the work of the survey of the coast, the *secondary* triangulation now encompasses the southern part of the State of New Jersey, from Staten island to Cape May; one series of triangles was carried around on the east or coast side, while a second was carried down the Delaware river and bay, uniting near the southern point of the State. The length of the side of the triangle which was common to both series was, of course, determined by each chain of triangles—one by the coast, and the other by the Delaware bay; the difference between the two determinations was two metres, or about six feet. In the primary triangles this difference will, from present appearances, be less than one foot.

* La Place.

Surveys of all the countries of Europe have been or are being made by the system of triangulation, to wit: Austria, Russia, Sweden, Denmark, Hanover, Prussia, Swabia, Bohemia and the States of Germany generally, Italy, Naples and Sicily, Switzerland, France, England, the British possessions in India, and the French colony in Algiers.

"Europe is covered with well-connected series of triangulations—from the south of Sicily to the polar circle; from Ireland, through England, France, Germany, to the interior of Russia; from Bordeaux to the frontier of Turkey, and in all the intermediate parts."

Some of the practical benefits which have resulted from the coast survey are already apparent. The discovery of the ship channel into the harbor of New York, the better determinations of the channels into Delaware bay, and the detection of the grossest errors in the existing charts of that bay, constitute a portion of the advantages which have already been derived from this work.

The engraving of the chart of the bay and harbor of New York, with the country adjacent to the same, within a circuit of twenty miles, is now in progress; two sheets, embracing the entrance to the harbor, with the channel delineated thereon, are already in a state of great forwardness, and, in all probabilty, will be completed by the 1st of June, 1842.

To the question, "Whether no other mode exists by which accurate results can be obtained within less time than they can be furnished by a trigonometrical survey," the answer is, *No.* There is no *short* method by which these results are attainable. It is not the "quantity" of triangles alone which determines the industry or skill of the observer, but the quality. To make the triangulation of a given district of country with the least possible number of well-conditioned triangles, is one of the important problems to be solved; quality, again, and not quantity, is the essential requisite.

Usually, the experience of the world is justly considered when any great object is to be attempted or effected. Why should it be excluded from the category, in judging the merits of this magnificent work? We have the combined testimony of all the science of Europe in favor of making surveys by triangulations, and, in fact, the positive assertion that it is the *only* proper method. Why should we not adopt the conclusions of nations which, to say the least, are older in these matters than we ourselves are, rather than to resort to methods which are a century behind the age we live in?

Why, with the great advantages which the "chronometric system" is said to possess, is it not adopted by those who are best capable of judging it by its merits? Rather let the whole work be destroyed, than to suffer it to be done discreditably. If we cannot make it in a manner which shall bear the scrutiny of the scientific world, let it rest for another fifteen years. Sextants and chronometers are invaluable instruments in their proper sphere, but they certainly do not furnish the means by which triangulations, are to be made, or corrected, or superseded, as some would seem to desire.

Organization of the work.

1. The main or *primary triangulation,* upon which all the work depends, is made up of triangles, having sides of from 10 to 50 miles in extent. The angles in these triangles are all measured by Mr. Hassler.

2. Within these main triangles, smaller triangles are formed; this constitutes the *secondary triangulation;* the sides of these vary in length from 2 to 10 miles. The angles of these triangles are measured by the assistants of Mr. Hassler; two and sometimes three parties are engaged in this part of the work; usually they enter the field in March and April, and leave the same for the calculations, &c., in the office, in December.

3. The secondary triangulation, in turn, forms the basis of the plane-table or topographical surveys; these include all the details of the ground, outline of the coast or shore, courses of bays, rivers, roads, &c. This portion of the work is distributed among 5 or 6 parties, each having a district of country allotted to it. A party consists of 1 assistant and 5 or 7 hands, according to the nature of the country to be surveyed. These parties usually take the field in April and May, and return to the office, to make up their plottings and maps of the work of the season, in November.

4. The hydrographic determinations are made entirely by the naval assistants of Mr. Hassler. Points on shore are furnished by the triangulation, both main and secondary, together with the coast or shore line from the plane-table surveys. By this means the sounding parties are enabled to determine the true position of their soundings, by measuring the angles subtended between stations previously established upon the shore. Two parties are engaged in the hydrographic part of the work, each being furnished with the necessary assistants from the navy, and with vessels, boats, &c., belonging to the coast survey. These parties are engaged in their labors upon the coast from April or May to November, according to the character of the weather; in the winter months they are employed in laying down upon their charts the results of the work of the season.

The triangulation now extends from Narragansett bay, Rhode Island, to Cape Henlopen, Delaware, on the coast, and from the neighborhood of New York to the head of Chesapeake bay, covering an area of about 11,000 square miles. The hydrographic surveys cover 5,600 square miles, and the topographical or plane table surveys 4,200 square miles. This work is represented upon upwards of 200 maps and charts, of various scales, according to the nature of the work, from $\frac{1}{5000}$ to $\frac{1}{100000}$; that is to say, one foot in extent upon the map will represent, according to the scale used, 5,000 feet, or 100,000 feet upon the earth's surface.

The actual length of coast line, (including Long Island,) already determined and laid down upon the map, is - - -	631	miles
Do. of the larger bays, rivers, and islands - - -	697	"
Total of shore line, coast, bay, &c. - - - -	1,328	"

Classification of the expenses.

The whole amount expended for the survey of the coast from the *appropriation* therefor, for the year 1841, was $96,174 98.

1. Of this sum, the general expenses of the work, including the main triangulation, compensation of all persons employed therein, instruments and books, and all expenses not enumerated in the items below, amounted to -	$32,671 09
2. The secondary triangulation, including compensation of persons therein employed, 3 parties - - -	19,352 06

3. The hydrographic surveys, including the cost of repairs of the vessels, boats, &c., and allowances to officers for expenses, 2 parties and 4 vessels - - - -	$25,459 16
4. Plane-table or topographical surveys, including compensation of all persons employed therein, 6 parties - -	18,692 67
	96,174 98

The conclusions which are deducible from the preceding remarks may be summarily stated thus:

1. Availing ourselves of the experience and practice of all European nations, it is just to conclude that the survey of the coast can only be made (if it shall be accurately executed) by a triangulation.

2. Conceding the ground that it is by a triangulation alone that exact results can be obtained, it may be shown, by a reference to the history of similar works, that the methods pursued in executing the survey of the coast of the United States are, in principle and in details, in accordance with the best of those adopted by other nations.

WASHINGTON, *February* 25, 1842.

[It is proper to state that this paper on the coast survey was prepared by Capt. Swift.]

MAY 2, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

Examination of Captain Thomas R. Gedney.

1. Question. Are you an officer of the navy?

Answer. Yes.

2. Question. Are you now employed in the coast survey; and if so, since what time and in what capacity?

Answer. I have been employed in it since October, 1834, in charge of one of the hydrographical parties.

3. Question. How many of such parties are there?

Answer. Two. The other is commanded by Lieutenant Blake.

4. Question. How many persons, and what vessel or vessels, are employed in your party?

Answer. Last year I had two vessels, the schooner Jersey and the brig Washington, with, I think, fourteen officers, all told; and, I believe, thirty-two seamen and forty-four boys. This amount of force was necessary.

5. Question. What surveys have you made since October, 1834?

Answer. I have been engaged in making soundings. I commenced in Fire Island bay in 1834; then the outer coast of Long Island, in 1835, from Fire island to near New York; then the harbor and bay of New York, and to Montauk point, along the outer coast of Long Island, in part of 1835 and in 1836 and 1837; in 1838 and 1839, from Fisher's island to Block island and Point Judith; in 1840 and 1841, on the coast of New Jersey, as far as Egg Harbor. These soundings include also all the inland navigation from Fire island to Egg Harbor. In addition to this, in 1841, I performed a piece of detached work between Cape Henlopen and Cape May.

6. Question. Have you completed the soundings along the whole extent of coast from Point Judith to Egg Harbor?

Answer. Yes.

7. Question. Are those soundings, as verified by you, in a condition to be published?

Answer. Yes.

8. Question. Do you make any astronomical or other observations on the coast?

Answer. No, except so far as may be needful to keep my own time.

9. Question. Have any views of the coast been taken by you or from your vessels?

Answer. Yes. Mr. Farley has taken a panoramic view of the whole of Long Island and of all the light-houses wherever I have sounded. We have taken no other views, except of the entrance of the new channel in New York harbor.

10. Question. Is the coast of Long Island an easy or a difficult one?

Answer. I think it an easy one myself.

11. Question. What is the chief occasion of wrecks on Long Island?

Answer. When vessels are running in, and are caught by a heavy southeaster, it is difficult to get out, from the trending of the two coasts of Long Island and of New Jersey, and the current setting from New Jersey coast, by reason of which vessels, being thus embayed, are apt to be driven on shore.

12. Question. Have you sounded Jamaica bay?

Answer. Yes, in 1835.

13. Question. What depth of water did you carry into that bay?

Answer. Six feet at low water, eleven and a half at high water, in common tides. At the present time, the depth at low water is seventeen feet.

14. Question. Would not the knowledge of the actual depth of the water in the channel leading into Jamaica bay be useful to a vessel which was unable to claw off the coast?

Answer. Yes; it might preserve a vessel from being stranded.

15. Question. What amount of repairs of instruments have you had done at the office of the coast survey?

Answer. I cannot say.

16. Question. Have you had other repairs done elsewhere; and if so, by whom, and to what amount?

Answer. I have had repairs done for our, or my, party, the last year, to the amount of forty or fifty dollars, by Mr. Montandon, and by George Blunt, of New York, it having been convenient to have this done on the spot there.

17. Question. How far inland do any of the points extend which you have used, as furnished you by any of the triangulating parties?

Answer. Some of them have been from ten to twelve miles inland. They were used for measuring angles from the vessel and from different points. The points which I occupied for measuring were generally on the coast, within a quarter of a mile of the beach.

18. Question. Please to describe your mode of proceeding in this respect.

Answer. I have three officers on shore, at three different stations, with a sextant and a watch each, and a boy with a spyglass also to each station. I then am anchored or lying to off shore in my vessel. I make a signal

in the morning, when I get under way, to commence work, I knowing that the men are at their stations by their hoisting a signal flag for that purpose. I commence by running up a signal; so soon as the signal starts from the mast head, the officers on the shore measure the angle between the brig and one of the stations, and the officers on board the brig, two of them, then measure each of them an angle between the stations on shore, so as to give in all five angles; each officer, as well on shore as on board, marking the time, to see that they agree. Meanwhile I am taking my soundings, on the change of which the signals are repeated and new angles taken as before. In these observations I consider the vessel as a fixed point. This system of operation I have been able to carry out as far as twelve or fourteen miles seawards, which is the greatest distance I have gone. I can see the land inland about ten or twelve miles from the shore, along that part of the coast sounded by me; but if the land were higher the distance seen would be much greater.

19. Question. Did you sound the new channel, commonly called Gedney's channel?

Answer. Yes.

20. Question. Would you have been able, with the ordinary facilities for sounding, to ascertain that channel, without the previous triangulation of the coast?

Answer. Yes; I could have buoyed it out so far as to make it equally useful to navigation.

21. Question. Is the knowledge of that channel of great importance to the shipping of New York?

Answer. I think it is.

22. Question. Could not a master of a vessel, when employed off the harbor of New York, with such information as a good chart of the harbor would furnish, run his vessel in with tolerable safety by that channel?

Answer. Yes.

23. Question. Do you know any reason why a chart of that channel has not been published?

Answer. I do not know any, unless it be that it was not ready. Mr. Hassler has charge of that; I have not.

24. Question. When did you sound out that channel?

Answer. In 1835.

25. Question. Is not the channel as good now as when you first sounded it?

Answer. Yes; I sounded it again last year, for the purpose of ascertaining the fact, and found it so.

26. Question. Is the line of the coast, where examined by you, fixed or subject to change?

Answer. The beach itself, at the mouth of small inlets, is subject to change, with severe gales of wind.

27. Question. Is the topography of the country within the coast of any importance to navigators?

Answer. It is not, except for four or five miles, or where there is any remarkable eminence or other object inland.

28. Question. Is it customary to lay down the topography of the country on the charts of navigators?

Answer. I have never seen it in any charts except of islands. In charts

of the West India and other islands it is sometimes given; but in those cases it is not necessary for purposes of navigation.

29. How long do you continue sounding, one year with another?

Answer. I generally commence in May, and leave off early in November.

30. Question. Are you able to keep up with the triangulation?

Answer. Yes; and I have been in advance of the plane-table parties.

31. Question. Are the plane-table parties necessary to the soundings?

Answer. Yes.

32. Question. If you had occasion to sound at a greater distance from the shore than 12 or 14 miles, how would you proceed?

Answer. I should employ small vessels, anchoring them to serve as fixed points; or it might be done by means of chronometers, starting from some given or known point.

33. Question. What proportion of the year, and of the day in each year, have you been able to make your observations, and carry on the work?

Answer. The answer to this question is annexed in paper marked A.

34. Question. Have not your operations along the coast either corrected errors in printed charts or added many new and more complete soundings to those heretofore published in any chart?

Answer. I believe they have.

35. Question. Do you know any reason why the soundings taken by you should not be published?

Answer. I do not.

MONDAY, *May* 2, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

Examination of Lieutenant George Blake.

1. Question. Are you an officer of the navy, employed in the coast survey; and if so, in what capacity, and since what time, and on what part of the coast?

Answer. I am a lieutenant in the navy, and have had charge of a hydrographical party from 1835 to the present time; I have been in Long Island sound and Fisher's Island sound, and in Delaware river and bay.

2. Question. What vessel or vessels, and what number of officers and men, have you under your command?

Answer. My force has varied very much; I had last year the schooners Gallatin and Nautilus, with nine officers and forty-one men.

3. Question. Have you been engaged in the outer or the inner waters?

Answer. The inner altogether.

4. Question. What proportion of instruments have you had made or repaired at the office in Washington?

Answer. I have seldom had any sextants or glasses repaired there; but a large part of the drawing instruments have been made there, to the value or cost of say $500 at any private establishment, that is, during the whole time I have been in the survey.

5. Question. Have any views of rocks, shoals, or other dangerous places, been taken from your vessels?

Answer. No; views have been taken of all the light-houses.

6. Question. Have you, in the examination of Delaware bay, discovered any great errors in the supposed location of any shoals?

Answer. Yes; very great.

7. Question. In what cases?

Answer. In that of Cross ledge, especially; but there is no proper chart of Delaware bay; the only one extant is a mere rude sketch. The error in the case of Cross ledge was four miles, I think.

8. Question. Is it not important that these errors should immediately be made known, and a correct chart of the bay published?

Answer. Yes, undoubtedly.

9. Question. Do you know of any reason for withholding from the public a knowledge of the soundings of Delaware bay, as far as verified by you?

Answer. I know of none.

10. Question. Can a topographical map, so constructed as to give in detail a full and self-explaining picture of the country, that, with the map before the eye, the military operations may be properly judged and guided in the cabinet, be obtained, in carrying on the coast survey, without adding greatly to the expense, and materially delaying the execution of the work?

Answer. No, it cannot.

MONDAY, *May* 30, 1842.

Present: Mr. Mallory, Mr. Aycrigg.

Mr. W. J. Stone's examination.

1. Question. Map marked exhibit C being shown, witness is asked if he recollects the map.

Answer. Yes.

2. Question. Who engraved the map?

Answer. I did.

3. Question. Is that an exact copy of the original sent to you from the House of Representatives?

Answer. It is.

4. Question. How long did it take you to engrave and print this map?

Answer. In from seven to ten days it was fully executed and delivered to the House.

5. Question. With what person connected with the coast survey did you communicate at the time you engraved this map?

Answer. Mr. Hassler. I called on him, and had a conversation on the subject.

6. Question. Exhibit B being shown and examined, he is asked if that in an impression from the same plate.

Answer. Yes.

7. Question. Will you please to examine exhibit B, and see if there is any difference between this and exhibit C?

Answer. The only difference that I can perceive is, that another scale has been put in the place of the one engraved by myself, which was copied from the original.

8. Question. In what manner was that alteration made?

Answer. By cutting out the engraved scale and inserting one with the pen. The engraved scale on exhibit C is 3 inches to the mile; while the scale inserted with the pen is $\frac{1}{10000}$ th, being, in fact, 6 inches to the mile, instead of 3.

9. Question. Have you the original extract sent to you from the office of the coast survey?

Answer. I have.

10. Question. Are there engravers in the United States competent to execute, faithfully and correctly, any work like that required for the coast survey?

Answer. Yes; as well as it can be done in any part of the world.

11. Question. What is considered a liberal salary for a good workman?

Answer. About $1,200 per annum.

12. Question. Is there any difficulty in getting good copper in the United States for engraving purposes?

Answer. No difficulty whatever.

13. Question. How long will it take to engrave the map of the harbor of New York, and what will it cost?

Answer. I cannot answer without examining the chart.

The chairman then gave Mr. Stone a note to Mr. Hassler, of the following tenor, as near as remembered, viz: requesting Mr. Hassler to permit Mr. Stone to examine the manuscript chart of the harbor of New York.

The committee then adjourned.

THURSDAY, *June* 2, 1842.

Present: Mr. Mallory, Mr. Cushing, Mr. Aycrigg.

William J. Stone in examination.

1. Question. What is your business and residence?

Answer. I reside in Washington, and I am an engraver.

2. Question. How long have you followed that business here?

Answer. From twenty-three to twenty-four years.

3. Question. Have you been accustomed to engrave maps and charts?

Answer. Yes; that has been my chief, and is, at present, my only business; I having abandoned other branches of engraving, to devote myself to that.

4. Question. Is there any difficulty in procuring competent map engravers in the United States?

Answer. None.

5. Question. Do you know of any special superiority of German engravers over those of the United States?

Answer. No; I consider the American workmen better, cleaner, and more rapid.

6. Question. Please to look at the map hereto annexed, and marked A. William J. Stone, and state whether it is the original map sent from the House to you, and from which you engraved the map of Newark bay, as mentioned in the first part of your testimony.

Answer. It is.

7. Question. What is the scale on that manuscript map?

Answer. Of three inches to the mile, as on the map I engraved.

8. Question. Annexed is a map of Cape Cod, (marked B, William J. Stone:) did you engrave that?

Answer. Yes.

9. Question. How long does it take, in your establishment, to engrave such a map?

Answer. About two months.

10. Question. What are the dimensions of that map?

Answer, Thirty inches by thirty-six inches.

11. Question. When were you summoned by the committee to attend and be examined?

Answer. I received Mr. Mallory's letter on Monday, the 30th May, and attended that morning.

12. Question. Was that the first intimation you received on the subject?

Answer. Yes.

13. Question. Have you had previously any conversation with any member of the committee on the subject of the examination?

Answer. Never, of any kind whatever.

14. Question. Had you any knowledge of the purpose for which you were summoned?

Answer. No.

15. Question. Did you, as requested by the committee, call on Mr. Hassler, and present the note of the chairman?

Answer. I did.

16. Question. What occurred?

Answer. The interview was so disagreeable, that I would rather not describe it, unless it be insisted on by the committee.

The chairman therefore propounded to the committee the following question: Shall Mr. Stone be required to state what occurred in his interview with Mr. Hassler? and it was determined in the affirmative—Mr. Mallory, Mr. Aycrigg, and Mr. Cushing, present, and voting.

The question being again propounded to Mr. Stone, he answered as follows:

I went to Mr. Hassler's office, and knocked at the door. A servant showed me into his room, and asked me to sit down, and in a minute or two Mr. Hassler came in. I then handed him Mr. Mallory's letter. Mr. H. read it, and immediately fell into a violent rage, and swore that I should not see the map, neither should the committee have it. After much rudeness and violent language, both towards the committee and me, Mr. Farley came in, and Mr. H. handed him the letter. After some further conversation, Lieutenant Page came in, and Mr. H. showed him the letter, and further conversation ensued. At length Mr. H. permitted me to examine the map, which I did; and on my departure, he handed me a letter for the chairman of the committee, which I delivered to Mr. Aycrigg. This letter is annexed, and marked C, F. Mallory.

17. Question. How long would it take to engrave such a map, and what would it cost?

Answer. It would require about a year, I think. There are eight plates, each of 22½ by 32½ inches, making 5,912 superficial inches, which, at 3 cents per inch, would be $177 36, for the *copper;* the engraving, the sum of $4,132. This estimate is given for the execution of the work in the best and most accurate manner, understanding that the parallels of latitude and

longitude, with their subdivisions, are marked in by an officer of the survey, and the engraving is to exactly correspond with the same, which must ensure an accurate chart. I have made a liberal estimate, to enable the engraver to enter minutely into detail, and to do justice to himself and to the Government.

WASHINGTON CITY, *March* 23, 1842.

SIR: Among the questions put to me in the committee's meeting, there was one, at least, which appeared much insisted upon, and by circumstances was rather discussed than answered.

It seemed to put in doubt the propriety of the journals, and other works of the coast survey, to remain in the coast survey office, and requesting them to be delivered to the Treasury Department for safety. I will here supply more distinct answers.

1. This office here is one of the offices of the Treasury Department, exactly as much as any of the rooms in the Treasury building itself.

2. The extension of the Treasury Department works has obliged to have a number of other offices out of the yet unfinished Treasury building proper, so is this office.

3. The foreign standards of weights and measures have just now been transported from the Treasury building to this office, for their more proper and more appropriated safe keeping.

4. There are three houses, adjoining each other, rented by the Department, two at the expense of the coast survey, and one at the expense of the weight and measure works and the foundry establishment, besides its access to the street.

5. The total of the buildings adapted themselves so peculiarly to the use of both works, that no building in the city could, in any way, equal the conveniences they afford, by their present distribution.

6. Various arrangements have been made, at public expense, as well as at the expense of the owner, to adapt them the better; one story was elevated, to procure drawing rooms superior to any I know of; for better security, the roofs have been slated; and, in general, every arrangement made for convenience and security.

7. In every one of the three buildings, which connect all through with one another, two persons at least sleep; these are assistants, clerk, workmen, and I myself, so that the buildings are well watched all night.

8. The maps and many other valuable objects, are placed so that even in the extreme case of fire, they would be saved with the greatest ease.

9. The whole of the coast survey work must, in all cases, and at all times, be of the easiest access, nay, present, during the whole time that the work is going on, still more so than in any other office such may be required.

10. In requiring place in the Treasury building only to deposite the foreign standards, which had been expunged from the State Department to the Patent Office, where they were exposed to damage, I could not get a well appropriated place for want of room.

11. The lower vaults of the Treasury building, where I got a place to deposite the weight and measure standards, packed up and not yet sent off, could not but with difficulty be got, and such an one would not do,

because of their not being sufficiently dry and aired for paper, the maps especially would be utterly destroyed.

12. To displace the works from the office would be laying great impediment in the way of the work, and expose the parts deposited to *dilapidation* and *abuse*.

13. Every time that a certain systematically full part of the work, between two base lines, and two astronomical stations, will be executed, a full report will be made, and it is hoped published by Congress, which will rest that part forever, and then the documents of that part may be placed into some specially selected place of deposite, as original record, but until that time they *must remain* in the office in which they originate.

14. It would be the most effective mode of clearing up any subject whatsoever, that may be desired, and come in question, if the committee would be so kind to come over to the office, which is so near the Capitol, and visit all the parts of the work, as they are in activity, and constantly in evidence for every visiter.

F. R. HASSLER.

Hon. F. MALLORY,
Chairman of the Select Committee
of Investigation of the Coast Survey.

WASHINGTON CITY, *March* 30, 1842.

I must add a more detailed answer to that question which asked me "How I would proceed in the Southern coast, where marshes, woods, &c., presented peculiar impediments?" I answered to it: "By mixed astronomical and geodetical observations." This question was followed by that: "Is that not more or less the case with all the coast survey?"

This question showed that the nature of the scientific principles to be applied and indicated by my answer were unknown. I must therefore *explain:* what is called, in mathematical practice, MIXED astronomical and geodetical observations, is, when both these elements concur in the *same individual determination;* this is the case in the application of a problem of practical mathematics, which I have applied in Switzerland and in this country, on Weasel mountain, (to the full knowledge of my assistants,) to obtain the junctions of my works of 1817 with those of 1833, in the beginning, when I had not yet a new base line nor sufficient angles; it was equally successful in both cases.

It consists in "one goedetic line being given in position and length, the latitude of either point being known, the latitude and the angle, the line subtends from a third point, being observed, together with the azimuth of either end point, to determine the place of observation." From such a result new connexions are then opened further onwards; other similar problems may be made.

This is what I was beginning to express when I was stopped, under the denomination of entering into arguments, which Mr. Cushing refused to hear.

That I should expose it from its elementary principles, is what I am sure the committee cannot intend, because it is a problem which, joining both branches of science, would require long deductions of principles, almost an elementary work, for persons not acquainted with the science.

In triangulation, the two kinds of observations, astronomical and geodetical, are *disconnected;* each operation is *separate*, and they are only compared to draw conclusions upon one another, for a new, different result, required to place the survey in general to its proper place upon earth; therefore the astronomical parts are only made at a few properly selected places, and with *general views* for the work, *not* for *details*, like in the other case, as I have stated in my answer to question 5, article 3d, of my report of December 2, 1841.

F. R. HASSLER.

Upon the question of limitation of the works for the survey of the coast.

WASHINGTON, *April*, 1842.

1st. The limitation to any determined distance from the coast would require that the mountains, which are indispensably necessary for the station points of the survey, be within that distance.

2d. This is well known not to be the fact, therefore also the limitation not adapted to the nature of the country, thence this limitation would become impossible to be observed, if even decreed.

3d. If even smaller elevations were found within these limits, which it might be said fit to substitute instead of the greater ones, it would be improper to use them otherwise than so as they are used now, namely, for secondary triangles, and the plane-table operations.

4th. These smaller elevations from their too great proximity would occasion triangles by far too small to give the accuracy required for the connexions of the work.

5th. The multiplication of the triangles would evidently also require a much greater length of time to execute them, because every one of them would require as much time and trouble as one of the large triangles, which might cover six or twelve of the small ones.

6th. With this increasing of the operations the necessity of cutting through woods, &c., increase actually in still greater proportion as the triangles themselves, and these cuttings are one of the great difficulties of the work.

7th. Such smaller triangles are even much more tedious to make properly than the large ones, therefore they consume each more time, and of necessity retard the work, by limiting the greater strides which the freedom of work at present admits.

8th. Upon the limitation of the work only in the *topographical part*, the same reasoning applies as to the more extensive operations; the inland bays, rivers, creeks, &c., which are navigable, are all so winding and very often hid in hardly approachable marshes, that to follow them, which often would be fully impossible, would necessarily take up much more time than to survey them by the general survey of the whole topography of the neighborhood.

9th. How far therefore this topography shall, can, or must, go, it is as impossible as improper to determine beforehand; without the special reference to any given locality nothing can be said about it in general terms.

10th. This reference to any given locality can only be decided by the operator upon the spot, and the special superintendent of the work, as has always been done hitherto.

11th. The topography has hitherto never yet been carried further than

the proper aim, and the principles of the work require; on the contrary, in several instances, an extension of the work has been specially desired.

12th. Any idea of limitation and distinction between the different parts of the works would never be understood by the uninformed people with whom the operators in the work must come in daily contact.

13th. Thence would result, that any owner of land, upon which an operator in the survey would have to go, could explain this limitation to his fancy or interest, and attack him, drag him to jail, and otherwise expose him to insult and ill-treatment, at his own option, as has been too often the case already.

14th. That even this accessory incident causes much loss of time, and forms an actual retardation of the work, is *self*-evident.

15th. The topographical part appears by experience to be that least objected to by the inhabitants, to judge from the manner in which the operators have been received, in comparison with the difficulties that have been laid in the way of the other parts of the work.

16th. In general, a limitation to three miles from the coast, as has been talked of, is a virtual abolition of the work itself, as well from the side of the natural as the moral difficulties it would suscitate, and the impossibility of giving to the work the required accuracy, nor would any other limitation be less injurious.

F. R. HASSLER.

WASHINGTON, *May* 30, 1842.

SIR: The unprovoked *insult* offered to me, by sending the engraver Stone to me to inspect the work of the coast survey in the map of New York, is too much, as well for the powers of the committee, as for the feelings of an honest man.

You know that the maps of the coast survey cannot be engraved but in the office under my own inspection. You know that the map in question is already cut up in plates, two of which are under the engraver's hands, nearly finished; two others just beginning; for two more the drawing is nearly finished; and two more are half finished drawings.

You know that the engraver Stone is in no way qualified to do such work, nor that I could be made responsible for any of his doings.

Hence you cannot otherwise but conclude that the measure you begin is destructive to the work, therefore to the execution and expenses hitherto incurred, therefore directly opposite to the aim professed by the committee to favor the coast survey work.

No man can expect that I, who am answerable for the work, could be compelled to give the final execution in the hands of a man in whom I have not the slightest reason to have any confidence whatever.

I consider the sending of Stone to *inspect my work, as he said first, as an unmerited insult*, and I am certain that every member of the committee, placed in my situation, would consider it so.

With best respects and good wishes, your obedient servant,

F. R. HASSLER.

Hon. FRANCIS MALLORY,
Chairman of the Committee on the Coast Survey.

WASHINGTON CITY, *June* 3, 1842.

SIR: Mr. Mallory having communicated to me the questions addressed to me in the committee, with my hasty answers at the time, according to the agreement, in order that I might add to my answers the explanations and extensions which they require, I have made the proper additions and remarks, and added to them some papers, (copies,) which I had given in to the committee at some times intermediate, with nearer particulars in some instances.

Mr. Mallory, chairman of the committee, being now absent for a fortnight, as he said, I take the liberty herewith to address to you the papers resulting from these additions, for the use of the committee, most likely best to circulate among the members, to cause as little delay as I can in the labors of the committee, to a final close, which would be desirable, to enable me to go to the field work time enough for my plans or projects of this season.

I suppose Mr. Stone will have made his report upon his *examination* of the manuscript map of New York, for which he has been sent to me in the name of the committee.

Mr. Mallory has also informed me that I should not leave here, because the committee would call me up in examination upon the works of the weights and measures. I, therefore, am now waiting, and like always in readiness to answer also upon this part of my works.

I have the honor to be, with perfect respect and esteem, sir, your obedient servant,

F. R. HASSLER.

Hon. ISAAC E. HOLMES,
Member of the Committee upon the Coast Survey.

Additions to the answers of F. R. Hassler to the questions of the Select Committee for the Coast Survey, May, 1842.

To 1 add: By my contract with the Government, I am bound to deliver nothing of the work but to the Government or its order, that is, the Treasury Department, with whom my contract is made. It is therefore through that medium that all publications, and whatever may have reference to them are to be ordered, that are to be executed by me in this respect.

To 2 add: But they must, for that purpose, at the time of their application for publication or otherwise, be reduced to the scale which their application will require; like that is always the case, no map being published so as it is surveyed.

To 3 add: It is evident in principle that the map of harbors must as well surveyed as published upon a much larger scale than those of a mere running coast.

To 4 add: It is necessary on the part of the Government to take proper measures to give, with the publication, guaranty to the public, for the authenticity of all that is published. (See answer to question 5 in my report of December, 1841.)

To 5 add: But the publication of the Delaware is of much more pressing importance.

To 6 add: But this cannot be done until a full system of main triangulation between two base lines is completed.

To 7. Because this was not a requisite in the case; the points used were all only detail points. What may be proper to be quoted of mathematical data, belongs to the general account of the work.

To 8 add: My papers upon various subjects relating to the survey of the coast of the United States, in the philosophical transactions of Philadelphia, 2d volume, new series, 1825, which are in duplo in the Library of Congress, give full account of these parts; what may become necessary to add after the present work, has to await its proper time. (Remark:) The word measuration is, in all these articles, used entirely against its sense in the science.

To 9 add: Nor is this proper to be done but at an appropriated distance from the first base line, and astronomical station of some amount proportionate to the work which is to be grounded upon it.

To 10, 11, 12, 13, add: These stations were not exclusively astronomical stations; the astronomical observations were intended more for preliminary determinations at the beginning, to guide the work, and to take advantage of the presence of the assistants, who were all present, to introduce them and to exercise them in this kind of observations. The main aim of these stations was the determination of main triangulation points.

To 12 add: There also a solar eclipse was observed.

To 14 add: Upon the station of Weasel mountain all the means for astronomical determinations and azimuths, were united, and a regular system of these observations executed, with its appropriated combinations, upon peculiar methods, which I made and prescribed, and which succeeded to satisfaction. The isolated observations of the preceding stations were of course reduced to this by way of comparison.

To 15 add: Those of 1817 were measured only preliminarily with the chain; still the verification proved very satisfactory, as the triangle results and the measurement differed less than 8 inches in about five miles. The base line of 1834 was measured with the microscopic apparatus, and exactly so as described in the papers of the philosophical transactions of 1825, quoted above.

To 16 add: From a point southeast of the light-house, towards the sea, upon the sand along the sea eastwards, the points are marked by square-hewn red sandstone, of near four feet length, fixed solid in the ground. (See my 3d report, May 8, 1835.)

To 17 add: The end points of these are marked by hollow cones of stone ware.

To 18 add: It was, of course, proper to take advantage of this element on hand, to start the work more rapidly in 1833, by using determinations grounded upon these bases, so much the rather as they had proved exact; the use made of them in 1817 appears in the schedula of the triangulation which I handed in to the Treasury Department in 1818.

To 19 add: The remark to 6 applies here most forcibly, and upon a larger scale; such an account is to be given only when two bases are joined. I did it on a small scale in 1818, because I had, by way of precaution, measured two bases near each other, (see the reasons in my printed papers above quoted.) Now, in the renewed work, this must be done only when another large base line is measured, by the same means and methods as that on Fire Island beach has been, and at a distance from that, in proper proportion

with the extent to which the survey shall reach. There is a *lapsus calami* in the statement of my answer.

To 20, 21, and 22: For concealing. But it would be of no use whatsoever to any body except copyists, who would, by abusing the public property in the work, degrade it. It would be, therefore, an expense not only useless, but very detrimental. It will, besides, all appear in the account referred to in the addition to 19; in fact it would be highly improper to do it, before the publication of the more extensive system, of which it shall form a part in proper time. There is however no concealment about it.

To 23 add: It is the duty of the Government to let no parcelling out be possible, under penalty of seeing the Government's own work ultimately discredited; such a desire cannot be fairly entertained.

To 24 add: This quality of being official is absolutely required to give confidence to the public, therefore security to the navigation, (see question 5, in my report of December last.)

To 25 add: When the account of the modes, and of the means to their execution will be joined to them, which can be done only after a certain full system between two main bases, can be presented to the public.

To 26 add: Unless flagrant falsification, which men of science would discover immediately in the account rendered of the work, but in the map alone there lies no such verification, therefore also they are not admitted as any proof of the work; notwithstanding that in common habit, *in the offices here*, this is not regarded, nor any account of the mode of operating is asked.

To 27 add: Just therefore the hasty publication of an unfinished work has no value.

To 28 add: Like stated upon question 7, which is in fact the same.

To 29 add: Where I expect to find a proper locality to measure one, probably upon what is called Eastern shore.

To 30 add: Unless circumstances should decide me to accelerate still more, on the ground of finding better locality, therefore larger triangles, which would be more advantageous to join northerly from there the points, now reached from the north.

To 31 and 32 add: The secondary, plane-table, and naval parties, are now (25th May) all out; how long I shall be detained by the circumstances, I cannot know, as it does not depend of me.

To 33 add: That is no more than is fully compensated by the advantages which it gives in the office part of the work, and the keeping in order of the instruments of the coast survey, which is of daily occurrence, in which my task is very much eased by it.

To 34 add: Without the constant attendance to my works, at any hours that can be used for them, my task would be positively inexecutable; this is evidently the state of the establishment, and the works produced.

To 35 add: That extra works and varieties occur in all works, is too well known to expect that every day shall be equal to every other day; my easiest part is the field work.

To 36 add: The field work is more agreeable, in the favorable season, than the office work; they are always anxious to go out as soon as they can.

To 37 and 38 add: These are sufficiently explained as for the fact, but it must be added here, that the speaking disreputably and inimically against the coast survey work in Congress, occasions ignorant men in the

country, who read these things, to lay impediments in the way of the work, and to ill-treat us, which is a great loss to the work, and its economy.

To 39: It is well known that the accidental circumstance of the exhaustion of the old appropriation, and the delay of the new one, have kept all back to the end of May, in 1842, and that I remain even after that. I advanced money to assistants to enable them to go out, only $350; but if the attacks had not been made upon me, as well known, I would have prevented all stoppage, as I did three times in the beginning of the work, but under existing circumstances it was not proper for me to advance my credit as I did in those cases, and also before in London.

To 40, 41, and 42, add: The main triangulation determining large distances with greater accuracy than the secondary triangulation, it serves as element and groundwork for the latter, which, in consequence of the accuracy of these elements, can proceed outside of the limits of the main triangulation for a certain distance, without losing sensibly in accuracy. But this has its determined limits; the main triangulation has always kept near enough to the other parts of the work, not to expose it to any loss of accuracy, detrimental to the use made of the secondary triangulation.

To 43 add: This namely means that, in this place and time, both triangulations must come up together, and then the field of operation is open in all directions.

To 44, 45, 46, 47, 48, and 49: I should desire very much that, by the time the work is in that state, more extensive means might present themselves, appropriated to the exigency of the case that may then be, but to say any thing about it, would be of no avail, and premature.

To 50 and 51 add: It must be remarked upon these articles that, the putting me in jail at Mount Holly by a warrant of Judge Dayton, of Trenton, given upon the oath of a *clergyman* of the name of Brown, who *swore* his damage was over $200, because I had refused to pay, at first presentation, instantly, a bill presented to me by a, so called, Judge Haywood, for $25 damages, because I found it overrated and asked an impartial estimate, to legitimate me to direct the payment to be made, (the accounting officer being absent;) that such a circumstance, I say, I considered as neither *decent* nor agreeable; such acts go to the direct overthrow of the work, the court concern following; it cost both sides useless, but I had to stand the disagreement, and the Treasury Department had to defend the suit, which awarded the *reverend* Mr. Brown with difficulty, as a highest extreme, the $25 claimed, most of the jury voting first for $10, $15, or $20, instead of the hundredth which he had *sworn to.* It was necessary to stand this legal transaction in self-defence—the documents upon it can be exhibited.

At Yards the same impudence is now repeated, damages asked of more than double the value, and impudent letters written upon it, &c.

Such things not only cost money, but have a tendency to give apprehensions upon the safety of our station points, and signals, to the great annoyance of the work.

To 52 add: We have been obliged to make a special agreement with the owner of the land of the station next after Yard, to avoid difficulties if possible, by a contract for the use of the land for three years.

To 53, 54: I have habitually only one of the persons engaged in the work, at lower wages than assistant, to write the angles, not to take an assistant, at higher wages, away from a more important work; in this pecu-

liar instance at Yards, a friend was a great part of the time with me, who was capable to assist me, as I was sick, and in signalizing, to ascertain visibility of distant stations, being acquainted with the country.

To 55, 56: It is very natural that in this, like in every other subject of science, or knowledge, the acquirements and improvements are gradual; they develope themselves as the occasion for them is given, and with a considerable, and proportional consummation of time. So much so, that even in Europe this branch of science is not so much spread, as it is pretended, to be already in this country, where it has never yet been employed at all; for the detached small surveys, made so abundantly, do not come at all in comparison, nor under the principles of science, which is absolutely required for such an extensive work as the coast survey, especially in the form and in the locality of the earth in which it lies.

To 57: These are not the exact words of my answer; I answered, with measured reflection, "*Science* is no secret, but it *requires* a great deal of *study* to *acquire it.*

To 58: The accusation of secret, started against me, is *most unfounded*, as my assistants will certainly aver.

To 59, 60, 61: To explain nearer these three answers, would require a theoretical and practical treatise upon the subject, which would be too long, and not appropriated here.

To 62: It would be presumptuous in any man, to name a certain determined time, none would undertake it unless he had the accessory *intention to mislead.* (See my answer to question 13, of the resolution of the last Congress session.) Steady assiduity, and well-guided exertions, will bring it forward as fast as the nature of the work, and the localities of the country will admit, and more can neither be expected, *nor obtained*, by no means whatsoever; mathematical principles and nature, cannot be bargained with.

To 63: It is evident, that the length is no determining element of the work, because the nature of the coast, and its indentures, etc., form the determining element, as stated repeatedly.

To 64: This would evidently have to be measured by the principles stated in the preceding answer, and therefore can afford but a very vague scale of comparison; what I have said upon that in my report of last December, gives all the data, that can be given to a man knowing both, the science and the country.

To 65: This is an individual experience of mine, no doubt the determinations, charts, maps, &c., will vary among one another.

To 66, 67: Need no addition.

To 68, 69, 70, 71, 72, 73, 74: These questions go evidently into details of the practical applications of the mathematical principles, to certain localities, which can be discussed only with the map of these localities before the eye.

To 71: I decline no answer upon any question.

To 75: I must add a more detailed answer to that question which asked me: "How I would proceed in the Southern coast, where marshes, woods, &c., presented peculiar impediments?" I answered to it "by mixed astronomical and geodetical observations." This question was followed by that "Is that not more, or less, the case with all the coast survey?" This question showed, that the nature of the scientific principles to be applied, and indicated by my answer, were unknown. I must therefore *explain:* what is called, in mathematical practice, MIXED astronomical and geodetical ob-

servations, it is, when both these elements concur in the *same individual determination;* this is the case in the application of a problem of practical mathematics, which I have applied in Switzerland, and in this country, on Weasel mountain, (to the full knowledge of my assistants,) to obtain preliminarily the junction of my works, of 1817, with those of 1833, in the beginning, when I had not yet a new base line, nor sufficient angles; it was equally successful in both cases.

It consists in "one geodetic line being given in position and length, the latitude of either point being known, the latitude, and the angle which the line subtends from a third point, being observed, together with the azimuth of either end point, to determine the place of observation."

From such a result new connexions are then opened further onwards.

This was what I was beginning to express, when I was stopped, under the denomination of entering into arguments, which Mr. Cushing refused to hear.

That I should expose it from its elementary principles is, what I am sure, the committee cannot intend, because it is a problem which, joining both branches of science, would require long deductions of principles, almost an elementary work, for persons not acquainted with the science and its practical application.

In the triangulation the two kinds of observations, astronomical and geodetical, are *disconnected*, each operation is *separate*, and they are only compared to draw conclusions upon one another, for a new, different result, required to place the survey in general in its proper place upon earth; therefore the astronomical parts are only made at a few properly selected places, and with general views for the work, not for details, like in the other case, so as I have stated in my answer to question 5, article 3, of my report of December 2d, 1841.

To 76: The second base forms as much an indispensable part of a survey of a large extent as the first base. This is a principle in the science well known by all accounts of large surveys.

To 77: (I had added) and corrected. This could, however, not be the case for any great amount, in a well-conducted work, and a well-conditioned series of large triangles.

There are other data and results to be obtained, and considered, in such a completed system of a work, which are well known to be deduced from it by the science, but which to treat here would require an elementary, theoretical, and practical deduction, entirely out of place.

To 78, 79, 80, 81, and 82: These questions could be discussed long, without leading to any actual practical effect. They are treated under the general denomination of the question of limitations asked to be introduced in the work, in the paper already handed in, and here repeated, viz:

Upon the question of limitation of the works for the survey of the coast.

1. The limitation to any determined distance from the coast would require that the mountains, which are indispensably necessary for the station points of the survey, be within that limited distance.

2. This is well known not to be the fact; therefore, also, the limitation not adapted to the nature of the country: thence this limitation would become impossible to be observed, if even decreed.

3. If even smaller elevations were found within these limits, which, it

might be said, fit to substitute instead of the greater ones, it would be improper to use them otherwise than so as they are used now, namely: for secondary triangles and the plane-table operations.

4. These smaller elevations, from their too great proximity to each other, would occasion triangles by far too small to give the accuracy required for the connexion of the work.

5. The multiplication of the triangles would evidently also require a much greater length of time to execute them, because every one of them would require as much time and trouble as one of the large triangles, which might cover six or twelve of these small ones.

6. With this increasing of the operations, the necessity of cutting through woods, &c., increases actually in still greater proportion than the triangles themselves, and these cuttings are one of the great difficulties of the work.

7. Such smaller triangles are even much more tedious to make properly than the large ones; therefore, they consume each more time, and, of necessity, retard the work, by limiting the greater strides which the freedom of the work at present admits. The improper increase of the expenses is self-evident.

8. Upon the limitation of the work only in the *topographical part* the same reasoning applies as to the more extensive operations. The inland bays, rivers, creeks, &c., which are navigable, are all so winding, and very often hid in hardly approachable marshes, that to follow them, which often would be fully impossible, would necessarily take up much more time than to survey them by the general survey of the whole topography of the neighborhood.

9. How far, therefore, this topography shall, can, or must go, it is as impossible as improper to determine beforehand, without the special reference to any given locality, nothing can be said about it in general terms.

10. This reference to any given locality can only be decided by the operator upon the spot and the special superintendent of the work, as has always been done hitherto.

11. The topography has hitherto never yet been carried further than the proper aim, and the principles of the work require; on the contrary, in several instances, an extension of the work has been specially desired.

12. Any idea of limitation and distinction between the different parts of the works would never be understood by the uninformed people with whom the operators in the work must come in daily contact in the field works.

13. Thence would result that any owner of land upon which an operator in the survey would have to go could explain this limitation to his fancy or interest, and attack him, drag him to jail, and otherwise expose him to insult and ill treatment, at his own option, as has been too often the case already.

14. That even this accessory incident causes much loss of time, and forms an actual retardation of the work, is self-evident, as well as its expensiveness.

15. The topographical part appears, by experience, to be that least objected to by the inhabitants, to judge from the manner in which the operators have been received, in comparison with the difficulties that have been laid in the way of the other parts of the work.

16. In general, a limitation to three miles from the coast, as has been talked of, is a virtual abolition of the work itself, as well from the side of the natural as the moral difficulties it would suscitate, and the impossibility

of giving to the work the required accuracy; nor would any other limitation be less injurious.

17. The shore line of a coast is never seen from a ship approaching it; the picture of the elevated land is what presents itself to the sailor; in this he is guided by so much of the topography as can be seen at a reasonable distance at sea, and this lies back in the country at distances which are not determinable but by actual survey; thence the only rule is that which I have followed, and long ago stated, namely: the "topography must go to the ridge of mountains which determine the heads of the coasting rivers or creeks, or their passage through such mountains, what is called in France, technically, '*le versant de la Vallie côtiere*,' or '*le voisant de la cote*.'"

Such it has always been understood and proved.

18. My rule of action, and guide in the work, must be my contract to make the work "*honorable* and *permanently useful, to the nation*:" the way to obtain the aim must be left to me; if I was to be guided by any foreign direction, except mathematical principles, some of my assistants might even rise up against me, refusing to do, what they might think to exceed my powers, and I would either have to dismiss them for such refusal, or the work would become impossible.

19. Hitherto the work has proceeded in harmony, and with all good-willing exertions on the part of every one; if such had not been the liberal action of all in the case, not half the work would be done, which actually is done.

21. The attempt to find causes for change in my arrangement, by the resolution of the last Congress session, and the present committee, has already caused a great damage.

To 84: As I keep a regular journal every day, since 1811, when I left Schenectady for London, for all the time that I am in public employment, I can give exact account of every event of any moment; here follows therefore the extract from these journals, referring to this question. My work in the office has always been the most arduous and laborious task, in the combination of the scientific methods, devising the means, the calculations, and all the manifold parts, of the administration, or direction of the works. Any man of science in this practical line will *see that easily*.

Times of going to the field work, and returning from it each year, thus:

In 1832.

September 25, having received the instruments, I left Washington the 26th of September, at 8 o'clock, A. M., to reconnoitre for the continuance of my works of 1817, towards the east of it; returned to Washington the 31st of January, 1833, in the evening.

1833.

April 5, at 7½, A. M., left Washington for the first beginning of actual primary triangulation; returned to Washington the 3d of January, 1834, in the evening.

1834.

After having finished all the preparations and comparisons for the meas-

urement of the base line, I left the 29th of May, at 9 o'clock, A. M., having made also stations; returned 21st January, 1835, in the evening.

1835.

There being much calculation to be made, and many arrangements, for the organization of the parties, the State of Maryland having offered an arrangement to join the survey of that State with that of the coast survey, I went out only at different intervals to reconnoitre the country in Maryland, and until Washington and the outer bays, accompanied by Mr. J. H. Alexander, of Baltimore, until late in the fall and winter. Details could be given if needed.

1836.

The present office was established. I left 17th August, at 7½ o'clock, A. M., and returned the 8th of January, 1837.

1837.

I left Washington 14th June, at 8¾ o'clock, A. M., and returned at 4½ o'clock, P. M., 5th January, 1838.

1838.

I left Washington July 19, at 8 o'clock, A. M., and returned 24th December, 1838, just at sunset.

1839.

I left Washington the 9th of June, at 7 o'clock, A. M., and returned the 5th of January, 1840, beginning of dark.

1840.

I left Washington the 14th of September, at 8 o'clock, A. M., 1840, and arrived again at Washington the 20th of January, 1841, at 6 o'clock, P. M.

1841.

I left Washington 29th August, at 10 o'clock, A. M., 1841, and returned 22d December, 1841, at night.

This enumeration shows how the office work has increased since the beginning, when the work was starting, and the elements for it were first collected in the field. In the further progressing state of the work, the calculations, as well of myself, as of the assistants, the reduction into maps, making of projections, to take to the field, for the topographical and hydrographical works, their plotting and working out, required as much, and in most cases even more work, from the assistants in the office, than out of doors; so that indeed the going out for the field work is considered as real relief, from the harder works of the office, as well for me, as for the assistants. For what relates to my assistants' *time* of going to the field work, they must be asked themselves.

To 83 till 90, inclusive: There is some miswriting in some of my answers to these questions.

Instructions for sounding outside of Long Island and New Jersey shore, from Block Island until Cape May, out of sight of land, and some interior parts, given to Capt. Gedney, in 1841:

1. The soundings are to be extended in the lower part of New Jersey, as far as the Gulf stream, which will be met there, at a distance appropriated to the wants of the approaches to the shore in navigation.

2. The return current of the Gulf Stream will be met before, and perhaps already something of an inner stream, which runs inside of this parallel to the Gulf stream, nearer to the shore, in the more southern parts of the coast, as a result of the contre-current; it may be sensible along the Jersey coast, but along the shore of Long Island none of these will likely be felt.

3. These two inner currents will, in their places, have a tendency to lead the sounding vessels off from their intended courses, so that account must be kept of this circumstance in the sailing and the determination of the points of soundings.

4. There will be found along the Jersey shore, near about the distance where the land ceases to be visible, a sand bank, or beach under water, which, when met with in any place, it is proper to follow in its course, as a special object. It will likely present more or less breadth and interruptions by deep water similar to the inlets of the dry beaches of the shore.

5. As the entrances of the inlets through the dry beaches are of importance, it will be necessary to determine if these two outer and inner inlets correspond, and, in any case, to determine any best course of navigation leading to the inlets of the beaches through these openings or interruption of this outside bar. They are much used by coasting vessels.

6. On the outside of Long Island shore such a bank is not likely to be, in a similar manner as along the Jersey shore, but rather a deepening placed somewhat similarly, but further from the shore, outside of which there will likely be less depth again.

7. In the offings of New York bay, where these two probable dispositions cross one another, great attention will be paid to the irregular changes of the depth and the currents; these latter will change with the time and the different elevations of the tides, therefore also at different times of the year; perhaps some regularity may show itself in it, with the time of the tide, which it will be of interest to ascertain.

8. It would lead to clear up the question of the currents, if the *direction* of the current of the *ebb tide in the offing* was carefully followed in its course, particularly in the times of the highest tides; because, these will always occasion temporary currents in directions, which depend on many circumstances of the winds, and the configuration of the ground under water.

9. In the part of the Jersey shore already passed over, the soundings ought yet to be multiplied in several places by boats, nearer to the shore than the larger vessels can come; this joins with the investigation stated above, of the beach under water or shoal bank, which longes the Jersey shore, and the openings through it. In calm weather, passages are well practicable with boats, which may be sent off from the vessel attending to them from the outside.

10. In the part of the soundings already done and falling in the map of New York, the register map exhibits some omissions, which must be filled

up first; therefore, will be the first work to be attended to this spring, and the results of them be sent into the office as soon as obtained; these are:

A. The low grounds of Communepa, at the west of the light-house of Robin's reef; around Bedlow's and Ellis's islands, they have in the lower part only one line sounded through in a northerly direction, which is not an actual channel, but the steamboats pass through two different channels, over the flat west of the light-house and east of the island, &c.; there are docks at the two islands which are of constant use and even proposed for public works, &c. These flats in general are navigated at high water in different directions by small vessels; it is therefore necessary to make a regular, full, accurate sounding of the whole—the docks, channels, &c.—with boats, directed from the vessel stationed at proper places, and determined from the many triangle points of the neighborhood.

B. The cove, called the Great Kilns, at the southeast side of Staten island, northeast of Princess bay, has an inlet practicable, at high water, for small vessels, which occasions very often that many go in to shelter in it; it must be sounded with boats.

C. The whole shoaler part of the Jersey shore, from South Amboy to the Navesink, and the bay behind Sandy Hook, must be sounded nearer in shore, till to below 2 feet depth, even some inlets of the creeks, the bay and harbor of Keyport, Middletown point, &c. Steamboats and coasting vessels frequent this shore; it is therefore necessary and important to have the detail soundings of it.

D. The eastern part of Gravesend bay must be filled up with soundings in the same way.

E. The inlet of Rockaway and into the Jamacia bay has been omitted to be sounded, as far as it is practicable, towards the interior with small vessels which frequent it very much, a part even admits larger vessels. It will be proper to fill up that deficiency, and to go with a boat round in the interior, to see how the low grounds, which are extensive and with marshy bottom, are constituted.

The same is the case with the neighborhood, Hog Island inlet, and several such places around; nearer notice of them must be taken in the maps; and by the indication of the low soundings, the end of the navigable part may be indicated, in the same manner as that has been done in Great South bay.

F. In all these places it is proper to determine the two lines of high and low water.

G. In all the bay, the currents must yet be observed more particularly.

H. In all soundings the nature of the bottom is of course observed, and, in proper places, introduced in the maps or charts.

11. For the accurate determinations of the places of these different interior soundings, you will have to put up again the signals of the neighborhood, which will be needed as fixed points, to determine the position of the vessels and the boats from them.

12. To determine your position, out of sight of land, you will always take your departure from a point yet in sight of some well-determined stations, and get, by observation upon four or five points, the means of verification by independent data, for the more accurate determination of this starting point.

13. From such points you may then proceed in a regular, uniform course and direction, determining the rate of going of the vessel, and keep-

ing account of the time elapsed since the starting from the point of departure to all the points at which you will take soundings, by which you will be able to make an estimate of the position of such a place, and all the points under way at which soundings have been taken; whenever occasion presents itself, you may verify your work by retracing the route backwards, determining again the point of arrival, within sight of the same, or other convenient, well-determined points on the shore, determining the place of arrival in the same manner as the point of departure has been. By keeping account of these forward and return courses, by both the log and the time of the chronometer, with a first free determined rate of velocity, you may, by this comparison of the two double results, get an insight into the currents, if any, in the directions gone through.

14. This method you may pursue to a certain distance from either the Jersey or the Long Island shore, particularly if no changes occur from lateral currents or other disturbing causes.

15. You may, under favorable circumstances, from any well-determined sounding point, send off boats to make soundings, under the guide of an azimuth compass, in a direction rectangular to the course of the vessel, but this will be admissible only where the depth is not too great. The distances, being measured by the time and velocity of the boat, ascertained as well as possible.

16. In starting from a point south of the Long Island shore, well determined by the problem of three points, in the manner described above, you may be sailing under a determined angle with the meridian, in a steady southerly direction, then you can, by the determination of your latitude at noon, indicate the point of arrival at that time, by which the length of your whole course will be determined, and become comparable with the register of your sailing; by this, also, all the points at which soundings have been taken in the course of the line, and its continuance afternoon, will become determined proportionally, and become comparable.

17. In such a course, and in general, in any case of determination of your position by the noon observations of the sun, you will find it advantageous for the accuracy of the result, as well as most easy, to make use of the method of determining latitude and longitude, simultaneously, by circum-meridian observations, with a reflecting instrument and a chronometer, a method which I have described and used to advantage.

18. You will make, as much as possible, regular observations on board ship, to ascertain the rate of your chronometers, and compare them at intervals with the well-determined time of New York, keeping separate account of the going of the chronometers, which, besides that, you will compare together every day. Of the whole, you will keep a regular register, in the manner in which you have the form in one of mine. The chronometers being regulated for mean time, it will also be necessary to get mean time in New York.

19. To verify your compass, you will make a regular comparison of it with any one of the principal lines of the main triangulation of the coast, near your operations, of which the real azimuth will be furnished to you whenever you will inform the office of the coast survey of the line chosen.

20. The base line of the Long Island shore itself may be fitting for that purpose; you may, at the same time there investigate the state of security and preservation of the monument stones, placed at the two ends of the

base, which it is so highly important to preserve undisturbed, and your information upon this subject to the coast survey office is desired.

21. Whenever *out of sight of land*, you will, at every noon, make the observation indicated by the method above alluded to, keeping a regular account of the results of the observations, both as to latitude and the time of your chronometers: these determinations will form the principal data to compare with the time of New York.

22. For all observations of latitude or time, at sea, you will make use of your best sextant of Troughton, using the largest magnifying powers, and always make series of as many observations as can be conveniently made, suppose five or ten, in the latter case forming two calculations, each of five observations, to take a mean result.

F. R. HASSLER.

WASHINGTON CITY, *May* 1, 1841.

WASHINGTON CITY, *May* 7, 1842.

SIR: You will, with all the officers and crew attached to your party of the brig Washington, proceed, as soon as you can be ready, to sea, to execute the direction given to you in my instruction of May 1, 1841, which you will consider as herewith repeated to you at full length, and execute all the operations to be performed for the soundings out of sight of land, between the longitudes of the east end of Long Island and of Cape Henlopen and the latitudes of the same points, in the manner indicated to you at that time.

You will employ in this work all the means of assistants, and all other means which are at your disposition, exclusively, for all the time during which the season may be favorable to that work, or until to its full completion, that, if possible, it may not become necessary to recur to the same works another season. You will in this work follow the special instructions, and description of methods of observing, &c., which I have given to you in writing, to your instruction of last year.

When you will either have fully executed the task here stated, or the season will no more allow work at such a distance from the coast, as may be required, you will report to me your progress immediately, to receive such instruction about your further works as the state of the work and the circumstances will then dictate.

With best wishes, yours, &c.

F. R. HASSLER.

Com'r TH. R. GEDNEY, *U. S. N.*,
Assistant in the Coast Survey.

It is evident to every man acquainted with the coast and its approaches that the district, described in these instructions, forms the offings of the two ports of New York and the Delaware bay. The brig Washington is considered a vessel well adapted for this work; it is in good order for it.

To 91: The end of my answer should stand thus: according to my special *formulæ* for the work. There are other miswritings in the question and the answer.

To 92 and 93: These answers I consider sufficient, as any detailed discussion could not lead to any useful result; there are slight misunderstandings in the writing, which are of no moment, as for instance in 93, *ascertained* is not my, nor a proper, expression, &c.

To 94 to 98, inclusive: These answers I consider as self-evident, and entirely of the domain of the science, in one respect, and of the decision of the Goverment in another; I have said upon it what was to be said by me, in its proper place, in my report of last December. If the work is not carried on, with all the means that science dictates for its execution, *it is worse than useless, and discreditable.* I consider myself always bound to such a course, as I have hitherto pursued, and have found myself always approved in this view, by those men *best able* to judge, and by those in the *proper stations to decide upon it.*

To 99: So far as is expected from small secondary triangles; but, according to good principles, it must still be *joined* in its middle, by triangles across the country, from the main triangulation inland; this is indispensable mathematical requisite.

To 100: It is well known, by my very first plans of operation for the work, that this was the only true course for the main triangulation.

To 101: It is self-evident to any practical mathematician, and answered in a former question.

To 102, 103, and 104: Are sufficient explained. I may only add now, 25th May, that a third engraver has just arrived from Philadelphia.

To 105: There is evidently an omission of some words in my answer.

To 106: This time, includes in part the time used in the preparatory arrangements.

To 107 and 108: It is *well known* that the finer style of topography is not in practice yet in this country; my duty required, that this part of the execution of the work should be of the best quality, to answer honorably the aim of the work, in its final appearance in the public: therefore I procured, with authorization of the Treasury Department, two men known in Europe already in this line, from the quarter in best renown for the appropriated style of these works, which will guide the style of the work, also with the engravers, to be engaged hereafter.

To 109: The habitual way in common use is very bad. To preserve the accuracy obtained by the work of the survey, the main points, which guide the positions, are brought upon the copper, by the same assistant, who makes the drawing of the map, which secures the accuracy. For the same reason, also, the engraving and the printing must be made in the office itself, where it is done much more economically, under proper inspection, and not dilapidated.

To 120 add: Whenever an interest was manifested for any part of the work, for improvements, or otherwise, the extracts of the work desired, were given under the *authorization* of the Treasury Department, under whose decision all *communications* or *publications* are to be made, *according to* my agreement.

List of the individual maps executed and delivered.

No.	Maps.	By whom made.	Scale.	Date.	Remarks.
1	Harbor of Bridgeport, Ct. - -	Lt. G. S. Blake -	1-10,000	1835	Engraved.
2	Newark bay, N. J. - -	Lt. Th. R. Gedney -	1-10,000	183–	Engraved.
3	Harbor of New Haven, Ct. -	Lt. G. S. Blake, and Wm. M. Boyce.	1-10,000	1838	Engraved.
4	Country between the Thames and Niantic, from the sound up to Mohigan creek.	F. H. Gerdes -	1-10,000	1840	Treasury Department, for the honorable J. W. Williams.
5	Sandy Hook bar - - -	C. Renard - -	1-10,000	1841	Treasury Department, light-house, Mr. Pleasonton.
6	Thames river, topography and hydrography.	F. H. Gerdes -	1-20,000	1842	Treasury Department, for Senator Huntington.
7	Sandy Hook bar - - -	H. L. Whiting -	1-10,000	1842	Topographical bureau.
8	Fisher's Island sound, and the entrance of New London harbor, Ct.	F. H. Gerdes -	1-20,000	1842	Treasury Department, for the honorable J. W. Williams.

To 111 and 112: The principles of my action in this respect, are fully exposed already in my printed papers upon the coast survey, quoted before. The reduction, to any other measure, consists only in the addition of a constant logarithm, as for instance, that for the yards, and even for the miles, is given in my printed logarithmic and trigonometric tables. As all the scales of the maps are expressed by their fractional value, the distance upon the maps can be ascertained in any measure whatsoever, and by that means is really given in any measure whatsoever, which is widely different from the *bad method* so many miles to the inch, which has no regular comparable proportion.

The pressing of the questions put to me in the committee, and refusing all explanatory answers, in a subject which cannot be understood without them, must of course always leave some unilluminated spots after the examination is over, I must therefore take the liberty to supply afterwards.

1st. Mr. Aycrigg asked particulars about: why I measured with the metre as unity. I will not delay here by any detailed explanation, but must take the liberty to refer to my report upon the coast survey works of May 17, 1834, section 34, where the subject is fully treated, it stands in page 148 of the first volume of documents upon the survey of the coast, printed by me in 1834, and in the Congressional Documents of that time.

2d. Mr. Cushing said, that the discoveries of dangers in the navigation of the sound had been kept *secret ten years*; this is an *entirely erroneous statement*, the work itself being even not as old as that, the sound was of course worked later; the sounding part was made by Lieutenant Blake, United States navy, assistant in the coast survey; I request that he be asked particularly to clear up this *erroneous* statement.

3d. Upon the publication, or not publication of any thing resulting from the coast survey, *no reproach whatsoever can be applied to me*, because, by my contract with the Government, I am prohibited to communicate any results without order of the Treasury Department. Whenever such orders were given, they were instantly executed, as well known, sometimes even they were provoked by me, and given to public officers. My public accounts showed regularly every year the state of the work, *upon which any call could have been grounded.* I must, in this respect, request again that my answers to questions 5 and 7, of my last report, be considered as inserted here, and also the section 12, of my communication of 23d March last.

4th. The publication is, of course, a consequence of the survey; but only in proper time. Its reduction, as well by calculation as by the mapping, is a work absolutely intermediate between the two, therefore the means given by the appropriation are to be distributed in due proportion between them, *according to the state of the work*, and the means on hand, by the existing appropriation at any special time.

Besides, no publication can be creditably done, unless it presents a work, presenting a systematic whole in itself, be it a map of a harbor, or a certain part of the coast. The origin of the improper, hasty claims, is too well known to me; it would be of too much real damage to give way to it.

5th. I was asked how many hours the assistants worked per day; I answered, as many as the day allows, (*the work cannot be made in office hours.*) This addition, I believe, has been omitted to be written down; in fact, all my assistants, like I, work from interest for the work, and not as

hirelings by the hours, it would be a disgrace to treat the actors in a scientific work with such illiberality.

To 113 and 114 : These answers are self-evident.

To 115 add : As far as known to me, at least in respect to the scientific account of the work, as there is nothing of it in the publication of the English survey.

To 116 and 117 : Sufficiently clear by themselves.

To 118 : The hours of work are immaterial to mention, as they all work with really liberal exertions, for the best advantage and promotion of the work, even with regard to economy.

A well-organized work produces much result, without appearing laborious.

To 119 add: My work in establishing the uniformity of standards, weights, and measures, in this country, with more accuracy (I can safely pretend) than other countries have it, are public documents which speak upon that. My various books printed, upon elementary parts of mathematics, upon astronomy, tables, &c., might be looked at in the Congress Library, and if desired I will show the manuscripts of other works not yet published. However, my situation in early life had caused me to apply to diplomacy and jurisprudence; and I occupied offices of high trust in these branches, to full satisfaction, as my papers may prove, my first entering into public life dating now *over* 56 *years ago*.

I must be excused to enter here in extraneous details, because I recollect very well Mr. Mallory's question was general, *whether I know something more than only the coast survey*. Without the limitation to mathematical.

To 120 add : But the constant persecution to which the work has been exposed, and especially *now is*, impede its progress very much; there is a damage now incurred by the propositions of the last Congress session, and the present investigations, which have been occasioned by it, of positively upwards of $50,000, in delay of the work, and accessories; besides the discouragement occasioned by it, in all those persons who are engaged in the work, by their seeing their liberal exertions rewarded by *throwing out suspicions* against them, these occasion a still greater damage. The discredit thrown out in the public, occasions impediments with the people in the country, with whom we come in contact, they consider themselves equally authorized to ill-treat us, which makes the work difficult, and increases the expenses beyond reason, to no good purpose, and subject to uncertainty.

F. R. HASSLER.

WASHINGTON CITY, *June* 1, 1842.

TREASURY DEPARTMENT, *June* 9, 1842.

SIR : I have the honor to submit, herewith, the information called for in the resolutions of the select committee of the House of Representatives, on the subject of the coast survey, enclosed in the communication of the honorable Francis Mallory, chairman of said committee, addressed to the President under date of the 12th of March last, copies of which were furnished by the committee to this Department on the 16th ultimo.

The information is contained in the accompanying letters and statements

from the War and Navy Departments, the Second and Fourth Auditors, and the Register of the Treasury, numbered from 1 to 5, both inclusive.

All which is respectfully submitted.

W. FORWARD,
Secretary of the Treasury.

The PRESIDENT *of the United States.*

NAVY DEPARTMENT, *June* 3, 1842.

SIR: In reply to your letter of the 16th ultimo, transmitting "a copy of a communication from the Hon. F. Mallory, chairman of the select committee on the coast survey," and requesting this Department to furnish the information asked for, so far as its files and records would enable it to do so, I have the honor to transmit a copy of a letter from the Fourth Auditor, with a statement showing the names of the officers of the Navy who have been employed on the coast survey, and the amount of pay received by each.

I am, very respectfully, your obedient servant,

A. P. UPSHUR.

Hon. WALTER FORWARD,
Secretary of the Treasury.

TREASURY DEPARTMENT,
Fourth Auditor's Office, May 31, 1842.

SIR: A letter addressed to you by the acting Secretary of the Treasury, on the 16th instant, enclosing a communication from the chairman of a select committee of the House of Representatives to the President of the United States, requesting certain information in regard to the coast survey, having been referred to this office for a report, I have the honor to transmit a tabular statement, "showing the 'navy pay' received by the several officers employed on the said survey, during the respective periods of their engagement on such service," so far as it can be ascertained from the files or records of this office. It is proper for me to observe, however, that, as the purser's accounts for the first quarter of the present year have not all been received, (the law allowing three months after the close of the quarter for rendering them,) it is possible that some payments may have been made, between the 1st of January and the 12th of March last, to the officers employed on the said survey, which are not included in the statement submitted; but, if there be any such, I am satisfied that the amount of them is inconsiderable.

The papers referred to me are herewith returned.

I have the honor to be, &c.

A. O. DAYTON.

Hon. A. P. UPSHUR,
Secretary of the Navy.

List of officers of the navy who have been employed on the coast survey, "between the period of the commencement thereof and the 12th of March, 1842," showing also the amount of navy pay received by each while engaged in the performance of said duty, so far as appears by documents on file in this office.

Names.	Rank.	Amount.
Thomas R. Gedney -	Lieut. comm'g and commander -	$13,593 20
Geo. S. Blake - -	Lieutenant commanding -	12,421 88
I. T. McLaughlin -	Passed midshipman - -	447 69
Francis Huger -	Do - - -	437 40
B. W. Hunter - -	Do - - -	423 02
A. S. Worth - -	Do - - -	409 23
T. A. Jenkins - -	Passed midshipman and lieut. -	7,272 20
W. J. H. Robertson -	Passed midshipman - -	281 61
Joshua Humphreys -	Midshipman - - -	286 69
John Rodgers - -	Passed midshipman and lieut. -	408 11
Geo. M. Totten -	Midshipman - - -	276 23
John L. Ring - -	Passed midshipman - -	3,017 08
Levin Handy - -	Do - - -	3,266 79
Alberto Griffith -	Passed midshipman and lieut -	3,424 91
B. F. Sands - -	Do do -	7,158 93
A. A. Holcomb -	Do do -	5,773 71
R. W. Meade - -	Do do -	3,215 11
W. H. Ball - -	Passed midshipman - -	3,140 41
D. D. Porter - -	Passed midshipman and lieut. -	5,627 08
F. Clinton - -	Passed midshipman - -	2,464 75
J. Sterrett - -	Do - - -	887 77
Richard Bache -	Passed midshipman and lieut. -	3,880 90
S. C. Rowan - -	Do do -	4,584 46
R. Wainwright -	Do do -	1,544 52
Geo. M. Bache -	Do do -	3,912 98
C. P. Patterson -	Do do -	3,491 38
C. W. Chauncey -	Lieutenant - - -	1,841 71
J. J. Boyle - -	Do - - -	3,039 08
D. F. Dulaney -	Assistant surgeon - -	455 51
I. K. Mitchell - -	Lieutenant - - -	2,974 40
W. Chandler - -	Do - - -	2,960 43
E. G. Parrott - -	Passed midshipman and lieut. -	1,452 76
H. H. Lewis - -	Passed midshipman - -	709 21
T. H. Stevens - -	Midshipman - - -	195 97
Stephen Johnston -	Lieutenant - - -	1,402 78
John Mooney - -	Passed midshipman and lieut. -	1,093 13
H. S. Stellwagen -	Do do -	2,026 01
Henry Moore - -	Lieutenant - - -	916 54
W. A. Bartlett -	Passed midshipman - -	961 86
I. P. McKinstry -	Do - - -	302 15
Oliver Todd - -	Passed midshipman and lieut. -	7,935 76
B. J. Moriler - -	Do do -	3,718 21
T. A. Budd - -	Passed midshipman - -	1,478 88

LIST—Continued.

Names.	Rank.	Amount.
T. A. M. Craven -	Passed midshipman - -	$4,949 69
Z. Holland - -	Do - - -	482 52
W. Bleecker - -	Do - - -	266 06
W. Craney - -	Midshipman - - -	220 81
A. McLane - -	Do - - -	227 57
H. C. Flagg - -	Passed midshipman and lieut. -	1,877 43
C. W. Morris - -	Do do -	2,913 66
Henry Oaks - -	Midshipman - - -	263 06
W. E. Newton -	Do - - -	251 39
I. I. Almy - -	Passed midshipman - -	710 23
W. B. Whiting -	Passed midshipman and lieut. -	4,301 06
I. F. Mercer - -	Do do -	2,875 99
W. S. Young - -	Do do -	6,050 09
O. H. Perry - -	Passed midshipman - -	527 60
W. C. Lambert -	Do - - -	682 15
C. C. Barton - -	Do - - -	448 84
Luther Stoddard -	Do - - -	303 79
Francis Lowry -	Do - - -	1,217 42
John Hall - -	Do - - -	227 72
T. M. Brashear -	Do - - -	245 76
I. B. Dale - -	Passed midshipman and lieut. -	2,045 97
D. R. Crawford -	Passed midshipman - -	269 60
Ed. Jenkins - -	Do - - -	589 12
R. C. Cogdell - -	Do - - -	293 81
S. D. Lavallette -	Midshipman - - -	170 06
J. N. Barney - -	Passed Midshipman - -	139 39
M. C. Delaney -	Surgeon - - -	1,749 02
S. Sharp - -	Do - - -	2,781 45
T. I. Page - -	Passed midshipman and lieut. -	11,781 07
O. H. Berryman -	Passed midshipman - -	3,218 65
I. A. Dahlgren -	Do - - -	3,127 35
F. A. Bacon - -	Do - - -	43 83
W. May - -	Midshipman - - -	148 90
F. P. Hoban - -	Do - - -	132 75
I. C. Graham - -	Passed midshipman - -	288 61
C. J. Wyche - -	Do - - -	500 56
A. L. Case - -	Do - - -	507 32
		181,942 71

WAR DEPARTMENT, *May* 17, 1842.

SIR: In answer to your letter of the 16th instant, and the several papers, copies of which you enclosed to this Department from the "select committee on the subject of the coast survey," I have to transmit a report of the Colonel of the corps of Topographical Engineers. It is believed that the further inform-

ation embraced in the call must be furnished from the records and files of the Treasury and Navy Departments, and their subordinate bureaus.

The papers transmitted by you are respectfully returned herewith.

Very respectfully, your obedient servant,

J. C. SPENCER.

To the SECRETARY OF THE TREASURY.

NOTE.—The pay accounts of officers of the army are settled by the Second Auditor of the Treasury.

BUREAU OF TOPOGRAPHICAL ENGINEERS,

Washington, May 17, 1842.

SIR: I have the honor to acknowledge your direction to report upon certain queries from the select committee on the coast survey. Of the queries on the paper A, the 4th is the only one applicable to the War Department.

The following is the list of army officers who have been employed in this duty:

Major John J. Abert, corps topographical engineers, in 1816.

Major John J. Abert, corps topographical engineers, in 1817.

Major John J. Abert, corps topographical engineers, in 1818.

Lieutenant W. G. McNeill, of the artillery, in 1818.

Lieutenant J. A. Adams, of the artillery, in 1818.

Lieutenant J. R. Vinton, of the artillery, in 1818.

Captain W. H. Swift, corps topographical engineers, in 1832, 1833, 1836, 1837, 1838, 1839, 1840, 1841, and 1842.

Major Abert and Captain Swift were, while so employed, also the disbursing agents of the Treasury Department.

It is not in my power to state either the "army pay and emoluments" or any "additional pay" which these officers received while on this duty, as the accounts in the case do not pass through this office. The Second Auditor will be able to furnish the information in reference to army pay and emoluments, and the First Auditor that in reference to additional pay.

The queries of the paper B are the following:

1st. Whether a part of the topographical corps of the army can be detached for the purpose of the coast survey.

Answer. This can undoubtedly be done; probably from four to six could be detached during the present season; and more, as the various surveys upon which the corps is now engaged are completed, if other duties are not in the mean time assigned to it.

2d. Whether the expense of the service of the coast survey will probably be reduced by detaching a part of the topographical corps.

Answer. There would certainly be a reduction, to the extent of the civil agents, and the amounts of compensations paid to them, who would have their places supplied by officers of the corps.

3d. Whether the expenses of the survey of the coast will probably be reduced by employing other persons than officers of the army and navy to perform the duties they are now employed to perform in the coast survey.

Answer. This is a question of compensations, supposing qualifications to be equal in each. As officers of the army and navy draw their pay from the army and navy appropriations, it is clear, that, if some of these are em-

ployed in the coast survey, the appropriation for that survey will be relieved to the amount of their pay; and equally clear, that, if these officers are not so employed, but others in their places, these others must derive their compensations from the appropriation for the coast survey, and the appropriation be taxed to that extent.

Very respectfully, sir, your obedient servant,

J. J. ABERT,
Col. Corps Topographical Engineers.

Hon. J. C. SPENCER,
Secretary of War.

TREASURY DEPARTMENT,
Second Auditor's Office, May 23, 1842.

SIR: In obedience to the request contained in your letter of the 18th instant, to be furnished with "the amount of army pay and emoluments, in dollars and cents," allowed to the officers of the topographical engineer corps, mentioned "in Colonel Abert's letter, herewith sent; also, the pay and emoluments of Lieutenants Bomford and Mackay, of the army, who were employed in the coast survey duty in the year 1833," I have the honor to report as follows:

Major John J. Abert was paid for the year 1816 - -	$1,545 20
Major John J. Abert was paid for the year 1817 - -	1,616 40
Major John J. Abert was paid for the year 1818 - -	1,592 40
Lieutenant W. G. McNeill was paid for the year 1818 -	689 20
Lieutenant J. A. Adams was paid for the year 1818 - -	689 20
Lieutenant J. K. Vinton was paid for the year 1818 - -	689 20
Captain W. H. Swift was paid for the year 1832 - -	963 60
Captain W. H. Swift was paid for the year 1833 - -	1,160 16
Captain W. H. Swift was paid for the year 1834 - -	1,067 80
Captain W. H. Swift was paid for the year 1835 - -	947 00
Captain W. H. Swift was paid for the year 1836 - -	948 00
Captain W. H. Swift was paid for the year 1837 - -	947 00
Captain W. H. Swift was paid for the year 1838 - -	1,363 93
Captain W. H. Swift was paid for the year 1839 - -	1,926 80
Captain W. H. Swift was paid for the year 1840 - -	1,916 80
Captain W. H. Swift was paid for the year 1841 - -	1,829 40
And from the 1st January, 1842, to 31st March, 1842, to which time only does he appear to have been paid for this year - - - - - - -	487 50
Lieutenant Bomford (J. Y.) was paid for the year 1833 -	764 96
Lieutenant Mackay (John) was paid for the year 1833 -	837 90

And return herewith the accompaniments of your letter.

I am, sir, very respectfully, your obedient servant,

W. B. LEWIS.

McCLINTOCK YOUNG, Esq.,
Acting Secretary of the Treasury.

Captain Swift, by the act of July, 1838, receives the pay and emoluments of a captain of cavalry; previous to which, he received only the pay, &c., of a captain of infantry; and by that act he receives one ration for every five years' service; and since 1838 has, in addition, been in receipt of double rations, as he was also for part of 1838.

A list of all officers of the navy employed in the coast survey; their navy pay during their service in the coast survey; and the additional pay of each in the coast survey, from the year* 1833 *to* 31*st December*, 1841.

Year and quarter.	Nane and rank.	Compensation.	
		Additional.	Arrearages.
1833, 1st quarter	Mid. Henderson - -	$95 00	
1833, 2d quarter	Lieut. Bell - -	176 00	
1833, 3d quarter	Mid. Henderson - -	88 00	
1833, 3d quarter	Lieut. Bell -	184 00	
1833, 4th quarter	Lieut. Bell - -	184 00	
1837, 1st quarter	T. R. Gedney - -	–	$1,516 00
Do -	G. S. Blake - -	–	1,434 00
Do -	Mid. Handy - -	–	633 00
Do -	Sands - -	–	706 00
Do -	Lambert - -	–	336 00
Do -	Budd - -	–	449 00
Do -	Todd - -	–	558 00
Do -	Craven - -	–	585 00
Do -	Flagg - -	–	47 00
Do -	Dahlgren - -	–	760 00
Do -	C. M. Morris - -	–	330 00
Do -	A. S. Worth - -	–	119 00
Do -	Mercer - -	–	331 00
Do -	Bleecker - -	–	119 00
Do -	T. S. Page - -	–	760 00
Do -	Griffith - -	–	449 00
Do -	T. A. Jenkins - -	–	760 00
Do -	A. F. Holcomb -	–	304 00
Do -	W. H. Ball - -	–	353 00
Do -	R. W. Meade - -	–	219 00
Do -	A. S. Case - -	–	213 00
Do -	D. D. Porter - -	–	336 00
Do -	F. Oakes - -	–	204 00
1837, 2d quarter	Clinton - -	–	336 00
Do -	Holland - -	–	216 00
Do -	Berryman - -	65 00	
Do -	Handy - -	61 00	
Do -	Humphreys - -	–	128 00
Do -	R. W. Meade - -	68 00	
Do -	T. R. Gedney - -	156 75	
Do -	T. J. Page - -	372 50	
Do -	J. A. Dahlgren - -	375 00	
Do -	T. A. M. Craven - -	107 70	
Do -	F. F. Hagar - -	85 00	

* For navy pay, see statement of Fourth Auditor, accompanying Secretary of the Navy's report, marked No. 1.

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1837, 2d quarter -	B. J. Morller - -	$91 00	
Do -	O. H. Berryman - -	30 00	
Do -	J. McLaughlin - -	119 00	
Do -	B. F. Sands - -	100 00	
Do -	A. Griffith - -	91 00	
Do -	A. A. Holcomb - -	91 00	
Do -	J. L. Ring - -	91 00	
Do -	R. W. Meade - -	30 00	
Do -	W. B. Whiting - -	101 00	
Do -	H. C. Flagg - -	101 00	
Do -	W. H. Ball - -	91 00	
1837, 3d quarter -	Mid. Handy - -	61 00	
Do -	Berryman - -	92 00	
Do -	Newton - -	–	$194 00
Do -	McLane - -	–	134 00
Do -	Meade - -	62 00	
Do -	Holcomb - -	62 00	
Do -	T. A. Jenkins - -	625 00	
Do -	G. S. Blake - -	313 50	
Do -	T. A. M. Craven - -	100 00	
Do -	Mid. Sands - -	100 00	
Do	O. H. Perry - -	113 00	
Do -	W. S. Young - -	173 00	
Do -	H. C. Flagg - -	92 00	
Do -	O. Todd - -	211 00	
Do -	J. F. Mercer - -	183 00	
Do -	T. A. Budd - -	129 00	
Do -	A. Griffith - -	92 00	
Do -	L. Handy - -	61 00	
Do -	R. W. Meade - -	30 00	
Do -	D. D. Porter - -	183 00	
Do -	W. B. Whiting -	92 00	
1837, 4th quarter	T. J. Page - -	312 50	
Do -	J. A. Dahlgren - -	375 00	
Do -	Mid. Clinton - -	190 00	
Do -	Holcomb - -	61 00	
Do -	Porter - -	31 00	
Do -	Ring - -	136 00	
Do -	Berryman - -	92 00	
Do -	Griffith - -	44 00	
Do -	Handy - -	92 00	
Do -	Ball - -	123 00	
Do -	Almy -	193 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1837, 4th qua r.	Mid. Clinton - -	$44 00	
Do -	Young - -	51 00	
Do -	Meade - -	30 00	
Do -	Budd - -	46 00	
Do -	Perry - -	45 00	
Do -	T. J. Page - -	312 50	
Do -	T. A. Jenkins - -	312 50	
Do -	T. R. Gedney - -	156 75	
Do -	Mid. Morller - -	184 00	
Do -	Sands - -	100 00	
Do -	Whiting - -	92 00	
Do -	Almy - -	46 00	
Do -	Meade - -	31 00	
Do -	Ball - -	61 00	
Do -	Holcomb - -	61 00	
Do -	Meade - -	31 00	
Do -	Mercer - -	51 00	
Do -	Todd - -	92 00	
1838, 1st quarter	Graham - -	121 00	
Do -	Handy - -	31 00	
Do -	Berryman - -	31 00	
Do -	Holcomb - -	31 00	
Do -	Lieut. G. S. Blake - -	210 00	
Do -	Mid. Porter - -	92 00	
Do -	Handy - -	28 00	
Do -	Berryman - -	28 00	
Do -	Ball - -	59 00	
Do -	Meade - -	59 00	
Do -	Lieut. T. J. Page - -	102 58	
Do -	T. R. Gedney - -	175 00	
Do -	F. A. Jenkins - -	312 50	
Do -	T. A. M. Craven - -	200 00	
Do -	Mid. Sands - -	119 00	
Do -	Whiting - -	90 00	
Do -	Holcomb - -	59 00	
Do -	Handy - -	31 00	
Do -	Ball - -	31 00	
Do -	Berryman - -	31 00	
1838, 2d quarter -	Robertson - -	125 00	
Do -	Todd - -	90 00	
Do -	Berryman - -	30 00	
Do -	Clinton - -	117 00	
Do -	Craney - -	142 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1838, 2d quarter -	Mid. Handy - -	$30 00	
Do -	Meade - -	61 00	
Do -	Porter - -	89 00	
Do -	Ring - -	30 00	
Do -	Flagg - -	46 00	
Do -	Morller - -	90 00	
Do -	Barton - -	44 00	
Do -	Berryman - -	31 00	
Do -	Handy - -	31 00	
Do -	Almy - -	100 00	
Do -	J. A. Dahlgren - -	1,067 30	
Do -	T. J. Page - -	125 00	
Do -	F. A. Jenkins - -	312 50	
Do -	Mid. Sands - -	100 00	
Do -	Lieut. T. R. Gedney -	156 75	
Do -	G. S. Blake - -	259 50	
Do -	Mid. Patterson - -	97 00	
Do -	Todd - -	91 00	
Do -	Berryman - -	30 00	
Do -	Ball - -	91 00	
Do -	Wainwright - -	97 00	
Do -	Holcomb - -	91 00	
Do -	Meade - -	61 00	
Do -	Mercer - -	111 00	
Do -	Lieut. Sterrett - -	68 00	
Do -	Mid. T. A. Budd - -	111 00	
Do -	Barton - -	30 00	
Do -	Whiting - -	91 00	
Do -	Perry - -	135 00	
Do -	Young - -	107 00	
1838, 3d quarter -	Budd - -	17 00	
Do -	Perry - -	17 00	
Do -	M. G. Delaney, surgeon -	97 00	
Do -	Mid. Bacon - -	34 00	
Do -	Handy - -	61 00	
Do -	Stoddart - -	34 00	
Do -	Barton - -	31 00	
Do -	Meade - -	31 00	
Do -	Rowan - -	127 00	
Do -	Sterrett - -	31 00	
Do -	Bache - -	127 00	
Do -	M. G. Delaney -	31 00	
Do -	Griffith - -	120 00	
Do -	M. G. Delaney -	31 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1838, 3d quarter -	Mid. Sterrett - -	$31 00	
Do -	Meade - -	31 00	
Do -	Wainwright - -	62 00	
Do -	Patterson - -	62 00	
Do -	Whiting - -	62 00	
Do -	Flagg - -	136 00	
Do -	Stoddart - -	31 00	
Do -	Lowry - -	39 00	
Do -	Brashear - -	38 00	
Do -	Barton - -	31 00	
Do -	Hall - -	39 00	
Do -	Ring - -	123 00	
Do -	Berryman - -	62 00	
Do -	Handy - -	31 00	
Do -	Hunter - -	—	$190 00
Do -	Sands - -	100 00	
Do -	T. J. Page - -	125 00	
Do -	T. R. Gedney - -	156 75	
Do -	T. A. Jenkins - -	312 50	
Do -	T. A. M. Craven - -	200 00	
Do -	M. L. Delaney, surgeon -	30 00	
Do -	Mid. Meade - -	30 00	
Do -	Sterrett - -	30 00	
Do -	Todd - -	92 00	
Do -	Young - -	92 00	
Do -	Ball - -	61 00	
Do -	Handy - -	30 00	
Do -	Barton - -	30 00	
Do -	Hall - -	30 00	
Do -	Lowry - -	30 00	
Do -	Whiting - -	30 00	
1838, 4th quarter	M. L. Delaney - -	31 00	
Do -	Mid. Meade - -	31 00	
Do -	Holcomb - -	123 00	
Do -	Rowan - -	92 00	
Do -	Handy - -	31 00	
Do -	Patterson - -	61 00	
Do -	Whiting - -	31 00	
Do -	Barton - -	31 00	
Do -	Clinton - -	184 00	
Do -	Berryman - -	61 00	
Do -	Griffith - -	92 00	
Do -	Porter - -	184 00	
Do -	Sterrett - -	31 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1838, 4th quarter	Mid. Bache - -	$92 00	
Do -	Sands - -	33 33	
Do -	Wainwright - -	61 00	
Do -	Ring - -	61 00	
Do -	Ball - -	31 00	
Do -	Barton - -	12 00	
Do -	Flagg - -	73 00	
Do -	Young - -	43 00	
Do -	Stoddart - -	73 00	
Do -	Mercer - -	123 00	
Do -	Hall - -	43 00	
Do -	Lowry - -	43 00	
Do -	Brashear - -	73 00	
Do -	Meade - -	13 00	
Do -	Clinton - -	13 00	
Do -	Lieut. G. S. Bache - -	261 25	
Do -	Mid. Berryman - -	30 00	
Do -	Wyche - -	—	$225 00
Do -	T. J. Page - -	125 00	
Do -	T. R. Gedney - -	166 15	
Do -	T. A. Jenkins - -	312 50	
Do -	B. F. Sands - -	66 66	
Do -	Mid. Handy - -	61 00	
Do -	Holcomb - -	61 00	
Do -	Ring - -	61 00	
Do -	Porter - -	61 00	
Do -	Patterson - -	61 00	
Do -	Bache - -	61 00	
Do -	Wainwright - -	61 00	
Do -	Berryman - -	31 00	
Do -	Ball - -	61 00	
Do -	Morller - -	275 00	
Do -	Todd - -	92 00	
Do -	Whiting - -	61 00	
1839, 1st quarter	T. A. M. Craven - -	100 00	
Do -	Mid. Griffith - -	12 00	
Do -	Rowan - -	61 00	
Do -	Mercer - -	92 00	
Do -	Handy - -	31 00	
Do -	Whiting - -	31 00	
Do -	Ring - -	31 00	
Do -	Berryman - -	31 00	
Do -	Porter - -	31 00	
Do -	Whiting - -	28 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1839, 1st quarter	Mid. Rowan - -	$59 00	
Do -	Wainwright - -	59 00	
Do -	Berryman - -	28 00	
Do -	Handy - -	28 00	
Do -	Patterson - -	59 00	
Do -	Clinton - -	79 00	
Do -	Holcomb - -	59 00	
Do -	Ring - -	28 00	
Do -	Bache - -	59 00	
Do -	T. J. Page - -	125 00	
Do -	T. A. Jenkins - -	312 50	
Do -	B. F. Sands - -	100 00	
Do -	G. S. Blake, lieut. com. -	209 00	
Do -	Mid. Handy - -	31 00	
Do -	Porter - -	59 00	
Do -	Patterson - -	31 00	
Do -	Ball - -	90 00	
Do -	Berryman - -	31 00	
Do -	Moriler - -	90 00	
Do -	Ring - -	31 00	
Do -	Holcomb - -	31 00	
Do -	Clinton - -	31 00	
1839, 2d quarter -	Whiting - -	61 00	
Do -	Handy - -	30 00	
Do -	Ring - -	30 00	
Do -	Chauncey - -	32 00	
Do -	Berryman - -	30 00	
Do -	Wainwright - -	61 00	
Do -	Holcomb - -	30 00	
Do -	Bache - -	61 00	
Do -	Clinton - -	30 00	
Do -	Ball - -	30 00	
Do -	Patterson - -	30 00	
Do -	T. A. M. Craven - -	100 00	
Do -	Mid. Meade - -	63 00	
Do -	Ring - -	31 00	
Do -	Patterson - -	31 00	
Do -	Berryman - -	31 00	
Do -	Ball - -	31 00	
Do -	Wainwright - -	31 00	
Do -	Rodgers - -	—	$183 00
Do -	T. J. Page - -	125 00	
Do -	Lieut. T. R. Gedney -	156 75	
Do -	T. A. Jenkins -	312 50	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1839, 2d quarter -	T. A. M. Craven - -	$187 50	
Do -	Mid. Ring - -	30 00	
Do -	Griffith - -	83 00	
Do -	Wainwright - -	30 00	
Do -	Berryman - -	30 00	
Do -	Young - -	104 00	
Do -	Lowry - -	104 00	
1839, 3d quarter -	Sharpe - -	31 00	
Do -	Ring - -	62 00	
Do -	Berryman - -	31 00	
Do -	Wainwright - -	31 00	
Do -	Whiting - -	62 00	
Do -	Rowan - -	92 00	
Do -	Meade - -	92 00	
Do -	Holcomb - -	33 00	
Do -	Ball -	31 00	
Do -	Sands - -	187 50	
Do -	Patterson - -	30 00	
Do -	Ball - -	30 00	
Do -	Whiting - -	60 00	
Do -	Mercer - -	150 00	
Do -	Lieut. Todd - -	212 00	
Do -	G. M. Bache -	78 00	
Do -	Mid. Porter - -	122 00	
Do -	Bache - -	92 00	
Do -	Clinton - -	92 00	
Do -	Lieut. Chauncey - -	92 00	
Do -	Mid. Ball - -	31 00	
Do -	Patterson - -	31 00	
Do -	Wainwright - -	31 00	
Do -	Holcomb - -	92 00	
Do -	Berryman - -	31 00	
Do -	S. Sharpe, surgeon - -	124 00	
Do -	B. F. Sands - -	187 50	
Do -	T. J. Page - -	125 00	
Do -	T. A. Jenkins - -	312 50	
Do -	Lieut. T. R. Gedney -	156 75	
Do -	T. A. M. Craven -	187 50	
Do -	Young - -	92 00	
Do -	Griffith - -	92 00	
Do -	Chauncey - -	61 00	
Do -	Bache - -	61 00	
Do -	Mid. Patterson - -	61 00	
Do -	Whiting - -	30 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1839, 3d quarter	Mid. Holcomb - -	$30 00	
Do -	Porter - -	61 00	
1839, 4th quarter	Berryman - -	30 00	
Do -	McKinstry - -	152 00	
Do -	Morller - -	183 00	
Do -	Lieut. G. S. Blake - -	365 75	
Do -	Mid. S. C. Rowan - -	153 00	
Do -	Lieut. Bache -	31 00	
Do -	Mid. Bache - -	92 00	
Do -	Porter - -	31 00	
Do -	Lieut. Meade - -	61 00	
Do -	Mid. Wainwright - -	61 00	
Do -	Lieut. Griffith - -	31 00	
Do -	Mid. Ball - - -	61 00	
Do -	Whiting - -	31 00	
Do -	Mercer - -	123 00	
Do -	Lowry - -	31 00	
Do -	Holcomb - -	31 00	
Do -	Lieut. Chauncey - -	37 00	
Do -	Mid. Ring - - -	67 00	
Do -	Lieut. Meade - -	6 00	
Do -	Surgeon Sharpe - -	67 00	
Do -	Mid. Clinton - -	98 00	
Do -	Porter - -	38 00	
Do -	Lieut. Bache - -	30 00	
Do -	Todd - -	122 00	
Do -	Lieut. T. R. Gedney -	156 75	
Do -	T J. Page - - -	125 00	
Do -	T. A. Jenkins - -	312 50	
Do -	T. A. M. Craven - -	187 50	
Do -	Mid. Sands - - -	187 50	
Do -	Lieut. Young - -	92 00	
Do -	A. A. Holcomb - -	30 00	
Do -	Mid. Morller - -	92 00	
Do -	S. C. Rowan - -	61 00	
Do -	Wainwright - -	61 00	
Do -	Bache - -	61 00	
Do -	Porter - -	61 00	
Do -	A. A. Holcomb - -	31 00	
Do -	Mid. Ball - - -	61 00	
Do -	Lieut. Bache - -	31 00	
Do -	Mid. Patterson - -	92 00	
1840, 1st quarter	Lieut. G. S. Blake - -	156 75	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1840, 1st quarter	Mid. Sands - -	$62 50	
Do -	Holcomb - -	31 00	
Do -	Patterson - -	31 00	
Do -	Berryman - -	123 00	
Do -	Todd - -	62 00	
Do -	Sands - -	62 50	
Do -	Rowan - -	60 00	
Do -	Ball - -	60 00	
Do -	Berryman - -	29 00	
Do -	Holcomb - -	29 00	
Do -	Morller - -	81 00	
Do -	Mercer - -	144 00	
Do -	T. R. Gedney - -	184 15	
Do -	T. J. Page - - -	125 00	
Do -	T. A. M. Craven - -	187 50	
Do -	Mid. Sands - -	62 50	
Do -	Young - -	91 00	
Do -	Porter - -	60 00	
Do -	Lieut. G. M. Bache -	91 00	
Do -	A. L. Holcomb - -	31 00	
Do -	T. A. Jenkins - -	79 79	
1840, 2d quarter	Mid. Patterson - -	60 00	
Do -	Wainwright - -	13 00	
Do -	Ball - -	44 00	
Do -	Lieut. T. R. Gedney -	58 25	
Do -	G. S. Blake -	156 75	
Do -	Mid. Berryman - -	30 00	
Do -	Rowan - -	92 00	
Do -	Wainwright - -	91 00	
Do -	Whiting - -	61 00	
Do -	Young - -	61 00	
Do -	Lowry - -	71 00	
Do -	Flagg - -	71 00	
Do -	Patterson - -	61 00	
Do -	Berryman - -	31 00	
Do -	Holcomb - -	61 00	
Do -	Chandler - -	52 00	
Do -	Mitchell - -	52 00	
Do -	Boyle - -	52 00	
Do -	Moor - -	52 00	
Do -	Porter - -	61 00	
Do -	Lieut. G. M. Bache -	61 00	
Do -	S. Sharp, surgeon - -	52 00	
Do -	Lieut. T. R. Gedney -	104 50	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1840, 2d quarter	T. A. Jenkins - -	$125 00	
Do -	T. A. M. Craven - -	187 50	
Do -	Mid. Berryman - -	30 00	
Do -	Lieut. Stellwagen - -	82 00	
Do -	Mid. Holcomb - -	30 00	
Do -	Dulaney - -	82 00	
Do -	Porter - -	30 00	
Do -	S. Sharpe, surgeon - -	30 00	
Do -	Mid. Whiting - -	30 00	
Do -	T. J. Page - - -	125 00	
1840, 3d quarter -	D. F. Dulaney - -	31 00	
Do -	Mid. Berryman - -	31 00	
Do -	Lieut. Stellwagen - -	31 00	
Do -	Mid. D. D. Porter - -	31 00	
Do -	Lieut. Chandler - -	61 00	
Do -	Mid. Patterson - -	61 00	
Do -	Lieut. Mitchell - -	61 00	
Do -	G. M. Bache -	61 00	
Do -	H. H. Holcomb - -	31 00	
Do -	Lieut. Moore - -	61 00	
Do -	Young - -	61 00	
Do -	Mid. Whiting - -	31 00	
Do -	Lieut. Boyd - -	61 00	
Do -	Mid. Lowry - -	92 00	
Do -	Mid. Whiting - -	31 00	
Do -	Surgeon Sharpe - -	62 00	
Do -	Lieut. Chauncey - -	144 00	
Do -	G. M. Bache - -	31 00	
Do -	Mid. Berryman - -	31 00	
Do -	T. R. Gedney - -	156 75	
Do -	T. J. Page - - -	125 00	
Do -	T. A. M. Craven - -	187 50	
Do -	T. A. Jenkins - -	125 00	
Do -	D. D. Porter - -	61 00	
Do -	A. A. Holcomb - -	61 00	
Do -	D. F. Dulaney - -	61 00	
Do -	Mid. Patterson - -	61 00	
Do -	Surgeon Sharpe - -	30 00	
Do -	Mid. Whiting - -	30 00	
1840, 4th quarter	Lieut. G. S. Blake - -	261 25	
Do. -	Mid. R. Bache - -	183 00	
Do -	C. W. Morris - -	133 00	
Do -	Lieut. W. Chandler -	92 00	
Do -	G. M. Bache - -	61 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1840, 4th quarter	Lieut. Patterson - -	$31 00	
Do -	J. K. Mitchell - -	92 00	
Do -	Lieut. Todd - -	274 00	
Do -	Mid. Porter - - -	31 00	
Do -	D. F. Dulaney - -	31 00	
Do -	A. A. Holcomb - -	31 00	
Do -	F. Lowry - - -	65 00	
Do -	J. B. Dale - - -	90 00	
Do -	W. B. Whiting - -	29 00	
Do -	H. S. Stellwagen - -	97 00	
Do -	J. J. Boyle - - -	98 00	
Do -	H. C. Flagg - -	158 00	
Do -	S. Sharpe, surgeon - -	40 00	
Do -	O. H. Berryman - -	72 00	
Do -	H. Moor - - -	103 00	
Do -	C. W. Chauncey - -	77 00	
Do -	Mid. D. D. Porter - -	61 00	
Do -	Lieut. G. M. Bache - -	61 00	
Do -	Mid. R. Bache - -	92 00	
Do -	Lieut. Young - -	153 00	
Do -	T. J. Page - - -	125 00	
Do -	Mid. C. W. Morris - -	77 00	
1841, 1st quarter	T. A. M. Craven - -	187 50	
Do -	Lieut. A. W. C. Chandler -	61 00	
Do -	J. K. Mitchell -	61 00	
Do -	G. S. Blake - -	209 00	
Do -	Mid. C. W. Morris - -	31 00	
Do -	Dale - - -	89 00	
Do -	A. A. Holcomb -	92 00	
Do -	D. D. Porter - -	31 00	
Do -	J. K. Mitchell - -	31 00	
Do -	Lieut. T. R. Gedney -	282 53	
Do -	Mid. R. Bache - -	59 00	
Do -	Lieut. W. S. Young - -	59 00	
Do -	Mid. C. W. Patterson -	120 00	
Do -	D. D. Porter - -	28 00	
Do -	Lieut. Todd - -	120 00	
Do -	Mid. W. B. Whiting -	27 00	
Do -	A. A. Holcomb -	28 00	
Do -	T. A. M. Craven - -	187 50	
Do -	T. J. Page - - -	125 00	
Do -	T. A. Jenkins - -	125 00	
Do -	C. W. Morris - -	59 00	
Do -	S. C. Rowan - -	304 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1841, 1st quarter	Lieut. G. S. Blake - -	$90 00	
Do -	Mid. C. M. Patterson -	31 00	
Do -	W. B. Whiting -	31 00	
Do -	Lieut. W. Chandler -	90 00	
Do -	Mid. D. D. Porter - -	31 00	
Do -	Lieut. J. K. Mitchell -	59 00	
1841, 2d quarter	R. Bache - - -	31 00	
Do -	A. A. Holcomb - -	122 00	
Do -	Mid. Crawford - -	120 00	
Do -	Lieut. W. S. Young -	61 00	
Do -	Mid. Patterson - -	91 00	
Do -	Lieut. J. B. Dale - -	150 00	
Do -	Mid. E. Jenkins - -	187 00	
Do -	T. A. M. Craven - -	187 50	
Do -	T. J. Page - - -	125 00	
Do -	T. A. Jenkins - -	25 00	
Do -	W. B. Whiting - -	91 00	
Do -	Lieut. T. R. Gedney -	221 16	
Do -	C. W. Morris -	91 00	
1841, 3d quarter	G. M. Bache - -	30 00	
Do -	D. D. Porter - -	30 00	
Do -	J. K. Mitchell - -	30 00	
Do -	S. Sharpe, surgeon - -	75 00	
Do -	W. Chandler - -	91 00	
Do -	E. G. Parrott - -	75 00	
Do -	H. S. Stellwagen - -	75 00	
Do -	J. K. Mitchell - -	61 00	
Do -	G. M. Bache - -	61 00	
Do -	Thos. H. Stevens - -	75 00	
Do -	O. Todd - - -	122 00	
Do -	D. D. Porter - -	61 00	
Do -	R. Bache - - -	91 00	
Do -	W. A. Bartlett - -	75 00	
Do -	H. A. Holcomb - -	31 00	
Do -	H. H. Lewis - -	106 00	
Do -	A. A. Holcomb - -	31 00	
Do -	D. D. Porter - -	62 00	
Do -	D. R. Crawford - -	26 00	
Do -	C. P. Patterson - -	92 00	
Do -	A. A. Holcomb - -	30 00	
Do -	C. W. Morris - -	92 00	
Do -	R. Bache - - -	92 00	
Do -	W. B. Whiting - -	92 00	
Do -	J. B. Dale - - -	92 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1841, 3d quarter	E. Jenkins - - -	$92 00	
Do -	J. Mooney - - -	1[illegible]5 00	
Do -	S. Johnson - - -	1[illegible]3 00	
Do -	S. Sharpe, surgeon - -	92 00	
Do -	W. S. Young - -	153 00	
Do -	O. Todd - - -	92 00	
Do -	W. A. Bartlett - -	92 00	
Do -	W. Chandler - -	92 00	
Do -	R. C. Cogdell - -	37 00	
Do -	Thos. H. Stevens - -	92 00	
Do -	T. R. Gedney - -	156 75	
Do -	G. S. Blake - - -	418 00	
Do -	T. J. Page - - -	125 00	
Do -	T. A. Jenkins - -	125 00	
1841, 4th quarter	T. A. M. Craven - -	143 82	
Do -	E. G. Parrott - -	92 00	
Do -	H. J. Stellwagen - -	92 00	
Do -	G. M. Bache - -	92 00	
Do -	J. K. Mitchell - -	92 00	
Do -	W. Bartlett - - -	31 00	
Do -	A. A. Holcomb - -	31 00	
Do -	C. P. Patterson - -	31 00	
Do -	S. Sharpe, surgeon - -	31 00	
Do -	R. C. Cogdell - -	39 00	
Do -	S D. Lavalette - -	76 00	
Do -	E. Jenkins - - -	39 00	
Do -	A. A. Holcomb - -	30 00	
Do -	S. Sharpe, surgeon - -	30 00	
Do -	C. P. Patterson - -	30 00	
Do -	W. Bartlett - - -	30 00	
Do -	G. S. Blake - - -	156 75	
Do -	R. Bache - - -	92 00	
Do -	G. M. Bache - -	92 00	
Do -	S. Johnson - - -	92 00	
Do -	W. S. Stellwagen - -	92 00	
Do -	D. D. Porter - - -	92 00	
Do -	D. D. Porter - - -	30 00	
Do -	C. P. Patterson - -	31 00	
Do -	A. A. Holcomb - -	31 00	
Do -	H. H. Lewis - -	61 00	
Do -	H. H. Lewis - -	92 00	
Do -	E. G. Parrott - -	92 00	
Do -	J. K. Mitchell - -	92 00	
Do -	C. W. Morris - -	92 00	

LIST—Continued.

Year and quarter.	Name and rank.	Compensation.	
		Additional.	Arrearages.
1841, 4th quarter	J. B. Dale - - -	$92 00	
Do -	S. Sharpe, surgeon - -	31 00	
Do -	O. Todd - - -	92 00	
Do -	W. S. Young - -	92 00	
Do -	W. Chandler - -	92 00	
Do	T. A. Jenkins - -	125 00	

T. L. SMITH, *Register.*

TREASURY DEPARTMENT,
Register's Office, June 9, 1842.

A list of all persons, other than officers of the navy and army, employed in the coast survey, from its commencement to the 31*st December*, 1841, *the order or orders under which they were employed, and the amount of compensation, regular and extra, paid to each.*

Year and quarter.	Names of the persons.	Compensation paid.		
		Regular.	Extra.	Arrearages.
1811 to 1818	F. R. Hassler -	$29,310 94		
1832 -	F. R. Hassler -	1,125 00		
1833	F. R. Hassler -	4,500 00		
1833, 2d qr. -	R. J. Livingston -	144 34		
Do -	J. Ferguson - -	325 59		
1833, 3d qr. -	J. Ferguson - -	512 00		
Do -	J. R. Livingston -	171 06		
Do -	E. Blunt - -	477 16		
1833, 4th qr.	E. Blunt - -	512 25		
Do -	J. Ferguson -	512 25	$125 00	
Do -	R. J. Livingston -	171 06		
1836, 1st qr. -	Charles Renard -	356 65		
Do -	Hugo L. Dickins -	95 58	84 30	
Do -	F. R. Hassler -	1,125 00		
Do -	E. Blunt - -	509 45		
Do -	Chas. Renard -	351 81		
Do -	J. Ferguson -	506 02	125 00	
Do -	H. L. Dickins -	185 87		

LIST—Continued.

Year and quarter.	Names of the persons.	Compensation paid.		
		Regular.	Extra.	Arrearages.
1836, 2d qr. -	H. L. Dickins -	$281 44		
Do -	C. M. Eakin -	842 85	$84 30	
Do -	F. R. Hassler -	1,125 00		
Do -	Jas. Ferguson -	509 45	124 31	
Do -	Edm. Blunt -	509 45	90 16	
1836, 3d qr. -	H. L. Dickins -	286 98		
Do -	W. Wurdeman -	239 62		
Do -	Tho. McDonnell -	115 30		
Do -	Sam. Hein - -	433 00		
Do -	F. R. Hassler -	1,125 00		
Do -	F. Gerdes - -	138 38		
Do -	C. M. Eakin -	532 56		
Do -	E. Blunt - -	515 05	125 68	
Do -	C. Renard - -	355 68		
Do -	James Ferguson -	515 04	125 68	
1836, 4th qr. -	H. L. Dickins -	283 66		
Do -	C. M. Eakin -	426 06	106 51	
Do -	F. R. Hassler -	1,125 00		
Do -	James Ferguson -	515 04	125 68	
Do -	Edm. Blunt -	512 25	125 00	
Do -	C. M. Eakin -	—	195 83	
Do -	Sam. Hein - -	215 04		
Do -	F. H. Gerdes -	188 53		
Do -	C. Renard - -	355 68		
Do -	W. Wurdeman -	219 11		
Do -	Thos. McDonell -	173 96		
1837, 1st qr. -	H. L. Dickins -	279 11		
Do -	F. R. Hassler -	1,125 00	—	$6,494 52
Do -	James Ferguson -	505 23	123 28	
Do -	C. M. Eakin -	522 43		
Do -	C. Renard - -	348 19		
Do -	Wm. Wurdeman -	251 42		
Do -	S. Hein - -	247 42		
Do -	Thos. McDonnell -	201 42		
Do -	F. H. Gerdes -	150 00		
1837, 2d qr. -	John Farley -	500 00		
Do -	Sam. Hein - -	200 00		
Do -	F. R. Hassler -	1,500 00		
Do -	Jas. Ferguson -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. Boyce - -	395 60		
Do -	T. W. Werner -	375 00		
Do -	F. H. Gerdes -	375 00		

LIST—Continued.

Year and quarter.	Names of the persons.	Compensation paid.		
		Regular.	Extra.	Arrearages.
1837, 2d qr.	H. L. Dickins -	$375 00		
Do -	Thos. McDonnell	150 00		
Do -	C. Preuss - -	125 00		
Do -	T. P. Dornenburg -	164 04		
Do -	W. Wurdeman -	252 50		
Do -	W. Jacobi - -	65 00		
Do -	H. Paulson - -	65 00		
1837, 3d qr.	Thos. McDonnell -	177 67		
Do -	Sam'l Hein - -	222 75		
Do -	F. W. Werner -	375 00		
Do -	F. R. Hassler -	1,500 00		
Do -	Jas. Ferguson -	1,000 00		
Do -	Edm'd Blunt -	695 65		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	F. H. Gerdes -	375 00		
Do -	H. L. Dickins -	375 00		
Do -	C. Preuss - -	375 00		
Do -	J. P. Dornenburg -	200 00		
Do -	W. Wurdeman -	252 57		
Do -	W. Jacobi - -	197 50		
Do -	W. Hill - -	100 00		
1837, 4th qr.	W. Hill - -	10 00		
Do -	F. R. Hassler -	1,500 00		
Do -	Jas. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	H. L. Dickins -	375 00		
Do -	F. H. Gerdes -	375 00		
Do -	T. W. Werner -	375 00		
Do -	C. Preuss - -	378 50		
Do -	T. P. Dornenburg -	200 00		
Do -	S. Hein - -	231 36		
Do -	Thomas McDonnell -	168 62		
Do -	W. Wurdeman -	208 00		
Do -	W. Jacobi - -	195 00		
1837, 3d and 4th qrs.	John Farley - -	1,000 00		
1838, 1st qr.	F. R. Hassler -	1,500 00		
Do -	Jas. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		

LIST—*Continued.*

Year and quarter.	Names of the persons.	Compensation paid.		
		Regular.	Extra.	Arrearages.
1838, 1st qr.	C. M. Eakin -	$750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	T. W. Werner -	375 00		
Do -	C. Preuss - -	375 00		
Do -	H. L. Dickins -	375 00		
Do -	F. H. Gerdes -	375 00		
Do -	T. P. Dornenburg -	200 00		
Do -	Sam'l Hein - -	251 43		
Do -	W. Wurdeman -	251 42		
Do -	Wm. Jacobi -	195 00		
Do -	Tho. McDonnell -	201 43		
Do -	John Farley -	500 00		
1838, 2d qr.	Thos. McDonnell -	202 00		
Do -	W. Werner - -	375 00		
Do -	F. R. Hassler -	1,500 00		
Do -	Jas. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	H. L. Dickins -	375 00		
Do -	C. Preuss - -	375 00		
Do -	F. H. Gerdes -	375 00		
Do -	T. P. Dornenburg -	200 00		
Do -	S. Hein - -	252 00		
Do -	W. Wurdeman -	245 14		
Do -	Wm. Jacobi -	195 00		
Do -	John Farley -	500 00		
1838, 3d qr.	Chs. Preuss - -	62 50		
Do -	T. W. Werner -	375 00		
Do -	F. R. Hassler -	1,500 00		
Do -	Jas. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. Eakin - -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	J. J. S. Hassler -	478 26		
Do -	F. H. Gerdes -	375 00		
Do -	H. L. Dickins -	375 00		
Do -	T. P. Dornenburg -	200 00		
Do -	Sam'l Hein - -	222 86		
Do -	W. Wurdeman -	230 28		
Do -	W. Jacobi - -	195 00		

LIST—Continued.

Year and quarter.	Names of the persons.	Compensation paid.		
		Regular.	Extra.	Arrearages.
1838, 3d qr.	Tho. McDonnell -	$182 80		
Do -	John Farley -	500 00		
1838, 4th qr.	F. R. Hassler -	1,500 00		
Do -	James Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	J. J. S. Hassler -	500 00		
Do -	H. L. Dickins -	391 50		
Do -	T. W. Werner -	375 00		
Do -	F. H. Gerdes -	375 00		
Do -	S. Hein - -	226 73		
Do -	Thos. McDonnell -	184 33		
Do -	W. Wurdeman -	217 71		
Do -	T. P. Dornenburg -	200 00		
Do -	W. Jacobi - -	197 50		
Do -	John Farley -	500 00		
1839, 1st qr.	F. R. Hassler -	1,500 00		
Do -	Jas. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	J. J. S. Hassler -	500 00		
Do -	C. Renard - -	750 00		
Do -	F. H. Gerdes -	375 00		
Do -	H. L. Dickins -	375 00		
Do -	T. P. Dornenburg -	252 00		
Do -	S. Hein - -	251 43		
Do -	W. Wurdeman -	251 43		
Do -	Tho. McDonnell -	201 43		
Do -	W. Jacobi - -	192 50		
Do -	T. W. Werner -	375 00		
Do -	John Farley -	500 00		
1839, 2d qr.	F. R. Hassler -	1,500 00		
Do -	Jas. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	J. J. S. Hassler -	500 00		
Do -	F. H. Gerdes -	375 00		
Do -	H. L. Dickins -	375 00		
Do -	J. P. Dornenburg -	250 00		

LIST—Continued.

Year and quarter.	Names of the persons.	Compensation paid.		
		Regular.	Extra.	Arrearages.
1839, 2d qr.	T. W. Werner -	$375 00		
Do -	S. Hein - -	290 00		
Do -	Tho. McDonnell -	191 72		
Do -	Wm. Jacobi -	195 00		
Do -	W. Wurdeman -	244 00		
Do -	John Farley - -	500 00		
1839, 3d qr. -	Tho. McDonnell -	184 66		
Do -	S. Hein - -	280 89		
Do -	T. W. Werner -	375 00		
Do -	F. R. Hassler -	1,500 00		
Do -	J. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	F. H. Gerdes -	375 00		
Do -	T. P. Dornenburg -	250 00		
Do -	W. Jacobi - -	197 50		
Do -	W. Wurdeman -	217 14		
Do -	J. J. S. Hassler -	500 00		
Do -	John Farley -	500 00		
1839, 4th qr.	H. L. Dickins, 3d qr.	375 00		
Do -	H. L. Dickins -	125 00		
Do -	H. L. Dickins -	125 00		
Do -	S. Hein - -	270 80		
Do -	Tho. McDonnell -	192 85		
Do -	W. Wurdeman -	252 57		
Do -	W. Jacobi - -	197 50		
Do -	F. R. Hassler -	1,500 00		
Do -	Jas. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	J. J. S. Hassler -	500 00		
Do -	F. H. Gerdes -	375 00		
Do -	John Farley -	500 00		
1840, 1st qr.	H. L. Dickins -	125 00		
Do -	H. L. Dickins -	125 00		
Do -	F. R. Hassler -	1,500 00		
Do -	James Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	W. M. Boyce -	500 00		
Do -	J. J. S, Hassler -	500 00		

LIST—Continued.

Y earnd quarter.	Names of the persons.	Compensation paid.		
		Regular.	Extra.	Arrearages.
1840, 1st qr.	H. L. Dickins -	$125 00		
Do -	T. W. Werner -	375 00		
Do -	Thomas McDonnell	202 00		
Do -	S. Hein - -	302 00		
Do -	W. Wurdeman -	252 00		
Do -	William Jacobi -	195 00		
Do -	John Farley -	500 00		
1840, 2d qr.	Thomas McDonnell	202 00		
Do -	T. W. Werner -	375 00		
Do -	F. R. Hassler -	1,500 00		
Do -	J. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	F. H. Gerdes -	375 00		
Do -	H. L. Dickins -	375 00		
Do -	J. J. S. Hassler -	500 00		
Do -	S. Hein - -	302 00		
Do -	W. Wurdeman -	252 00		
Do -	W. Jacobi - -	195 00		
Do -	John Farley - -	500 00		
1840, 3d qr.	H. L. Dickins -	375 00		
Do -	Thomas McDonnell -	193 00		
Do -	T. W. Werner -	375 00		
Do -	F. R. Hassler -	1,500 00		
Do -	James Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	J. J. S. Hassler -	500 00		
Do -	F. H. Gerdes -	375 00		
Do -	John Farley -	500 00		
Do -	Samuel Hein -	293 43		
Do -	W. Wurdeman -	252 57		
Do -	W. Jacobi - -	197 50		
Do -	L. Muller - -	168 00		
1840, 4th qr.	F. R. Hassler -	1,500 00		
Do -	James Ferguson -	1,000 00		
Do -	C. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	John Farley -	500 00		
Do -	W. M. Boyce -	500 00		

LIST—Continued.

Year and quarter.	Names of the persons.	Compensation paid.		
		Regular.	Extra.	Arrearages.
1840, 4th qr.	J. J. S. Hassler -	$500 00		
Do -	T. W. Werner -	375 00		
Do -	F. H. Gerdes -	375 00		
Do -	H. L. Dickins -	375 00		
Do -	S. Hein - -	282 47		
Do -	W. Wurdeman -	250 86		
Do -	W. Jacobi - -	197 50		
Do -	L. Muller - -	150 37		
1841, 1st qr.	Thomas McDonnell -	184 87		
Do -	S. Hein - -	288 86		
Do -	L. Muller - -	248 40		
Do -	W. Jacobi - -	192 50		
Do -	W. Werdeman -	251 43		
Do -	Thomas McDonnell -	201 43		
Do -	F. H. Gerdes -	375 00		
Do -	F. R. Hassler -	1,500 00		
Do -	James Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	J. J. S. Hassler -	500 00		
Do -	H. L. Dickins -	375 00		
Do -	C. Renard - -	750 00		
Do -	John Farley -	500 00		
1841, 2d qr.	L. Muller - -	199 98		
Do -	W. Jacobi - -	195 00		
Do -	W. Werdeman -	249 14		
Do -	Samuel Hein -	302 00		
Do	F. R. Hassler -	1,500 00		
Do -	James Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	J. J. S. Hassler -	500 00		
Do -	F. H. Gerdes -	375 00		
Do -	T.W.Werner, 1 & 2 qr.	750 00		
Do -	John Farley -	500 00		
1841, 3d qr.	H. L. Dickins, 2d qr.	375 00		
Do -	J. J. S. Hassler -	166 66		
Do -	L. Muller - -	66 66		
Do -	F. R. Hassler -	1,500 00		
Do -	J. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		

LIST—Continued.

Year and quarter.	Names of the persons.	Compensation paid.		
		Regular.	Extra.	Arrearages.
1841, 3d qr.	C. M. Eakin -	$750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	John Farley -	500 00		
Do -	H. L. Dickins -	375 00		
Do -	F. H. Gerdes -	375 00		
Do -	T. W. Werner -	375 00		
Do -	S. Hein - -	282 69		
Do -	W. Wurdeman -	252 57		
Do -	Thomas McDonnell -	187 96		
Do -	J. J. S. Hassler -	166 66		
Do -	L. Muller - -	66 66		
1841, 4th qr.	W. Jacobi - -	197 50		
Do -	L. Muller - -	66 66		
Do -	S. Siebert, engraver -	300 00		
Do -	T. A. Rolle, do -	216 66		
Do -	L. Muller - -	66 66		
Do -	W. Wurdeman -	252 57		
Do -	W. Jacobi - -	197 50		
Do -	F. R. Hassler -	1,500 00		
Do -	J. Ferguson -	1,000 00		
Do -	E. Blunt - -	1,000 00		
Do -	C. M. Eakin -	750 00		
Do -	C. Renard - -	750 00		
Do -	W. M. Boyce -	500 00		
Do -	T. W. Werner -	375 00		
Do -	F. H. Gerdes -	375 00		
Do -	S. Hein - -	277 14		
Do -	Thomas McDonnell -	198 34		
Do -	H. L. Dickins -	375 00		
Do -	S. Siebert, engraver -	150 00		
Do -	T. Rolle - -	108 34		
Do -	John Farley -	500 00		
Do -	J. J. S. Hassler -	500 00		
Do -	L. Muller - -	66 66		

T. L. SMITH, *Register.*

TREASURY DEPARTMENT,
Register's Office, June 9, 1842.

A list of all officers of the army employed in the coast survey; their army pay and emoluments, in dollars and cents, whilst so employed; and the additional pay of each for service in the coast survey, from 1816 *to the* 31*st December,* 1841.

Year.	Name and rank.	Army pay.	Additional pay.	Total.
1816	Major J. J. Abert - -	$1,545 20	$357 20	$1,902 40
1817	Major J. J. Abert - -	1,616 40	912 50	2,528 90
1818	Major J. J. Abert - -	1,592 40	327 50	1,919 90
1818	Lieutenant W. G. McNeill -	689 20	156 25	845 45
1818	Lieutenant J. A. Adams -	689 20	183 75	872 95
1818	Lieutenant J. R. Vinton -	689 20	253 75	942 95
1832	Lieutenant M. D. Mackay -	–	76 25	76 25
1832	Captain W. H. Swift -	963 60	–	963 60
1833	Lieutenant John Mackay -	837 90	–	873 90
1833	Lieutenant J. V. Bomford -	764 96	267 00	1,031 96
1833	Captain W. H. Swift -	1,160 16	929 47	2,089 63
1833	Lieutenant A. D. Mackay -	–	7 50	7 50
1834	Captain W. H. Swift -	1,067 80	–	1,067 80
1835	Captain W. H. Swift -	947 00	–	947 00
1836	Captain W. H. Swift -	948 00	* 292 80	1,240 80
1837	Captain W. H. Swift -	947 00	*4,648 13	5,595 13
1838	Captain W. H. Swift -	1,363 93	*2,830 67	4,194 60
1839	Captain W. H. Swift -	1,926 80	*2,868 52	4,795 32
1840	Captain W. H. Swift -	1,916 80	*2,148 42	4,065 22
1841	Captain W. H. Swift -	1,829 40	*1,919 27	3,748 67

* Includes his commission on disbursements.

T. L. SMITH, *Register.*

TREASURY DEPARTMENT,
Register's Office, June 9, 1842.

p. 49 – Hassler's memoir mentions Lieut. Lambert as one of the Army Officers.

TREASURY DEPARTMENT, *June* 20, 1842.

SIR: I have the honor to transmit the following communication, in answer to the inquiries made in your letter of the 31st ultimo, in behalf of the special committee "on the coast survey."

First. Respecting "the contract between the Government and F. R. Hassler, superintendent of coast survey," of which a copy is asked by the committee, I beg leave respectfully to refer to the accompanying papers, (marked A, B, C, and D,) as containing all the information in possession of the Department, in reference to the engagement of the services and the terms on which Mr. Hassler undertook to perform the work, in the year 1816, and on its revival in 1832.

Second. In reference to the inquiry, "under what authority was Mr. F. R. Hassler employed to make a set of measures for the United States?" I would respectfully refer the committee to the copy of a communication, herewith sent, from Mr. Secretary Ingham, under date of the 30th of April, 1831, (marked C,) by which it appears he was employed by the Treasury Department, with the sanction of the President, to superintend the manufacture of weights and measures for all the custom-houses of the United States.

Third. In regard to the inquiry, "when was the work commenced, and how much has been expended, yearly, from its commencement up to the present time, specifying the sums, to whom paid, and for what purpose?" it is to be remarked, in answer to the first branch of this inquiry, that on the 29th of May, 1830, the Senate of the United States adopted a resolution directing the Secretary of the Treasury "to cause a comparison to be made of the standards of weight and measure now used at the principal custom-houses in the United States, and report to the Senate at the next session of Congress." To comply with the requirements of this resolution, it appears Mr. Secretary Ingham deemed it expedient to engage the services of Mr. Hassler to make the necessary comparisons, as shown by the accompanying copy of his letter to that gentleman, dated 12th June, 1830, (marked B,) and inviting him to come on to Washington to perform that duty. To institute the comparisons mentioned, it became necessary to require the collectors of the principal ports to forward their standards to Washington, which occasioned some unavoidable delay in the commencement of the work. The proper tests and comparisons were accordingly made by Mr. Hassler, and the determined results were submitted to the Senate, in reports from the Department, under dates of the 3d of March, 1831, and 20th June, 1832, which will be found in Senate documents, 2d session of 21st Congress, 2d volume, document 74, and Executive documents, 1st session 22d Congress, volume 6, document 299.

As the results of these comparisons exhibited serious discrepancies between the standards used at the respective ports, the Department gave directions to Mr. Hassler to superintend, in this city, the manufacture of standard weights and measures for all the custom-houses. These directions were given in April, 1831, but, as many arrangements had to be made before the work of fabricating these standards could be properly entered upon, such as the collection of materials and the preparation of requisite machinery, some time elapsed before it went into complete operation. There is no data in the Department by which the precise time when the work was commenced can be fixed.

In reply to so much of the second branch of the inquiry under considera-

tion as relates to the amount "expended yearly, from its commencement," I beg leave to refer to the statement prepared by the Register of the Treasury, and transmitted to the committee on the 15th instant, in compliance with the request of Mr. Aycrigg, a member of the committee.

Fourth. As to the inquiry, "from what source or sources have the funds thus used been derived?" I have to state that the funds have been derived from the accruing revenue, under the authority believed to be given in the 21st section of the general collection act of the 2d of March, 1799, requiring surveyors of the customs, from time to time, and particularly on the first Mondays in January and July, in each year, to examine and try the weights, measures, and other instruments, used in ascertaining the duties on imports, with standards, "to be provided by each collector, at the public expense, for that purpose." The construction given by the Department to this provision of law seems to have been sanctioned by a special committee of the House of Representatives, of which the Hon. Horace Binney, of Pennsylvania, was chairman, as shown by their report. No. 132, vol. 1, second session of the 23d Congress, which closes with the following resolution, which was adopted by the House:

"*Resolved*, That it is highly expedient that the Treasury Department should complete, with as little delay as practicable, the fabrication of standards of weights and measures, for the supply of the different custom-houses of the United States, upon the principles set forth in the reports of the Secretary of the Treasury to the Senate on the 3d of March, 1831, and 20th June, 1832."

Both Houses of Congress subsequently sanctioned the source from which the expenditures were made, by a joint resolution of the 14th June, 1836, directing the Secretary of the Treasury to finish a complete set of all the weights and measures adopted as standards, for the respective States; and by the 7th section of the act "for the support of the military academy," &c., passed the 7th July, 1838, the Secretary of the Treasury is directed to cause to be made, under the superintendence of Mr. Hassler, one standard balance for each State, and, when completed, to be delivered to the respective Governors, for the use of each of the States.

Fifth. In regard to the inquiry, "how many complete sets of weights and measures have been delivered to the Treasury Department, and how have they been disposed of?" I beg leave, in answer, to refer the committee to the statement herewith sent, (marked D.) by which it will be found that two hundred and seven sets of large weights, forty-four sets of ounce weights, and forty-one yard measures, have been delivered by Mr. Hassler to the Department; that, of the former, there have been distributed to custom-houses and States, &c., one hundred and nineteen, of the second twenty-three, and of the latter thirty-four.

Sixth. In respect to the inquiry, "when is it probable the work will be finished?" I would remark, that the Department is not possessed of such information as to enable it to fix any precise time when the work will be finished; but, as it is informed that the capacity measures, and the balance of the ounce weights and yards, have been fabricated, and are now undergoing their final comparison, it is not supposed that much time will elapse before their final completion. It is understood that the balances designed for the States are also in a state of forwardness. It is deemed proper to observe, in conclusion, that it is not contemplated to furnish the respective

custom-houses with balances or ounce weights, they being designed for the respective States alone.

I have the honor to be, very respectfully, your obedient servant,

W. FORWARD,
Secretary of the Treasury.

Hon. F. MALLORY,
Chairman of Select Committee on Coast Survey.

WASHINGTON, *July* 12, 1816.

SIR: Herewith I have the honor to deliver the more detailed articles of the agreement between the Treasury Department and myself, relative to the survey of the coast, as desired by the letter of the Secretary of the Treasury, under the 5th instant.

You will judge if I have expressed myself clearly upon the subjects under consideration, or not, and dispose, in consequence, as you find most proper.

I have the honor to be, with respect and esteem, sir, your most obedient, humble servant,

F. R. HASSLER.

——— JONES, Esq.,
Treasury Department, Washington City.

Articles of engagement between the Treasury Department of the United States and F. R. Hassler, relative to the survey of the coast of the United States.

A. Mr. Hassler engages to bestow all his time, labor, and attention, to the work of the survey; as well to make, himself, the principal part of the general large triangulation, and the consequent calculations, as to superintend and direct the establishment of the observatories, and the officers of engineers, or naval officers, who will be engaged under his orders, in the detail parts of the work, and give them proper instructions to that effect, according to the plan proposed by him, under the 15th May, 1816.

B. He will, to that purpose, have the use of such instruments and books of the collection he has procured, or which are yet to be procured, for the use in this work, as he may find necessary for his objects, and give directions relative to those which are to be used by the officers under his direction.

C. He will be provided from the corps of engineers, on his application to the general of said corps, with the following assistance to his own works, or such part of the same as he may deem necessary, according to circumstances, viz:

1. Two officers of engineers, topographical or others.
2. Some cadets of said corps, in number according to the circumstances.
3. Twelve men of said corps, for the most part artificers, with corporal or sergeant.
4. One large baggage wagon, with four horses, or two smaller ones, as he may require, with the necessary drivers to them.
5. Two saddle horses.

6 Tents for the accommodation of himself, the above-mentioned officers, cadets, and men, and the shelter of the instruments.

7. The necessary field utensils, as well for the personal accommodation of the company as for the works occurring, not comprehending Mr. Hassler's private equipment.

D. Under Mr. Hassler's orders, the officer first in rank accompanying him will have the chief command of the above military assistance, and act as treasurer upon the funds, which will be given to said officer to defray all the expenses of a public nature occurring or ordered by Mr. Hassler; and said officer will render account upon these funds to the Treasury Department.

E. The following are to be considered expenses of a public nature, viz:

1. The keeping in order and securing from injury of the instruments belonging to the Government, their stands and boxes, and the fitting them up for use.

2. Such additions to the collection of instruments and books as may be found necessary by Mr. Hassler in the progress of the work, as well to complete the collection from time to time as to furnish a sufficient number of them for the use of the detail surveyors.

3. The construction of the signals and signal lamps, and their attendance and protection

4. The preparations of the stations, for the convenience of observations, and the securing of them for future utility.

5. The transport of the instruments and the baggage of the company.

6. All expenses consequent or relating to the keeping in order and maintenance of the military assistance stated in article E.

7. All expenses for the establishment of the permanent or temporary observatories, to be erected according to Mr. Hassler's plans.

8. The printing of blank formulas of journals and calculations, for the detail surveyors, if such are found advantageous, as it is probable.

F. Mr. Hassler will receive, as compensation for his personal work in the survey, his superintendence and direction of the whole, and all his personal expenses consequent thereof, the sum of five thousand dollars annually, to be paid quarterly, on his drafts upon the Treasury Department, or otherwise.

G. It is understood that the work shall not be carried on in the form of a bureau or office; but that Mr. Hassler himself, as well as the officers under his direction, shall execute such work as devolves upon them, or are ordered to them in the field, by defraying their own personal expenses, and at home in their private quarters. Therefore, no accounts will be admitted upon room hire, fire wood, stationery, or smaller drawing implements, not provided by the collection of the Government. The above-mentioned compensation is to be considered compensating all his personal expenses, in his absence from home, in the work of the survey, and the items here mentioned, required for his personal use in this work, exclusive only of the expenses stated as of a public nature in article E.

H. The appointments to be made in future, to officers undertaking separate parts of the work, will be fixed so as to comprehend the same articles, and to follow the same principles.

I. If, therefore, Mr. Hassler shall at any time require officers to work under his direction in his quarters, it will be at his option, and entirely a

matter of his private arrangement; otherwise, every officer is to be understood to execute his house work in his own quarters.

K. From these regulations are excepted:

1. All expenditures relating to the use of vessels or shipping, for soundings and the nautical part of the survey, for which proper arrangements will be made in time by the Treasury Department, upon propositions to this effect.

2. The clear executed copies of the maps and charts, either general or special, which will be required by the proper authorities, or prepared for publishing; for which proper draughtsmen will be appointed, and paid according to separate arrangements, to be made with men who may have applied to such works with particular success.

3. All expenses and consequences of engraving, printing, publishing, or executing such number of copies of the maps or charts as may be required for this purpose, or desired by the Government, or the officers to whom it may belong.

F. R. HASSLER.

WASHINGTON, *July* 12, 1816.

TREASURY DEPARTMENT, *August* 3, 1816.

SIR: The correspondence and documents relative to your being employed as superintendent of the survey of the coast, under the act of Congress respecting that object, have been submitted to the President, and your services are engaged, on the following terms:

1. The whole of your time, labor, talents, and attention, shall be given to the work, as well in relation to the superintendence of the duties to be performed by military or naval officers and assistants, or by draughtsmen and engineers, as in relation to the parts of the work which are to be executed by yourself.

2. You will be provided with competent assistance of officers and men, from the corps of engineers and from the navy, with tents and field equipage, with baggage wagons and horses; and you will have the free use of the public instruments and books, for the purposes of the survey.

3. The party of officers, men, and assistants, accompanying you, will be ordered to conform to your instructions; and all the incidental expenses of the survey, which are of a public nature, will be defrayed by the Government; but your own personal expenses are to be defrayed by you, whether you are employed at home or abroad.

4. Funds will be placed, from time to time, upon your requisition, in the hands of the chief officer accompanying you, to be disbursed, upon your order, in the payment of the expenses of a public nature, and to be accounted for by him at the Treasury once at least in every three months.

5. You will receive, in full for all your services, a compensation at the rate of $3,000 per annum, and for your personal expenses an allowance at the rate of $2,000 per annum, to commence on the 18th day of June, 1816, and to be paid quarterly at the Treasury, upon your drafts.

6. You will make frequent reports of your progress to this Department, and deposite here all the surveys, drafts, notes, charts, maps, journals, and documents, in any wise belonging to the survey of the coast; and you will return the public instruments and books to such place as shall be directed, when they are no longer required for the business of the survey.

7. If at any time it should be necessary to explain the nature and extent of your employment and engagement, your communications to this Department, and particularly the articles submitted by you on the 12th July, 1816, will be resorted to.

It only remains to repeat the President's solicitude for a successful and speedy execution of the great national work which is thus confided to you, and to assure you of the esteem with which I am, sir, your most obedient servant,

A. J. DALLAS.

Mr. F. R. HASSLER,
[*To the care of Robert Patterson, Esq., Director of the Mint, Phila.*]

Copy certified conformable to the original.

F. R. HASSLER.

Upon the articles of agreement between the Treasury Department of the United States and F. R. Hassler, relative to the survey of the coast of the United States.

1. Mr. Hassler engages to undertake the direction of the survey of the coast of the United States, according to the law to that effect of 1807, and the act to put the same in activity, passed in 1832, as well by performing such of the principal parts of the same as will require his own personal work, as by directing and superintending the work of such officers of the army and navy, and also civil engineers, as will be appointed, upon his recommendation, in the other parts, and the detail surveys, the determination of soundings, and such like.

2. He will, for that purpose, have the use and disposition, for himself or his assistants, of the instruments and all other necessary implements, books, &c., that have been procured in time for that purpose, and such others as will be procured successively for the same use.

3. He will also be provided with the proper means of safe conveyance of these instruments and other objects, either by land or by water, according to the arrangements which he will make at proper times for that purpose.

4. He will receive the assistance of such officers, cadets, midshipmen, or other men of the military or naval service, as will be appointed upon his request, and who will be provided with all their necessary field equipments, &c.

5. All the assistants and men, military, naval, or civil, that will be appointed for this service, will be ordered to conform to his instructions and directions, and, in case of their refusal, he will have the liberty to order them to report for other services, or dismiss them.

6. He will have the sole and free disposition of the carriages or other means of conveyance, and other objects or implements appertaining to the equipments for this work.

7. He will be provided with tents for the instruments and for the accommodation of himself and his assistants, with the necessary tools for preparing stations, placing signals, and the other necessary works for the encampment on the stations, and mending implements, &c., that might be in

need of it, the necessary means for signals, and for the preservation of the stations of the survey.

8. One of the assistants will act as accountant for all public expenses made upon the orders of Mr. Hassler, and will receive from the appropriations made for the survey such sums, at different times, as shall be agreed upon. He will account for them, at stated times, to the Treasury Department, for which service he will receive a compensation.

9. All drawing, plotting, execution of maps, or such like, will be done by the assistants, upon Mr. Hassler's orders, either in their private quarters or in an office, as may be judged best adapted to the case; the office expenses will be paid by the accounting officer, on public account.

10. All the stationery needed in the work, as well for Mr. Hassler as for any of the assistants, will be provided by the accounting officer, at public expense, in the field or at home.

11. Officers or engineers, detailed out by Mr. Hassler for separate works, of detail parts or others, will conform to the instructions which they will receive from him upon their work; they will be furnished with such instruments, implements, and assistance, as he will direct; and their expenses of a public nature will be accounted with the accountant above stated. They will report to Mr. Hassler, as he will direct; for such works they will receive adequate compensation.

12. Mr. Hassler will receive, for compensation of his services, $3,000 per annum, and in lieu of his private personal expenses $2,000 per annum, to be paid together quarterly, upon his draft, bill, or otherwise, unless, in the progress of the work, he should be obliged to make voyages at greater distances, when an allowance, by the way of mileage, will be determined.

13. Mr. Hassler will be provided with an ostensible public paper, stating his employment, and the nature and object of the same, to support him in his actions and transactions in any part of the country he may have to go for the purpose of his work, to serve equally for his assistants and the persons employed under him.

F. R. HASSLER.

WASHINGTON CITY, *August* 6, 1832.

Instruments, implements, and assistance required.

1st. These cannot be very essentially different from what they were in 1817. In the present state of the instruments and their accessories, it will be best to give them under detailed inventory, as stated in its place, to the disposition of the chief of the work, to take the best advantage of them that they will afford, to have them put in as good order as possible, and to allow him to replace the missing accessories as best he can.

2d. The carriage made purposely for the transportation of the principal instruments was sold, but is yet on hand, and can be made serviceable until a new one may be constructed, which would most likely delay too long at present. For the other parts of the transportation it will be easy to get a Jersey wagon, as has been used before.

3d. Horses and harness it will be necessary to purchase—the first strong and sure; the second simple, but strong. The mode of transportation of the instruments by a proper carriage, made of a size exactly to serve as a box

for them, and upon springs and thorough-braces, has been found more secure and economical for this country than the transportation by hand. It admits, therefore, also, to reduce the number of laboring hands for the work of the triangulation.

4th. The whole party in the work must be supplied with the necessary tents for their encampment in the field, and other necessary field equipments, besides axes, pickaxes, spades, and other tools, required for the placing of signals, preparing stations, and keeping every thing in good order. (I have even always such tools with me as are proper for keeping the instruments in good order, and repairing lighter accidental damages.)

5th. It must be observed, that the proper provision and arrangement of the accessories, and even the ease of an observer, are essential elements of accurate observation, as well as attentive and intelligent assistants; both favor the unimpeded and proper progress of the work, and are therefore essentially economical. A defective state of these parts is very detrimental.

6th. It is expected that none of the chronometers will be in a serviceable state; that defect may be supplied by the loan of a second-pendulum clock at West Point, (of Troughton's arrangement,) made expressly for transportation, which is not expected to be in use there; even a circular instrument of Troughton's, which is there, most likely in the same predicament, might be borrowed with advantage for the secondary triangles mentioned in the proper place.

7th. The selection of the assistants, in officers or other able men, must of course belong to the chief of the work, who will recommend them, and they will receive their appointments from the Department, but, if necessary, removed upon the proposition of the chief of the work. For the present first beginning, to execute the part stated for the immediate work, three such persons will only be required, whom I wish to name, besides what accidental help I shall have to call my son in for, on account of his acquaintance with the former work.

8th. The number of laboring men will vary at different times. When the base lines are measured, fifteen to twenty will be required for the simple triangulations, particularly that proposed at present in completion and extension of the triangulation made in 1817. Six or seven may be sufficient, besides the drivers for the carriages and what may be needed for detail triangulations, if they are undertaken simultaneously.

9th. The best manner of getting this part of the assistance in laboring men is to take them from the military, where they may be easily spared from some garrison or other. Their habit and regulation of discipline, and their being placed under the order of an officer, introduces much easier the necessary regularity, and they stand for their conduct under proper regulation.

10th. The pay and maintenance, in every respect, of the officers and men taken from the army and navy, is in all cases to be provided for and paid by the army corps to which they belong, or the navy in general, according to the regulations in which they otherwise stand; so, also, they will receive all their equipments. They must, in general, be considered as coming to this service in the same manner as to any other in their line to which they might be ordered.

F. R. HASSLER.

WASHINGTON CITY, *August* 6, 1832

TREASURY DEPARTMENT, *August* 9, 1832.

SIR: With the President's approbation, you have been appointed to make, under the superintendence of this Department, the survey of the coast of the United States, directed by the acts of the 10th February, 1817, and 10th July, 1832.

The act last mentioned having authorized the employment of other persons as well as those in the land and naval service, such assistants, of either description, as may be necessary in the work, will be provided at your request.

Funds will be placed, from time to time, upon your requisition, in the hands of one of your assistants, to be disbursed for such expenses of a public nature as may be properly chargeable to the appropriation for the survey of the coast, and he will render his accounts, approved by you, quarterly, to the First Auditor.

Those expenses of the persons in the military and naval service employed in the survey, which are chargeable to military and naval appropriations, will be defrayed by the officers of the respective Departments, and accounted for under the direction of those Departments.

You will receive, in full for all your services, a compensation at the rate of $3,000 per annum, and, for all your personal expenses, an allowance at the rate of $1,500 per annum, payable quarterly, to commence on the 2d of August, 1832, you having been employed since that time in the necessary arrangements of the instruments and other preparatory works. It is to be understood, however, that you will still continue your services in the construction of weights and measures for the custom-houses, as far as may be compatible with your duties in the coast survey, without any other compensation than what is allowed for the coast survey.

In all other respects than those indicated by this letter, the terms and nature of your employment will be the same as were fixed by the letter addressed to you by this Department on the 3d of August, 1816.

The plan of operations and methods formerly adopted by you in the coast survey having been approved of, you will recommence and continue the work in conformity with them, including such modifications as are suggested in your report of the 6th instant.

I am, respectfully, your obedient servant,

LOUIS McLANE,
Secretary of the Treasury.

F. R. HASSLER, Esq.

WASHINGTON CITY, *August* 12, 1832.

MOST HONORED SIR: I have the honor to acknowledge the receipt of your favor of the 9th instant, by which you are pleased, with the authorization of the President, to give into my charge and direction the important national work of the survey of the coast of the United States, with a compensation of $3,000 annually for my services, and an annual allowance of $1,500 for my personal expenses, to begin from the 2d instant.

I am too well aware of the great importance of the work, its exigencies and nature, and the magnitude of the task, not to appreciate duly the value of the confidence you place in me by this trust. I shall call up all my exertions to prove these feelings, by conducting the work in a manner as

honorable as permanently useful to the country; for which it presents so valuable means, that I feel highly honored by the occasion thus given to me to contribute my exertions toward such an aim.

The diminution of the allowance for my personal expenses, from what they had been rated at in my first appointment in 1816, is not such that within the limits of such estimations, made beforehand, its effects could be distinctly foreseen; I could only say, that while I was in activity in this work in 1817, my annual expenses in my absence from home amounted to about $2,000. What effect the now somewhat changed prices of things may have in this respect is of course impossible to foretell; therefore this is so much less an objection with me, as in any case I am certain it is not the intention of the Government to put me to pecuniary loss, and that, therefore, in case it should be found appropriate, this part may easily be modified to the exigency of unforeseen circumstances.

I shall also attend to the standarding of weights and measures, in which I have hitherto been engaged. I have taken such arrangements as will enable my assistant in it, Mr. Schmid, to prepare the works to the last stage of their adjustment, which I shall then make myself next winter, after my return from this year's field work in the survey. His acquaintance with the subject, and his practice in that part during his presence in all my former operations, render him fully capable to the task; and his work will abridge mine so as to bring the necessity of my personal attendance within such limits of time as will be compatible with my work in the survey.

With thanks for the honor of your confidence, I remain, with perfect respect and esteem, most honored sir, your most obedient servant,

F. R. HASSLER.

Hon. Louis McLane,
Secretary of the Treasury of the United States.

COAST SURVEY

19

V

April 15, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

James Ferguson examined.

1. Question How long have you been employed in the coast survey?
Answer. Since 10th May, 1833.
2. Question. In what capacity?
Answer. As a principal assistant; one of the three principal assistants.
3. Question. What particular part of the duty do you at present perform?
Answer. Making the secondary triangulation.
4. Question. Who makes the primary?
Answer. Mr. Hassler.
5. Question. Is there any essential difference in the scientific principles of the primary and the secondary triangulation; and if so, what?
Answer. The primary requires an instrument of great power, and of nicer graduation; there is no other difference. There is no difference in the mathematical elements.
6. Question. Cannot any scientific person, who is competent in and well practised in the secondary triangulation, perform the primary?
Answer. The primary requires more mathematical knowledge than the secondary, and greater knowledge of practical means; but to the whole question, I answer, yes.
7. Question. If Mr. Hassler should die, must the survey stop, for want of any person in the survey, or in the country, to take it up and carry it on?
Answer. No.
8. Question. Which has proceeded furthest in advance, the primary or the secondary triangulation?
Answer. The secondary. I add, that the secondary is necessarily imperfect, inasmuch as it depends on the primary for its verification.
9. Question. If the primary had preceded the secondary, might not the latter have been verified as it proceeded?
Answer. Certainly.
10. Question. Why has the primary been allowed to remain in arrears of the secondary triangulation?
Answer. I cannot say.
11. Question. Is not the secondary triangulation sufficiently accurate for all practical purposes in the publication of a map of the work so far as it has gone?
Answer. Yes; for all practical purposes.
12. Question. From what point to what point on the coast have the secondary triangulation and the hydrographical survey been completed?
Answer. The secondary triangulation has been completed from Point Judith, including the sound and both sides of Long Island, to Cape May, covering both shores of New Jersey, and including the whole of the Delaware on both sides; and it also crosses the peninsula to the Chesapeake, where it is now in progress, but not yet completed. I refer to the officers engaged in the hydrographical work for answer as to that part of the question.
13. Question. Do you expect that any perceptible error in the secondary triangulation will be detected by the further progress of the primary?

Answer. I should think the maximum error would not exceed five feet in the whole distance. This I infer from the work already verified, where the error proved to be no greater than this. I refer in this to my own work; but the other may be, for aught I know, more accurate still.

14. Question. Did you use the main triangulation as the basis of your work (the secondary triangulation) when you commenced?

Answer. Yes.

15. Question. Do you not in fact proceed in the secondary triangulation at present in the same manner as in the primary?

Answer. The only difference is the difference of the instruments.

16. Question. You have exhibited to the committee abstracts of the whole work on the coast, from Point Judith to Cape May; what objection is there to the publication of those abstracts?

Answer. The first objection is, that no base of verification has yet been measured; the second is, that we are uncertain as to the difference in any meridian in this country and any in Europe, to a minute and a half in longitude; and the third is, that we have not yet determined the ellipticity of the earth.

17. Question. Is either of those things necessary to give practical utility to the soundings and distances in particular bays or harbors?

Answer. Perhaps not; but the superintendent will of course take care of his character as a man of science.

18. Question. In your opinion, ought the practical use of the work, by its publication, to mariners, to be deferred indefinitely, for the supposed purpose of allowing the superintendent to take care of his character as a man of science?

Answer. No.

19. Question. Has the character of the superintendent as a man of science suffered by the publication of the charts of New Haven and Bridgeport, and Newark bay?

Answer. No.

20. Question. If not, what injury would it do to his character as a man of science to publish a chart of New York harbor?

Answer. None; such a map is now in the engraver's hands, for publication.

21. Question. What injury, by the publication of charts of the whole coast, from Point Judith to the Delaware?

Answer. If it were practicable, none.

22. Question. Do you furnish the points of observation to the sounding parties yourselves?

Answer. They are ascertained by us, reported to Mr. Hassler, and by him furnished to the sounding parties.

23. Question. Do you reduce your own observations?

Answer. Yes, certainly.

24. Question. Have you been engaged in Maryland in 1835?

Answer. No; I came in Maryland in 1839.

25. Question. Was any body else engaged in Maryland in 1835?

Answer. Only Mr. Hassler, with Mr. James H. Alexander, as a mere reconnoissance.

26. Question. Has there been any difficulty in procuring suitable points for observation as far as the main triangulation has proceeded?

Answer. Yes; since we entered the valley of the Delaware.

27. Question. Where first?

Answer. At Mount Rose, near Princeton, in New Jersey; some in opening the line from Newtown; then at Willow Grove and at Stony Hill; some difficulty in connecting Mount Holly with the point below; a good deal at Yards. These obstructions could not have occupied more than five months.

28. Question. When is it you propose to measure a base of verification?

Answer. It is spoken of for this year.

29. Question. Why has it not been done sooner?

Answer. The work has not been sufficiently advanced. It has been thought desirable to obtain such a line on the Chesapeake.

30. Question. What is the present condition of the place of the original base line?

Answer. I have not been there since 1836. Then the beach was considerably washed, but the points were undisturbed. Now, I understand, the beach is changed, and the base in danger; but the elements of it will be preserved by the mountain base, inland from the original base.

31. Question. Will a minute and a half's difference between the European and American meridians show on ordinary maps?

Answer. Yes; it would be about a mile.

32. Question. Why has not this difference, in the course of the ten years since the resumption of the survey, been ascertained?

Answer. I cannot answer that. We have observed eclipses of the sun. We have made no other observations for the longitude.

33. Question. Have the observations thus made been reduced?

Answer. Yes, and calculated. I add, that, if we had considered it a sine qua non to determine the longitude, the time occupied in this way might have retarded the other work.

34. Question. But you have previously said that the want of the determination of this fact was one of the objections to publishing any part of the work.

Answer. I said it was an objection, but I did not mean to be understood as saying that it was an insuperable objection.

35. Question. Is the absence of a base of verification any insuperable objection to the publication of the work along Long Island sound?

Answer. I think not. I say no.

36. Question. Is the survey engaged now in measuring an arc of a great circle of the earth, with a view to ascertain its ellipticity?

Answer. That will be one result of the survey, and a very important one, in a scientific point of view.

37. Question. When will that result be reached?

Answer. It should await the measurement of the base of verification.

38. Question. Is it necessary to have measured such an arc, and verified the ellipticity of the earth, before it is possible to publish a map, for practical purposes of navigation, of Long Island sound?

Answer. I think not.

39. Question. Where are the results of the work, so far as completed, now kept?

Answer. In the depot of the survey, at Washington.

40. Question. Are they in duplicate?

Answer. Some; not all. The primary triangulation is all in duplicate. Of the secondary, mine is not. As to the rest, I do not know.

41. Question. Of that which is in duplicate, are both parts kept at the depot?

Answer. Yes.

42. Question. Several of the public buildings at Washington have from time to time been destroyed by fire; is the depot a fire-proof building?

Answer. No; it is not.

43. Question. If the results and other matters in the depot should be destroyed by fire, must not the work be done over again?

Answer. Yes. Precautions have been taken to enable the speedy removal of the papers, if the building take fire, by their being in cases on the ground floor.

44. Question. Of the work in duplicate, why is not one copy deposited for safe keeping in the Treasury Department?

Answer. I do not know.

45. Question. Is all the work in such a state that, if Mr. Hassler should die suddenly, it may be used, and reduced or calculated immediately by others?

Answer. Yes.

FRIDAY EVENING, *April* 15.

Examination of Mr. Ferguson continued.

Present: Mr. Cushing and Mr. Aycrigg.

[NOTE.—To make the evidence more distinct, from question No. 46 to question No. 74, it must be observed, that the statement after No. 74, (marked A,) the statement marked "to be annexed to Mr. Ferguson's evidence," and the statement marked "to be annexed to Mr. Ferguson's testimony," together with the chart of Newark bay, referred to in question No. 48, were presented at the beginning of this meeting; the statements having been previously prepared, in writing, by Mr. Ferguson, in answer to questions put to him by the committee at the previous meeting.]

46. Question. Is there any substantial and adequate reason why the mathematical elements of the work should not be published as parts of it are completed?

Answer. No other but that it will require time to put them in order.

47. Question. At what time in each season do you take the field?

Answer. This is stated in the schedule annexed, and marked A.

48. Question. There is shown by you a published chart of Newark bay, purporting to be an extract from the United States coast survey; is there any meridian on the map? (Annexed, and marked B.)

Answer. No.

49. Question. Is the latitude or longitude of any part of it given?

Answer. No.

50. Question. What is the length of Newark bay, as stated in this map, from Shuter's island to the confluence of the Passaic and Hackensack rivers?

Answer. It is, by the scale of the map, five miles and eighty-two-hundredths. But the scale is an erroneous one, and was not published or verified by the superintendent. The actual distance between the two points specified is five miles and six hundred and twenty-three thousandths, obtained by me by measuring on the original topographical map.

51. Question. Please to inspect the map of Newark bay, which is now shown to you, marked C.

Answer. Itappears to be the same map, engraved from the same plae as B; but thescale is different, and is at the same time erroneous. It seems to be written $\frac{1}{20000}$ instead of $\frac{1}{10000}$, or erroneous in the proportion of 2 to 1, or about that.

52. Question. If the chart of New York, or any part of the coast, be

published, do you apprehend any dangerous error would be introduced by map sellers?

Answer. If published without care, there would, undoubtedly.

53. Question. Is it considered judicious to suppress the results of the survey, through fear that, if published, map sellers may make errors in copying the maps for sale?

Answer. No.

54. Question. Is the survey of any practical use, unless published?

Answer. Yes; in the experience acquired by the officers of the navy and others engaged on the survey. I am not aware of any other.

55. Question. Do you understand the proper uses of the survey to be confined to the instruction thus acquired by the officers engaged in it?

Answer. No; the uses are a knowledge of the coast for commerce and navigation, and a communication of it by a publication of the maps.

56. Question. Can the survey be of any practical use to the country at large, without the publication of charts and maps?

Answer. Certainly not.

57. Question. Where are the instruments used by you repaired?

Answer. At different places, but generally at the office of the survey here.

58. Question. Have you had any difficulty in procuring repairs at other places?

Answer. I have scarcely ever had occasion for repairs; I should think not exceeding five dollars in amount since 1833, when I entered the survey. All my instruments are of European manufacture. They are good instruments.

59. Question. What necessity is there of plane-table parties, except near the coast?

Answer. No absolute necessity, except for the secondary triangulation near the coast.

60. Question. How far in from the coast have plane-table parties gone on the survey?

Answer. I cannot say precisely. They are carried on by Mr. Gerdes, Mr. Sands, Mr. Boyd, Mr. Dickens, and Mr. Werner.

61. Question. Do the plane-table parties require much science?

Answer. They require practical skill.

62. Question. When a secondary triangulation precedes the primary, is it not a second without a first?

Answer. Technically, it is.

63. Question. Is it not working wrong end foremost for a secondary to precede a primary triangulation?

Answer. I think not, because the secondary loses none of its accuracy by the primary following it.

64. Question. Can you ascertain what the errors of the secondary are until you have the primary?

Answer. No.

65. Question. How are your distances measured?

Answer. In French metres. It is not the standard of the country, but it is the standard best authenticated, and best known in geodetic operations. Our standard is the English yard. The foot is the most common measure used in this country, both for scientific and practical purposes.

66. Question. Is the metre in common use in this country in any way?
Answer. No.

67. Question. Is it not as easy to convert yard measure into metres as metre-measure into yards?
Answer. It is the same thing.

68. Question. In that case, what benefit is there in having the work of the survey in metres?
Answer. None but what I have given before.

69. Question. What is the standard used in the English survey?
Answer. Either the English yard or foot.

70. Question. What is the object of the proposed second base line?
Answer. To verify the work.

71. Question. Cannot the work proceed north and south at the same time?
Answer. Not at present, without a larger appropriation and more persons; at least, that is my opinion.

72. Question. Have you a general knowledge of the configuration of the coast?
Answer. Yes, to Cape Henry.

73. Question. On what part of the coast, north or south, can the work be carried on most easily?
Answer. At the north, by reason of the nature of the coast.

74. Question. Of how many points on the coast has the survey ascertained the latitude and longitude?
Answer. I should think my own points were five hundred; and, altogether, a thousand.

A.

Year.	Time of taking field.	Time of going home.
1833	May 10	December 28.
1834	February 20	December 3.
1835	April 6	January 10, 1836.
1836	May 1	December 9.
1837	April 25	November 25.
1838	May 20	November 19.
1839	April 15	November 29.
1840*	June 16	December 22.
1841	February 15	December 12.

It must be understood that these dates are given from recollection, and can only be relied on as accurate within a day or two.

*This year I was detained longer from field work, to calculate triangles necessary for the map of New York.

Number of stations made in each year.

In 1833 - - - - -	24
In 1834 - - - - -	64
In 1835 - - - - -	26
In 1836 - - - - -	28
In 1837 - - - - -	13
In 1838 - - - - -	10
In 1839 - - - - -	15
In 1840 - - - - -	16
In 1841 - - - - -	7
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[To be annexed to Mr. Ferguson's evidence.]

To the question of the committee, "What is the distance between Shuter's island and the point at the confluence of the Passaic and Hackensack rivers, and what the mean width of the bay of Newark?" Mr. Ferguson answers:

That the distance between the above points is 5.623 statute miles, and the mean width of the bay of Newark 1.37 mile.

That on a map of the said bay, printed at the request of the collector of Newark, the distance between Shuter's island and the point between the Hackensack and Passaic is 5.82 statute miles; but that this map has an erroneous scale attached to it, and was not published or verified by the superintendent of the survey. The map appears conformable to the original of the survey, but the scale given for it is incorrect.

To the question of the committee, "How many points were determined in 1833 in the main triangulation, and what distance were they apart; what extent of country did they cover; what number in 1834, 1835, 1836, 1837, 1838, 1839, 1840, and 1841; and what extent of country do they cover?" Mr. Ferguson answers:

That the part of the question *as to the distances "apart"* is answered by giving, in the following schedule, the length of the longest and shortest lines of the survey each year; that it is difficult to divide the works of successive years from each other; and that the computations are given in gross in square statute miles, presuming that the committee merely wished an approximate and comparable estimate.

In 1833, length of longest line, miles -	41.3	Square miles covered, 1,350
length of shortest line, miles -	7.2	
In 1834, 1835, and 1836, though other stations were occupied, the primary triangulation did not cover any additional space.		
In 1837, length of longest line, miles -	20.69	Square miles, 318
length of shortest line, miles -	8.73	
In 1838, length of longest line, miles -	38.41	Square miles, 300
length of shortest line, miles -	23.29	
In 1839, length of longest line, miles -	31.00	Square miles, 1,070
length of shortest line, miles -	10.93	
In 1840, length of longest line, miles -	18.51	Square miles, 209
length of shortest line, miles -	12.30	

In 1841, length of longest line, miles	- 31.02	Square miles,	330
length of shortest line, miles	- 17.07		
Square miles covered by whole primary triangulation		-	3,577

It is but fair, and perhaps also necessary, to state to the committee that the effect of the primary triangulation, in the progress of the survey, is not properly estimated by the number of square miles within the polygon which it makes, but by the quantity of secondary triangulation for which it afforded the bases. In this view of the subject, the number of square miles covered in each year would be much increased.

[To be annexed to Mr. Ferguson's testimony.]

1833—Buttermilk.
Round.
Bald.
Tashua.
Mount Carmel.
Ruland.
West Hills.
1834—Base measured.
1835—Reconnoissance in Maryland.
1836—West Hills.
1837—Ruland.
East base.
West base.
Harrow.
1838—Weasel.
Springfield.
1839—Beacon Hill.
Disborough.
Stony Hill.
Mount Rose.
Newtown.
Willow Grove.
1840—Willow Grove.*
Mount Holly.
1841—Yard.

Upon the examination of Mr. Ferguson.

The captious questions 5 till 10, inclusive, could of course not elicit any thing; the answers prove it.

Answer to question 11. Mr. Ferguson mistakes.

The answer to 13 would be best calculated over again, as the result indicated needs verification.

Answer to question 15 enters under the same predicament as from 5 to 10.

Answer to question 16 is very right; but answer to 17 subjects it to a personal modification, which it ought not to do, as the principle in itself is fully decisive; the question itself is badly styled.

Question 18 is grounded upon the bad turn in which question 17 had been placed; thence the 19th and 20th are of no value.

Questions 21 and 33. It is well known: that not all can be done at once; the work has always been carried on with the full celerity which the disposable means allowed.

From all the questions 22 till 27, the committee could in no way expect any valuable information.

Answer to 28. I thought Mr. Ferguson knew better.

Question 30. The care of the base-line monuments is given into special instruction to the light-house keeper of Fire Island beach, by the collector

* The station of Willow Grove was occupied both in 1839 and 1840.

of New York; when I was there last, only in one place, near two-thirds of the line, the water had washed in, as far as to go across the measured line, at high water, but the line is fully secure.

Answer to 35 is not sufficiently reflected and cleared up, because, for a part of the district in question, work is actually in doing, while it is proper, in good principle, to go on only gradually to further distances.

Question 36 shows again great anxiety, lest the coast survey might lead to an *honorable scientific result;* after this, the questions until up to 42 are evidently useless.

To question 42 an answer might be given, speaking very much for the safety of the coast survey office against fire, which I told to a member of the committee.

The rest of that 1st examination is trashing straw.

Question 46 to 52, inclusive, are void in all possible respects.

Question 53 must be discussed again here, as it seems it is insisted upon by the committee: that the money of the nation shall be spent for the benefit of chart sellers, and the public confidence in the work, therefore the *security of the utility of its results*, be thrown in the wind.

A proper organization of this subject will be proposed in due time, when the state of the work will dictate the regular series of publications, it is of no use to speak now nearer upon it, than to state that if no regular order and arrangement is made in this respect, the maps which may be given out will be *vilified.*

The questions 54 to 56, inclusive, are miscarried catches.

Questions 57 and 58 appear to have been dictated by an instrument maker out of work, for they cannot serve the work in any way.

Questions 59, 60, 61, 62, 63, 64, 65, 66, and 67, prove that the committee was fatigued in inventing questions, and had thrown itself into a vicious circle, which Mr. Ferguson ultimately solved, in the answer to question 68, by referring back to what he had said before.

The answers to questions 69 till 74 must have been highly instructive for the committee, as they offer much field for speculation without bottom. The discussion upon the Newark bay map, requested so minutely from Mr. Ferguson, shows evidently a high degree of research upon mathematical accuracy, and similar subjects, which exceeds itself again, when it comes to determine the square miles covered by triangles who have but three corners, as well explained at the end of the article.

F. R. HASSLER.

WASHINGTON CITY, *January*, 1843.

FRIDAY EVENING, *April* 15, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

Examination of Mr. Blunt.

1. Question. Do you know any sufficient reason why maps and other results of the survey should be withheld from the public knowledge?

Answer. None, when they are in sufficiently complete state to be useful to navigators.

2. Question. Is any part of the survey sufficiently complete for that now?

Answer. Yes.

3. Question. How much?

Answer. New York harbor is being reduced for the engravers. Long Island sound is capable of being reduced from Point Judith to New York. The outer coast is already complete, so far as expressed, from Montauk point to Great Egg Harbor, I believe, with exception of off-shore soundings.

4. Question. How far inland from the coast has any part of the work been carried?

Answer. I am unable to say, except in regard to the secondary triangulation, which I have in part conducted. I am one of the principal assistants.

5. Question. Are you acquainted with hydrographical surveys in England?

Answer. Yes.

6. Question. Do they publish results as soon as ascertained?

Answer. They are published in sheets so soon as completed, to be useful to navigation.

7. Question. Can copies or information be obtained by individuals?

Answer. Yes; I have known copies to be obtained repeatedly for my brother, who is a chart seller; as from the Thunder and from the Blossom.

8. Question. Does the hydrographical office in England derive any profit from the sale of the charts?

Answer. I think £200 or £300 per annum. The charts are published under the direction of the Admiralty, with the seal of the Admiralty to authenticate them.

9. Question. Have you applied at any time, as an individual, to the hydrographic office?

Answer. Captain Beaufort offered to give me personally any information I desired. This was when I was a private individual, before being connected with the survey.

10. Question. In your opinion, could the work be extended north and south at the same time?

Answer. It might, with more force; and with the present force, if the line of verification were not to be measured. We can proceed more rapidly at the north than at the south with the triangulation.

11. Question. In going south, do you apprehend any difficulty in the hydrographical part of the work, as distinct from the topographical? Cannot the mere coast survey be prosecuted without leaving the coast and going inland?

Answer. No.

12. Question. How do you propose to survey the coast of Virginia?

Answer. By carrying a series of triangles down the Chesapeake bay, and by extending them up or down the valleys of the rivers, as circumstances will allow.

13. Question. What natural elevations have you in lower Virginia?

Answer. None of any consequence.

14. Question. What do you propose to use as a substitute?

Answer. Artificial elevations and signals.

15. Question. In what way do you propose to triangulate the region of Dismal Swamp, and similar regions of country?

Answer. I have no knowledge in regard to that region.

16. Question. Are we not greatly deficient in knowledge of soundings in Buzzard's bay, Nantucket shoals, Cape Cod, and Massachusetts bay?

Answer. Yes.

17. Question. Is not a knowledge of those soundings of the greatest importance to navigation?

Answer. Yes; it is more wanted there than any where else. More tonnage passes. Most vessels from Europe, for New York and Philadelphia, come between the Gulf stream and Nantucket shoals, in addition to the navigation north of Cape Cod. Most of the coasting trade comes through the Vineyard.

18. Question. What amount of work or repairs have you had done in the office here to instruments?

Answer. Nothing but the mounting of one telescope, which came from Europe without a stand. I have had no difficulty in obtaining repairs elsewhere, if needed.

19. Question. Should you think it necessary to have a mechanician with you in the field?

Answer. To measure the base line it might be desirable; not otherwise.

20. Question. Was any copper imported for the engraving from Vienna?

Answer. Yes.

21. Question. Was it used?

Answer. No.

22. Question. Why not?

Answer. It was not considered suitable.

23. Question. Can good copper for engraving be procured in this country?

Answer. Yes.

24. Question. Have you had any practice as an engraver?

Answer. Yes.

25. Question. Can impressions be taken from a plate in an unfinished state, to show the progress of the work?

Answer. Yes.

26. Question. Can impressions be taken from the plates now engraving in the survey?

Answer. Yes, without injury to them.

27. Question. How long will it take to furnish the eight plates of the harbor of New York, with the present force, at the rate it now goes on?

Answer. I cannot state by conjecture. I should think about three years.

28. Question. Is it not possible to have the work done accurately and more rapidly than at present, if more hands were put on the work?

Answer. Yes.

29. Question. Is it necessary to have a workshop for the repair of instruments at the office?

Answer. I am not able to say. There are some instruments for which it is convenient.

30. Question. In what time could the New York map be finished?

Answer. There might be an engraver for each plate.

31. Question. Of what use are the plane tables, so far as regards navigation?

Answer. I do not consider it of any use to extend the survey any further back than the slope of the hills at the head of navigation.

32. Question. Are the plane tables further back?

Answer. I do not know how far back. I presume they are.

33. Question. What is the signification of the words "primary triangulation?"

Answer. They signify the main series of triangles on which any work to be surveyed is based, extending as far as possible throughout the work.

34. Question. What is a secondary triangulation?

Answer. It is a series commenced within the primary triangles, extending in whole or in part through the same, and dependent on the primary series.

35. Question. Is it possible for a series of secondary triangles to exist where there are no primary ones?

Answer. No.

36. Question. Is not the use of secondary triangles for plane-table parties to furnish detailed points?

Answer. Yes.

37. Question. If in any work there be but one series of triangles, does any such fact exist as primary and secondary?

Answer. No.

38. Question. When you commenced, was not the secondary triangulation intended to be, as the name imports, secondary to and within a primary triangulation?

Answer. Yes.

39. Question. Is it so now?

Answer. East of New Haven I have extended a main triangulation to Newport, and filled up the same with a secondary series of triangles.

40. Question. Is the main triangulation determined by Mr. Hassler, and ending at Yards and Mount Holly, of the same nature as the main or as the secondary triangulation by you, east of New Haven?

Answer. The same as the main triangulation by me, east of New Haven.

Remarks upon the testimony of Mr. Blunt.

Answer to third question. I should have expected Mr. Blunt better informed upon the scientific requisites, to admit fairly publications of maps of an extent of coast, than he shows, by this answer. The extent of coast cannot *honestly* be published before the system of primary triangulation is positively enclosed between two bases, filled with the main triangulation between them, because this is *absolute requisite of the proper location.*

The individual maps of bays &c., are all that can be given to the public with propriety, upon special call, as has always been done hitherto, in any of the parts of the country actually enclosed in a finished system.

Answer to sixth question. In England they have the *main triangulation before them fully executed, since before the end of last century;* they can therefore work in any place, grounding upon that part which is near to any harbor, bay, &c., and are enabled by that to give it to the public by piecemeal, which is not allowable, where the *triangulation is not* made beforehand. It will, besides, be found: that this piecemeal communication is all, and the full coast map *I wish yet to see!*

Answer to questions seventh and eighth. These show evidently that in England, *as properly due,* the authentic maps of the survey are not delivered over to *chart sellers,* but that they must, *as proper, purchase them from the office,* and that is the only *honest way* of doing. Mr. Blunt, who gives the answer, is the head of the firm of *Edmund & G. W. Blunt,*

chart sellers, in New York. Why he does deny his partnership is for him to answer.

Answer to eleventh question. Is properly answered by a flat: NO.

Questions twelve, thirteen, fourteen, fifteen, sixteen, and seventeen, are useless, being, as prospective, without any principles, and ill placed, as proves all this.

Answer to questions eighteen and twenty-nine. It is evidently not to be asked the partner of a seamens' instruments repairing shop *any question* about a part of the coast survey establishment, so indispensable for a work of the extent of the coast survey, as the establishment to keep the instruments in constant good order, and make such works as I must require for my own use. *No man* can judge upon the full extent of the value of that establishment *but myself.* From a rival who expected to have these works as an accessory, *of right,* to his share, there could be no expectation of an appropriated answer.

Question nineteen. Shows the ignorance of the questioner and answer.

Answer to question twenty-three. It is well known to the person answering, that the copperplates can be *procured in this country,* but that they are *imported from abroad,* the importers often putting their own names upon the plates, as *he offered it to me himself.* The actual state of things I have explained elsewhere; the full truth is withheld.

Answer to question thirty. Shows the ignorance of the man who can say that there could be an engraver to each plate. If he knew the very first principles of the organization of an engraving establishment, he would state that the work must be distributed according to its *kind,* as done in the survey, and each kind of work, of *each plate,* to pass through the competent hand purposely engaged for it, and *not each plate a man,* as little as the same assistant makes the secondary triangulation, the plane table, and the soundings, in the same quarter. How the plates are distributed I have stated elsewhere.

Answer to questions thirty-one and thirty-two. It is expected that, upon such subjects, the direction of the superintendent, who oversees the whole extent of the work, deserves more attention than that of an assistant, who sees, *of course, distinctly only* within his limits.

Answer to question thirty-five. The simple *no* says nothing. Mr. Blunt ought to have been suffered to explain, as I doubt not he would be able, that the secondary triangulations are allowable to be extended as well *within* as *without* the main triangulation, to a *certain limit,* with the same certainty, and that, therefore, in both cases, the main triangulation is equally the guide of the secondary.

Answer to questions thirty-six, thirty-seven thirty-eight, thirty-nine, and forty. All this is so asked, and so answered, as to bring out no proper information; it stands slant; as it refers to the further prosecution and organization of the work, it is entirely out of place to enter into any explanation prospectively.

F. R. HASSLER.

WASHINGTON CITY, *January* 1843.

APRIL 30, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

Examination of Captain Swift.

1. Question. Are you employed in the coast survey; and if so, in what capacity, and since what time?

Answer. As an assistant, since 4th April, 1833. I am also the disbursing agent, since about 2d July, in the same year.

2. Question. Will you furnish to the committee an exhibit of the expenditure on the survey for the years 1841 and 1842; say of the appropriation of March, 1841, classifying the same so as to show the amount expended on the maritime, and the amount on the land part of the work; the amount on the primary and secondary triangulation, and on the plane tables; the amount for salaries, and for expenditure at the bureau; and in the same way of any and all other conveniently specified classes of expenditure?

Answer. The answer is annexed in the papers marked A 1 and A 2.

3. Question. Will you furnish to the committee a copy of a printed pamphlet on the coast survey, distributed among the members of the House in February last?

Answer. The pamphlet is annexed, (marked B.)

4. Question. Is there any sufficient reason for suppressing or omitting to publish the results of the survey as thus far ascertained, and as the same may continue to be obtained?

Answer. No, I think not.

5. Question. May not maps of specific completed parts of the survey be published, while the work is in progress on other parts of the coast?

Answer. Yes.

6. Question. Of how large a part of the coast is the survey now so far completed that such maps might be published?

Answer. The whole of Long Island sound, including both sides of Long Island, New York harbor, and a portion of the northern part of New Jersey, coast and interior.

7. Question. Might not the soundings, position of headlands, and the like, of all so much of the coast, be now published?

Answer. Yes.

8. Question. Is there any sufficient reason for withholding from Congress the mathematical elements of the survey, so far as completed?

Answer. No.

9. Question. In whose possession are those facts and *data* at this time?

Answer. They are at the office in Washington, so far as completed, and except so far as parts of the work now in progress are in the hands of the assistants.

10. Question. Are there duplicates of the observations, measurements, and other unpublished elements of the survey?

Answer. There are of parts, but I think not of the whole.

11. Question. Are the elements of the base line, and of other primary and essential parts of the work, in such form and situation as to be secure from loss by fire or otherwise, and be capable of being handed over to and understood by any competent successor of Mr. Hassler?

Answer. All this is in duplicate in the office, accessible to the assistants, and susceptible of being understood and used by them. No part of this has been published except the final result of the base measurement. The details have not been published. The papers are subject to the hazard of fire; but not more so, and perhaps less, than in some other buildings in Washington.

12. Question. Is there any objection to depositing one of the duplicates in each case in the safes of the Treasury Department?

Answer. No.

13. Question. Would not this be proper, to guard against accidents?

Answer. It certainly would add to the security.

14. Question. In what way are the principal duties of the survey subdivided between the superintendent and his assistants?

Answer. The duties of Mr. Hassler, in addition to the general supervision of the work, are the main triangulation, while the assistants are employed in the secondary triangulation and detailed surveys.

15. *Question. Is the main triangulation in arrears of the secondary; and if so, why?*

Answer. It is. I am not aware of the reason, except the illness of Mr. Hassler, and his inability to do it, caused thereby.

16. Question. Cannot that work be performed by one of his assistants?

Answer. Yes.

17. Question. How long has Mr. Hassler been so ill as not to be able to attend to that work?

Answer. It was in October of last year that he became ill. He was also ill the preceding year, in September.

18. Question. What prevented his taking the field and performing the work in the spring and summer of those two years?

Answer. I am unable to say.

19. Question. What sum is allowed to Mr. Hassler, annually, for expenses, exclusive of compensation?

Answer. Salary $3,000, and expenses $3,000.

20. Question. For what expenses is this $3,000 designed? Is it for personal expenses?

Answer. I suppose it is the expenses of living.

21. Question. Is he paid for other expenses when he goes into the field?

Answer. He is furnished with an instrument carriage and horses for the instruments and himself, and a baggage wagon besides, for instruments, at the public expense.

22. Question. Is it the same carriage which he is accustomed to use in Washington?

Answer. Yes.

23. Question. Are horses and men paid at the public expense for the carriage and wagon through the year?

Answer. Yes; four horses, one permanent driver, and one other man, who also assists about the office.

24. Question. Please to specify, in the answer to the 2d question, the whole of the expenditures on these carriages, horses, and men, as are of the classes of expenditures therein referred to.

Answer. It is contained in the paper annexed, and marked A.

25. Question. What are the precise duties performed by Mr. Hassler during the chief part of the year, in which he remains at Washington?

Answer. The weights and measures, and the computation of his own field work, and occasional general computation.

26. Question. Do not the assistants reduce and compute their own work?

Answer. Yes.

SATURDAY, *May* 13.

Present: Mr. Mallory, Mr. Cushing.

Continuation of the examination of Captain Swift.

27. Question. Do you wish to add any explanation to the papers now produced in answer to the 1st question, and marked A 1 and A 2?

Answer. In comparing the accounts in the papers marked A 1 and A 2, and in the printed sheet B, there is a discrepancy in the sums, assigned to the secondary triangulation and plane-table parties, respectively. The manuscript (marked A 1 and A 2) is the later and correct statement, the statement in B being an approximate estimate, made up before the complete settlement of the accounts.

28. Question. Does the whole amount expended pass through your hands, and how is it drawn from the Treasury, and on what vouchers paid?

Answer. All the expenditure for work on shore passes through my hands, also the per diem allowance of the officers on board the vessels, and the extra compensation of the lieutenant commandant; but the other payments, in the hydrographical part of the work, do not pass through my hands, being made by the commander of the vessels. The money expended by me is received by me from the Treasury, on requisition made by me on the Department. All the disbursements, except for salaries, &c., fixed at the Treasury Department, are made under the authority of Mr. Hassler.

29. Question. Who prescribes the number of subordinate persons to be employed, and the amount of miscellaneous expenses to be incurred?

Answer. The assistant in charge of each party, subject to the control of the disbursing officer.

30. Question. Who appoints the persons employed in the survey?

Answer. Mr. Hassler.

31. Question. Who fixes their compensation?

Answer. If below $1,000, Mr. Hassler; if more, it is referred to the Department. Such is the practice, so far as I know.

32. Question. Is it necessary to have an instrument maker's shop in the survey?

Answer. I think it is both economical and convenient. An amount of work was done there the last year fully equal to the cost of maintaining the shop.

33. Question. Cannot some portion of the topography of the survey be dispensed with without detriment to the hydrographic part of the work?

Answer. I conceive that the plane-table survey is useful, but it may not be necessary for any hydrographical object that it should be so far extended.

34. Question. What, then, is it useful for?

Answer. I do not know any thing, except that it contributes to a more exact knowledge of the topography of the country adjacent to the coast.

A 1.

Statement of the expenditures made for the survey of the coast of the United States, and for engraving the chart of the harbor of New York, during the year 1841 *and a part of* 1842.

Amount expended by Captain W. H. Swift, from 1st January, 1841, to 31st December, 1841 - - - - -	$80,639 13	
Amount expended by Commander Thomas R. Gedney, 17th May, 1841, to 31st March, 1842 - - - - -	9,162 42	
Amount expended by Lieut. Commandant Geo. S. Blake, 11th March, 1841, to 28th February, 1842 - - - -	4,766 77	
		$94,568 32

Details of the expenditures.

For the main triangulation, including the compensation of the superintendent, the heliotropers, and hands employed therein, and all incidental expenses, except horses, wagons, and harness, and repairs of same, and pay and subsistence of driver - - -	$9,289 87	
For horse keeping, (4 horses,) repairs of one instrument carriage, one wagon, harness, and pay and subsistence of driver - - -	1,445 98	
		$10,735 85
For the secondary triangulation, including the compensation of the assistants, heliotropers, and hands employed therein, and all incidental expenses, except horses and wagons, harness, and repairs of ditto - - - - -	20,656 14	
For horses, horse keeping, repairs of wagons, and harness, pay and subsistence of 2 drivers, (3 wagons and 5 horses) - - -	2,160 74	
		22,816 88
For the plane-table surveys, including the compensation of the assistants and the hands employed therein, and all incidental expenses -		17,212 29
For the hydrographic surveys: Amount paid by Capt. Swift to the naval assistants, for the authorized allowance of $627 per annum to the lieut. commandants, and of $1 per day to the lieutenants and passed midshipmen -	8,644 94	
For amount paid by Commander T. R. Gedney, from 17th May, 1841, to 31st March, 1842, for repairs of 2 vessels, sails, boats, pilotage, and incidental expenses, (Washington and Jersey)	9,162 42	
For amount paid by Lieut. Com't G. S. Blake, for same from 11th March, 1841, to February 28, 1842, (schooners Gallatin and Nautilus) -	4,766 77	
		22,574 13

For expenses of the coast survey office, including rent, fuel, lights, and attendance - - - - - -	1,999 17
For expenses of the instrument maker's shop, including the compensation of the persons employed therein, and the cost of tools and materials purchased for same - -	2,318 11
For compensation and expenses of the persons employed in engraving the chart of the harbor of New York - -	2,011 14
For the *general expenses* of the work, including the compensation of all assistants and others not embraced in the preceding schedule, and all purchases and expenditures not specified in same - - - - - - -	14,900 75
	94,568 32

W. H. SWIFT,
Disbursing Officer Coast Survey.

WASHINGTON, *May* 4, 1842.

To Captain Swift's examination.

To questions 4 and 5, the answer does not enough distinguish between the different state of the different parts of the work. Bays, harbors, &c., single detached parts may be given out, like detailed plans of country, disconnected with the general work of the map; but it is positive destruction of the work to publish extents of the coast before a full system between two bases, and two astronomical main stations, at considerable distance, is completed and joined by the main triangulation.

Questions 6, 7, and 8, are entirely erroneous in their application. The reports contain all that is proper to be published; nothing proper to publish is withheld.

Questions 12 and 13. There is so much of economy spoken, and still in this an expense is proposed, entirely useless, and in many respects improper, on account of bad consequences, that might come from it, without giving *means* to increase the work.

Answer to 14. Forgets entirely that there is a scientific part in the work, which cannot be made without work, and which I attend to; that it is found valuable by men of science, is published by them, and even can be witnessed.

Answer to 15 and 16. Notwithstanding I was sick at Yards, *I never missed a single observation possible;* Captain Swift was not then present at the station, (Yards.)

Answer to 18. I was the two years kept from going out by reports asked, standards finishing, &c.

Answer to 33. The question being made only as a catch, it ought to have been remarked: that, without the topography to a certain distance, it would, in many cases, not be possible to determine upon which side of the lines there lies water or land; the distance to which the topography must go cannot otherwise but be left to the operator. It is positive nonsense only to treat that subject; in modern science and surveys it is well known what is meant; only *the sea-charts of the lowest grade* of former times are without topography.

NOTE.—The publication questions should also be answered from the side that all persons engaged in the coast survey are actually employed, and that if more should be published, more men would have to be appointed, or other actual survey work must be neglected for it, as the appropriation is a determined quantity, within which the work is to be done.

It is well known that of all the coast-survey and weight and measure works, *not even the slightest means existed*, and that when attempted in any other way, but *by me*, it always signally *failed*. Now where is the justice and reason to disbelieve my organization, and statements, and to suffer to be guided by imperfect knowledge, but can really any good come out of such a course?

F. R. HASSLER.

WASHINGTON CITY, *January*, 1843.

MAY 2, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

Examination of Captain Thomas R. Gedney.

1. Question. Are you an officer of the navy?

Answer. Yes.

2. Question. Are you now employed in the coast survey; and if so, since what time and in what capacity?

Answer. I have been employed in it since October, 1834, in charge of one of the hydrographical parties.

3. Question. How many of such parties are there?

Answer. Two. The other is commanded by Lieutenant Blake.

4. Question. How many persons, and what vessel or vessels, are employed in your party?

Answer. Last year I had two vessels, the schooner Jersey and the brig Washington, with, I think, fourteen officers, all told; and, I believe, thirty-two seamen and forty-four boys. This amount of force was necessary.

5. Question. What surveys have you made since October, 1834?

Answer. I have been engaged in making soundings. I commenced in Fire Island bay in 1834; then the outer coast of Long Island, in 1835, from Fire island to near New York; then the harbor and bay of New York, and to Montauk point, along the outer coast of Long Island, in part of 1835 and in 1836 and 1837; in 1838 and 1839, from Fisher's island to Block island and Point Judith; in 1840 and 1841, on the coast of New Jersey, as far as Egg Harbor. These soundings include also all the inland navigation from Fire island to Egg Harbor. In addition to this, in 1841, I performed a piece of detached work between Cape Henlopen and Cape May.

6. Question. Have you completed the soundings along the whole extent of coast from Point Judith to Egg Harbor?

Answer. Yes.

7. Question. Are those soundings, as verified by you, in a condition to be published?

Answer. Yes.

8. Question. Do you make any astronomical or other observations on the coast?

Answer. No, except so far as may be needful to keep my own time.

9. Question. Have any views of the coast been taken by you or from your vessels?

Answer. Yes. Mr. Farley has taken a panoramic view of the whole of Long Island and of all the light-houses wherever I have sounded. We have taken no other views, except of the entrance of the new channel in New York harbor.

10. Question. Is the coast of Long Island an easy or a difficult one?

Answer. I think it an easy one myself.

11. Question. What is the chief occasion of wrecks on Long Island?

Answer. When vessels are running in, and are caught by a heavy southeaster, it is difficult to get out, from the trending of the two coasts of Long Island and of New Jersey, and the current setting from New Jersey coast, by reason of which vessels, being thus embayed, are apt to be driven on shore.

12. Question. Have you sounded Jamaica bay?

Answer. Yes, in 1835.

13. Question. What depth of water did you carry into that bay?

Answer. Six feet at low water, eleven and a half at high water, in common tides. At the present time, the depth at low water is seventeen feet.

14. Question. Would not the knowledge of the actual depth of the water in the channel leading into Jamaica bay be useful to a vessel which was unable to claw off the coast?

Answer. Yes; it might preserve a vessel from being stranded.

15. Question. What amount of repairs of instruments have you had done at the office of the coast survey?

Answer. I cannot say.

16. Question. Have you had other repairs done elsewhere; and if so, by whom, and to what amount?

Answer. I have had repairs done for our, or my, party, the last year, to the amount of forty or fifty dollars, by Mr. Montandon, and by George Blunt, of New York, it having been convenient to have this done on the spot there.

17. Question. How far inland do any of the points extend which you have used, as furnished you by any of the triangulating parties?

Answer. Some of them have been from ten to twelve miles inland. They were used for measuring angles from the vessel and from different points. The points which I occupied for measuring were generally on the coast, within a quarter of a mile of the beach.

18. Question. Please to describe your mode of proceeding in this respect.

Answer. I have three officers on shore, at three different stations, with a sextant and a watch each, and a boy with a spyglass also to each station. I then am anchored or lying to off shore in my vessel. I make a signal in the morning, when I get under way, to commence work, I knowing that the men are at their stations by their hoisting a signal flag for that purpose. I commence by running up a signal; so soon as the signal starts from the mast head, the officers on the shore measure the angle between the brig and one of the stations, and the officers on board the brig, two of them, then measure each of them an angle between the stations on shore,

so as to give in all five angles; each officer, as well on shore as on board, marking the time, to see that they agree. Meanwhile I am taking my soundings, on the change of which the signals are repeated and new angles taken as before. In these observations I consider the vessel as a fixed point. This system of operation I have been able to carry out as far as twelve or fourteen miles seawards, which is the greatest distance I have gone. I can see the land inland about ten or twelve miles from the shore, along that part of the coast sounded by me; but if the land were higher the distance seen would be much greater.

19. Question. Did you sound the new channel, commonly called Gedney's channel?

Answer. Yes.

20. Question. Would you have been able, with the ordinary facilities for sounding, to ascertain that channel, without the previous triangulation of the coast?

Answer. Yes; I could have buoyed it out so far as to make it equally useful to navigation.

21. Question. Is the knowledge of that channel of great importance to the shipping of New York?

Answer. I think it is.

22. Question. Could not a master of a vessel, when employed off the harbor of New York, with such information as a good chart of the harbor would furnish, run his vessel in with tolerable safety by that channel?

Answer. Yes.

23. Question. Do you know any reason why a chart of that channel has not been published?

Answer. I do not know any, unless it be that it was not ready. Mr. Hassler has charge of that; I have not.

24. Question. When did you sound out that channel?

Answer. In 1835.

25. Question. Is not the channel as good now as when you first sounded it?

Answer. Yes; I sounded it again last year, for the purpose of ascertaining the fact, and found it so.

26. Question. Is the line of the coast, where examined by you, fixed or subject to change?

Answer. The beach itself, at the mouth of small inlets, is subject to change, with severe gales of wind.

27. Question. Is the topography of the country within the coast of any importance to navigators?

Answer. It is not, except for four or five miles, or where there is any remarkable eminence or other object inland.

28. Question. Is it customary to lay down the topography of the country on the charts of navigators?

Answer. I have never seen it in any charts except of islands. In charts of the West India and other islands it is sometimes given; but in those cases it is not necessary for purposes of navigation.

29. How long do you continue sounding, one year with another?

Answer. I generally commence in May, and leave off early in November.

30. Question. Are you able to keep up with the triangulation?

Answer. Yes; and I have been in advance of the plane-table parties.

31. Question. Are the plane-table parties necessary to the soundings?
Answer. Yes.

32. Question. If you had occasion to sound at a greater distance from the shore than 12 or 14 miles, how would you proceed?

Answer. I should employ small vessels, anchoring them to serve as fixed points; or it might be done by means of chronometers, starting from some given or known point.

33. Question: What proportion of the year, and of the day in each year, have you been able to make your observations, and carry on the work?

Answer. The answer to this question is annexed in paper marked A.

34. Question. Have not your operations along the coast either corrected errors in printed charts or added many new and more complete soundings to those heretofore published in any chart?

Answer. I believe they have.

35. Question. Do you know any reason why the soundings taken by you should not be published?

Answer. I do not.

Commander Gedney's examination.

To questions 7 and 20, 35. How can soundings be published, without their locations being determined? This location is done by the land operation, therefore the question is captious and futile.

Question 11. These currents are complicated, and variable; they require therefore probably still more investigation.

Question 16. The often-repeated question about the instrument maker's room or shop, in the coast survey office, which is so evidently indispensable, for the daily wants of keeping all instruments in order, and where all the plane table instruments, and similar, are made new, shows rather a propensity to delay, than to advance, the work, which by it gets independent from all waiting for the convenience of extraneous artists, and which so often already has saved importation from Europe.

Questions 23, 24, and 25, are well answered, but it is known publicly that the general map was engraving when the questions were asked, and that two special maps for special purposes had been delivered for the use of public offices.

Questions 27 and 28. Commander Gedney mistakes his answer, as the French atlas in the office proves the contrary, and the works of the coast survey must not be governed by the bad precedent of charts made only for sale.

Question 30. The keeping together of the topographical and hydrographical parties is kept up as much as localities admit, at all events always sufficiently to advance the work; the hydrographer can never go, with any advantage, much ahead of the topography; nor is it proper that he should adventure himself to work without it, to any extent, as it duplicates the labor.

F. R. HASSLER.

WASHINGTON CITY, *January*, 1843.

MONDAY, *May* 2, 1842.

Present: Mr. Cushing, Mr. Aycrigg.

Examination of Lieutenant George Blake.

1. Question. Are you an officer of the navy, employed in the coast survey; and if so, in what capacity, and since what time, and on what part of the coast?

Answer. I am a lieutenant in the navy, and have had charge of a hydrographical party from 1835 to the present time; I have been in Long Island sound and Fisher's Island sound, and in Delaware river and bay.

2. Question. What vessel or vessels, and what number of officers and men, have you under your command?

Answer. My force has varied very much; I had last year the schooners Gallatin and Nautilus, with nine officers and forty-one men.

3. Question. Have you been engaged in the outer or the inner waters?

Answer. The inner altogether.

4. Question. What proportion of instruments have you had made or repaired at the office in Washington?

Answer. I have seldom had any sextants or glasses repaired there; but a large part of the drawing instruments have been made there, to the value or cost of say $500 at any private establishment, that is, during the whole time I have been in the survey.

5. Question. Have any views of rocks, shoals, or other dangerous places, been taken from your vessels?

Answer. No; views have been taken of all the light-houses.

6. Question. Have you, in the examination of Delaware bay, discovered any great errors in the supposed location of any shoals?

Answer. Yes; very great.

7. Question. In what cases?

Answer. In that of Cross ledge, especially; but there is no proper chart of Delaware bay; the only one extant is a mere rude sketch. The error in the case of Cross ledge was four miles, I think.

8. Question. Is it not important that these errors should immediately be made known, and a correct chart of the bay published?

Answer. Yes, undoubtedly.

9. Question. Do you know of any reason for withholding from the public a knowledge of the soundings of Delaware bay, as far as verified by you?

Answer. I know of none.

10. Question. Can a topographical map, so constructed as to give in detail a full and self-explaining picture of the country, that, with the map before the eye, the military operations may be properly judged and guided in the cabinet, be obtained, in carrying on the coast survey, without adding greatly to the expense, and materially delaying the execution of the work?

Answer. No, it cannot.

Upon the examination of Lieutenant Blake.

Question 4. The account asking of the instrument shop occurs again;

these questions together have taken more time than it would have cost the committee to see its propriety by a full visit of it.

Questions 8 and 9. Lead no farther than all such, the under-water part of the work can, of course, not be presented to the public, without the land part to which it belongs, who would without it know where it lies.

By question 10, (the last,) the select committee appears to constitute itself into a council of war.

F. R. HASSLER.

WASHINGTON CITY, *January*, 1843.

MONDAY, *May* 30, 1842.

Present: Mr. Mallory, Mr. Aycrigg.

Mr. W. J. Stone's examination.

1. Question. Map marked exhibit C being shown, witness is asked if he recollects the map.

Answer. Yes.

2. Question. Who engraved the map?

Answer. I did.

3. Question. Is that an exact copy of the original sent to you from the House of Representatives?

Answer. It is.

4. Question. How long did it take you to engrave and print this map?

Answer. In from seven to ten days it was fully executed and delivered to the House.

5. Question. With what person connected with the coast survey did you communicate at the time you engraved this map?

Answer. Mr. Hassler. I called on him, and had a conversation on the subject.

6. Question. Exhibit B being shown and examined, he is asked if that in an impression from the same plate.

Answer. Yes.

7. Question. Will you please to examine exhibit B, and see if there is any difference between this and exhibit C?

Answer. The only difference that I can perceive is, that another scale has been put in the place of the one engraved by myself, which was copied from the original.

8. Question. In what manner was that alteration made?

Answer. By cutting out the engraved scale and inserting one with the pen. The engraved scale on exhibit C is 3 inches to the mile; while the scale inserted with the pen is $\frac{1}{10000}$th, being, in fact, 6 inches to the mile, instead of 3.

9. Question. Have you the original extract sent to you from the office of the coast survey?

Answer. I have.

10. Question. Are there engravers in the United States competent to execute, faithfully and correctly, any work like that required for the coast survey?

Answer. Yes; as well as it can be done in any part of the world.

11. Question. What is considered a liberal salary for a good workman?

Answer. About $1,200 per annum.

12. Question. Is there any difficulty in getting good copper in the United States for engraving purposes?

Answer. No difficulty whatever.

13. Question. How long will it take to engrave the map of the harbor of New York, and what will it cost?

Answer. I cannot answer without examining the chart.

The chairman then gave Mr. Stone a note to Mr. Hassler, of the following tenor, as near as remembered, viz: requesting Mr. Hassler to permit Mr. Stone to examine the manuscript chart of the harbor of New York.

The committee then adjourned.

THURSDAY, *June* 2, 1842.

Present: Mr. Mallory, Mr. Cushing, Mr. Aycrigg.

William J. Stone in examination.

1. Question. What is your business and residence?

Answer. I reside in Washington, and I am an engraver.

2. Question. How long have you followed that business here?

Answer. From twenty-three to twenty-four years.

3. Question. Have you been accustomed to engrave maps and charts?

Answer. Yes; that has been my chief, and is, at present, my only business; I having abandoned other branches of engraving, to devote myself to that.

4. Question. Is there any difficulty in procuring competent map engravers in the United States?

Answer. None.

5. Question. Do you know of any special superiority of German engravers over those of the United States?

Answer. No; I consider the American workmen better, cleaner, and more rapid.

6. Question. Please to look at the map hereto annexed, and marked A. William J. Stone, and state whether it is the original map sent from the House to you, and from which you engraved the map of Newark bay, as mentioned in the first part of your testimony.

Answer. It is.

7. Question. What is the scale on that manuscript map?

Answer. Of three inches to the mile, as on the map I engraved.

8. Question. Annexed is a map of Cape Cod, (marked B, William J. Stone:) did you engrave that?

Answer. Yes.

9. Question. How long does it take, in your establishment, to engrave such a map?

Answer. About two months.

10. Question. What are the dimensions of that map?

Answer, Thirty inches by thirty-six inches.

11. Question. When were you summoned by the committee to attend and be examined?

Answer. I received Mr. Mallory's letter on Monday, the 30th May, and attended that morning.

12. Question. Was that the first intimation you received on the subject?

Answer. Yes.

13. Question. Have you had previously any conversation with any member of the committee on the subject of the examination?

Answer. Never, of any kind whatever.

14. Question. Had you any knowledge of the purpose for which you were summoned?

Answer. No.

15. Question. Did you, as requested by the committee, call on Mr. Hassler, and present the note of the chairman?

Answer. I did.

16. Question. What occurred?

Answer. The interview was so disagreeable, that I would rather not describe it, unless it be insisted on by the committee.

The chairman therefore propounded to the committee the following question: Shall Mr. Stone be required to state what occurred in his interview with Mr. Hassler? and it was determined in the affirmative—Mr. Mallory, Mr. Aycrigg, and Mr. Cushing, present, and voting.

The question being again propounded to Mr. Stone, he answered as follows:

I went to Mr. Hassler's office, and knocked at the door. A servant showed me into his room, and asked me to sit down, and in a minute or two Mr. Hassler came in. I then handed him Mr. Mallory's letter. Mr. H. read it, and immediately fell into a violent rage, and swore that I should not see the map, neither should the committee have it. After much rudeness and violent language, both towards the committee and me, Mr. Farley came in, and Mr. H. handed him the letter. After some further conversation, Lieutenant Page came in, and Mr. H. showed him the letter, and further conversation ensued. At length Mr. H. permitted me to examine the map, which I did; and on my departure, he handed me a letter for the chairman of the committee, which I delivered to Mr. Aycrigg. This letter is annexed, and marked C, F. Mallory.

17. Question. How long would it take to engrave such a map, and what would it cost?

Answer. It would require about a year, I think. There are eight plates, each of 22½ by 32½ inches, making 5,912 superficial inches, which, at 3 cents per inch, would be $177 36, for the *copper*; the engraving, the sum of $4,132. This estimate is given for the execution of the work in the best and most accurate manner, understanding that the parallels of latitude and longitude, with their subdivisions, are marked in by an officer of the survey, and the engraving is to exactly correspond with the same, which must ensure an accurate chart. I have made a liberal estimate, to enable the engraver to enter minutely into detail, and to do justice to himself and to the Government.

Remarks upon Mr. Stone's examination.

Answer to question 2. Is not the fact; Stone did not engrave it himself, another person did it, in his pay.

Answer to question 4. The time indicated for the work appears very doubtful, unless done coarsely.

Answer to question 5. Is entirely incorrect; Stone came with a map, (perhaps the one quoted,) wanting to show it to me, saying: it is not a fine work, but it will be a good solid work. I refused minding it, and directed him off with it; this was all the conversation, for I had then, as always, the same opinion of him.

Question 6, 7, 8, and 9. Are sufficiently refuted by Commander Gedney, and other facts.

Answer to question 10. The topographical drawing, as used in good style of maps in Europe, has never yet been done in this country. *I challenge positively* the exhibition of one. To make the coast survey maps in the same way as the sea charts, and the work shown under Stone's name, would be a positive disgrace to the work, and the state of the art and science in this country, thence it is not admissible for the work. Stone can only engrave cards, and such like, as I have a man in the weight and measure, works to mark the standards.

Answer to question 11. Mr. Stone is no judge of what is a liberal pay for good work, because, 1st, he never intends to pay work liberally; 2d, he is not able to distinguish between the qualification of the actual art of the topographical work.

Answer to question 12. Upon the getting copper, Mr. Stone's statement is not very close; the difficulty of getting copper ought rather to be referring to the *quality* and *and whence it comes originally from.* He knows as well as I: that he gets his plates from the importers of them, and that there are no other good large plates in the country; he hides this truth.

Answer to question 13. Whether examined or not examined, Stone cannot give a fair estimate of the work of the map of New York, when he was shown it, he could only measure it with a foot rule, and said, "we do not mind these mountains," that is, in other words, acknowledging incapacity for the work.

Stone's 2d interrogatory.

Answer to question 4. To ask a man, so ignorant in his pretended art, as Stone is, an opinion about other country's artists, can of course *not produce* an answer worth any thing.

Questions 6 and 7 are old exploded repetitions.

Answers to 8 and 9 will need certificate; beside, the work is bad.

Question 10. The size of the map is the smaller determining element; the quantity of fine work upon it is the principal criterion. Stone *cannot even have it done.*

Questions and answers 11, 12, 13, 14, 15, are evidently an agreed upon farce between Q. and A.

Answer to question 16. It is positively FALSE that I ever swore he should not see the map, or *touched* any thing *about the committee.* I received and treated him *in words*, as he knew that he deserved it of me; but to the committee I wrote frankly and open what I found, and still find, wrong in the transaction. I told him at the first, *you are not able* to put this map upon copper; he acknowledged instantly "*I know that very well.*" This, for him, unavoidable acknowledgement is the only fair part of this whole transaction of the attack upon me, which I, with full right, declared to ex-

ceed entirely the limits of propriety. The inimicality of Stone to me was well known to the members. I gave direction to show Stone into the upper room, where the map was, which he, in real undertaker's way, measured with a foot rule, in hope to have to order the coffin for it.

Answer to question 17. *Is completely incorrect* in every individual part. Stone is as little able to judge upon the case as to execute it; neither numbers nor statements are *true*.

F. R. HASSLER.

WASHINGTON CITY, *January*, 1843.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, May 17, 1842.

SIR: I have the honor to acknowledge your direction to report upon certain queries from the select committee on the coast survey. Of the queries on the paper A, the 4th is the only one applicable to the War Department.

The following is the list of army officers who have been employed in this duty:

Major John J. Abert, corps topographical engineers, in 1816.
Major John J. Abert, corps topographical engineers, in 1817.
Major John J. Abert, corps topographical engineers, in 1818.
Lieutenant W. G. McNeill, of the artillery, in 1818.
Lieutenant J. A. Adams, of the artillery, in 1818.
Lieutenant J. R. Vinton, of the artillery, in 1818.
Captain W. H. Swift, corps topographical engineers, in 1832, 1833, 1836, 1837, 1838, 1839, 1840, 1841, and 1842.

Major Abert and Captain Swift were, while so employed, also the disbursing agents of the Treasury Department.

It is not in my power to state either the "army pay and emoluments" or any "additional pay" which these officers received while on this duty, as the accounts in the case do not pass through this office. The Second Auditor will be able to furnish the information in reference to army pay and emoluments, and the First Auditor that in reference to additional pay.

The queries of the paper B are the following:

1st. Whether a part of the topographical corps of the army can be detached for the purpose of the coast survey.

Answer. This can undoubtedly be done; probably from four to six could be detached during the present season; and more, as the various surveys upon which the corps is now engaged are completed, if other duties are not in the mean time assigned to it.

2d. Whether the expense of the service of the coast survey will probably be reduced by detaching a part of the topographical corps.

Answer. There would certainly be a reduction, to the extent of the civil agents, and the amounts of compensations paid to them, who would have their places supplied by officers of the corps.

3d. Whether the expenses of the survey of the coast will probably be reduced by employing other persons than officers of the army and navy to perform the duties they are now employed to perform in the coast survey.

Answer. This is a question of compensations, supposing qualifications to

be equal in each. As officers of the army and navy draw their pay from the army and navy appropriations, it is clear, that, if some of these are employed in the coast survey, the appropriation for that survey will be relieved to the amount of their pay; and equally clear, that, if these officers are not so employed, but others in their places, these others must derive their compensations from the appropriation for the coast survey, and the appropriation be taxed to that extent.

Very respectfully, sir, your obedient servant,

J. J. ABERT,
Col. Corps Topographical Engineers.

Hon. J. C. SPENCER,
Secretary of War.

Remarks upon the letter of Colonel Abert.

The enumeration of the military officers is incomplete. I am obliged by it to enter into a historical statement, why the relation between the coast survey and the army is such as it is.

Two officers are omitted in the statement—*Lieut. A. D. Mackay* and *Lieut. J. V. Bomford.* The latter was present only in 1833. But, in relation to Mr. Mackay, I must state the fact which broke off the employment of military officers, except Captain Swift.

Lieut. Mackay had been, in 1832, with me in the first reconnoitering for the coast survey in Connecticut. He liked it, and I wished very much to retain him; but, during the winter, he was ordered off, to quell the insurrection of the laborers upon the Chesapeake and Ohio canal. When this duty had an end, I applied again for him. Speaking to that effect with the Secretary of War, I was directed to Major General McComb. When I entered his room with him, he pretty loudly said: "No sooner have I ordered an officer somewhere, that there comes a reclamation for another disposition. Can you not get other people to your work?" I answered: "Yes, sir; I can get plenty English, French, Poles, Swiss, &c." To this, he answered immediately: "Then take your d——d Poles, Swiss, Germans, &c., and let my officers alone." At this interview General Wool was present, who, it seemed to me, partook of my propensity to laugh upon the scene. Then I related the circumstance to Colonel Abert, who was rather displeased with the result of my application, as were also several other gentlemen in office.

Lieut. Mackay was ordered to Florida. I attempted again a written application for him, alleging, that any officer without the qualifications which Lieut. Mackay had, could do equally well the service in Florida; but he had left within the proper time of his order, and, on his voyage to Florida, *was drowned*, by the misfortune of the steamboat.

That, upon such a reception from the Commander General of the army, it would have been highly improper: to make any further application for officers, is *palpable.*

The work could not stop for that; and I got very soon opportunity to get able assistants from the civil rank, which, as my contract shows, were, *with most undoubted propriety*, considered as equally appropriated to be appointed to the work; so that very soon all the places in the coast survey were well and ably filled with men, engaged satisfactorily in it till to this day.

More persons than are now employed in the coast survey, it would be *improper to appoint* now, in any way whatever. To change those now employed, would be a great loss to the work in which they are now initiated, and which goes on very well and quietly with them; while introducing any new ones *now* would of course break up the unity in the work, delay and deteriorate it very materially, as it cannot be expected otherwise with new men. The *flagrant injustice* which would be done by such a mutation, would *unavoidably discredit* the employment in this work, as it would show a complete *disregard* to services rendered, to justice and merit in this work; and, in the consequent *disgust*, the officers new engaged would share as much as any other man.

This moment is peculiarly inadequate to make any change in the personal employed, or in any other part. *Results are asked* importunely, *overhastily;* and the men, who could alone help in their acceleration, to be dismissed for new ones, implies the *most direct contradiction.*

It must be observed, that the officers of the Topographical Bureau might be ever so well informed, in the different branches in which they served, still the coast survey work is very different from it. Instead of a work of experienced men, it would again be made a work of beginners. That this would be contrary to all economy, is too evident.

I may be allowed to observe, that the pay of officers and civilians in this case would be *about equal*, and, *to the nation, it is of course equal, whether the money comes out of one appropriation, or out of another.* The result obtained by it is the only important part; and the advantage in this respect lies evidently in the continuance of all the arrangements just as they now are, in the present momentaneous state of the work especially.

Therefore, there is not one consideration in favor of any change at this time, *while delay and danger, even of destruction, is evident in any alteration whatever.*

F. R. HASSLER.

WASHINGTON CITY, *January*, 1843.

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VI

SURVEY

OF THE

COAST OF THE UNITED STATES.

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SURVEY OF THE COAST OF THE UNITED STATES.

29

Further rectification of facts alleged in the discussion of Congress, in December, 1842.

1. To avoid the length which the repetition of the allegations would occasion, I shall only here state the facts in their *exact truth*, the comparison with the accounts given in the discussions, or retained from recollection, will be sufficient to find out to which allegations they refer as rectification. I follow the order of date omitting all personal references.

2. The mathematical principles upon which the survey is carried on, and the methods of observation, of my own invention, used, are the full proof of its accuracy, they have been stated as such by the men of the highest standing in that branch of mathematical and physical sciences.

3. It is due only to the accuracy in the principles of acting on land, that it is possible to make any discoveries under water, because this determines the place where the lead is thrown, which the simple sounding operation is incapable of indicating.

4. The make of the land decides how far the topography must go inland, to follow the windings of a creek or river costs much more time and work, therefore, also money, than the sweeping survey of the whole country in which they lie, and all the highlands, &c., that may be seen from the water in any way, must be presented by the chart to the aspect of all seamen.

5. The money spent under my direction in the coast survey, is just about half of what has been stated; that sum, quoted wrongfully, is much nearer to what the Navy spent between 1818–'28, without having any map whatsoever to shew for it—accounts would shew that, if called for.

6. The number of officers and other persons employed at any one time is far less than stated, those named by the Treasury Department's report, are all those ever employed for longer or shorter time in the work; their salaries have never been considered as overrated by the men of science knowing the work to be performed.

7. Arrogance is only when a man pretends to what he is not able, what a man knows, and is able to do, and the standing he has proved himself to fill satisfactorily, he has the right, and, as a man of truth, the duty to state without deserving the reproach of arrogance.

8. What may appear eccentricity to a man standing at a distance from a mass of information, may not be eccentric at all in reality, therefore, eccentricity is entirely only relative between the persons concerned.

9. The business of engraving stands as follows: the maps published in this country hitherto, were all without what is called topographical drawing, in the present conventional, generally accepted by the methods now used, are required to give a miniature likeness of the country, which is evidently not the case in neither the sea charts, nor in the maps of the States, in this country. Therefore, it became necessary, as I stated in proper time to the Treasury Department, that the seed to this part of engraving should be imported as yet. The engraving of real land maps divides itself in various

branches, the numbers, the outlines, the topographical drawings, the lettering, the views, &c., are all to be done by different hands, the work is divided by its kind, not by the plates. It must all be done in the very office in which the drawings and general execution of the maps is done, under the same direction; officers of this country who have visited, for instance, the Irish survey, will be able to give account of the mode of proceeding there.

Without such an organization, *all accuracy is lost, and the principal quality of the work is destroyed*, which of course is *wasting what has cost so much care, labor, and expense.* In this branch the establishment for the coast survey is as yet only begun, there are now four engravers, each in a different branch, at work upon six copper plates, each of them in his special line, two new imported, and two from Philadelphia, they progress of course more rapidly in proportion as they become more habituated and acquainted with the speciality of their work.

10. Of the procuring of the copper plates, the following is the true historical statement in full. The good quality of the copper for large map engraving is a very essential requisite, they ought to be able to bear the largest number of impressions possible, in that lies the main economy, as the expense of engraving is always very great, the more it is extended to a greater number of copies, the more the economy in it is obtained.

It is well known, that no copper mine has yet been found in this country that has encouraged its working. Therefore, copper had at any rate to be obtained from abroad. It is equally well known, that Hungary has the best and most abundant copper mines of different varieties; upon these grounds I consulted with the former Austrian Ambassador, Baron Marechal, and got from him a special recommendation to his friend General * * * * Chief of the Politechnic School in Vienna, to order and procure copper plates of the required dimensions, and of the best quality. The money part of the commission, and the forwarding being cared by Mr. Schwartz, the well known and amicably serviable Consul of the United States at Vienna.

The plates arrived in due time, before the engravers were even ordered or needed. However, when they were tried for use, they proved not good, notwithstanding no man can deny that precautions enough had been taken to procure the best quality. To satisfy the anxiety shewn for the beginning of engraving, I sent immediately the engraver to Philadelphia, where a copper plate planisher, Keim, made two plates, which were somewhat better, but such large plates are specially difficult to get of appropriate sufficiently good quality, it is not the same thing as making small plates for a likeness or such.

These plates were therefore, also not fully satisfactory, and it became necessary to procure real good plates from Paris direct, where my friend Mr. Beautems-Beaupré, Chief of the Bureau of Depot de la Marine, had the kindness to have some constructed for the coast survey, which have now been begun to be used. Thus after trying the nearest, and what had at first been considered the best, without the expected success, I succeeded by the third trial only, but now well.

11. The chart of Newark bay was given to engrave by Congress, before even any idea of engraving for the coast survey in general had been thought of, therefore the engraver from Hamburg now present, had not yet even been *thought of*; and the work was taken away from the office.

12. The letter of Mr. Mallory, requesting me to give the map of New York to Mr. Stone, *to examine* (please consult Johnson's dictionary for the

real meaning of this word) an operation which would require, of course, a good mathematician conversant with the principles and practice of the works of the *coast survey*; I felt very hard to be subjected to the *examination* of a man whom I know incompetent for that task. I even told him directly "you are not capable to put this map upon copper," he immediately answered "I know that very well."

THE MAP WAS HOWEVER SHEWN TO HIM IMMEDIATELY, in presence of several assistants, and he measured it with a two foot rule, as if to order the coffin for it of proper size. Those of my assistants who were present at the time, were as much displeased with the circumstance as myself, and I found it necessary to state on that occasion, a limit which I had hoped would not be stepped over; Stone himself felt that he had overstepped his limits.

13. My report of last 18th November, and the §9, above, shews the principle, upon which the engraving is to be carried on, if it shall not destroy the work itself, by *its inaccuracy*, for such work only there can be responsibility expected from the Coast Survey Office, for any *work done out of it and given out of it in any other way*, under whatever order it may be, it is *impossible to conceive the slightest responsibility on the part of the office, its chief, or any person in it.*

14. Many years ago, when I was in no way connected with the coast survey or the Government, I tried to join a map of the coast from Northern and Southern State maps, at the request of a friend, but at their junction no coincidence could be obtained; this was a transient subject of conversation only with Mr. Mallory, but in no way whatsoever connected with any thing relating to the coast survey; there was *no result possible to draw*, from the want of coincidence, which I found, thence *nothing could even have* been published; the idea of the work was abandoned by that friend.

15. Upon the principles of publication of such works as result from the survey of the coast, I have made mention in proper places, and the examples of other countries stand before the public. In all of them the main triangulation had been given by some *preceding scientific work, long before* any map was either thought of, or asked for. I, on the contrary, am requested to give maps before the main triangulation can possibly be finished; this inversion of the order, which *nature*, and *science*, *dictates*, can not otherwise but give to the work a turn, at the same time over laborious and often disappointed.

16. Individual harbors, bays, passes, &c., may be published, as have been delivered constantly, upon every call for them, but the connected map of the coast cannot be given before the chain of triangles, upon which it shall be grounded, is completed between two bases. To publish other specialities, or communicate scattered data from the work, would be giving it up to spoliation and ultimate disgrace. Any demand of that kind can be guided only by improper private interest, and is not to be gratified. It is for that purposely stipulated in my contract, that no results shall be given otherwise but upon call of the Government; under whom the whole mass of this work constitutes a *property of the whole nation*, in no way claimable by a single individual.

17. What relates to the new channel at the entrance of New York bay, has been communicated to several public offices in manuscript, preliminarily to the full publication of the map of New York, now engraving; the public usefulness of the channel is in full activity, it is buoyed out, so that no delay can be reproached in any way whatever.

18. The case for which a small steamboat is proposed, is not that which can apply to the coast survey, except perhaps in some individual cases for short times. There never have been twenty barges employed in the coast survey, as well known; to save $100,000 annually, out of an appropriation of just that amount, is a problem not yet soluble mathematically.

19. As the money transactions are not of my Department, I cannot be quoted as authority for what balance of appropriation may be on hand; I, myself, ask for this information in the Treasury Department, when I need to know it, for the purpose of regulating my plan of operation according to the means on hand. I never make any disbursements. That the work, and especially my personal party, is conducted with the strictest economy and, at less expense, than has ever been done in any other country, proportionally to the price and mode of living, in this country and in others, would certainly prove itself by any comparison of facts (not one spring-seat sofa will be found in any of the bills.)

20. My age dates from 6th October, 1770. It is with life or age, like with all other things, it lasts the longer and remains the longer effectif; the better it is used and husbanded.

21. It is a direct injustice to reproach to the officers issuing from the Military Academy of West Point, and from the Naval Schools, their not being competent to take the lead in a work which they are not instructed the very first principles of, nor provided with any means for. The thing *is impossible for them*, I must state my own experience. Immediately after President Jefferson had approved my plan of operation for the coast survey in 1807, from among the thirteen plans handed in, and examined, by the Commitee held in Philadelphia, he also decided the postponement of the execution of the work, on account of the warlike appearance of affairs with England.

At the same time the first Professorship of Mathematics and Natural Philosophy of West Point was vacant; Mr. Garnet, a private gentleman of New Brunswick, N. J., well known eminent Mathematician, and Col. Williams, chief of the Engineers and of the Military Academy, proposed me for that Professorship, which I occupied 1807,--'8,--'9, to such satisfaction as letters in my possession, and the opinion of students of those times may show.

I attempted to give to some (then new) Lieutenants just dismissed from the Academy, some practical information, in a direction leading to works of the nature in question. I even wrote upon it, but they found themselves entirely unprepared, I could do only little, and they soon left. During the time I was there, and one of my friends (who afterwards died in Arkansas) there was some teaching in this line of the science, which was ever since interrupted until, as I have just been told, it was again begun last year,—but it requires longer years of instruction and practice to acquire proper proficiency in that branch of science.

In 1808, I made a plan for the studies and organization of the Military Academy, which may still be found in the War Department. What they are not taught in the Academy, the students *cannot be expected to bring out of it*, their future practice alone can put them in the possibility of acquiring it, according to the special duties, they may be placed into, which is entirely a chance of circumstances.

The naval schools are well known to be only for practical seamanship, without sufficiently entering into higher branches of Mathematics, as are required for works similar to the coast survey. I made also for a Naval Academy a plan in 1832, which may perhaps be found in that Department, it is

well known that no change has taken place in this respect, therefore also the *Naval Officers are entirely innocent of the accusation lanced against them.*

22. When in 1834, a Bureau was proposed to direct the coast survey, a meeting of one half hour proved the inadequacy of it completely.

23. I was in London for the instruments from fall 1811, to fall 1815, under the disagreeable situation of an alien enemy, by the then war with England.

24. The State over whose territory the coast survey has the most extended, is New Jersey, therefore also in that State the most money of the coast survey expenditure has been disbursed.

25. I arrived in the United States in October, 1805, but had been in public business in Switzerland before, since 1786, though there engaged in the archives and as a member of Courts of Justice; always, however, applying to Mathematics and Natural Philosophy as subjects of predilection. In April, 1807, I entered my first appointment in this country at West Point, (as stated above.)

26. A suspension of the work of the survey now, would be attended with very great direct loss, as well in work as in objects on hand for its continuance; and principally because it would most likely not be possible to bring it up again within more than a man's age, as the interval lost between 1818 and 1832, may easily lead to conclude under existing circumstances.

27. It must be evident to any reflecting mind, that a scientific work changing hands, loses the advantages of the experience, and practical skill, acquired by the operators, and loses the character of a systematic work.

28. Since the resolution of 24th June, 1841, so much of my time has been taken up by polemic discuss, pressed upon me first from Congress, which has, of course, other disagreements in its consequence, that actually more than one year of my work was lost, which I would, with immensely more satisfaction, have applied to the forwarding of the interesting and valuable works which I have engaged for with the Government.

F. R. HASSLER.

WASHINGTON CITY, *January* 10, 1842.

COAST SURVEY OF THE UNITED STATES.

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1. In the last discussion upon the appropriations, it has pleased Mr. Aycrigg, and one more of the members of a committee of five representatives in Congress, to throw out the broad cast accusation, that I was mentally and physically incompetent to that task which I have now performed for ten years, with full approbation and even praise, on the part of the men of science of Europe, and of this country.

2. This statement was made not only without producing any proof, but also in full contradiction to abundant facts, and without producing the report which the committee is bound to make to Congress with the documents in support; namely, the examination of myself and assistants upon the Coast Survey, and my report asked by the very member upon my works for the establishment of uniform standards of weights and measures for the United States.

3. As it is impossible that an assembly of the representatives of a whole nation should possibly be guided by mere empty words without any proof, it appears not necessary to go into an actual refutation of an assertion, the nullity of which can be well dismissed, and will be proved by Congress calling for the examinations, &c., quoted under 2d. So much the rather, as luckily my well known state of mental and physical capacity cannot possibly depend upon the decision of a committee of Congress, and are now in full good state, as they have been observed by the gentlemen who have favored the Coast Survey Office with their visit.

4. I will, therefore, limit myself here to two statements made under the denomination of facts, but which are related in a manner completely different from what they actually are.

5. The wrong scale upon a map of Newark Bay, by Lieut. Com. Gedney. This fact stands thus:

6. When Lieut. Gedney was sounding Newark Bay, he communicated uncautiously, without any communication with me, and against the regular order of the work, a chart of his soundings, to some persons pressing him for it. When informed of it, I had to

call him to the regular order of the work, that nothing should be delivered unknown to me, and without orders previously obtained from the Treasury Department; this to get caused some delay, while local contending interests in Newark were impatient. This Mr. Aycrigg reproached to me, in the committee, that he had so long to ask for it. When the whole summer's work was brought in the bureau, Lieut. Gedney had a map made as desired, and more extensive, under his direction, wherein the fraction of the scale was mistaken, which map *was never exhibited to me until at the time of the committee*, when he complained to me *that such a great crime was made to him out of an accidental miswriting* of a fraction by one of his subaltern officers. I believe he then told me that the error was corrected; I properly remonstrated with him that this accusation was the reward for his hurrying a work with unreasonable impatience, and without any communication with me. Mr. Aycrigg, who takes up this subject as an accusation against me, is *completely aware of every particular*, as Lieut. Gedney explained it all to himself, he can therefore not be otherwise but perfectly aware that he does me a wilful injustice.

7. Mr. Aycrigg accuses me of having made, in a pamphlet of 200 pages, 400 errors, which I myself corrected. I had no idea that I should have to reveal to the public the errors of some learned men, by being forced into self-defence by a misapplication of the fact against the actual statement made on the face of it. I do it reluctantly, but as the full proof can be administered, I must give it as follows.

8. When the Coast Survey broke up in 1818, and after my return from the Northern Boundary Survey, I gave in 1820, under the title, "*Papers upon various subjects relating to the Survey of the Coast of the United States*," to the Philosophical Society of Philadelphia, the descriptions of the instruments, the method of operating and observing, which I had partly used, partly proposed to use, in that work. Old Dr. Patterson, then its president, the gentleman the most acquainted with the work and its various first plans, &c., proposed it as a great national work, and upon the report of a committee, it was the 30th March following, ordered to be printed. But the Philosophical Society being short of funds, the execution of the printing was delayed so long, that in 1822 the Philosophical Society of New York, where I then was, desiring to see a work, which they considered so honorable for the country, published, asked the manuscript from Philadelphia, but was refused it—see the opinion

of Professor Renwick of New York, in the Syllabus of his Lectures upon natural philosophy.

9. All at once, without the slightest notice given to me from Philadelphia, the volume of the Philosophical Society's Transactions, containing these papers, appeared in 1825; but with the sense in science so terribly distorted that I complained of it, and asked for my original manuscript, which I had requested to be preserved; and then found that Professor Patterson, now Director of the Mint in Philadelphia, and Mr. Nulty, a good theoretical mathematician, both members of the Philosophical Society, who had never been in, nor seen, or studied any particular part of mathematics bearing upon a work of that nature, had undertaken to correct (as they called it,) the language of my papers. Now, it is well known, that it is impossible for a man knowing nothing of a subject to write upon it with propriety of expression; thence, the most absurd errors crept into the printing. I was obliged, in self-defence, to print immediately corrections which rendered the mistakes less absurd, though they do not bring the expressions back to my original manuscript.

All the men of science acquainted with the subject of these papers acknowledge my language in manuscript proper, but not the one introduced in lieu of it in the printing, and all the subjects of the papers were highly approved, in German, French, and English publications equally.

10. The complaint against my language is new and is affected, merely arising from want of acquaintance with the subject. Already in 1806, people of good society in Philadelphia considered my language as very appropriate in expression. Mr. Jefferson called it very clear, one of the best public editors of this country declared it very precise and perspicuous. In England, and by Englishmen, it was always approved as expressing subjects very well, though it was not of the common street character. I was in that compared with an eminent lawyer of London, and I got at different times acknowledgments of a good and very clear expressive style of English. But I am not alone in having observed that in this country the English language actually varies from the English of England, and from one State to the other. As I wrote books in New York and in Virginia, I have had sufficient experience to see some of my expressions approved in the Southern States, and condemned in the Northern. But always the main difficulty was the unac-

quaintance with the subject upon which I wrote, and not the language in itself.

11. If there should be any part of the accusation of errors of print tried to refer to my Logarithmic and Trigonometric tables, published stereotype in New York, I must state as follows—they were in the first appearance considered as containing far less errors than commonly occur in first editions of such works. They were instantly all corrected, and an edition of 1000 was made for Admiral Krusenstern, chief of the Russian Naval Academy, as most appropriate, (who not long ago offered me to be recommended to the Emperor for a decoration.)

They were sufficiently approved in England, so that immediately an edition was published there, quoting its origin from me.

12. I have written a number of other books, which were well approved in Europe, and in this country, by the men acquainted with the science to which they relate; I rely upon that public, which is the only one that can be acknowledged competent, for the ultimate decision of the case.

F. R. HASSLER.

Philadelphia, 23*d Dec.* 1842.

R C

2 / VII

INVESTIGATION

UPON THE

SURVEY OF THE COAST

OF THE

UNITED STATES,

AND THE

CONSTRUCTION OF STANDARDS

OF

WEIGHT AND MEASURE,

BY A

SELECT COMMITTEE OF CONGRESS,

IN 1842.

PUBLISHED BY F. R. HASSLER.

1843.

United States Job Printing Office, Ledger Building, Phila.

WASHINGTON, JUNE 26, 1841.

Hon. CALEB CUSHING, Member of Congress.

SIR,—The many mistakes which are in your statements in Congress, relating to the Survey of the Coast of the United States, committed to my charge, occasion me to take the liberty to request of you, that you will please to visit the office, in the last house, right hand side of New Jersey Avenue upon Capitol Hill, as it must be disagreeable to you to labor under so many misapprehensions, or side influences, by which besides you might occasion irreparable mischief before the so desirable investigation has proved them as unfounded as they are.

For the investigation which you provoke, I thank you very much.

I enclose here, also, some of the last reports which may have escaped your notice. The previous documents are too voluminous and unfortunately much of a polemic nature, occasioned by similar unfounded attacks, which were overcome in 1836. A previous circumstance in 1818, similar to your call, which was successful, destroyed the work then, after only about one year's existence, caused the nation an expense of about half a million, for which not a map of the size of a hand is producible in the Navy Department, where the accounts testify to my statement. At that time, it was the naval chaplain, Felsh, who occasioned the damage, and the bill passed Congress without any inquiry, committee, or other discussion, and it was not until 1832, (not 1831) that the law for the renewal of the work could be passed, even with unfavorable limitations, the work beginning again 1833, notwithstanding the notice given by the then Secretary of the Navy, now Senator Southard, dates already in 1828.

Please to consider nothing of all this as personal to me, it is the good of the public, and your own credit, alone which I consult in addressing you; as for me, personally, I can only gain from that side by any investigation.

I have the honor to be, &c.

(Signed) F. R. HASSLER.

On motion of Mr. MALLORY,

Ordered, That the letter from the Secretary of the Treasury, laid before the House on the 3d January, transmitting a report of F. R. Hassler, Superintendent of the Coast Survey, showing the progress made in that work, and the report from the Secretary of the Treasury, laid before the House on the 31st January, 1842, in relation to the expenditures on account of the Survey of the Coast, be referred to a select committee. Mr. Mallory, Mr. Wise, Mr. Cushing, Mr. Ayerigg, and Mr. Holmes were appointed said committee.

Saturday, February 19, 1842.

Thursday, March 17, 1842.

Present, Mr. MALLORY, Mr. WISE, Mr. HOLMES, Mr. AYCRIGG.

Mr. Hassler appeared before the Committee, agreeably to the request of the Chairman, made by order of the Committee at former meeting.

EXAMINATION OF F. R. HASSLER.

1. Question by Mr. Mallory. Have you deviated in any way from the original plan adopted in 1807?

Answer. Not in the least.

2. Question by the same. Is not the work now conducted on a more extended plan than was originally intended, and does it not embrace objects not originally contemplated by the Government?

Answer. Not in the least.

3. Question by same. Is it intended that the present Coast Survey shall furnish the necessary data for the measurement of an arc of the meridian, or a parallel of latitude?

Answer. No.

4. Question by same. Is there any necessary connection between such measurement, and a hydrographic Survey of the Coast?

Answer. No.

5. Question by same. Could an arc of the meridian or parallel of latitude be measured with more facility, expedition and economy, if disconnected from all other objects?

Answer. Yes.

6. Question by Mr. Aycrigg. You refer in your Report (Document No. 28,) to a number of volumes in which the work is contained; is the work in those volumes reduced?

Answer. They are reduced.

7. Question by Mr. Mallory. Where are these papers kept?

Answer. In my office.

8. Question by same. Are they safe from fire?

Answer. Yes.

9. Question by same. Are there any duplicates of these papers?

Answer. Some; of the greater part.

10. Question by same. Of what paper are these duplicates?

Answer. Of all, except the last year's work.

11. Question by Mr. Aycrigg. Is the Government in possession of any of the data, or are they in your possession?

Answer. They are in the office—a house rented by the Treasury Department, and under the care of persons in the employment of Government.

12. Question by Mr. Mallory. Who do you mean, when you say, "persons in the employment of Government?"

Answer. Myself and my assistants.

13. Question by same. Suppose the house should be burnt and papers destroyed, would not Government sustain great loss?

Answer. Yes; but I conceive the house completely safe, proper measures being taken to guard against fire. The houses have been slated with this view.

14. Question by same. Have any other maps or charts been published besides those of New Haven, Newark and Bridgeport?

Answer. No other.

The hour of 12 having arrived, the Committee adjourned to meet on this day week.

Additions to the first examination of F. R. Hassler.

To questions 3, 4, and 5. Here is omitted what I said to Mr. Mallory upon the measurement of an arc of meridian, or such like, namely: I will do it, if you want. Upon which he retired smiling.

Questions 6, 7, 8, 9, 10, 11, 12, and 13, show evidently the desire to take the *results of the field works* immediately out of my hands, which would expose them to spoliation, as I know would be the case. I answered therefore simply, but could not otherwise but be displeased with the (for me evident) tendency of the questions. Besides, it must be observed, that such measures could lead to nothing but positive disappointment.

Question 14. This answer must be corrected by the list of maps handed in afterwards.

QUESTIONS AND ANSWERS.

Q. 1. Have any maps been prepared and completed so as to be ready for publication, other than the three published? And if so, what?

Ans. 1. A complete map of New York Harbor is engraving. 2. A partial map of the entrance of New York has been prepared and delivered to the Fifth Auditor for the Lighthouse Bureau. 3. One for the Thames River in Connecticut nearly ready for delivery, to an order of the Secretary. 4. One for the Topographical Bureau for the site of fortification of the entrance of New York harbor at Sandy Hook. 5. One of the north shore of Long Island Sound at New London, called for by the Secretary of the Treasury.

The four last named were prepared for the offices.

[Add. By my contract with the Government I am obliged to deliver nothing of the work, but to the Government or its order, with whom my contract is made. It is therefore through that medium that all publications, and whatever may have reference to them, are to be ordered, which are to be executed by me in this respect.]

Q. 2. Is either of the eight maps above named, so far correct and complete in itself as to be of any utility in and for the localities to which it applies?

Ans. To be sure. Each is complete and of use in itself.

[Add. But they must for that purpose, at the time of their application for publication or otherwise, be reduced to the scale which their application will require; like that is always the case, no map being published so as it is surveyed.]

Q. 3. Are these all on the same scale or otherwise?

Ans. They are not all on the same scale, but some larger and some smaller, according to the purpose for which they were respectively intended.

[Add. It is evident in principle that the maps of harbors must be, as well surveyed, as published, upon a much larger scale, than those of a mere running coast.]

Q. 4. Is there any objection to the publication of definite and successive parts of the work as they may be completed, such as the map of New York now in the engraver's hands?

ANS. No; not in the least, as soon as the engraving is finished.

[Add. It is necessary on the part of the government to take proper measures to give with the publication guarantee to the public for the authenticity of all that is published. (See answer to question 5, in my report of December, 1841.)]

Q. 5. Is it necessary to complete the survey of Delaware Bay before it can be practicable to publish a chart of Long Island Sound?

ANS. No.

[Add. But the publication of the Delaware is of much more pressing importance.]

Q. 6. Is there any objection to the publication of the work connected with the maps, as they are published?

ANS. No; it is proper to publish the data on which the chart is constructed, in order to verify its correctness, and as a guide for the use of it.

[Add. But this cannot be done until a full system of main triangulation between two base-lines is completed.]

Q. 7. Has the work of mensuration and triangulation connected with the maps of Bridgeport, New Haven and Newark, been published with them?

ANS. No.

[Add. Because this was not a requisite in the case, the points used were all only detail points; what may be proper to be quoted of mathematical data belongs to the general account of the work.]

Q. 8. Has any part of the mensuration of the survey, and of other scientific elements of the work, been published?

ANS. No.

[Add. My papers upon various subjects relating to the survey of the coast of the United States, in the Philosophical Transactions of Philadelphia, second volume, new series, 1825, which are in duplicate in the Library of Congress, give full account of these parts; what may become necessary to add after the present work, has to await its proper time.]

Remark.—The word mensuration is in all these articles used entirely against its sense in the science.

Q. 9. Has any systematically full part of the work between two base-lines and two astronomical stations been completed as yet

ANS. No; the locality of the coast hitherto surveyed has not permitted it.

[Add. Nor is it proper to be done but at an appropriated distance from the first base-line, and astronomical station, of some amount proportionate to the work which is to be grounded upon it.]

Q. 10. Where is your furthest eastwardly astronomical station on the coast?

Ans. Mount Carmel near New Haven.

Q. 11. Where is your next astronomical station proceeding southwestwardly?

Ans. Tashua near Bridgeport.

Q. 12. Where your next?

Ans. West Hills on Long Island.

[Add. There also a Solar Eclipse was observed.]

Q. 13. Where the next?

Ans. Buttermilk Hill, near Tarrytown, New York.

[Add. to 10, 11, 12, 13. These stations were not exclusively astronomical stations; the astronomical observations were intended more for preliminary determinations at the beginning to guide the work, and to take advantage of the presence of the assistants, who were all present, to introduce them, and to exercise them in this kind of observations. The main aim of these stations was the determination of main triangular points.]

Q. 14. Any others?

Ans. Yes. Weazel Mountain near Patterson, N. J., and some southwest of that.

[Add. Upon that station of Weazel Mountain, all the means for astronomical determinations and azimuths were united, and a regular system of those observations executed with its appropriated combinations, upon peculiar methods, which I made and prescribed, and which succeeded to satisfaction. The isolated observations of the preceding stations were of course reduced to this, by way of comparison.]

Q. 15. How many base-lines have been measured in the Survey?

Ans. Two in 1817 and one in 1834.

[Add. Those of 1817 were measured only preliminarily with the chain, still the verification proved very satisfactory, as the triangle results and the measurement differed less than 8 inches in about 5 miles. The base-line of 1834 was measured with the microscopic apparatus, and exactly as described in the papers of the Philosophical Transactions of 1825, quoted above.]

Q. 16. Between what points is the base-line, measured in 1834?

Ans. On the beach at Fire Island light-house, L. I., and the line measured is eight and three quarter miles in length, measuring eastwardly from the light-house.

[Add. From a point southeast of the light-house, towards the sea, upon the sand along the sea eastward. The points are marked by square hewn red sand-stone, of near 4 feet length, fixed solid in the ground. See my 3d Report of May 8, 1835.]

Q. 17. Where are the base-lines of 1817?

Ans. One in English Neighborhood, N. J., and the other at Gravesend Beach, L. I.

[Add. The end points of these are marked by hollow cones of stoneware.]

Q. 18. Has any use been made of the two last named base-lines in the work of the Survey?

Ans. Yes: for the beginning in 1833.

[Add. It was, of course, proper to take advantage of this element on hand, to start the work more rapidly in 1833, by using determinations grounded upon these bases, so much the rather as they had proved exact. The use made of them in 1817, appears in the schedula of the triangulation, which I handed into the Treasury Department in 1818.]

Q. 19. What objection is there to publishing the details and mathematical elements of the work as completed from Point Judith to New York Harbor?

Ans. The main triangulation has not been completed so far as Point Judith, but only the secondary. The main triangulation has been completed only between Friar's Head, opposite New Haven, and Mount Carmel in Connecticut, eastwardly, and Mount Holly, N. J., and Yard's, (Newton township, near Philadelphia,) southwestwardly. The secondary triangulation has been completed from Point Judith to Cape Henlopen on the Coast, and from New York across to the head of the Chesapeake.

[Add. The remark to 6, applies here most forcibly, and upon a larger scale. Such an account is to be given only when two bases are joined; I did it on a small scale in 1818, because I had, by way of precaution, measured two bases near each other, (see the reasons in my printed papers above quoted.) Now, in the renewed work, this must be done only when another large base-line is measured, by the same means and methods, as that on Fire Island Beach has been, and at a distance from that in proper proportion with the extent to which the Survey shall reach.*]

Q. 20. What reason is there for concealing from the public the elements of the work between Friar's Head and Mount Holly?

Ans. None.

[Add. to 20, 21, 22. For concealing. But it would be of no use whatsoever to any one, except copyists, who would, by abusing the public property in the work, degrade it, it would be, therefore, an expense not only useless but very detrimental; it will, besides, all appear in the account referred to in the addition to 19; in fact it would

* There is a *lapsus calami* in the statement of my answer.

be highly improper to do it before the publication of the more extensive system, of which it shall form a part in proper time. (There is, however, no concealment about it.)]

Q. 21. Has it been published?

Ans. No—it is not proper.

Q. 22. Why is it not proper?

Ans. Because, it will introduce imitations of the work to the detriment of its validity.*

Q. 23. Imitations by whom?

Ans. By common chart sellers or others.

[Add. It is the duty of the government to let no parceling out if possible, under penalty of seeing the government's own work ultimately discredited; such a desire cannot be fairly entertained.]

Q. 24. How is the Survey injured by individuals publishing charts, copied from those of the Survey?

Ans. Because the maps would not be official.

[Add. This quality of being official is absolutely required to give confidence to the public, therefore security to the navigation, (see question 5, in my Report of December last.)]

Q. 25. Would not the publication of the data with the maps, enable scientific men to judge of the accuracy of the work?

Ans. Of course.

[Add. When the account of the modes and of the means to their execution will be joined to them; which can be done only after a certain full system between two main bases can be presented to the public.]

Q. 26. Would not the withholding the data until the completion of the Survey enable the operator to force results?

Ans. No—in the manner in which the work is carried on it cannot be.

[Add. Unless flagrant falsification, which men of science would discover immediately in the account rendered of the work; but in the maps alone there lies no such verification; therefore, also, they are not admitted as any proof of the work, notwithstanding that in common habit, *in the offices here,* this is not regarded, nor any account of the mode of operating is asked.

Q. 27. Can scientific men judge of the accuracy of the work, unless the mathematical elements of it be published?

Ans. No.

[Add. Just, therefore, the hasty publication of an unfinished work has no value.]

* There seems to be an error in copying.

Q. 28. Have the mathematical elements of the charts of Bridgeport, New Haven and Newark, been published?

Ans. No.—That will come into the general account.

[Add. Like stated upon question 7, which is in fact the same.]

Q. 29. When do you propose to publish such a general account?

Ans. So soon as I shall have reached the verification base on the Chesapeake.

[Add. Where I expect to find a proper locality to measure one, probably upon what is called the Eastern-shore.]

Q. 30. When do you expect to reach that point?

Ans. In a few years.

[Add. Unless circumstances should decide to accelerate still more, on the ground of finding better locality, therefore larger triangles, which would be more advantageous to join northerly from there the points now reached from the north.]

Q. 31. When do you expect to complete the Delaware?

Ans. If I can get out in season, by the end of the year.

Q. 32. What prevents your getting out in season?

Ans. The want of money—nearly all the appropriation having been expended.

[Add. to 31, 32. The secondary, plane-table, and naval parties are now (25th May,) all out; how long I shall be detained *by the circumstances,* I cannot know, as it does not depend on me.]

Q. 33. Does the work on the Weights and Measures occupy any of your time, which might be appropriated to the Survey?

Ans. No.—It does not take any of my time.

[Add. That is, no more than is fully compensated by the advantages which it gives in the office part of the work, and the keeping in order of the instruments of the Coast Survey, which is of daily occurrence, in which my task is very much eased by it.]

Q. 34. How much of your time is wanted personally to the coast survey?

Ans. All the time, except the inspection and reporting on the Weights and Measures.

[Add. Without the constant attendance to my works, at any hours that can be used for them, my task would be positively inexecutable. This is evident by the state of the establishment and the works produced.]

Q. 35. How much time does it take to inspect and report upon the Weights and Measures?

Ans. About half an hour in the morning and half an hour in the afternoon of the day—but not of each day. This is only while I am in the office. I am generally in the field from the middle of May

to that of December. Sometimes I am in the field to the end of December.

[Add. That extra works and varieties occur in all works is too well known, to expect that every day shall be equal to every other day. My easiest part is the field work.]

Q. 36. At what time in the spring do the different corps start on their duties?

Ans. Generally in April, remaining until the middle or end of November.

[Add. The field work is more agreeable, in the favorable season, than the office work; they are always anxious to get out as soon as they can.]

Q. 37. Did you lose part of a year last year, and if so, why?

Ans. I lost the aim of last year's work, in order to answer the resolution of the House of Representatives on the Coast Survey, of January 24th, 1841, and by the fever which seized me in October.

Q. 38. At what time did you take the field last year, and how much of your time did the resolution occupy?

Ans. I did not take the field until the middle of September. The resolution occupied me three or four weeks. I was also detained to make a report on Weights and Measures.

[Add. 37, 38. These are sufficiently explained as for the fact, but it must be added here, that the speaking disreputably and inimically against the Coast Survey work in Congress, occasions ignorant men in the country, who read these things, to lay impediments in the way of the work, and to ill treat us, which is a great loss to the work and its economy.]

Q. 39. Is the work in the office now in such a state of forwardness as not to interfere with the commencement of the field work this year, so soon as the season will permit the work to go out?

Ans. Not in the least.

[Add. Namely, *interfere*. It is well known that the accidental circumstance of the exhaustion of the old appropriation, and the delay of the new one, have kept all back to the end of May, in 1842, and that I remained even after that. I advanced money to assistants to enable them to go out, only $350; but if the attacks had not been made upon me, as well known, I would have prevented all stoppage, as I did three times in the beginning of the work; but, under existing circumstances, it was not proper for me to advance my credit, as I did in those cases, and also before in London.]

Q. 40. Why is not the main triangulation up with the secondary?

Ans. On account of the difficulties of finding suitable elevations on both sides of the Delaware.

Q. 41. Who conducts the main triangulation?

Ans. I, myself, according to positive stipulations.

Q. 42. Why is not the main triangulation carried as far eastward as the secondary?

Ans. Because it was not needed.

[Add. to 40, 41, 42. The main triangulation determining large distances with greater accuracy than the secondary triangulation, it serves as element and ground-work for the latter, which, in consequence of the accuracy of these elements, can proceed outside of the limits of the main triangulation for a certain distance, without losing sensibly in accuracy, but this has its determined limits; the main triangulation has always kept near enough to the other part of the work, not to expose it to any loss of accuracy, detrimental to the use made of the secondary triangulation.]

Q. 43. When will it be needed?

Ans. So soon as the junction is made with the base-line on the Chesapeake.

[Add. This namely means, that in this place and time, both triangulations must come up together, and then the field of operation is open in all directions.]

Q. 44. When that junction is made, do you propose to suspend the work south, and go back east, or to have two parties?

Ans. When the junction is made, while the secondary triangulation goes on south, I shall continue the primary triangulation east.

Q. 45. Cannot the main triangulation be carried on, except under your immediate personal supervision?

Ans. Not in the present state of things.

Q. 46. Why not?

Ans. *Because there is nobody to do it, and the circumstances are* contrary.

Q. 47. Is there nobody else attached to the Survey who can do it?

Ans. Not now.

Q. 48. What are the contrary circumstances spoken of?

Ans. Want of money; that is of a larger appropriation.

Q. 49. Must the main triangulation be suspended eastward, until you can take it up personally?

Ans. In the present state of things, yes.

[Add. to 44 to 49, inclusive. I should desire very much, that by the time the work is in that state, more extensive means might present themselves appropriated to the exigency of the case that may then be; but to say any thing about it would be of no avail, and premature.]

Q. 50. In what portion of the field work have you been personally employed the last year?

Ans. At Yard's, behind Philadelphia.

Q. 51. Where the year before?

Ans. Willowgrove and Mount Holly.

[Add. to 50, 51. It must be remarked upon these articles, that the putting me in jail at Mount Holly, by a warrant of Judge Dayton, of Trenton, given upon the oath of a *clergyman* of the name of Brown, who swore his damage was over $200, because I had refused to pay at first presentation, instantly, a bill presented to me by a so-called Judge Haywood, for $25 damages, because I found it overrated, and asked an impartial estimate to legitimate me to direct the payment to be made, (the accounting officer being absent,) that such a circumstance, I say, I considered as neither *decent* nor agreeable; such acts go to the direct overthrow of the work; the court concern following it cost both sides useless, but I had to stand the disagreement, and the Treasury Department had to defend the suit, which awarded the *reverend* Mr. Brown, with difficulty, as a highest extreme the $25 claimed, most of the jury voting first for 10, 15, or $20, instead of the hundreds which he had *sworn to.* It was necessary to stand this legal transaction in self-defence; the documents upon it can be exhibited.

At Yard's, the same impudence is now repeated; damages asked of more than double the value, and impudent letters written upon it, &c. Such things not only cost money, but have a tendency to give apprehensions upon the safety of our station points and signals, to the great annoyance of the work.]

Q. 52. Where do you propose to employ yourself on the field work the present year?

Ans. South of Yard's and of Mount Holly, on both sides of the Delaware.

We have been obliged to make a special agreement with the owner of the land of the station next after Yard's, to avoid difficulties, if possible, by a contract for the use of the land for three years.

Q. 53. What is the precise duty or part of the work performed by you at Yard's, and at Mount Holly?

Ans. Measuring the angles of the main triangulation.

Q. 54. How many assistants were there in the party in which you operated last year?

Ans. None.—I did the work alone. That is, I did the mathematical work alone.

[Add. to 53, 54. I have habitually only one of the persons engag-

ed in the work at lower wages than an assistant, to write the angles, not to take an assistant at higher wages away from a more important work. In this peculiar instance at Yard's, a friend was a great part of the time with me, who was capable to assist me, as I was sick, and in signalizing to ascertain visibility of distant stations, being acquainted with the country.]

Q. 55. *Is there any person in the Coast Survey, competent to take charge of, and continue the work, if you should cease to do it?*]

Ans. Not as yet.

Q. 56. Do you mean to be understood, that without your personal superintendence the work must cease, and that no man can take it up, continue and complete it?

Ans. Not honorably.

Add. to 55, 56. It is very natural that in this, like in every other subject of science, or knowledge, the acquirements and improvements are gradual, they develop themselves as the occasion for them is given, and with a considerable and proportional consumption of time. So much so, that even in Europe this branch of science is not so much spread, as it is pretended to be already in this country, where it has never yet been employed at all; for the detached small surveys, made so abundantly, do not come at all in comparison, nor under the principles of science, which is absolutely required for such an extensive work as the Coast Survey, especially in the form and in the locality of the earth in which it lies.]

Q. 57. *Is there any profound secret in the measuration of triangles, and the making of astronomical observations known to you alone of all mankind?*

Ans. Science is a public thing, but it requires study to be perfect in it.

[Add. These are not the exact words of my answer. I answered, with measured reflection, "*Science* is no secret, but it requires a great deal *of study to acquire it.*"]

Q. 58. Is there any person in the Survey who is pursuing such a line of observation and study, as to be in the way of learning to measure triangles, and take observations hereafter in your stead?

Ans. I give them all instruction which they will accept.

[Add. The accusation of secret, started against me, is *most unfounded,* as my assistants will certainly aver.]

Q. 59. Does no one in the survey but you measure triangles or take observations?

Ans. Every one of the principal assistants takes the secondary triangles.

Q. 60. What difference is there in the mathematical elements of primary and of secondary triangles?

Ans. The larger triangles *require more attention to the figure of* the earth, and *to the mathematical elements arising from it.*

Q. 61. Does geodesy apply to the main triangulation and not to the secondary?

Ans. More especially, but not exclusively.

[Add. to 59, 60, 61. To explain nearer these three answers would require a theoretical and practical treatise upon the subject, which would be too long, and not appropriate here.]

Q. 62. How long will it take to finish the work along the whole coast of the United States, going on *at the rate of time* and appropriation heretofore used?

Ans. That *nobody can say, in* either one way or another.

[Add. It would be presumptuous in any man to name a certain determined time, none would undertake it unless he had the accessory *intention to mislead.* (See my answer to question 13 of the resolution of the last Congress session.) Steady assiduity, and well guided exertions, will bring it forward, as fast as the nature of the work and the localities of the country will admit, and more can neither be expected *nor obtained,* by no means whatsoever; mathematical principles and nature cannot be bargained *with.*]

Q. 63. *What is the whole extent of the general coast from* Passamaquoddy to the Sabine, not including rivers?

Ans. I cannot tell.

[Add. It is evident that the length is no determining element of the work, because the nature of the coast and its indentures, &c. form the determining element, as stated repeatedly.]

Q. 64. What proportion of the entire coast of the United States has thus far been surveyed?

Ans. I cannot say.

[Add. This would evidently have to be *measured by the principles stated in the preceding answer, and therefere can* afford but a very vague *scale of comparison*; what I have said upon that in my report of last December, gives the data that can be given to a man knowing both the science and the country.]

Q. 65. You have said that the latitude and longitude of Cape Hatteras was erroneous in the charts: How did you ascertain it?

Ans. By having attempted to make a union of the northern and southern maps, which join at that place, in 1828.

[Add. This is an individual experience of mine; no doubt the determinations, charts, maps, &c. will vary *among* one another.]

Q. 66. *How long before the survey* will reach Cape Hatteras?

Ans. It is impossible to say; it is too vague a guess.

Q. 67. Have you any personal knowledge of the localities of the Southern Coast?

ANS. I have never been any further south than Norfolk.

Q. 68. You have said that it was difficult to find suitable elevations on both sides of the Delaware; which cause prevented the main triangulation from keeping up with the secondary? (No. 40.) How do you propose to obviate similar difficulties on the flat coasts of the South?

ANS. By care and assiduity, and by the methods used on the Jersey sea-coast.

Q. 69. Is that work on the Jersey sea-coast a primary or a secondary triangulation?

ANS. It is a secondary triangulation.

Q. 70. What is the peculiarity of the methods used on the Jersey sea-coast where there is a deficiency of actual elevations?

ANS. By adapting the triangulations to any locality which may be found favorable.

Q. 71. You did not specify any of the means you propose to recur to at the South in the absence of actual elevations: Do you decline to state what they are?

ANS. No.

[Add. I decline no answer upon any questions.

Q. 72. What are they?

ANS. By mixed astronomical and geodetical observations.

Q. 73. Why were not such means used to overcome the impediments to the completion of the main triangulation on the Delaware?

ANS. Because they would not apply with propriety. There are better means.

Q. 74. What are those better means?

ANS. By meeting those localities by triangulations from the south side of the locality.

[Add. to 68, 69, 70, 71, 72, 73, 74. These questions go evidently into details of the practical application of the mathematical principles to certain localities, which can be discussed only with the map of these localities before the eye.]

Q. 75. You say that the peculiar methods by which you propose to overcome the difficulties on the southern coast are mixed astronomical and geodetical operations. Are not such the general means used everywhere in the survey?

ANS. The means of both are different in the two cases.

N. B. Here is to be inserted the separate paper, which I handed in for further explanation.

Q. 76. What is the object of the second base-line?

ANS. The verification of the whole work, which is the system of all such works.

[Add. The second base forms as much an indispensable part of a survey of large extent as the first base; this is a principle in the science, well known by all accounts of large surveys.]

Q. 77. If the object is to verify the survey, and suppose it does not agree, what is the consequence?

Ans. That the error, if any, is to be investigated.

[Add. I had added and corrected. This could, however, not be the case for any great amount in a well conducted work, and a well conditioned series of large triangles. There are other data and results to be obtained and considered in such a completed system of a work, which are well known to be deduced from it by the science, but which to treat here would require an elementary theoretical and practical deduction entirely out of place.

Q. 78. It is stated in one of your reports that the survey extends over 11,000 square miles: Is that mapped?

Ans. Yes, to be sure.

Q. 79. What benefits result to navigation by having all the details of the topography of the country?

Ans. There is no more topography in the maps than what is necessary for that object.

Q. 80. Cannot a portion of the topography be dispensed with without detriment to the object of a knowledge of the coast for navigation?

Ans. *Not to that extent to which it is carried now. I could not* dispense with any of the topography as it is now done.

Q. 81. Do not the hydrographical parties have to wait for those engaged on the topography?

Ans. They cannot go six inches without it; but they do not wait: the topographical part has always been ahead.

Q. 82. What distance from the coast have you carried the soundings?

Ans. Until they were out of sight of land; I mean the points given to them as guide; those points are made to be seen as far as possible. We elevated signals thirty feet or more.

[Add. to 78, 79, 80, 81, 82. These questions could be discussed long without leading to any actual practical effect. They are treated under the general denomination of the question of "Limitation," asked to be introduced in the work, in the paper already handed in.]

Q. 82. *The Committee wish you to state the time each year since* the recommencement of the work in 1832, at which you have taken the field, and also the time each party has commenced its work. Also the whole number of months occupied by yourself in working the main triangulation.

Ans. [Add. As I keep a regular journal every day, since 1811, when I left Schenectady for London, for all the time that I am in public employment, I can give exact account of every event of any moment; here follows therefore the *extract from the journals* referring to this question. My work in the office has always been the most arduous and laborious task, as well in the combination of the scientific methods, devising the means, the calculations, and all the manifold parts of the administration or direction of the work. Any man of science in this practical line will see that easily.]

Q. 83. You have sounded from Point Judith to Egg Harbor, along the coast. Have those soundings been extended as far out as you intend?

Ans. They are complete for the detailed maps, but they have not been carried out so far as I intend.

Q. 84. How much farther do you intend to carry the soundings?

Ans. To the Gulf Stream.

Q. 85. What will be the probable time required to extend the soundings, with the same force now employed, so far as you intend?

Ans. As this kind of work is to be done by astronomical observations, it depends entirely on the weather.

Q. 86. Where are the astronomical observations to be made?

Ans. Of course on board the ship, or sounding vessel, according to special instructions given to Lieut. Gedney last summer.

Q. 87. (By Mr. Wise.) For the present, is it necessary in order to carry the survey South, to extend the soundings to the Gulf Stream? And ultimately will the survey of the coast not be complete without extending the soundings to the Gulf Stream?

Ans. No, to the first clause of the question. As to the second clause, I answer, that the survey is in that respect ad libitum.

Q. 88. (By Mr. Wise.) By your answer to the second clause, am I to understand you as saying that the Government may carry the Survey as far out in the ocean as it chooses, but that the survey as far as it goes wherever it stops will be completed?

Ans. Yes.

Q. 89. (By Mr. Mallory.) Do you propose this or the next year to carry on these Gulf Stream soundings, by employing any of your present force?

Ans. Whenever any fit vessel is disposable, without otherwise impeding the work.

Q. 90. (By Mr. Mallory.) Is it probable that any such vessel will be disposable for that purpose during this or the next year?

Ans. It is likely, but it depends on the weather.

[Add. to 91. There is some miswriting to some of my answers to these questions.

Here I insert, as explanation, my instructions given to Captain Gedney, in 1841 and 1842.

It is evident to every man acquainted with the Coast and its approaches, that the district described in these instructions, forms the offings of the two ports of New York and the Delaware Bay; the brig Washington is considered a vessel well adapted for this work: she is in good order for it.

Q. 91 Of how many points in the United States have the latitudes and longitudes been ascertained and verified in the course of the Survey?

Ans. The calculation of the triangles in my work, gives in ultimate result the latitude and longitude of each point of the triangles, primary and secondary, according to my special form of the work.

N. B. The end of my answer should stand thus: "According to my special *formula for* the work." There are other miswritings in the question and answer.

Q. 92. Of the points of latitude and longitude thus determined, how many have been made public?

Ans. None; because it is not yet the proper time.

Q. 93. Have you determined the latitude and longitude of any points on the Coast? and if any, how many and what?

Ans. I have ascertained the latitude and longitude of points on the Coast as well as inland, according as the triangle points fell.

[Add. These answers I consider sufficient, as any detail discussions could not lead to any useful result. There are slight misunderstandings in the writing, which are of no moment, as for instance, in 93, *ascertained* is not my, nor a proper, expression.

Q. 94. Why have not the important points on the Coast thus determined, been made public?

Ans. The time of the publication is, when the general account of the triangulation is given, before which it will be of no use.

Q. 95. Did the French, in the triangulation of their country, use mixed geodetical and astronomical observations?

Ans. Not in the form in which I have stated in the first part of my written explanation.

Q. 96. Do you regard the Survey as a great scientific enterprize, embracing delicate problems of geodetic research, beyond what is necessary to an accurate but rapid Survey of the Coast for nautical purposes?

Ans. There is not a single movement in all I do, which is not necessary for the honorable and faithful execution of the work.

Q. 97. (By Mr. Mallory.) Is it intended as the basis of a topographical, military, and statistical Survey of the whole United States?

Ans. That is the government's business, and not mine.

Q. 98. Is the Survey conducted now with a view to any such ultimate purpose?

Ans. That is not given in my charge by the government, therefore I do nothing with it.

[Add. to 94 to 98. These answers I consider as self-evident, and entirely of the domain of the science in one respect, and of the decision of the government in another. I have said upon it what was to be said by me, in its proper place in my Report of last December. If the work is not carried on with all the means that science dictates for its execution, it is *worse than useless and discreditable.* I considered myself always bound to such a course as I have hitherto pursued, and have found myself always approved in this view, by the men *best able to judge*, and by those *in the proper stations to decide upon it.*]

Q. 99. Was not the secondary triangulation along the Jersey shore, found to be sufficiently accurate?

Ans. Yes.

[Add. So far as is expected from small secondary triangles. But, according to good principles, it must still be *joined* in its middle, by triangles across the country from the main triangulation inland; this is an indispensable mathematical requisite.]

Q. 100. Was not the main triangulation through New Jersey made with a view to the topographical Survey of that State?

Ans. No.

[Add. It is well known, by my very first plans of operation for the work, that this was the only true course for the main triangulation.]

Q. 101. Cannot the Survey of the bays and rivers be postponed, without injury to the general work, till the Survey of the Coast proper is completed?

Ans. It is impossible, because no accuracy could be got for the Coast.

[Add. It is self-evident to any practical mathematician, and answered in a former question.]

Q. 102. How many plates are now in the hands of the engravers?

Ans. Of actual copperplates, two.

Q. 103. Do they contain the whole map you are now getting ready for publication?

Ans. No: the Map of New York Harbor will cover eight such plates.

Q. 104. Why are not more preparing for publication?

Ans. They are in work; in a few days we can cut off a few more.

[Add. to 102—104. Are sufficiently explained. I may only add

now, 25th May, that a third engraver has just arrived from Philadelphia.]

Q. 105. How many engravers have you in employ?

Ans. Two; I would have if I had the money.

[Add. There is evidently an omission of some words in the statement of my answer.]

Q. 106. How long have those two been employed; and at what salary?

Ans. Since last January or December; one at $1800, and the other at $1300 per annum.

[Add. This time includes in part the time used in the preparatory arrangements.]

Q. 107. Where did you procure the copper for the above engraving, and where the engravers?

Ans. The copperplates now used were procured from Keim, in Philadelphia. The engravers from Hamburg, because they were the best, and best recommended.

Q. 108. Cannot American engravers put on copper all map engraving which has been put on paper?

Ans. No.

[Add. It is *well known* that the finer style of topography is not in practice yet in this country; my duty required that this part of the execution of the work should be of best quality, to answer honorably the aim of the work in its final appearance in the public; therefore, I procured, with authorization of the Treasury Department, two men known in Europe already in this line, from the quarter in best renown for the appropriated style of those works, which will guide the style of the work also with the engravers to be engaged hereafter.]

Q. 109. What is the ordinary amount of error in transferring from paper to copper?

Ans. In the way in which I do it, there shall be none.

[Add. The habitual way in common use is very bad. To preserve the accuracy obtained by the work of the Survey, the main points, which guide the positions, are brought upon the copper by the same assistant who makes the drawing of the map, which secures the accuracy. For the same reason, also, the engraving and the printing must be made in the office itself, where it is done much more economically, under proper inspection, and not dilapidated.]

Q. 110. Have the grossest errors in the position of places, stated in one of your reports to have been ascertained by you during the Survey, been pointed out by you for public information?

Ans. They have not yet been made public, but will be when the works relating to these places are published.

[Add. Whenever an interest was manifested for any part of the work, for improvements or otherwise, the extracts of the works desired were given, under the authorization of the Treasury Department, under whose decision all *communications* or publications are to be made *according to my agreement.*]

Q. 111. Are the measures in the Survey taken in French metres? If so, why?

Ans. Yes; because it is the only absolute standard; but the results are given in yards and metres both.

Q. 112. In what parts of yards?

Ans. In decimal parts only.

[Add. The principles of my action, in this respect, are fully exposed already in my printed papers upon the Coast Survey, quoted before. The reduction to any other measure consists only in the addition of a constant logarithm; as for instance, that for the yards, and even for the miles, is given in my printed logarithmic and trigonometric tables. As all the scales of the maps are expressed by their fractional value, the distances upon the maps can be ascertained in any measure whatsoever, and by that means are really given in any measure whatsoever, which is widely different from the *bad method*, so many miles to the inch, which has no regular comparable proportion.

Q. 113. What reason is there why all the *data* must remain in your office?

Ans. Because they are in daily use there.

Q. 114. Have you any reason to believe that the Surveys made by Captains Gedney, Wilks and Glynn, are not sufficiently accurate for the purpose of navigation?

Ans. I know nothing in regard to them.

[Add. to 113, 114. These answers are sufficient.]

Q. 115. Did the British officers survey the North Sea after the same manner that you are now surveying the Coast of the United States?

Ans. I am entirely unacquainted with what they did: there is nothing of it published.

[Add. As far as known to me, at least, in respect to the scientific account of the work; as there is nothing of it in the publication of the English survey.]

Q. 116. You stated in your printed Report, that you had accomplished now in a shorter time, and at less expense, more than had

been done in any other work of a similar kind. With what works do you make this comparison?

Ans. The English general Survey of England, Ireland and Scotland; the French survey of the inland and coast of France.

Q. 117. How many hours per day do your subordinate parties work in the field in favorable weather?

Ans. As many as possible.

Q. 118. Are there any data to ascertain how many hours?

Ans. They keep an account and will answer as to this.

[Add. The hours of work are immaterial to mention, as they all work with really liberal exertions for the best advantage and promotion of the work, even with regard to economy. A well organized work produces much result, without appearing laborious.]

Q. 119. Does this Survey employ the whole extent of your mathematical knowledge?

Ans. No.

[Add. My work in establishing the uniformity of Standards of Weights and Measures in this country, with more accuracy (I can safely pretend,) than other countries have it, are public documents which speak upon that. My various books printed upon the elementary parts of mathematics, upon astronomy, tables, &c., might be looked at in the Congress Library, and if desired, I will show the manuscripts of other works not yet published. However my situation in early life had caused me to apply to diplomacy and jurisprudence, and I occupied offices of high trust in these branches to full satisfaction, as my papers may prove, my first entering into public life dating now *over fifty-six years ago,* I must be excused to enter here in extraneous details, because I recollect very well, Mr. Mallory's question was general, *whether I knew something more than only the Coast Survey,* without the limitation to mathematical.]

Q. 120. Do you think, that under the most favorable circumstances, and with continuance of a yearly appropriation of $100,000, the Survey of the Coast can be completed in twenty years?

Ans. Perhaps. The progress is slower at first; and the means increase as the work proceeds.

[Add. But the constant persecution to which the work has been exposed, and especially *now is,* impedes its progress very much; there is a damage now incurred by the propositions of the last Congress session, and the present investigations, which have been occasioned by it, of positively upwards of $50,000 in delay of the work and accessories; besides, the discouragement occasioned by it in all those persons, who are engaged in the work, by their seeing

their liberal exertions rewarded by *throwing out suspicions* against them; these occasion a still greater damage.]

The discredit thrown out in the public, uncautiously, occasions impediments with the people in the country, with whom we come in contact; they consider themselves equally authorized to ill-treat us, which makes the work difficult, and increases the expenses beyond reason to no good purpose, and subjects to uncertainty.

HOUSE OF REPRESENTATIVES,
COMMITTEE-ROOM OF COMMERCE,
MARCH 12, 1842.

SIR,—I am directed by the Select Committee on the Coast Survey, to request you to hold yourself in readiness to attend a summons from the Committee for the purpose of explaining the condition of that work.

They will meet this morning in the Committee-room of Commerce, at 10, A. M., and may have occasion for your presence, if so, they will send a message.

Respectfully, your obedt. servt.,

(Signed) F. MALLORY, Chairman.

To F. R. HASSLER,
Supt. Coast Survey, Capitol Hill.

HOUSE OF REPRESENTATIVES,
COMMITTEE-ROOM OF COMMERCE,
MARCH 17, 1842.

SIR,—The Select Committee on the Coast Survey are now in session, and request your attendance this morning.

Respecttully, your obdt. servt.,

(Signed) F. MALLORY, Chairman.

F. R HASSLER, Esq.
Washington City.

WASHINGTON CITY, MARCH 31, 1842.

To the Honorable FRANCIS MALLORY, Chairman of the Committee of Investigation upon the Survey of the Coast.

GENTLEMEN—Allow me to take the liberty to request, that you allow me, in any form you may find proper, to get a full authentic copy of all the interrogatories, questions and answers, which have been the result of my examination.

If you will allow it, I might then yet add separately explanations, or further information, which in the haste of the process of proceedings may have remained unclear.

I have the honor to be, respectfully,
Gentlemen, your obedient servant,

F. R. HASSLER.

(COPY.)

SIR,—The Committee on the Coast Survey have requested Mr. St. E. Stone, to examine the manuscript Maps of the Harbor of New York, now in your office.

(Signed) F. MALLORY, Chairman.

F. R. HASSLER, ESQ.,
Supt. Coast Survey.

House of Representatives, May 30, 1842.

Honorable FRANCIS MALLORY, Chairman of the Committee on the Coast Survey.

SIR,—The unprovoked *insult* offered to me by sending the engraver Stone to me, to inspect the work of the Coast Survey in the Map of New York, is too much as well for the powers of the Committee, as for the feelings of an honest man.

You know, that the maps of the Coast Survey cannot be engraved, but in the office under my own inspection. You know that the map in question, is already cut up in plates, two of which are under the engraver's hands, nearly finished, two others just beginning, for two more the drawing is nearly finished, and two more are half finished drawings.

You know, that the engraver, Stone, is in no way qualified to do such work, nor that I could be made responsible for any of his doings.

Thence you cannot otherwise but conclude, that the measure you begin upon is destructive to the work; therefore, to the exertions and expenses hitherto incurred, directly opposite to the aim professed by the Committee to favor the Coast Survey work.

No man can expect that I, who am answerable for the work, could be compelled to give the final execution in the hands of a man in whom I have not the slightest reason to have any confidence whatever.

I consider the sending of Stone, *to inspect my work, as he said first*, as unmerited insult, and am certain that every member of the Committee, placed in my situation, would consider it so.

With respect and good wishes,
Your obedient servant,
(Signed) F. R. HASSLER.

WASHINGTON CITY, 30th May, 1842.

WASHINGTON CITY, 3d JUNE, 1842.

Honorable ISAAC E. HOLMES, Member of the Committee upon the Coast Survey.

SIR,—Mr. Mallory having communicated to me the questions addressed to me in the Committee, with my hasty answers at the time, according to the agreement, in order that I might add to my answers the explanations and extensions which they require, I have made the proper additions and remarks, and added to them some papers (copies,) which I had given into the Committee at some time intermediate, with nearer particulars in some instances.

Mr. Mallory, Chairman of the Committee, being now absent for a fortnight, as he said, I take the liberty herewith to address to you the paper resulting from these additions, for the use of the Committee, most likely best to circulate among the members to cause as little delay as I can in the labors of the Committee to a final close, which would be desirable to enable me to go to the field work, time enough for my plans or projects of this season.

I suppose Mr. Stone will have made his report upon his *examination* of the manuscript map of New York, for which he has been sent to me, in the name of the Committee. Mr. Mallory has also informed me, that I should not leave here, because the Committee would call me up in examination upon the works of the Weights and Measures. I, therefore, am now waiting, and, like always, in readiness to answer also upon this part of my works.

I have the honor to be, with perfect respect and esteem, Sir,
Your obt. servt.,
(Signed) F. R. HASSLER.

HOUSE OF REPRESENTATIVES, JULY 15, 1842.

SIR,—I am directed by the Committee on the Coast Survey, to inform you, that your attendance before the Committee will not again be required,

Respectfully, yours,
(Signed) F. MALLORY, Chairman.

To Mr. F. R. HASSLER,
Sup't. Coast Survey.

ADDITIONAL PAPERS HANDED IN TO THE COMMITTEE.

I.

MAPS DELIVERED.	DRAWN BY.	SCALE.	DATE OF DELIVERY.
1 Harbor of Bridgeport, Ct.	Lt. G. S. Blake,	$\frac{1}{10000}$	1835, engraved.
2 Newark Bay, N. J.	Lt. T. R. Gedney,	$\frac{1}{10000}$	18 , engraved.
3 Harbor of New Haven, Ct.	Lt. G. S. Blake & Wm. M. Boyce,	$\frac{1}{10000}$	1838, engraved.
4 Country between the Thames and Niantik, from the Sound up to Mohigan, Ct.	F. H. Gerdes,	$\frac{1}{10000}$	1840, Treas. Dep. for Hon. T. W. Willams.
5 Sandy Hook Bar,	C. Renard,	$\frac{1}{10000}$	1841, Treas. Dep. for (Mr. Pleasanton.)
6 Thames River, topography and Hydrography,	F. H. Gerdes,	$\frac{1}{20000}$	1842, Treas. Dep. for Senator Huntingdon
7 Sandy Hook Bar,	H. L. Whiting,	$\frac{1}{10000}$	1842, Topograp. Bureau.
8 Fisher's Second Sound and the Entry of New London Harbor, Ct.	F. H. Gerdes,	$\frac{1}{20000}$	1842, Treas. Dep. for Hon. T. W. Williams

II.

Times of my going to the field work, and returning from it, each year.

In 1832.

September 25th, having received the instruments, I left Washington the 26th September, at 8 o'clock, A. M. to reconnoitre for the continuance of my works of 1817, towards the east of it. Returned to Washington the 31st January, 1833, in the evening.

1833.

April 5th, at half past 7 o'clock, A. M., left Washington for the first beginning of actual primary triangulation; returned to Washington on the 3d January, 1834, in the evening.

1834.

After having finished all the preparations, and comparisons for the measurement of the base-line, I left the 29th May, at 9 o'clock, A. M., having made also stations; returned 25th January, 1835, in the evening.

1835.

There being much calculation to be made, and many arrangements for the organization of the parties, the State of Maryland having offered an arrangement to join the survey of that State with that of the Coast Survey, I went out only at different intervals to reconnoitre the country in Maryland and until Washington, and the outer bays, accompanied by Mr. J. H. Alexander, of Baltimore, until late in the fall and winter. Details could be given if needed.

1836.

The present office was established. I left 17th August, at half past 7 o'clock, A. M., and returned the 8th January, 1837.

1837.

I left Washington 4th June, at 8¾ A. M., and returned at half past 4, P. M., 5th January, 1838.

1838.

I left Washington July 19th, at 8 o'clock, A. M., and returned 24th December, 1838, just at sunset.

1839.

I left Washington the 9th June, at 7 o'clock, A. M., and returned the 5th January, 1840, beginning of dark.

1840.

I left Washington the 14th September, at 8 o'clock, A. M., and arrived again at Washington the 20th January, 1841, at 6 o'clock, P. M.

1841.

I left Washington at 10 o'clock, A. M., 29th August, and returned 22d December, 1841, at night.

This enumeration shows how the office work has increased since the beginning, when the work was starting, and the elements for it were first to be collected in the field. In the further progressing state of the work, the calculations as well of myself as of the assistants, the reduction into maps, making of projections to take to the field for the topographical and hydrographical works, their plotting and working out, required as much, and in most cases even more work from the assistants in the office than out of doors. So that indeed the going out for the field work, is considered as real relief from the harder works of the office, as well for me as for the assistants. For what relates to my assistants' *time* of going to the field work, they must be asked themselves.

Signed, F. R. HASSLER.

Washington City, 30th March, 1842.

III.

I must add a more detailed answer to that question which asked me, "How I would proceed in the Southern Coast, where marshes, woods, &c., presented peculiar impediments?" I answered to it, "By mixed astronomical and geodetical observations." This question was followed by that, "Is that not more or less the case with all the Coast Survey?"

This question showed that the nature of the scientific principles to be applied, and indicated by my answer, were unknown. I must, therefore, *explain;* what is called in mathematical practice MIXED astronomical and geodetical observations, is, when both these elements concur in *the same individual determination;* this is the case in the application of a problem of practical mathematics, which I have applied in Swiserland, and in this country on Buttermilk Hill (to the full knowledge of my assistants,) to obtain the junctions of my works of 1817, with those of 1833, in the beginning, when I had not yet a new base-line, nor sufficient angles; it was equally successful in both cases.

It consists in—one geodetic line being given in position and length, the latitude of either point being known, the latitude and the angle which the line subtends from a third point being observed, together with the azimuth of either end point, to determine the place of observation.

From such a result, new connections are then opened further onwards.

This was what I was beginning to express, when I was stopped, under the denomination of entering into arguments, which Mr. Cushing *refused* to hear.

That I should expose it from its elementary principles, is what I am sure the committee cannot intend, because it is a problem, which joining both branches of science, would require long deductions of principles, almost an elementary work for persons not acquainted with the science.

In the triangulation the two kinds of observations, astronomical and geodetical, are *disconnected;* each operation is *separate*, and they are only compared to draw conclusions upon one another, for a new, different result, required to place the Survey in general to its proper place upon earth; therefore, the astronomical parts are only made at a few, properly selected places, and with general views for the work, not for details like in the other case, so as I have stated in my answer to question 5, article 3, of my Report of December 2d, 1841.

Washington City, March 30*th*, 1842.

(Signed) F. R. HASSLER.

IV.

WASHINGTON CITY, MARCH 31, 1842.

Hon. FRANCIS MALLORY, Member of the Committee of Investigation of the Coast Survey.

SIR,—The pressing of the questions put to me in the Committee, must of course always leave some unilluminated spots after the examination is over; I must, therefore, take the liberty to supply always afterwards.

1. Mr. Aycrigg asked particulars about: why I measured with the metre as unity! I will not delay you by any detailed explanation, but must take the liberty to refer you to my report upon the Coast Survey works of May 17th, 1834, §34, where the subject is fully treated; it stands in page 148, of the 1st vol. of Documents upon the Survey of the Coast, printed by me in 1834.

2. Mr. Cushing said, that the discoveries of dangers in the navigation of the Sound had been kept secret *ten years*, this is an entirely erroneous statement, the work itself being even not as old as that; the Sound was, of course, worked later; the sounding part was made by Lieut. Blake, U. S. Navy, assistant in the Coast Survey; I request that he be asked particularly to clear up this erroneous statement.

3. Upon the publication, or not publication, of any thing resulting from the Coast Survey, *no reproach whatsoever can be applied to me*, because by my contract with the Government, I am prohibited to communicate any results, without order of the Treasury Department. Whenever such orders were given, they were instantly executed, as well known, sometimes even they were provoked by me, and given to public offices. My public accounts showed regularly every year the state of the work, upon which any call could have been grounded. I must, in this respect request again, that my answers to questions 5 and 7 of my last report be considered as inserted here; and also the §12, of my communication of 23d March last.

4. The publication is of course a consequence of the Survey and its reduction, as well by calculation, as to the mapping is a work absolutely intermediate between the two, therefore, the means given by the appropriation are to be distributed in due proportion between them, according to the state of the work, and the means on hand by the existing appropriation at any special time.

5. I was asked, how many hours the assistants worked per day. I answered, "as many as the day allows;" (*the work cannot be made in office hours,*) this addition, I believe, has been omitted to be written down, in fact, all my assistants, like me, work from interest for the work, and not as hirelings by the hour.

6. When I get the copy of the examination, I may see more that I can explain to a better understanding of my answers, which may appear to be required.

(Signed) F. R. HASSLER.

V.

Upon the Question of Limitation of the Works for the Survey of the Coast.

1. The limitation to any determined distance from the Coast, would require that the mountains, which are indispensably necessary for the station-points of the Survey, be within that limited distance.

2. This is well known not to be the fact, therefore also, the limitation not adapted to the nature of the country, thence, this limitation would become impossible to be observed, if even decreed.

3. If even smaller elevations were found within these limits, which it might be said fit to substitute, instead of the greater ones, it would be improper to use them, otherwise than so as they are

used now, namely, for secondary triangles, and the plane-table operations.

4. These smaller elevations, from their too great proximity to each other, would occasion triangles by far too small, to give the accuracy required for the connections of the work.

5. The multiplication of the triangles would evidently also require a much greater length of time, to execute them, because every one of them would require as much time, and trouble, as one of the large triangles, which might cover 6 or 12 of these small ones.

6. With this increasing of the operations, the necessity of cutting through woods, &c., increases actually in still greater proportion than the triangles themselves, and these cuttings are one of the great difficulties of the work.

7. Such smaller triangles are even much more tedious to make properly, than the large ones, therefore, they consume each more time, and of necessity retard the work, by limiting the greater strides which the freedom of the work at present admits. The improper increase of the expenses is self-evident.

8. Upon the limitation of the work only in the *topographical part*, the same reasoning applies, as to the more extensive operations; the inland bays, rivers, creeks, &c., which are navigable, are all so winding, and very often hid in hardly approachable marshes, that to follow them, which often would be fully impossible, would necessarily take up much more time than to survey them, by the general survey of the whole topograghy of the neighborhood.

9. How far, therefore, this topography shall, can, or must go, it is as impossible as improper, to determine beforehand; without the special reference to any given locality, nothing can be said about it in general terms.

10. This reference to any given locality, can only be decided by the operator upon the spot, and the special superintendent of the work, as has always been done hitherto.

11. The topography has hitherto never yet been carried farther than the proper aim, and the principles of the work, require; on the contrary, in several instances, an extension of the work has been specially desired.

12. Any idea of limitation and distinction, between the different parts of the works, would never be understood by the uninformed people, with whom the operators in the work must come in daily contact in the field works.

13. Thence would result that any owner of land, upon which an operator in the Survey would have to go, could explain this li-

mitation to his fancy, or interest, and attack him, drag him to jail, and otherwise expose him to insult, and ill-treatment, at his own option, as has been too often the case already.

14. That even this accessory incident causes much loss of time, and forms an actual retardation of the work, is self-evident, as well as its expensiveness.

15. The topographical part appears by experience, to be that least objected to, by the inhabitants, to judge from the manner in which the operators have been received, in comparison with the difficulties that have been laid in the way of the other parts of the work.

16. In general, a limitation to three miles from the Coast, as has been talked of, is a virtual abolition of the work itself, as well from the side of the natural, as the moral, difficulties it would suscitate, and the impossibility of giving to the work the required accuracy; nor would any other limitation be less injurious.

17. The shore line of a coast is never seen from a ship approaching it; the picture of the elevated land, is what presents itself to the sailor; in this he is guided by so much of the topography, as can be seen at a reasonable distance at sea, and this lies back in the country at distances, which are not determinable but by actual survey, thence the only rule is, that which I have followed, and long ago stated, namely, the "topography must go to the ridge of mountains which determine the heads of the coasting rivers, or creeks, or their passage through such mountains, what is called in France, technically, *le versent de la Vallée côtiere*," or, "*le versant de la Cote.*" Such it has always been understood and approved.

18. My rule of action and guide in the work, must be my contract to make the work "*honorably and permanently useful, to the nation.*" The way to obtain the aim must be left to me; if I was to be guided by any foreign direction, except mathematical principles, some of my assistants might even rise up against me, refusing to do what they might think to exceed my powers, and I would either have to dismiss them for such refusal, or the work would become impossible.

19. Hitherto the work has proceeded in harmony, and with all good willing exertions on the part of every one; if such had not been the liberal action of all in the case, not half the work would be done, which actually is done.

20. The attempts to find causes for change in my arrangement, by the resolution of the last Congress session, and the present Committee, have already caused a great damage.

UPON CHRONOMETRIC OPERATIONS.

1. The name of Chronometic Survey is a complete misnomer, chronometers *cannot survey*.

The determination of any point on earth by chronometric, or any other operation, requiring the knowledge of the time, requires three different determinations. 1st. The latitude. 2d. The time. 3d. Some phenomena by which the time becomes comparable with that of another place; or in absence of an actual phenomenon a given quantity, or proportion, by which the time of the place can be referred to that of another place. (N. B. When I was Professor at the Military Academy, West Point, 1807—1809, I made a full deduction of this subject by which I instructed some cadets in it.)

2. Chronometers determine only the time of a place, and to do that requires astronomical observations, generally made with inferior reflecting instruments.

The longitude, any how deduced, needs determination of latitude, to determine a point by their intersection. All the results, whatever, depend on the measurement of the altitude of celestial observations at sea, which are subject to unavoidable errors of several minutes.

3. The determination by chronometers must be very frequently repeated, if any even approximate result shall be obtained, for one single point; therefore, these results remain, what may be called, swimming, for many years, or in fact, rather are never exactly determined, while on a Coast the most minute and fully certain determinations are indispensable.

4. The distance that might be concluded from such determinations, would have to be calculated from astronomical elements reduced to the earth's surface, which cannot be done with any thing like an accuracy that can be indicated in any of the linear measures, so as to ground upon it an *actual survey* of the form of the Coast, road, or any thing like what the survey requires to determine, suppose a shoal, rock, or any other individual point of interest.

5. It is well known, that we speak of the time of Washington, Philadelphia, or such, without distinguishing which part of these places the time shall apply to; the chronometers, perfectioned as

they pretend to be, and referred to the necessary observations, which makes indication comparable with the actual time at the place, *cannot show* any distinction between these different parts, by any possibility whatever.

6. How many vessels have there *room to wreck* within, suppose, the precincts of Washington, Philadelphia, or any such city? thence, an instrument which cannot distinguish such distances, is positively no surveying instrument, besides, it determines no linear distances, while the rocks, shoals, or other dangers that may make a shipwreck, are generally small, and, therefore, their determination must be very accurate. These determinations must be guided by accurate survey upon the shore, where alone a survey is possible. Chronometers and sextant are for that entirely unavailable.

7. In my answers to question 15, of my last Report, I have in few words discarded all these ideas, they would not deserve more attention than there, with any man intimate with the scientific principles implied in the case.

8. To make any chronometric determination between points on land, it would be necessary to have a well determined and active astronomical observatory near the sea shore, (a condition which does not exist in this country,) where the time is at any instant determined within the decimal of a second; from this, chronometers, the rates of which are determined there with the minutest accuracy, would have to go off to any point that is to be determined, and return back to it in the shortest time possible, as for long times they cannot be trusted. Chronometers indicate only a time, or rather a place in their revolution, which must, by observation of celestial bodies, be referred to what is called the time of the place; (for which generally reflecting instruments are used by free hand.)

9. The latitude of that point of observation must be exactly known, and observations of time made there, and calculated, all to the greatest minuteness, and during several days, for each single result, of which a great number must be collected before it is allowable to call them a determination.

10. The repeated voyages which this operation requires, consume of course a great length of time, and proportionate large expenses, to produce at last only a very vague approximation, as this is well known in the science.

11. Every such determination is dependent as to the *chronometer*, of three circumstances of its rate, besides all the chances of the accuracy of the observations, which are very bad, and well known; the first rate, at the observatory, can be determined for the time it is there. It is more difficult, but still to a certain degree, possible,

to determine the rate at the station to be determined. But, the third rate which the chronometer may have had during the traveling, is positively undeterminable, and a mere chance; as it is well known that all chronometers alter their rate between being quiet and traveling, by the number of repetitions only a mean between all these evil chances is obtainable, and never any certainty.

12. Between such a collection of uncertain, disconnected points, it is directly impossible to survey details, which however are evidently the most important part of the work, far less to determine the place of any soundings.

13. On board ship horizontal angles can never be measured with the accuracy required to determine other points from them; they can only serve to determine *the momentaneous position of a vessel*, when taking an individual sounding, and no farther. A vessel ever so well at anchor, even with three anchors, presents always the lens on an inverted pendulum, oscillating from the points where the anchors touch the ground; it cannot avoid considerable play.

Vertical angles between the horizon and a celestial body, are the only observations admissible on board ships, referring to a point upon the earth; that these are subject to several minutes' uncertainty by the variation of the refraction, and other such causes, is too well known to allow any man of information to put them in any way in comparison with observations on the land.

Lunar distances need not be quoted, they are the same on board ships, and on land, only requiring more skill in the first case. But also, no man whatsoever would think, nor has ever thought, of applying them to *surveying* in either case.

14. By the above it is evident, and experience has often proved it, that the absolute error between two near points, is subject to be as great as that upon any large distance; this again makes it the less applicable for any use in actual surveying, nor has it ever been pretended to determine small distances on earth by the measure of the time.

15. The geographical position of the Coast of the United States, is eminently contrary to any chronometric determinations, and in general any determination from astronomical data, the chronometer is within certain limits but an uncertain tool, the whole dependence must be upon the observations, which are subject to miles of error, by no means admissible in an actual survey. The greatest part of the coast follows, with great varieties of indentations, or variations, so near the same meridian for considerable distances, that the chances of the chronometer's failings are greater than the actual difference of the longitude of the points to be determined.

16. Thus (see in the map,) 1st. From east end of Long Island, the many indentures of the New England Coast, are almost all in the case. 2d. From New York and Sandy Hook, south through Jersey, &c., till to about Cape Hatteras, the gradual and tolerable regular line is again so nearly in the same meridian, that the observations with chronometers could not fail to give indentures which do not exist. 3d. From Charleston to the Florida Capes, the same thing is the case as in No. 2. 4th. Long Island laying more east and west, could get better distances to determine by chronometers between a few points, but nothing would be obtained by it for all its bays, and important points of shipping and navigation, (this part of the work is now done.) 5th. The same is, but far less favorably, the case between Cape Hatteras and Charleston.

Supposing such parts to be intended to be filled up, with the necessary details, between two chronometric points, this becomes entirely impossible, from the want of accuracy of that very base determined by sextant and chronometer, with their chances of inaccuracy.

17. Chronometers and reflecting instruments render good services at sea, where all other means fail, but within such limits only as are there required, as the highest 6 to 10 miles, which is sufficient at sea, where from the mast of a common vessel, a horizon of 10 to 12 miles diameter is discernible. This chance is entirely inadmissible in a Survey of a Coast, where the details of position of land, shoals, dangers, &c., are the most essential, and which can never be determined at all by chronometers and similar means.

18. It is, therefore, evident that the Survey must be performed upon the land, because there is no possibility to determine distances upon water, in any way admissible with the aim of the Coast Survey. How far land inwards this Survey must go, even for the most simple requisites of the gross navigation outside, is determined by the make of the land, it is not admissible to designate or limit their extent.

The seaman never sees the shore line when he approaches land, he always sees only the farther distant elevations, by which he reconnoitres himself, thence the views added always to the charts, which show him the vertical appearances. When he comes so far as to see the actual shore line, he is lost. He will find himself thrown upon it, before he is aware of it.

19. There is no compounding with mathematical principles, when they shall be applied to a determined practical aim, any deviation from them leads inevitably to a complete failure. So, if it is the question of determining distances and positions, lines and angles

only can determine them, and these must be employed from the simple chain and compass operations to the highest branches of astronomy. The Coast Survey must ground all its operations upon them, and in such a manner as to obtain the highest possible degree of accuracy; if there is a deficiency of accuracy in one of the essential parts, it would increase to a complete distortion of the country in the sequel of the work, if suffered to continue to exist. Without these primary requisites of the methods used, the proper success of the Survey of the Coast is positively impossible.

20. All plans grounding upon chronometers for surveying, are fallacious, and by any attempt towards them, an immense expense would be incurred before even any work could be done, and never any standing results are obtainable; that is strictly mathematically proveable.

At the renewal, 1832, under these very naval plans, the very author of them told me of such a number of steamboats to put into activity for it, as the purchase and equipping with instruments and other effects, would have far exceeded the amount of money, that has been spent as yet in the Coast Survey, and its outfit with instruments and all, under my direction; for which results are exhibited permanently useful, and honorable to the country, as my contract enjoins to me, and a stock of property is acquired of high value and utility for the future; while by the plans, which it appears an idea started up to revive, certainly not four points of the Coast could have been determined with due reliance for the aim of the work. Sufficient proofs have been administered by other works, which are kept out of sight, to attempt to mislead always equally, and to mar the success of a work, which can succeed only by science, divested of all private interest.

21. The boasting up of chronometers by their makers, must not be taken as a true guide, a light reflection reduces the flourish to its proper level. A chronometer maker for instance, brags of one of his chronometers having had the price, or preference among a number of others; this chronometer bears the No. 867, or such like, number, the government of England bought it, thence clearly it cannot be considered as a recommendation for any other person *to buy any of the others*, as, 1st. The choice can now be only among those which were not able to compete. 2d. The high number of the successful one, indicates of itself a very unfavorable chance in the purchase. In England, it is even considered, that one third of the chronometers made, are good for nothing at all, and the full success a mere chance.

22. The determination of the longitude of Madeira by means of

chronometers, made by Dr. Tiarks, is often attempted to be held up for the accuracy of such like determinations; the following true remarks will set this claim to rest.

1st. The only communication between London and Madeira was by water, and the determination implied no line of coast whatever; it reduced itself to knowing the difference of *time* at two *places*, or cities, in the manner quoted above; the minuteness required between two near places on either coast was no consideration.

2d. Of twenty-eight chronometers which Dr. Tiarks had, only three proved so near as to be admissible in the result; the other gave no admissible approach. The last, or rather as Dr. Tiarks wrote to me, only one fully admissible, the Admiralty bought; the others, I suppose, will not be found recommendable for the aim of the Coast Survey, which requires so much minuteness.

23. Details and accounts to the same effect and result might be multiplied up to the present time, but it would be altogether superfluous, the accounts of the very best chronometers, and the highest authorities upon the subject, may be taken from the Astronomical Journal (Astronomishe Nachrichten) of Mr. Shumacher of Altona, all which will fully support even the minutest parts of the above statements.

24. Upon the real principles that science dictates for such works as the Coast Survey, the introduction of the announcement of the new map of France (here joined,) treats shortly from the most authentic sources. The difference between the two works, is no other, than the greater difficulty of the Coast Survey, on account of the coasting land being accessible only from one side.

25. When in 1818 my agency in the Coast Survey was destroyed, by influences over which the veil may remain, the Navy Department undertook it by partitioning off the Coast, and establishing works of which for several years appeared in the newspapers the notice, "The Coast Survey goes on gloriously," until pressed too hard, the truth made itself vent, by its own elasticity, and the expense of many hundred thousand dollars, woke up attention. The annual report of the Navy Department of 1828, giving account of this branch of the service, stated in final conclusion: "Nor can such Surveys be made without the aid of the means contemplated by the act of 10th February, 1807, to provide for surveying the Coast of the United States," which was proposed to be renewed again. But it lasted until 1832, before its passage could be obtained again in Congress. The particulars of the epoch from 1818 to 1828, remain as yet private to the Navy Department, without any public report, or maps.

26. The proposition of the Navy Department of 1828, was accompanied by a report, which is printed in the Congressional Documents of the time, made by Commodore Rodgers, (then yet in good health,) grounded in principle upon my previous plans, adopted already in 1807, and approved by the men of science in Europe, in their reviews of my papers upon the Coast Survey, printed in the Philosophical Transactions of Philadelphia, of 1825.

27. When it was evident in 1832, that the law renewing that of 1807, would pass, it appears that the naval officers prepared these reports, which are now asked for; but the President had proposed to me, to take up the work again, and my plans and propositions were renewed long before I had any knowledge of them. It is remarkable in them, that the same Commodore Rodgers, who had written the reports of 1828, at that time recommended, as chief of the Navy Commissioners still, these same plans, especially for their exclusive quality of being executable by the navy alone, without any reference to their scientific qualifications, and adaptedness to the work in view, and its aim; and in despite of the many strikingly evident impossibilities which they contain.

F. R. HASSLER.

Survey Station, Pine Hill, Gloucester County, N. J., November 29, 1842.

WASHINGTON CITY, MARCH 23, 1842.

Honorable FRANCIS MALLORY, Chairman of the Select Committee of Investigation of the Coast Survey.

SIR,—Among the questions put to me in the Committee's meeting, there was one, at least, which appeared much insisted upon, and by circumstances was rather discussed than answered.

It seemed to put in doubt the propriety of the journals, and other works of the Coast Survey, to remain in the Coast Survey office, and requesting them to be delivered to the Treasury *Department* for safety. I will here supply more distinct answers.

1. This office, here, is one of the offices of the Treasury Department, exactly as much as any of the rooms in the Treasury Building itself.

2. The extension of the Treasury Department works has rendered necessary a number of other offices out of the yet unfinished Treasury Building proper; so is this office.

3. The foreign Standards of Weights and Measures have just now been transported from the Treasury Building to this office, for their more proper and more appropriate safe keeping.

4. There are three houses adjoining each other, rented by the Department, two at the expense of the Coast Survey, and one at the expense of the Weight and Measure works; and the foundry establishment, besides, is across the street.

5. The total of the buildings adapted themselves so peculiarly to the use of both works, that no building in this city could, in any way, equal the conveniences they afford by their present distribution.

6. Various arrangements have been made, at public expense, as well as the expense of the owner, to adapt them the better. One story was elevated to procure drawing-rooms superior to any I know of; for better security the roofs have been slated, and, in general, every arrangement made for convenience and security.

7. In every one of the three buildings, which connect all through with one another, two persons at least sleep; these are assistants, clerk, workmen, and I myself, so that the buildings are well watched all night.

8. The maps and many other valuable objects are placed so that even in the extreme case of fire, they would be saved with the greatest ease.

9. The whole of the Coast Survey work must, in all cases, and at all times, be of the easiest access, nay, present, during the whole time that the work is going on, still more so than in any other office such may be required.

10. In requiring place in the Treasury Building only to deposit the foreign standards, which had been expunged from the State Department to the Patent Office, where they were exposed to damage, I could not get a well appropriated place for want of room.

11. The lower vaults of the Treasury Building, where I got a place to deposit the Weight and Measure Standards, packed up, and not yet sent off, could not but with difficulty be got, and such an one would not do, because of their not being sufficiently dry and aired for paper; the maps especially would be utterly destroyed.

12. To displace the works from the office would be laying great impediment in the way of the work, and expose the parts deposited to *dilapidation and abuse*.

13. Every time that a certain systematically full part of the work, between two base lines, and two astronomical stations, will be executed, a full report will be made, and it is hoped published by Congress, which will rest that part forever, and then the Documents of that part may be placed in some specially selected place of deposit, as original record; but until that time they *must remain* in the office in which they originate.

14. It would be the most effective mode of clearing up any subject whatsoever, that may be desired, and come in question, if the Committee would be so kind as to come over to the office, which is so near the Capitol, and visit all the parts of the work, as they are in activity, and constantly in evidence for every visiter.

(Signed) F. R. HASSLER.

ELEMENTARY REMARKS.

1. The second in time, which is the unit of the kind of quantity which the chronometers indicate, is 15 seconds in the arc, in the rotation of the earth, which measures the time. One second in the arc of a great circle on the earth's surface, is 98 or 100 feet English, therefore one second in time would, and at the equator does, subtend about 1500 feet; this diminishes with the increase of the latitude, in the ratio of the cosine of the latitude; in the mean latitude of the coast of the United States this is about from 72 to 86 feet for each second in the arc, and the error arising from one second in time would be 15 times that: namely, from 1080 to 1300 feet. Such determinations are therefore rather less accurate than the distances obtained by observing the difference of velocity between light and sound.

2. This exhibits the chance of error in distance to which *one single* second of the chronometer subjects in longitude. But the time of a chronometer, in relation to the actual time at its place on earth, depends on observations of altitudes of the sun, if observed at sea with a reflecting instrument, for which generally only sextants are used; this altitude is subject to an error of from 3 to 5 minutes, or miles, independently of the errors of the instrument and observation, from the mere uncertainty of the refraction, and similar causes, which therefore multiplies by so much the uncertainty of the observation by which the chronometric determination of time is affected, independently of the vacillating rate of the chronometer itself.

3. But the best chronometers even do not assure the accuracy of one second in time; the deviation of the chronometer over this, forms therefore the factor by which all these errors are *multiplied;* that they are too great already without this multiplication, is evident enough. How any man in the least acquainted with the exigency of the conscientious execution of the Coast Survey, and the elementary principles given by the science, could hesitate an instant between the choice of such means as chronometers, &c., and those which exact and well known principles of mathematics lay so directly before us, by trigonometry, is incomprehensible. Who will ever trust the map of a coast grounded upon so vague determinations?

4. The above discussion of the accuracy possibly obtainable in the longitude of a point by chronometers, refers only to the one line of the determination required to locate any point of the survey, by which a point of sounding or any other locality is determined. To complete its determination it is necessary to determine the distance of the parallel from the equator, by its intersection with the circle perpendicular to it, namely, the circle of latitude, or the meridian of the place; which in itself is already, as stated, the element indispensable to locate the point in the parallel to which these errors refer; this is determined as above stated, by observations of altitudes of celestial bodies, the uncertainty of which at sea is by no means overrated when, as above set down, at 3 or 5 miles, that is 3 or 5 times 60 seconds, each in that case, of 98 or 100 feet in length, or from 1800 to 3000 feet.

5. Taking now the chances of error of the best chronometers, which are rated by late experiences to at least 3 seconds in time, in the mean latitude of the United States, to suppose 80 feet per second in the arc, the product of this 15 times or 1200 feet for each second, which gives 3600 feet chance of error, we have a quadrilateral resulting of 3600 feet in one direction, and from 3 to 5 miles in the other, within which the point to be determined is uncertain, under the most favorable circumstances; any closer accuracy is a hazard not to be in any way calculated upon.

6. These calculations and considerations bring the determinations by reflecting instruments and chronometers, to what I have stated in my other paper, to be yet within the visible horizon of a ship at sea, that is a diameter of between 20 and 30 miles; thence comes the conclusion, that chronometers are good seaman's tools, where this accuracy is sufficient, as in a discovery voyage, where never more than a tolerable approximation is expected, and in other similar cases; but they are unable to give any determinations admissible in the determination and delineation of the coast, on account of their want of the accuracy required in that case.

7. The idea of determining the head lands and principal points of the coast, by observations requiring chronometers, as an instrument to determine a place upon earth, and principally for the Coast Survey, and then introduce between them the details, by separate geodetical surveys, is positively impossible; for when the first determinations, upon which the others *must* by principles be grounded or relied upon, are so uncertain as the chronometric determinations evidently are, the details can impossibly be made to fit between, and making them separate works, to be tried to fit between these uncertain points, would require either to destroy the accuracy of the geodetic

works, or to be obliged to repeat the whole of both operations, to ascertain where the errors lie, and attempt to correct the results, which it is impossible to do by the first operations, with decided accuracy; thence everlasting repetitions must follow and always yet leave uncertainty. I stated, in my other paper, the unvoidable uncertainty of the chronometers, derived between points on land by the undeterminable rate of them during any moving of them.

8. Perhaps it may be yet attempted to quote from my own plan of operations of 1807, that I spoke myself about chronometric determinations. But it must be observed: that at that epoch the intention of the government upon what the Survey of the Coast should be, was just to be ascertained, therefore it was proper for me to state what I did state, to ascertain these very intentions, by the choice which the President would make of the means proposed. The President, Jefferson, being a man of science, selecting the real scientific course, the mode of executing the work was for once and all decided, by invariable mathematical principles; all arrangements were made, the proper expenses have been incurred, an amount of property appropriated to these aims is on hand, amounting to upwards of $120,000, as I stated in my report, in answer to the questions raised in Congress last year.

9. The satisfaction of that late President, upon the principles and their application, which I explained and exhibited in the Transactions of the Philosophical Society of Philadelphia, printed in 1825, can be seen in the letter of Ex-President Jefferson, of 3d December, 1825, to me, in the first volume of the Documents of the Coast Survey, printed in 1834, page 49 and sequel.

F. R. HASSLER.

Pine Hill, 6th December, 1842.

N. B. These two last papers are an extension of the one given in to the committee, which appeared required for a better understanding of the subject.

TRANSLATION.

New Topographical Map of France, adapted to all the public services, and combined with the operations of the Cadaster.

The project of the operation to which the attention of the chambers, and the public, is herewith called, has been submitted to the examination of a committee of fourteen members, presented by the ministers of the interior, of war, of the navy, and of the finances; and the first dispositions agreed upon by this committee, have already been honored with the approbation of His Majesty.

An undertaking presented under such happy auspices, might be dispensed with, quoting other suffrages; as, however, this undertaking belongs to the exact sciences, we shall here begin by presenting an abstract of the opinion of the Marquis of Laplace, upon the project of the law relating to the finances, for the service of the year 1817. The striking coincidence which will be observed between the general views of this illustrious mathematician, and the whole of the plan here proposed, no doubt, will make, that no man will view the expenses as useless, that are necessary to put it in execution, particularly when considering that rigorously made calculations show, that the publication of the work would produce several millions over and above the expenses.

Extract of the Opinion of Marquis of Laplace.

(Chamber of Peers, Session 1816, Friday, 21st March, 1817.)

"To survey with accuracy the map of a kingdom, there is but one method, which unfortunately has not been followed in the operations of the Cadaster. It consists in forming two great lines perpendicular to one another, the one north and south, the other east and west. The whole space or country to be surveyed is covered by a net of great triangles, that are attached to these lines. Subdividing afterwards these large triangles by secondary ones, the work is brought down into the details of the communities, townships, &c. Thus the partial surveys are restricted in their deviations by the triangles, that circumscribe them, the faults of the surveyors are discovered and corrected. By this is obtained a system of operations,

good in its details, and perfect in its union. France has for the execution of such a system all the means that may be desired: the men of science the most able to direct it, a very well informed corps of geographical engineers, who have already made what exists the best in this kind of work, and to which officers of artillery and engineers can be joined. The Cadaster offers them the most favorable occasion to exercise themselves in these operations, which they shall execute in time of war.

"In this manner Prussia continues upon the other side of the Rhine the topographical works of our engineers; it cannot follow better models.

"Already one of the fundamental lines of which I have spoken traverses France from Dunkerque to Perpignan. A perpendicular directed from Strassbourg to Brest is begun; the first of these lines traced with the utmost accuracy has been extended over the Pyrenees, till to the Island of Formentara in the Mediterranean sea. By the favors of the liberal cares of the minister of the interior for the progress of the sciences, this line will be extended to the north till to Yarmouth. Colonel Madge, who surveys the map of England and Scotland, upon the plan that I have quoted, with equal zeal and ability, will unite with the Frenchmen of science in protracting jointly our meridian. The extent of this system comprehends an arc of about one seventh of the distance between the Equator and the Pole. The latitudes of its extreme points have been observed, and those of several intermediate points, and the length of the second pendulum corresponding to these points, has been measured, which gives a great deal of light upon the figure of the earth, and the inequalities of its degrees and of the gravity.

"I wish the ministers may please to take into consideration the plan that I propose. It is possible to adapt to it the part of the Cadaster already done, and to execute the same without delay in the operation, and without increase of expenses. Perhaps even the great number of geographical engineers, which our present state of peace allows to employ in this work, to which it is painful to see them strangers, would render its execution more prompt and less expensive.

"But a commission, appointed by government, to give it light upon this subject, would take the proper necessary informations for its decisions. It would examine how far the reproaches of negligence and incapacity, made to various agents of the Cadaster, are grounded. It would indicate the means to accelerate and perfect it.

"After having, in the formation of the great map of France, given to other nations an example, which they follow carefully, let us not

be inferior to them; let us not retrograde while they advance. Let us retain among us the glory of the sciences and of the fine arts; this glory, sweet and peaceable, has the advantage to be susceptible of increase without diminishing foreign glory, and to interest all nations by procuring to them new enjoyments."

The Marquis of Equevilly, Director of the General Depôt of the War Department, has equally called the solicitude of the Chamber upon the undertaking of so high an importance, as an accurate topographical map of France is for all the public services, at the epoch when he presented the plan, of which a sketch will be given hereafter, the same as the immortal author of the mechanic of heavens, and his station has rendered him the most able to judge upon this subject, by the various public services to which he has been called.

REPORT,

UPON THE

CONSTRUCTION OF STANDARDS

OF

WEIGHT AND MEASURE,

TO THE

COMMITTEE OF INVESTIGATION

OF THE

COAST SURVEY,

JUNE 29th, 1842.

[COPY.]

U. S. HOUSE OF REPRESENTATIVES,
JUNE 9, 1842.

F. R. HASSLER, Superintendent of Weights and Measures.

SIR,—The select Committee on the Coast Survey to which was referred your last report on Weights and Measures, request you to report, *forthwith*, to the Committee, a general and concise statement of the progress of the work up to this time; showing the time employed, the separate total expenses for assistants, for workmen, for the foundry, for materials, and the grand total of all the expenses, caused by the work. Also, to specify the number of standards of each description, and of scales thus far made, and an approximate estimate of the cost of each, so that the sum of the items shall equal the total expense. Also, a statement of the number of articles yet remaining to be made; also, the time and expense necessary to complete the whole.

Also, that the Report be made in such form as to give a concise view of the whole matter, *without the necessity of referring to other reports.*

Your obedt. servt.,

(Signed) JNO. B. AYCRIGG.

Honorable FRANCIS MALLORY, Chairman of the Committee of Investigation of the Coast Survey.

SIR,—With these lines, I have the honor to present to you the Report upon the works for Standards of Weight and Measure, requested from me, during your absence, in the name of the Committee upon the Coast Survey. I hope it will be satisfactory, notwithstanding its abridged form.

Washington City, 29th June, 1842.

F. R. HASSLER.

REPORT,

Upon the Works of the Establishment of Uniform Standards of Weight and Measure for the United States, made upon a call from the Select Committee of the House of Representatives, upon the Coast Survey, the 9th of June, 1842.

BY F. R. HASSLER.

With the best disposition to give to the Committee, *forthwith*, a general and concise statement of the progress of the works, performed by me, and under my direction, in the construction of the Standards of Weight and Measure for the United States, I find it a difficult task to bring, hastily, in a small compass, and still intelligible, the account of a work of so high an importance, as the settlement and construction of an accurate, and appropriated, system of uniform Standards of Weight and Measure, for a country so extensive as the United States, present for my task, according to my view of the duty which I have undertaken; a work which requires the discussion, and application to practical utility, of some of the most delicate branches of natural philosophy, and the finest and most tedious operations of mechanical arts, in metal, &c., where such a large number of standards of the same kind are to be made, as were *never before made*, within the required limits of *accuracy*. I can, therefore, hardly expect to render such an account to full satisfaction to persons who may be new in the subject, and unacquainted with its exigencies; every individual part of the execution of the work differs entirely from the similar works in the common transaction and execution of the every day's practice in common life; for which, besides, every means to the aim is to be created, as was the case with this work. To approach the nearest I may be able, to an adequate statement, I must divide your letter in its different parts, and treat each of them as a separate question, to be answered in the shortest manner possible: thus—

A. "Showing the time employed."

1. A joint resolution of both Houses of Congress, of 29th May, 1830, taking up again the subject of the great irregularity in the Weights and Measures in the country, (well averred since 1790,) from the side of its vast inconvenience in the Custom-houses, directed the Treasury Department to cause the Custom-houses to

send in, to the Department, samples or Standards of their Weights, and the Measures of length, and capacity, to be compared there.

2. A short time after, the honorable Secretary of the Treasury, Samuel D. Ingham, committed this task to my charge; I devised means for its execution. These works enabled me to decide numerically, the stipulations of the law of the Senate of the United States of 1793, "*that the Standards should be the mean of those found in the country.*" Upon these works I rendered account, under the 27th January, and 29th June, 1832.

I hope I may be allowed to insert here, the expression of a learned society, certainly impartial, upon this report and the principles which guided me in this work, upon which in fact, *the Standards of this country are grounded*, and upon the results which I obtained by it.

Extract of the Memoirs of the Royal Astronomical Society of London, vol. vi. Report of the Council of the Society of 8th February, 1833, page 232.

"The Council regret that the Standard Scale, mentioned in their last report, has not been finished. It is a work that necessarily takes much time, due attention being requisite to the minutest points which are likely to affect its accuracy. Whilst on this subject, the Council cannot omit noticing a public document, laid on the table of this society at their last ordinary meeting, which contains several new and interesting comparisons of two of the principal European standards of length. This document is a comparison of Weights and Measures, made by our associate, Mr. Hassler, to the Congress of the United States of America, and has arrived very opportunely, prior to the adjustment of the present standard."

As it appears not desired by the Committee, that nearer details of this preparatory work should be entered into, it may be sufficient to state here these ultimate numbers, viz:

The Yard, to be the mean of the yard given by the scale of 82 inches, made by *Troughton, for the Survey of the Coast*, (which has by English authority been declared of the most accurate, and its similars to be selected for the English standards.)

The Troy pound, of the Mint of Philadelphia, to be the Standard for the Weights; the Avoirdupois pound, and its multiples, to be in proportion to it, as 5760 to 7000.

The gallon = 58373,0 }
The bushel = 543391,8 } grains of the Mint weight of distilled water, at the temperature of its maximum density.

This principle of determination of capacity measure, at the temperature of the maximum density of the water, I communicated in

1796, from my teacher, Professor Trallas, in Bern, to Chevalier de Borda, in Paris; upon which it was introduced in the French system, in lieu of the temperature of melting ice, which had been contemplated before.

3. At that time, I had just again contracted with the Treasury Department for the work of the Coast Survey; this occasioned that the work of constructing the standards upon these data, was added to my task, (without any additional compensation.)

4. There were, of course, many discussions and other incidents, upon the mode of proceeding, procuring of the means for the execution of the work, the selection of a proper locality, and building, &c., which were uncontrolable, as all such things are, at the beginning of any work; they, therefore, required time for their settlement, during which the whole of my works came under the Honorable Secretary of the Treasury, then Levi Woodbury, with whom these subjects were finally settled, under approbation of the President of the United States.

5. Brass, of sufficient good quality, not being obtainable in commerce, and the necessary ingredient in its composition, the zinc, being in commerce of bad quality, mixed with iron, it was decided to take advantage of the blende of Perkiomen, in Pennsylvania, and later also of the ores of the upper Jersey and others, to reduce, (or distil, as it is called,) the pure zinc, for the necessary brass, ourselves, for which a furnace was established in a shed built for the purpose, in the Arsenal.

6. In September, 1835, one of the buildings now occupied for the office of the Coast Survey, and the works for the Weight and Measure Standards, promiscuously, was rented, and the turning lathe and the few tools, which had been prepared by one workman only, were transferred there, from the too small house in 13th street, occupied before for the comparison above stated; then, the further constructions for the necessary tools for the work were begun; for it must be observed, that special tools were required, appropriated to the works, such as are not in common commerce; and this want increased with the advancement of the work, which required tools always more peculiarly adapted to the task to be performed. The inventory of the whole establishment shows them, as well as all other objects belonging to the same, presenting a considerable amount of property.

7. In 1835, September 18th, the furnace for distilling the zinc, was reported complete, and the distillation begun.

8. In November, 1835, the first Report upon the actual beginning of the works upon Standards was made; and the principles of the

arrangement, the wants, and requisites of the establishment, discussed.

9. From thence, the delivery of actual Standards to the Treasury Department continued until to the last liquid capacity measures, in regular succession, as they were executed with the workmen necessary at each epoch of the work, more or less according to the wants; regular reports were made upon these deliveries, which I must here omit to quote, under the positive order of the letter addressed to me.

B—"Showing the progress of the work."

This is evidently not intended by the letter: to be done in detail, as the work progressed; the account of which is contained in my successive yearly reports.

It is therefore best, and shortest, to present it here, in form of a *table of the results* in actual Standards, &c., which have been executed in this office, since about the beginning of 1836, when the establishment may be considered as having been ready for that kind of work, until to this time, together with some of the accessory works, which naturally accompany the same. This table follows at the end.

C—"The separate total amount of expenses for assistants, for workmen, for the foundry, for materials, and the grand total of all the expenses caused by the work."

In this work, like in all other, that I agreed for with the government, *I refused distinctly all the money business of it;* I know nothing of the amount expended, neither in the whole, nor in detail. I never touched a dollar, nor a cent, of the money expended. I can only say, that all that was ordered, was calculated before hand, to the closest economy, compatible with the indispensable accuracy of the results, and its certainty; for bad work, not answering the aim, is no economy, but *money lost.* This highly important measure, of establishing uniformity of Standards in Weights and Measures, has cost to this nation, in proportion to the quantity of work produced, its accuracy, and the extensive usefulness, *far less time and money*, than any other nation, as I am well acquainted with it.

It is impossible for the Committee to form any proper judgment upon the establishment without properly visiting it in detail; it has actually been visited by men of science of all civilized nations, from Russia through all Europe, to South America, &c., with the highest approbation; all equally considering the establishment unique, and unequalled in its kind; and as actually highly creditable to the country; in which all the well informed citizens of the country rejoiced.

D—"Also to specify the number of Standards of each description, and of scales thus far made."

The Tabular exposition D. D., joined at the end, shows this in all its details.

E—"And an approximate estimate of the cost of each."

This is *impossible in nature,* as I am entirely ignorant of the sum expended. Upon what relates to the work itself, the question would be to decide, what shall, in the above quoted list, be called a standard; what shall be allowed for the tools and implements, made in the office; for the wear and tear of all the tools; the value of the property on hand, paid by the expenses, which is considerably more than might be expected; besides the value of the Standards themselves, what they would be valued at, &c.; for this, *the inventory* of the establishment would have to be consulted, &c. It cannot fail to strike at once, that all this scrutiny would require more time, than it would be reasonable to bestow upon it, to get the most uncertain and rough guess at a very uncertain result.

The objects produced by the establishment, are of course so different in value, amount of labor, and all other expenses, that a real proportional valuation is entirely out of question. For instance, a set of subdivisions of grains, in decimals, costs in London from 5 to 8 shillings sterling, of those we made many hundreds. A balance, like that made here for weighing of the half bushels, would not be made there under 1600 dollars, notwithstanding the greater ease of workmen and their greater cheapness. The balances for the States already will, and must, be superior by far in accuracy, to any made hitherto in the country, as are those already executed for the use of the office.

To give an idea of the habitual cost of such like works, which are, however, always only copies, grounded upon no scientific principles, as accurate Standards must be, to deserve the name of Standards, I will present here some facts, which may be compared if desired.

Standard copies, procured for the government *at different times, with their cost.*

Lot of old standards, procured by the Ambassador, Richard Rush, from England, in February, 1822, with certificate from the exchequer, enumerated in the comparison of 1832, £103 = $515.

(These are very inaccurate, in spite of the certificate.)

Three scales of yards and ell, by Thomas Jones, London. (Cost not found in the Treasury nor State Department.) These standards seem better made. (See their comparison.)

The pound weight, procured for the Mint, by Mr. Gallatin, 21st March, 1828, *the artist's account only,* £2, 5 = $11 25.

(Captain Kater having adjusted it.)

Four single pounds, procured for verification for the weight and measure establishment, cost 25 guineas = $131 25.

One balance of Troughton, of grain weight, up to 10,000, £26, 5 = $131 25.

(The weights of this collection, though accurate within themselves, are too small, being taken from the London Mint, which Dr. Moll of Utrect found, at the same time with me, too small. The Mint weight of London was therefore changed by act of Parliament, and the coins made before 1828 depreciated proportionally to one and a half grain in the pound.)

The standard of the Virginia University, consisting of, first, a balance and weights up to 5 pound troy, - - - $500.

Second, a scale, upon which is traced a yard and metre, with two microscopes, - - - - - - - - - $300.

For the standards procured from France, the account of Fortin shows a sum total of 4205 francs, - - - - $841.

(See copy of account.) These standards are very valuable.

The account of Mr. Pollock, of Boston, for balances and weights, furnished to Mr. Adams for his comparisons in 1820, $642.

(These are not sufficiently satisfactory.)

An adjustment of a pound troy in the Mint of London, costs, according to the statement of Professor Moll of Utrecht, *three guineas,* - - - - - - - - - - $15 75.

The certificate of the exchequer, for the oldest sets of standards, is quoted upon the indenture £1, 15, and their great inaccuracy shows that they have not any proper comparison, - $8 75.

F. "So that the sum of the items shall equal the expense."

This is evidently impossible by what has been said upon this subject before. The money spent upon such an indispensable and valuable establishment cannot be put in any comparison with the benefit which it bestows upon the society, and the daily intercourse of the citizens. The *economy* of a nation, or government, does not consist in not spending, but in *producing good by the money spent.*

G. "Also a statement of the articles yet remaining to be made."

This is shown by the table of results obtained in the work, which shows the unfinished work as well as what is fully finished. It presents a small quantity of unfinished work, comparatively, with the great mass of work actually executed.

It can only yet be remarked upon this subject that, at the end of

the mechanical work, and the full adjustment of the standards, there should still be added the experiments upon the expansion of the brass employed, by heat, comparatively with other metals; the specific gravity of the same, and their relation to the water: as these are scientific elements, that are to be ascertained to fix the system of the standards, in its scientific relations, which is so desirable for its credit and stability. This I had already mentioned to the Treasury Department, and I had heretofore made some experiments tending towards that aim. It may be yet observed that, in England, even the observations of the seconds pendulum were joined, to give to the work a still more extensive resting place, by the determination of the ratio between yard and pendulum.

H. "Also the time and expense necessary to complete the whole."

It must be observed upon that, that the distribution of the work *must* be made according to the *nature of the work*, without regard to the individual final execution of any single one; so that a work of a certain kind must go through all the individuals of the standards requiring that work; thence, speaking of works done, or not done, falls in *between the different parts* of the works, that are *in the whole to be done*, and determines nothing about the *how many* of each kind are done, or not done; the enumeration is contained in my reports, which I am prohibited to refer to.

As to the time, it must be observed, that for the adjustment of the capacity measure, of which the half bushels form the largest part, that by the finished construction of the balance for this aim, a most essential step is already made, but two favorable winters will, it is supposed, at least be needed to execute these adjustments, which can be made only under such a low temperature as is not obtainable in summer. The balances will, on the contrary, be worked at all the time, with the full assiduity which has always been used in all the works of this office; therefore they will proceed to completion as fast as possible. But it must be observed that an accurate balance, of some size, has a considerable number of component parts, and proportional work, requiring great accuracy.

In respect to the estimation of expenses, it must be observed, that all such prospective estimations are altogether too vague and therefore improper, because they cause expectations, for which it is impossible to assign any reasonable ground.

I. "Also that the report be made in such form as to give a concise view of the whole matter without the necessity of referring to other reports."

To establish an accurate and uniform system of standards of Weight and Measure in any state or country, is an unavoidable

and *distinct duty* of every civilized government, and this system requires even sometimes a renewal or verification.

All European governments, without distinction of their kind, have in modern times made such renewals or verifications, and published the principles of them in their countries.

This establishment is one of the means of promoting peace, and administering justice in all dealings among the citizens. The larger the country, the more essential and important the measure becomes; it is in general considered as indicating the civilization of the nation.

General Washington, well aware of the duties of a government, which he had so essentially helped to establish, said in his inaugural speech, 8th January, 1790, to the Senate of the United States:

"Uniformity in currency, weights and measures, of the United States, is an object of great importance, and will, I am persuaded, be duly attended to."

The answer of the Senate of the 11th January, 1790, quotes the measure as a subject that shall be duly attended to.

The 8th December, 1790, General Washington recommends this anew, and the 2d and 25th October, 1791, he said:

"An uniformity in the weights and measures of the country is among the important subjects submitted to you by the *constitution*, and if it can be derived from a standard, at once invariable and universal, must be no less honorable to the public councils than conducive to the public convenience."

A committee was established the 1st November, 1791. April 5th, 1792, a report of the committee presented a full system of weights and measures, upon the principles stated by General Washington.

17th and 18th November, 1792, the report was discussed, and also 20th November and 6th December, a full report was again presented, which was, January 29th, 1793, ordered to be printed. This last report being directed to be based upon the mean of the measures and weights found in the country. The 8th February, 1793, the decision was postponed to the next session of Congress.

From thence no special action on that subject appears on the part of Congress; but many State Legislatures made partial arrangements that had in general no lasting effect. However a number of laws passed, grounded upon the supposition that the uniformity *existed*, thereby increasing the difficulty.

The report, made in conformity to the suggestions of General Washington, became well known and was much approved in Europe. About that time I was engaged in making copies of the toises of Leland's, which had been compared in 1769, with the scale of Bird

in London, to determine the relation of French and English standards, on the occasion of the measurement of the Mason and Dixon lien in this country. One set of these toises is in the country, and was again compared in 1817, as is also the toise of Conivet of 1768, which I bought from the heirs of Dionis du Sejour, in which I standarded the toises with which the base-line of my triangulation in Switzerland was measured: (which was since further continued, &c. &c.)

In 1817, 3d March, a resolution of the Senate referred to the Secretary of State, to present "a statement relative to the regulations and standards for weights and measures, &c." which produced the elaborate report of the Honorable John Q. Adams, upon that subject, of 22d February, 1821, which proved forcibly the very great irregularity in measures of different parts of the country; this occasioned, of course, a new proposition for the so desirable uniformity. For that purpose also a set of English standards had been procured from London, certified by the Exchequer, 8th December, 1820, which however have proved to have very little accuracy, when compared in 1831 and 1842, with the liquid capacity measures, &c.

A Committee was established upon this report, which reported under the 11th March, 1822, proposing the fixation of Standards of Weights and Measures, to what would appear to have been the intention of those found in the country, saying, "To render uniform and stable, the Measures and Weights, which we at present possess," and "Standards to be made for the State Department, and for the States and Territories."

New standard units were then procured from England, and from France, under this resolution, which were deposited in the State Department. But no further action took place upon that; *no Standards of any kind were made*, or even attempted to be made.

The 19th May, 1828. The Troy Pound of the United States Mint in Philadelphia, which had been procured by Mr. Gallatin, verified directly by Captain Kater, who had made the English Standards, was declared by Congress,

"The Standard of Weight for the United States, the other Weights to be according to their legal proportion to the same."

As I was of old acquainted with this subject, and could easily foresee the absolute necessity of a measure to establish uniformity of Standards in this country, I did not lose sight of it, when I was sent to London, to have instruments for the Survey of the Coast constructed, under my direction, in 1812 to 1814; I had need, for that work, of accurate Standards of length, as well of England, as of

France; it was an addition of expense entirely unperceptible, (and actually not observed,) to procure also some Weights and Capacity Measures.

The next action upon the subject, was the Resolution of the Senate of the 29th May, 1830, quoted above. When on that occasion I was called by the Secretary of the Treasury, "to compare the Standards of the Custom-houses," these Standards, brought by me, formed the ground-work, and the means, of the whole establishment, which the Secretary of the Treasury was very glad to find on hand, instead of, as he had intended, yet to procure the means from England; besides, I could direct, to be constructed in this country, by arrangements never before applied in so large a scale, but highly approved by the scientific men in Europe, and in this country equally, balances to weigh till above 130 lbs., to a proportional great accuracy.

Without this circumstance, the whole establishment of the uniformity of Standards in this country would have failed again, by the delay unavoidable in procuring the means from abroad; this is proved in comparing dates with the cotemporaneous circumstances of those times.

The intimate connection of the two works, of the Coast Survey, and the Construction of Standards, shows itself already in that circumstance; my comparisons of length measures made in Newark, New Jersey, 1817, form part equally of Mr. Adams' Report of 1821, and of mine upon the Coast Survey, and equally again in the renewed operations in 1831.

From that time, the statement under A. renders account.

The operations going on successfully, a joint resolution of both Houses of Congress of 14th June, 1836, ordered:

"Full sets of Standards to be made *in this office for all the States*, equal to those made for the Custom-houses;" and in July, 1838, (see Laws of the United States, vol. 9, page 839,) it was ordered: "that also Balances should be constructed for the States, in this office."

The nearer particulars are stated in the preceding articles; it may here only be remarked, that so many Committees established during forty years before 1830, have been without any result, towards the beneficial aim in view; while what was done since 1835, has nearly completed the task, which to interrupt now by *any alteration whatsoever*, would be the entire destruction of the system, and therefore of the benefit which the country expects from it; the frequent calls from various parts of the country, prove fully how the more enlightened part of the nation considers these works.

I must here yet place the abridged comparisons of the time, and result of such works, in different countries, so far as they can interest in this country, that is principally of England, for which I will only refer, by quotation of dates, to the authentic public documents, viz:

1. The Parliamentary Report of	7th July, 1819.
" Commissioners' Report,	18th September, 1820.
" do. do.	31st March, 1821.
Report of the Committee of Lords,	1823.
Letter of the Commissioners,	14th September, 1825.

2. Of the Philosophical Transactions of the Royal Society of London, the following volumes give some account of the parts of the work of Captain Kater, connected with the same. In the year 1818, page 33 contains an account of pendulum observations, preparatory to the linear Standard, as it was first intended to accept it instead of the yard, or at least compare it with the same, so as to make it subservient to find the yard, in case of its loss, by its ratio to the pendulum.

In the same volume, page 103 contains the comparison of the French metre, with the different English scales.

In the year 1819, page 70, Reduction of the Pendulum Observations. In the same volume, page 337, Observations of the Pendulum at several of the Trigonometric Stations of the British Triangulations.

In the year 1821, page 75, Account of the various British Standards of Linear Measure. In the same volume, page 316, Remeasurement of the Cube, Cylinder, and Sphere of Sir George Shuckburgh, for determining Standards of Weights and Measures.

In the year 1826, Part 2d, page 1st, Account of the Construction of Standards of Weights and Measures for Great Britain and Ireland.

There were made:

Troy pounds, ...	5	Total 24.
Avoirdupois pounds, ...	5	
6lb. Troy, ...	2	
Gallons, ...	4	
Bushels, ...	4	
Yards, ...	4	

Only these appear in the account, adjusted simultaneously together, by Captain Kater.

However, the following list of deliveries appears to indicate, that they were afterwards multiplied by the artist, Mr. Bates; of their adjustment I find no account.

The Standards delivered, as stated thus in number, were to the

Exchequer, ...	24
Guildhall, ...	10
Dublin, ...	10
Edinburgh, ...	10
Total,	54

In the year 1830, page 359, a paper appears by Captain Kater, on the *Errors of his Linear Measures.*

This short indication may suffice here, to guide, if detailed information should be desired, to be followed up farther, by consulting the reports and the volumes of the Philosophical Transactions.

Upon the French Standard Establishment, we have the fullest accounts of all parts by the several quarto volumes of the "Base du Systeme Metrique," though the mode of operating is not applicable to this country's standards.

The different other States, Russia, Prussia, Holland, the many States of Germany and Italy, have all equalized and determined anew their system of weights and measures; their publications are of course in the languages of these countries, and are not much spread in foreign countries. Their collection, together with copies of the standards, is one of the subjects upon which I made a special proposition in writing, at the beginning of my works, to impress the advantage of such a collection, to fix upon good principles the daily reduction of all the foreign standards, which now are practised to the fancy of the calculators in the Custom-houses, no regular guide being given to them by authority.

K.—It is to be supposed that the committee has calculated before hand, the great and harmful delay which this detention, and what consequences the committee may still please to give to it, must have upon my works in the Coast Survey, for which I would some time ago have taken advantage of the season, for my works in the main triangulation in the field, which cannot be executed but in the proper season. I have, in my answers to the committee upon that work, stated the losses already arising from the attack of last year upon that work; I can only add here that if I am not soon relieved, the same loss to the work, of about one season's work, will be again incurred this year.

Similar circumstances have unfortunately happened before to my works, which occasioned, that, instead of being able to pursue my works with that assiduity and courage, which I always should like to bestow upon them, I have been called upon to write polemic reports and answers, and distract my attention from the scientific turn, which has the higher claim upon my attention and time, and which

would give to my works the advantages which belong to them. It is well known that both my works require the application of science, sometimes rather complicated, and that no merely *loose scientific* application can satisfy the exigencies of these works; on the contrary, it would introduce new uncertainties and disorder, leading to disappointment and disgrace.

L.—Having executed these answers to the letter received from Mr. Aycrigg, as speedily as the nature of the subject admitted, I have no doubt it will be satisfactory in relation to the works under my charge, for the Committee which has undertaken the inquiry, as much so as the inspection of the work has been to every visiter of the establishment, who takes any interest in the public good, which is the aim of it; however, I cannot refrain from inviting the Committee, most pressingly, not to omit a visit of the establishment in detail, when it cannot but strike, that the compactness of its different inseparable parts, is one of the greatest means of celerity, economy and accuracy, that its junction with the establishment of the Coast Survey produces a mutual assistance, thence an economy, for both, unobtainable by any other means, not connected under one and the same head and roof, besides the advantage which I had from my old acquaintance with the subjects themselves, and their scientific requirements. The same advantages could not be obtained by a whole society, of different opinions, and different degrees of scientific means, and informations; I might even quote again as proof, the failure of all previous attempts, towards this valuable aim, by Committee's as quoted above.

Now the object is nearly attained, and any change whatsoever that might be attempted to be introduced, would destroy again the whole system, make of the whole a disgraceful failure, and a direct pecuniary loss. All the particulars of the work are known, and spread over this county and Europe, and the approbation which my reports met all over, are sure guarentees of the public disapprobation that would follow any change or interruption.

WASHINGTON CITY, JUNE 29, 1842.

Received, February 13th, 1822, from the Register of the Treasury, the account of Thomas Jones, for Weights and Measures purchased by Richard Rush, for the Department of State, which account (amounting to £103,) has been paid by me, as Agent for paying the contingent expenses of Secretary of State Office.

(Signed) FONTAINE MAURY.

Account of Mr. Fortin, for French Standards.

	French Franks.
Metre a traits of Platinum, with box,	2,600
Kilogram of Platinum, with box,	1,100
Do. in brass, cilindrical,	45
Do. do. subdivided square,	100
Litre Modèle, brass, with box,	50
Brass Metre, subdivided, with box,	85
Box and Baling,	25
Custom House expenses,	10
Charges in Havre, Shipping, Insurance, etc.,	190
	4,205

Mr. Gallatin's account, 21st March, 1828.

Bates' account, ... £2, 5

Boston, 13th January, 1820.

THE UNITED STATES,

TO ALLEN POLLOCK, DR.

For best Large Balance, with Agate Suspension,	$300.00
Large Glass Case, for do.,	55.00
Set best polished Large Weights,	65.00
Brass bound Mahogany Case, for do.,	15.00
Two Thermometers, for large case,	10.00
Best Small Balance, with Agate Suspension,	120.00
Glass Case, for do.,	25.00
Weights, for do., to one hundredth of a grain,	40.00
Boxes, for small weights,	4.00
Packing Cases, Packing,	8.50
	$642.50

Received above amount of Moses Young.

(Signed) ALLEN POLLOCK.

No. 962.

Moses Young,

Register Office.

From other countries, also, weights and measures were procured, besides these, the accounts of which may be found among the Ambassador's accounts; the whole of the expenses incurred for them will be near about $4000; they are collected, as far as yet on hand, in this office, where they may be seen at any time, and compared with the work produced here.

A Tabular Statement of the Work executed for the System of Uniform Standards for the United States, from the beginning of the year 1836 to June, 1842, with their state at that epoch.

	Set.	No. in Set.	Pieces.
Full sets of Weights from 1lb. Troy, to 50lbs. Avoirdupois.			
Delivered to the Treasury Department for the States and the Custom Houses, in two interior boxes each,	200	10	2000
Do. do. do. do. Office,	1	10	10
Do. do. do. do. use of the Sub-Treasury,	2	10	20
Do. do. Patent Office, authorized by the Treasury Department,	1	10	10
Do. do. Old Point Comfort, upon direction of Treasury Department,	1	10	10
Kept in the Office for necessary future comparison,	2	10	20
	207		2070
Set of Ounce Weights.			
Delivered to the Treasury Department for the States, from $\frac{1}{10000}$ to 10 ounces,	29	27	783
Do. do. do. do. Office and the Patent Office,	2	27	54
Do. do. do. do. Office, small box up to 10 ounces and 1lb.,	1	12	12
Do. do. do. do. Sub-Treasury, up to 100 ounces,	1	35	35
Do. do. do. do. do. from 10 ounces down, and subdivided in 3 boxes,	2		40
Do. do. Mint of Philadelphia, boxes from 100 ounces down,	2	25	50
Do. do. do. unadjusted for the Branch Mints,	2	19	38
Do. do. do. unadjusted ounce weights up to 1000 ounces,	4	5	20
Do. do. Office of Sub-Treasury, one ounce set up to 1lb.,	1	8	8
Kept in the Office, my original to guide the work,	1	25	25
Do. do. full sets for future comparison, by combined weighing,	5	19	95
	50		1160
Standard Capacity Measures.			
Just packing for delivery, standards of liquid capacity measures,	54	5	270
Do. do. do. gallons, besides the above,	71	1	71
There are besides, gallons mechanically executed, ready for final adjustment,			19
One whole bushel, to be deposited in the Treasury Department, not yet adjusted,			1
Half bushels, ready for adjustment,			157
Each of the capacity measures has a glass cover, to adjust its fulness,			518
			1036

	Set.	No. in Set.	Pieces.
Standard Long Measures.			
Yards delivered, fully adjusted, each consisting of yard and matrix,	41	2	82
Yards mechanically executed, ready for the last repeated comparison,	110	2	220
Apparatus for comparing yards, with micrometric microscopes, &c.	4		4
	155		306
Brass Balances.			
Large balances made for use in the office of about 40 inches distance of suspensions,			4
Largest balances, described, for the adjustment of the half bushels,			1
Balance delivered to the Sub-Treasury,			1
Smaller balances of 13 and 27 inches distance between the knife edges,			2
Balances begun for the States,			30
One brass balance beam, given to the Mint of Philadelphia,			1
			39
Single Weights and Measures, and accessories to the Standard Weight boxes and others.			
Furnished to the Sub-Treasury, one box with 3 lb. and 2 forks,	1	5	5
Do. do. do. three boxes with single pound weights and forks,	3	2	6
Do. do. Frankford Arsenal near Philadelphia, 1lb. avoirdupois,	1	1	1
Kept in the Office for use in future comparisons, single pound weights,			55
Do. do. the original adjusting weights for my use, above 1lb. weight,			25
Delivered to the Committee of Massachusetts Legislature 1lb. troy, and 1lb. avoirdupois,			2
Four sets of weights for adjusting capacity measures,	4	6	24
For the gills, which were however omitted to be made,	4	1	4
Every box of large weights has two separate boxes, each having 2 forks and 4 screw holders,	207	12	2484
The ounce weight boxes have tongs and forceps of different sizes, the full sets each three,	44	3	132
One foot measure to Frankford Arsenal,			1
One yard, Brooklyn, New York,			1
One yard, Lieut. Thomas R. Gedney, U. S. N.,			1
One yard, Capt. W. H. Swift, U. S. Army,			1
One yard, Lieut. Glynn, U. S. N.,			1
One foot measure, Lieut. Glynn, U. S. N.,			1
One yard to the Land Office,			1
			2745

Boxes, with Fittings for the above Standards.	Set.	No. in Set	Pieces.
For 207 sets of large weight standards, 3 boxes for each set,	207	3	621
For the sets of ounce weights,			49
For the accessory weights given out,			9
For the full sets of liquid capacity measures delivered,			108
For the additional gallons delivered,			71
For the gallons on hand,			19
For the half bushels,			157
For the yards delivered, and those yet in office,			151
			1185
Outside Packing Boxes of the Standards delivered.			
For the large weights delivered,			207
For the ounce weights,			29
For the liquid capacity measures,			125
For the yard standards delivered,			41
			402

27th Congress, 3d Session.

Rep. No. 170.

Ho. of Reps.

VIII

COAST SURVEY.

2 2

February 9, 1843.

Printed by order of the House of Representatives.

Mr. Aycrigg, as an individual member of the Committee on the Coast Survey and of Weights and Measures, with the consent of the committee, reports his views and conclusions drawn from the testimony taken before said committee, and from the reports of the superintendent of the coast survey, as follows:

(1.) That the original object of the work has been lost in the extensive operations of the coast survey, which include much work unnecessary for the purposes of the navigator. (Page 7.)

(2.) That triangulation is the most accurate mode of making the survey so much desired, wherever the features of the country present the proper elevations, and that this triangulation depends on the measured base. (Page 8.)

(3.) That the "*measured* base" on Fire island is not the "*actual* base," and that its exact length has never been given.

That the "actual base" is the calculated side of a triangle, of which only *one side* (the measured base) is measured, and that the "monument" is not placed at the end of the measured base, as we should infer from Mr. Hassler's report of 1834–'35, but at the end of the "actual base;" and that the length of the "actual base" has not only never been measured, but probably never can be; and that, even supposing it possible to find the eastern termination of the measured base by a triangulation that admits of error, to find a point which was left by triangulation that also admitted of inaccuracy, still we cannot measure from this point to the other extremity of the base, on account of the washing away of the beach; and, consequently, that we can never verify even this part, the foundation of the whole work, which is placed upon a moving sand bar called Fire island, exposed to the ocean, between high and low water mark. (Page 9.)

(4.) That the longitudes of the different parts of the survey have not been yet obtained. (Page 11.)

(5.) That the secondary triangulation has gone far beyond the limits of the primary triangulation, and that the primary has never yet been verified. (Page 12.)

(6.) That we have not even the compass bearings, and, consequently, two of the three important parts of a chart (viz: longitude and compass bearings) being wanting, and the survey not tested, we can as yet have nothing certain; but still that this approximation should be published. (Page 13.)

(7.) That Mr. Hassler has taken but 20 primary stations for the whole time since he began, while the European works show a very different state of things. (Page 13.)

(8.) That Mr. Hassler remains in his office, and proposes to use the secondary surveys to find primary station points, in place of looking for them himself, and pushing on the main triangulation at least as fast as the secondary. (Page 14.)

(9.) That the secondary covers 11,000 square miles, while the primary covers but 3,577, although the primary is broad in proportion to its length, while a part of the secondary runs in a narrow strip along the Jersey coast. (Page 14.)

(10.) That very trifling causes are taken by Mr. Hassler as good ground to excuse his neglect of the work. (Page 15.)

(11.) Consequently, that the whole work is yet in doubt, arising from the culpable neglect of the superintendent; but that there is no evidence of fault on the part of his assistants. (Page 15.)

(12.) The proposition is therefore submitted, whether an expenditure of one year's time, and a tenth part of the yearly expense of the coast survey, might not have been so applied as to have been of more benefit than all that we have yet received from this work. (Page 16.)

(13.) Again it appears that the whole work of the coast survey is subject to great risk from fire and robbery. (Page 16.)

(14.) That the present mode of conducting the work will have a tendency to destroy the confidence in its accuracy. (Page 17.)

(15.) That the chart of Newark bay is a mere picture, without latitude, longitude, compass bearings, or north point, or any means to enable us to use it, except the scale (correctly copied from the original) "three inches to the mile," and the scale divided accordingly, making the length of Newark bay 11.8 miles.

That the copperplate copy, presented by one of Mr. Hassler's assistants, with a *corrected* scale, makes the length of the bay 5.82 miles, because the *corrected* scale is $\frac{1}{6}$ of an inch too short.

That the length of the bay is really 5.62 miles.

That it requires nothing more accurate than a carpenter's rule to measure the maps herewith presented, and an examination of the documents to prove that Mr. Hassler has lost his memory, and that the charge of wilful injustice against one of the committee cannot possibly have any foundation;

That Mr. Hassler has suppressed the date of this map, and given those of the other seven that he enumerates;

And that he has forgotten to mention another map of Newark bay regularly called for by the House, and now on file. (Page 17.)

(16.) It also appears that Mr. Hassler calculates to change the system of measuring the three angles of every triangle, and to depend on a single angle on the planes at the south. (Page 20.)

(17.) Therefore, a few suggestions are made, as to the difficulties, and the question raised, whether it would not be better to get further information before we advance in a manner that leads to results of doubtful utility? (Page 21.)

(18.) From the above, the objections to the present organization lead to the examination of a change to that which has been adopted by other countries with better success. (Page 22.)

(19.) The peculiarities of Mr. Hassler, taken from his own communications to the committee and other documents, are thrown in for the exam-

ination of those who consider him identified with the survey, as being the *only* man capable of conducting it. (Page 24.)

(20.) Conclusions from the above. (Page 24.)

In order that the House may be able to decide what importance should be attached to the evidence taken before the committee, from a knowledge of the means of information, relating to the subject under investigation, possessed by the witnesses, the following extracts are presented, in which each individual speaks for himself.

In order to prevent any injurious impression that might be produced, from a misunderstanding of the observations contained in this report, it is proper to remark, that no doubt is intended to be cast upon the testimony of any of Mr. Hassler's assistants; but at the same time we may naturally suppose that delicacy of feeling would cause them to put the best construction on every thing respecting their chief officer.

Extracts from a pamphlet distributed among the members of the House of Representatives.

20. My age dates from 6th October, 1770. It is with life or age, like with all other things, it lasts the longer and remains the longer effectif; the better it is used and husbanded.

21. It is a direct injustice to reproach to the officers issuing from the military academy of West Point, and from the naval schools, their not being competent to take the lead in a work which they are not instructed the very first principles of, nor provided with any means for. The thing *is impossible for them*, I must state my own experience. Immediately after President Jefferson had approved my plan of operation for the coast survey in 1807, from among the thirteen plans handed in, and examined, by the committee held in Philadelphia, he also decided the postponement of the execution of the work; on account of the warlike appearance of affairs in England.

At the same time the first professorship of mathematics and natural philosophy of West Point was vacant; Mr. Garnet, a private gentleman of New Brunswick, N. J., well known eminent mathematician, and Colonel Williams, chief of the engineers and of the military academy, proposed me for that professorship, which I occupied 1807–'8–'9, to such satisfaction as letters in my possession, and the opinion of students of those times may show.

I attempted to give to some (then new) lieutenants just dismissed from the academy, some practical information, in a direction leading to works of the nature in question. I even wrote upon it, but they found themselves entirely unprepared, I could do only little, and they soon left. During the time I was there, and one of my friends (who afterwards died in Arkansas) there was some teaching in this line of the science, which was ever since interrupted until, as I have just been told, it was again begun last year—but it requires longer years of instruction and practice to acquire proper proficiency in that branch of science.

In 1808, I made a plan for the studies and organization of the military academy, which may still be found in the War Department. What they

are not taught in the academy, the students *cannot be expected to bring out of it*, their future practice alone can put them in the possibility of acquiring it, according to the special duties, they may be placed into, which is entirely a chance of circumstances.

The naval schools are well known to be only for practical seamanship, without sufficiently entering into higher branches of mathematics, as are required for works similar to the coast survey. I made also for a naval academy a plan in 1832, which may perhaps be found in that Department, it is well known that no change has taken place in this respect, therefore also the *naval officers are entirely innocent of the accusation lanced against them.*

22. When in 1834, a bureau was proposed to direct the coast survey, a meeting of one half hour proved the inadequacy of it completely.

23. I was in London for the instruments from fall 1811, to fall 1815, under the disagreeable situation of an alien enemy, by the then war with England.

24. The State over whose territory the coast survey has the most extended, is New Jersey, therefore also in that State the most money of the coast survey expenditure has been disbursed.

25. I arrived in the United States in October, 1805, but had been in public business in Switzerland before, since 1786, though there engaged in the archives and as a member of courts of justice; always, however, applying to mathematics and natural philosophy as subjects of predilection. In April, 1807, I entered my first appointment in this country at West Point, (as stated above.)

26. A suspension of the work of the survey now, would be attended with very great direct loss, as well in work as in objects on hand for its continuance; and principally because it would most likely not be possible to bring it up again within more than a man's age, as the interval lost between 1818 and 1832, may easily lead to conclude under existing circumstances.

27. It must be evident to any reflecting mind, that a scientific work changing hands, loses the advantages of the experience, and practical skill acquired by the operators, and loses the character of a systematic work.

28. Since the resolution of 24th June, 1841, so much of my time has been taken up by polemic discussions, pressed upon me first from Congress, which has, of course, other disagreements in its consequence, that actually more than one year of my work was lost, which I would, with immensely more satisfaction, have applied to the forwarding of the interesting and valuable works which I have engaged for with the Government.

F. R. HASSLER.

WASHINGTON CITY, *January* 10, 1843.

James Ferguson examined.

1. Question. How long have you been employed in the coast survey?
Answer. Since 10th May, 1833.
2. Question. In what capacity?
Answer. As a principal assistant; one of the three principal assistants.
3. Question. What particular part of the duty do you at present perform?

Answer. Making the secondary triangulation.
4. Question. Who makes the primary?
Answer. Mr. Hassler. (P. 14.)

Examination of Edmund Blunt.

4. Question. How far inland from the coast has any part of the work been carried?
Answer. I am unable to say, except in regard to the secondary triangulation, which I have in part conducted. I am one of the principal assistants. (P. 22.)

Examination of Captain Swift.

1. Question. Are you employed in the coast survey; and if so, in what capacity, and since what time?
Answer. As an assistant, since 4th April, 1833. I am also the disbursing agent, since about 2d July, in the same year. (P. 24.)

Examination of Captain Thomas R. Gedney.

1. Question. Are you an officer of the navy?
Answer. Yes.
2. Question. Are you now employed in the coast survey; and if so, since what time, and in what capacity?
Answer. I have been employed in it since October, 1834, in charge of one of the hydrographical parties. (P. 37.)

Examination of Lieutenant George Blake.

1. Question. Are you an officer of the navy, employed in the coast survey; and if so, in what capacity, and since what time, and on what part of the coast?
Answer. I am a lieutenant in the navy, and have had charge of a hydrographical party from 1835 to the present time; I have been in Long Island sound and Fisher's Island sound, and in Delaware river and bay.
2. Question. What vessel or vessels, and what number of officers and men, have you under your command?
Answer. My force has varied very much; I had last year the schooners Gallatin and Nautilus, with nine officers and forty-one men.
3. Question. Have you been engaged in the outer or the inner waters?
Answer. The inner, altogether. (P. 40.)

William J. Stone in examination.

1. Question. What is your business and residence?
Answer. I reside in Washington, and am an engraver.
2. Question. How long have you followed that business here?
Answer. From twenty-three to twenty-four years.
3. Question. Have you been accustomed to engrave maps and charts?
Answer. Yes; that has been my chief, and is at present my only business; I have abandoned other branches of engraving, to devote myself to that. (P. 42.)

It is acknowledged on all hands that the charts of our coast are very defective. (1) We have hitherto had nothing to depend on but that obtain-

ed by the British Government at the time that we were colonies, and, subsequently, with a few isolated exceptions, the corrections applied by the energy and perseverance of individuals.

For all practical purposes, the action of our Government has been almost a nullity, (2) and, while other nations (19) have not only a thorough knowledge of their own coast, but have even sent out their vessels and taken surveys of the coasts of distant and almost uninhabited countries, the United States, possessing a marine both naval and mercantile at least equal in energy to any in the world, and ranking in commercial importance second only to that of Great Britain, does not even know the position of her own thickly-settled coast in the immediate vicinity of her most important harbors, (40) cannot even now tell the exact position of any part from the point to which all our navigators refer their calculations, (41) and has harbors and channels that were proved during the last war to be known to our enemies, and unsuspected by ourselves. The consequence of all this is, in the first place, a discreditable position in the eyes of the civilized world. This amounts to something, although of minor importance. But a grand difficulty is the want of a knowledge of our own coast for naval purposes during war, so that our own vessels cannot take advantage of the facilities afforded by nature, or avoid the hidden danger. And, again, that we are, in fact, most exposed where we feel most secure, and, consequently, take no precautions to prevent a surprise. Witness the exposed condition of the city of New York and of the navy yard at Brooklyn.

Again: The innumerable vessels covering the ocean, and approaching our coast, have no means of judging of their relative position, except from their charts. Our navigators ascertain their longitudinal position on the globe only with reference to the observatory at Greenwich, near London, the point from which the almanac used by them is calculated. If, then, a navigator wishes to know what course he must steer to avoid danger or reach his port, he first ascertains by astronomical observation his latitude, and his position with reference to the place for which his almanac is calculated; then, turning to his chart, marks upon the same his position in latitude and longitude. If his chart is correct, he then knows whether he is in danger, or the direction to his harbor; but, if his chart shows an open sea where there should be land, it is a treacherous guide, and worse than useless. He believes that he knows the distance to land. He moves on in confidence during the night, in high anticipation of meeting his friends at home within a day, but, before midnight, where his chart shows him yet remaining many miles of clear sea room, he is suddenly startled with the cry of "breakers ahead," and, before his vessel can be put about, she strikes, becomes a wreck, and all on board subject to the risk of destruction.

This is not a sketch from fancy. It is believed to be a correct description of an actual occurrence; but, for present purposes, it may be taken as a supposed case, for it is evident that such must be the result arising from the use of inaccurate charts.

It is not necessary to go further into this part of the investigation, for it must be evident, to all who will reflect on the subject, that humanity alone would rank a survey of our coast among the most important duties of the Government.

What, then, does the interest of navigation demand? Is it necessary

to wait until we ascertain the precise figure of the earth, and the exact length of a degree, to know whether a given arc of the meridian is a few inches, or even a few feet, longer or shorter, (41) when the navigator cares nothing about the figure of the earth, provided you will tell him what angle a certain star will make with the horizon in each position on the earth, and also what proportion of the circumference of the earth there is between that position and his fixed meridian from which he makes his calculations, and when he has no means of measuring *distances* that can even be compared with the approximation obtained by the pedestrian pacing off distances on land?

But the navigator does not depend upon this distance. The astonishing discoveries in astronomy have furnished him with certain guides in the *heavens*, to point out his exact position on the *earth;* and, according to the magnificent conception of a former President, (which has been oft and again ridiculed by those who had not sufficient knowledge of the subject to know that the expression was *philosophically correct*,) has converted the stars into "light-houses in the skies," by whose unerring light the mariner directs his course across the trackless ocean.

Must he be doomed to travel over hidden sand bars, among rocks and islands, and even along the very coast of the main land itself, with a storm in his teeth, and a lying chart before him, in the darkness of a stormy night, with the horrible anticipation of being wrecked, not because he does not know his position, although constantly in motion, but because he has no chart upon which he can depend for the position of the land, that is fixed and immovable—has always been there, and always will be there? Must we see wrecks upon wrecks, and thousands of lives sacrificed, for the want of information that has been obtained, and quietly doze over the drowning shrieks of the mariner and the traveller, while we enjoy the golden dream that, in a "few years," the "*result*" will be reached that will be "creditable to a man of science," (41) and then the *whole* will be published?

The idea is preposterous. We have now had a Government survey, in charge of the same individual, from August, 1816, to April, 1818, and from August, 1832, to January, 1843—a period of not less than thirteen years, and at an expense of $720,000 to the Government, besides the pay of the army and navy officers, between $200,000 to $300,000, making a total of about $1,000,000. And what has been the result, in practical utility to the navigator?

We have, in all, eight maps (2) of small districts, and of these the only one that belongs to the outer coast is the bar of New York harbor, a distance along the coast of a very few miles.

In view of this condition of things, let us examine the original intention of the survey.

1.

The act of Congress in 1807 shows that the object of the survey then authorized was for "such examinations and observations," &c., as "may be especially subservient to the commercial interest of the United States." (3)

Mr. Hassler was engaged to take charge of the work, to "make frequent reports," "to deposite here" (i. e. with the Treasurer) "all surveys," &c., to

"make himself the principal part of the general large triangulation," and to deliver charts when "required by the proper authorities, *or prepared for publication.*" (4) Of the views that governed the work in 1816, 1817, and 1832, we have no official information; but as soon as we get an official report we find that the original object was much extended by the superintendent, and that the "coast survey" must include the military information (5) which other nations reserve for the possession of the Government alone. (6)

In his next report he appears to have altered his views to the other extreme, and considers the survey as having no reference to national vessels, but only the commercial. (7)

But, in his report for 1841, his views are again expanded to the fullest extent. (8)

When examined before the committee, Mr. Hassler evaded the question, and would not state the general objects that governed his work, (9) but we can infer from his reports of 1834 (5) and 1841 (8) that his views embrace much more than was intended or is now desired. The committee endeavored to get precise answers as to the distance included in the topography, but very little information was obtained in this way. (10) We conclude, from this circumstance, that the detail surveying is carried many miles inland. We have the assertion of Mr. Hassler, that it is necessary to carry on the topography to the high ground in the rear of the coast, to include the station points, (11) that the survey of the coast cannot be accurately made without surveying the bays and rivers, (12) that there is no more topography on the maps than is absolutely required, (13) and that the hydrographical parties have not been detained for want of the topography of the coast proper. (14)

Now, we find, from the examination of those who know more about the actual progress of the work, that the sounding has been in advance of the plane table; (15) that the detail considered necessary (11 and 12) by Mr. Hassler would add greatly to the expense, and delay the execution of the work; (16) that there is no use, for the purposes of navigation, in having the topography far from the coast, nor is it customary. (17)

But it must be evident, to any man of common sense, that the minute topography of the land, that can only be seen at a distance by birds high in the air, or by the land traveller on the spot, is a matter that the mariner does not require and cannot use. That a chart should contain much of the topography of the country, for the use of the landsman, is certainly no objection, unless obtained at an unreasonable expense of time or money; but that it should be necessary to follow up the triangulation, (18) and fill up the space with minute topography, for the benefit of the "commercial interest," is a statement that will puzzle the sailor.

Amid the different opinions that have been expressed respecting the mode in which the survey has been conducted and the results obtained, it is gratifying to observe a desire, almost unanimous, to have the survey completed. This point being settled, we proceed to examine the testimony as to the

2.

TRIGONOMETRICAL SURVEY.

By referring to the notes appended, (19) it will be seen that nearly the whole of Europe has been triangulated, that it is the only correct method

of taking surveys of extended surfaces, and that it can be done with surprising accuracy.

This is doubtless a fair statement of the case; and hence it appears very remarkable that Mr. Hassler, in 1791, (19 and page 3) at twenty-one years of age, long before many of these works were commenced, was able to do the work that he thinks not one of his assistants is now able to do, (32) although they have had "his instruction" for many years, and the command of works, in French and English, giving detailed accounts of all the European field work and calculations. So he thinks, but they do not agree with him. The pretension that he is the only man in the country capable of conducting the work is ridiculous; but we shall hereafter enter more fully into this part of the investigation.

The only point of present importance is, that triangulation is the most correct mode of surveying.

3.

In carrying on a trigonometrical survey, the foundation of the whole work is the

MEASURED BASE (20.)

The length between its extreme points is determined with the greatest care, and the bounds, or termini, marked in the most permanent manner.

If then, when the triangulation is carried on to verification, a discrepancy is found, they are enabled to remeasure the original base, and compare the latter with the original determination. Or, in case of doubt at any future time, the exact length of the standard base can be determined, and consequently the whole survey corrected, if necessary (20); or a comparison of the measures used in the determination can be obtained, supposing even a doubt as to the length of the standard yard or foot in use at the time. Such is the usual mode of proceeding, and from the care in establishing the base on Hounslow Heath a remeasurement showed a difference of 8 inches. (20) It must also be observed that this error increases in proportion to the distance; and, consequently, the further the triangulation is carried the greater will be the error, for the measurement of the angles alone gives us nothing but proportions.

The undersigned has the following verbal information from Lieut. Blake, of the coast survey, respecting the "measured base," the "actual base," and the "mountain base:"

"The 'measured base' has no monument to mark its eastern termination, which was on the beach, between high and low water mark at the time of measurement. The 'actual base' was not *measured*, but the length calculated from the monument at the western terminus of the measured base to the east monument on the sand knoll. The position of the east monument was obtained, not by measurement, but by calculation, from three triangles having one side common—two of them being founded on distances taken backwards along the measured base, from its east terminus, and the third upon a short base, measured at an angle from the east terminus of the measured base.

"The position of the east end of the measured base not having been marked, it can be obtained by measuring 180 degrees from the station at Ruland's, since the east monument is in the line between Ruland's and the east end of the measured base.

"The mountain base represented on the sketch from the office is about 12 miles distant from the nearest point of the actual base, or from Ruland's to the east monument. From the west end of the actual base to the west end of the mountain base, at West Hills, is about 17 miles, and the length of the mountain base between West Hills and Ruland's is about 20 miles."

These are about the distances, according to recollection, of the conversation, and they correspond with the distances shown by the sketch from the office.

The letter of Lieut. Blake (20 bis) informs us that the distance between the east terminus of the measured base and the monument at the east terminus of the actual base is 162 metres, and that the sea has encroached upon the measured base line, but the actual base is believed to be out of danger.

Being desirous of having *certain* information respecting these points, from Mr. Hassler himself, and in such form that there could be no mistake, the letter at note (20 bis) was sent to him on the 6th instant, but, as yet, no answer has been received.* We must therefore depend upon the information derived from Lieutenant Blake, since this is doubtless good authority, although he stated that he was not present when the base was measured

The three sketches herewith presented, of which two are copied from draughts received from the office of the coast survey, and one from the Treasury Department, show the changes that have taken place at the west end of Fire island, which is a sand bar thrown up by the ocean, varying in breadth from 800 to 230, yards along the part on which the base is situated. The following extracts will show the variable nature of our coast, (21) even where we have reason to suppose it more permanent than a mere sand bar thrown up by the sea, and having sand hills blown upon it similar to the "dunes of Holland," subject even to be blown away by the wind. (21) The ocean side of Cape May is known to be washing away rapidly, and the sea is encroaching on the ground in front of the bath-houses.† We might also refer to the breach forming the Shrewsbury inlet; but, since it is not known that we can find authority, either written or on this floor, to add his knowledge to the statement of the fact, we pass this merely as a hint.

Now, supposing the remarks of Lieutenant Blake were correctly understood—(and if there is an error it can be corrected by information from the office of the coast survey, within a quarter of a mile of this House)—the "*base*," upon which the whole triangulation of the United States thus far depends, has nothing to mark its eastern termination, so that this line no longer exists, but in its place we have the "actual base," with one end on the beach at the level of the ocean, or very near it, and the other elevated on a "sand knoll," whose height we do not know. The "actual base," whose termini have been marked by monuments, has never been measured; and from that fact and the inspection of the map, showing different intervening irregularities, we infer that it never can be measured.

Should it be desired at any future time to verify the measurement, (20) we must use the "actual base," which is the calculated third side of a triangle, of which only one side was measured, and triangulate back again, to find the east end of the "measured base," using for that purpose the station at Ruland's, 12 miles distant, and, as far as we know, without any

* Received on 10th instant, and inserted. (Note 20 bis.) † See note (94.)

permanent monument to fix the spot. Thus the monument was fixed by triangulation that might have been inaccurate, (for we cannot now prove whether it was accurate or not,) and we must work back by another triangulation, that again admits of error, (even supposing the point at Ruland's to be fixed ;) and thus, after passing through two triangulations, of which the latter will be the most difficult, we may *guess* that we have the position of the eastern terminus of the measured base.

But, after we have obtained this point, we can make no use of it, for the sea has encroached on the measured base. Therefore, it is already *impossible* to *verify* the foundation of the whole work, for the base is practically gone; and in view of all the changes that constantly occur on our coast, we may well question whether, in the situation of this narrow strip of sand, exposed to the full swell of the ocean, the sea that has raised it, and made the changes that we see exhibited by the maps, may not, in a few years, sweep the whole of it away to some other place, and leave no vestige of the base.

This base cannot be remeasured, even in the present situation of the beach, but we are informed that "the elements of will be preserved by the mountain base inland from the original base." (21)

This mountain base is 12 miles from the *nearest* point of the measured base; it is 20 miles long, and its termini on two mountains!

We have never yet received any account giving the exact length of either of the three bases.

The east monument on the "sand knoll" is *not*, at the end of the line, "laid out accurately straight." (20)

4.

The base being permanently established, the primary triangulation (24 and 41) commences from the extremes of the base. Angles are measured between each terminus and some distant conspicuous point. The distances to these points are then calculated. These points in turn serve for new triangles in the same manner as the original points at the extremities of the base—the only difference being that the distance between the extremes of the base was measured, while the distances between all the other points are calculated from the angles. (19)

The latitude and longitude of every point in the whole survey are given by the distance of that point from certain other points whose latitude and longitude have been ascertained. (23)

The primary triangles are chosen with especial reference to accuracy in the general result, without regarding the minute topography. But, before we can ascertain the certainty of the result, it is necessary to know the figure (41) and density (26) of the earth in that part over which the survey is carried. This can only be ascertained by astronomical observation at different points, and by the measurement of different bases. (39 bis.)

Therefore, since the whole of a survey by triangles is a connected work, (37) if the foundation is not correct, the whole is false. The soundings depend upon the topography, (36) the topography on the secondary triangulation, (34 and 35) and the secondary on the primary triangulation. (28, 32, and 33) Thus it is evident that every thing is uncertain until the primary triangulation is certain, and this cannot be certain until it has been carried on to verification. (27)

Therefore, until the primary triangulation has been verified, we shall have no certain results from the secondary triangulation, even where the secondary is kept within its proper limits, in the immediate vicinity of the primary triangulation.

Much less can we depend on the secondary triangulation when carried beyond the primary, (38) being in its nature less accurate, and adding error to error, for want of new station points, furnished with greater certainty by the more perfect instrument used, and more favorable size and shape of the main triangles. (24 and 39)

Hence the primary triangulation should be carried on to verification (27 and 39 bis) with all possible industry, in order that, if any error should be discovered, it might be corrected immediately, so that each point in the main triangles being certainly established, in distance, in latitude, and in longitude, the whole of the remainder of the work would depend on a foundation *proved* to be correct. (39 bis.)

Consequently, the secondary triangles, the topography, and the soundings, depending on points whose positions would be certainly known, the whole work, in all its details, would be reduced to a certainty, and perfect maps could be made of each part, in succession, as fast as the notes were taken, (40) showing not only a *detached picture of the proportions*, but giving the latitude, longitude, and compass bearings of each part, and admitting exact measurement in miles or feet; or, in other words, the navigator would have perfect charts, as fast as they could be made, and not be compelled to wait, as is now the case, (41) for an indefinite period, until the primary triangulation converted the *uncertain* modulus, used in the detail works, to a *certain* measure. (33.)

Now, we find, from the testimony of one of Mr. Hassler's assistants, (41) that we do not know the exact difference of longitude between any point in the survey and the meridian of Greenwich, near London, from which all our navigators calculate their longitude, since they use the Nautical Almanac calculated at that observatory. But, from Mr. Hassler's testimony it appears that he has *one* perfect astronomical station on Weasel mountain, in the interior of the country. (23) That the calculations of the triangles *will give* in ultimate results the longitude and latitude of every point in the survey, cannot be denied. But before we arrive at this "ultimate result," we must have more astronomical observations, and his main triangulation carried over his secondary triangulation, and verified.

5.

To say that his main triangulation should be carried over his secondary may sound strange, but such is the present condition of his work. (38) In the early stages of the work, Mr. Hassler confined his secondary to the immediate vicinity of his main triangulation; (29, 30, 31) but, in 1839, (32, 50) he refers to a change in the mode of operation from the ordinary and regular arrangement to one that resembles the operation of a surveyor who measures his angles and paces the distances, trusting to his chainmen to give him the actual measure a "few years hence," to enable him to correct his approximations. The main triangulation extends from Mount Carmel, in Connecticut, to Yards near Philadelphia, a distance of about 150 miles in a direct line, while his secondary, after filling up this space, has extended to Point Judith, (41, 51) about 75 miles east of his main trian-

gulation, and to Annapolis about 100 miles south of his main triangulation, besides a *fringe of small triangles*, running along the Jersey coast, from Sandy Hook to Cape May, about 115 miles. (38, 41) The whole *without verification*, (25, 27) for the coincidence mentioned (in note 38) is no verification, without a *measurement of the actual distance*, to ascertain whether both triangulations are not in error.

Thus we have the whole of this work extending beyond the main triangulation suspended in doubt, for the want of the main triangulation establishing the points with greater accuracy; and the main triangulation itself, even as far as carried, yet requiring a few years before it can be verified. (41, 42)

6.

But it seems that Mr. Hassler had *no time* even to take the *compass bearings*, from station to station, although remaining on the spot for months. (43)

Thus it appars that we must yet wait a "few years" before we can have perfect maps, such as we have a right to demand in return for the million of dollars that have been expended, while, in the mean time, all that we can get will be approximate picture representations of the proportions, without latitude, longitude, or compass bearings. (Page 20.)

Although the survey has not all the certainty that it should have, still the figure of the earth is so nearly ascertained, by the triangulations in other countries, that we shall probably find but trifling errors to correct when the main triangulation has been verified.

The present information arising from the survey, both in the general position of the coast over which the work has been carried, and in the detail operations of soundings, &c., must therefore be vastly superior to any thing which we have at present. We should therefore have an immediate publication of the outlines of the draughts that have been reduced, showing the approximation thus far obtained, executed in the simplest manner, and with regard solely to accuracy, without respect to appearances. (44)

To withhold this information until the work is complete in all its parts, and the engravings executed in a style superior to any thing known in this country (44)—and that proceeds so slowly that Mr. Hassler's engraver could not feel certain that the maps of New York harbor alone would be finished in two years, although they have now been ready for engraving—and to wait until the work shall do credit to the superintendent "as a man of science," while wrecks upon wrecks are occurring annually on our coast, for want of the information that must of necessity have been obtained by the survey of the coast, appears to be a wanton trifling with the distresses of our fellow-beings, and not more reasonable than to refuse the miserable shipwrecked mariner a morsel of food, to save him from immediate starvation, while, with all due deliberation, we prepare a magnificent entertainment, of which he may partake, if he happen to live long enough.

7.

That we may form some opinion as to the relative position of this work and similar undertakings in Europe, we will refer to the countries with which Mr. Hassler invites a comparison (47, 51, 58) that we may be

able to judge whether there is any reason to blame him for the present uncertain condition of the *whole* work, arising from the want of certainty in the main triangulation, which Mr. Hassler claims as exclusively belonging to himself. (24)

In 1792, 1793, and 1794, Delambre and Mechain measured 9 degrees of latitude, requiring 115 triangles. (45) Allow each triangle to require but one station point, and we have an average of 19 per annum for each observer.

General Mudge, in his trigonometrical survey of England, &c., took 226 primary stations in 19 years, or about 12 per annum. (46)

In conducting the French triangulation of the kingdom, the Commission of the Depot of War give, among their general orders, the following:

"Each triangle of the first order being valued (on an average) at five myriametres of surface, the Committee of the Depot of War has fixed the number of stations which should be finished in one campaign at *fifteen* for the first order, and *twenty-five* for the second, not including those of the first order where they may be forced to return.

"The number of points of the second order, to determine in a triangle of the first order, is fixed at five. All these points should be station points." (*Memorial du Depot de la Guerre, vol.* 6, *page* 31.)

Now, what are the facts respecting the work of our survey?

By examining the appended extracts from Mr. Hassler's reports, and the evidence derived from his assistants before the committee, it will be seen that he has taken the angles from TWENTY stations (48) in ten years, "of which the two first, 1816 and 1817, were rendered useless by the overthrow of the work in 1818." (49)

Why useless? The hills were still in the same places! How can his work be useful to *others*, in carrying on any future operation, if he *himself* cannot use it? But grant him all the time he asks to be deducted from the time of his employment, and then compare his work with that done in other countries, where the surveys were regulated by those who were either willing to work themselves, or who knew what should be done by others!

8.

In the early stages of the work, (29, 30, 31) Mr. Hassler considered it necessary to carry the primary triangulation in advance; but subsequently, (32, 50) he considers it much better to remain in his office in Washington than to run about the country. No doubt, it was much less fatiguing, and, besides, he cleared a large proportion of the $3,000 given to him for the difference between living at home and in the field. (50, 72.)

9.

It must be observed that, when Mr. Hassler says (51) that "the works of the survey of the coast cover now upwards of 11,000 square miles with primary and secondary triangulation, topography, and soundings," he does not mean to include the primary triangulation for the whole, since we find, (52) from Mr. Ferguson's evidence, that the primary covers only 3,577 square miles.

The remark of Mr. Ferguson, as to the importance of the primary triangles, puts a wrong construction on this matter. (53) No objection is made

to Mr. Ferguson on this score, for it is not only natural, but even commendable, that he should put the most favorable views forward respecting his principal. The real question is the amount of time and labor required to do the work, and not its importance.

We may here, in passing, advert to the remark, made elsewhere, as to the great importance attached to this work, and the anxiety of the scientific world on account of it. (54) This importance does no more attach to the superintendent of the work than the worth of a diamond to the lapidary. The astronomer who should make an exact survey of a coast in a remote and unfrequented part of the world would deserve as much credit as one who did the same amount of work, and in the same style, in the most commercial district.

10.

It appears, again, that very small causes are sufficient to prevent Mr. Hassler (55) from taking the field. The report referred to by Mr. Hassler is *Document 28*, made *Dec. 2, 1841*. *It contains:*

1. A general view of the progress of the work.
2. A reference to documents that answer the question.
3. The number of stations occupied for the triangulation.
4. A statement that it is not necessary to answer the questions put to him, as they are contained in 180 volumes in his office.
5. A general view of the "astronomical observations."
6. An inventory of the books and charts, containing the work of himself and assistants.
7. The names of the three charts published, and general remarks as to the rest.
8. A statement of the expense for instruments, and the gross expense for each year.
9. General views of instruments and books purchased.
10. Refers to Treasury Department for answer.
11. General account of appointments.
12. General views as to expenses.

13 and 14. General remarks, that he cannot estimate the time nor expense of finishing the work.

15 and 16. A statement of triangulations in other countries, and general views of the plan of surveying.

17. A list of instruments belonging to the United States coast survey.

This report of eighteen pages, containing no details except the inventories, and no calculations—that contained nothing pertinent to the questions which any one else acquainted with the coast survey could not have written as fast as he would write a business letter—that was not answered for more than five months, and that from the field—caused Mr. Hassler to lose "most of last year's work," by occupying him "three or four weeks."

11.

Therefore, viewing the present uncertain condition of the whole survey, and tracing the whole cause to the superintendent, we hold it proved that we must attribute the present condition to the culpable neglect of the superintendent. (58)

The assistants of Mr. Hassler are in no wise to blame, as far as we have any evidence. That their work is uncertain arises from the circumstance that Mr. Hassler claims the main triangulation as exolusively his work, and has neglected to drive it ahead.

12.

In view of all the results that have been obtained from the heavy machinery of the coast survey, the question is seriously submitted to practical men, whether a small appropriation to fit out the vessels now employed in the coast survey, (58 bis) furnished with charts, chronometers, and other instruments, from the depot, and directed to determine the latitude and longitude of the light-houses, (now amounting to about 250 in number,) with the principal headlands, islands, bars, and other important points, together with a few observations on the most important soundings, (while in certain detached portions of the coast, where the intermediate distance is laid down on the charts with *dangerous* inaccuracy, a surveyor with compass and chain might take a rapid survey of the line of coast between the points of observation,) would not in one year have done more real service to the commercial interest of the country than all the information yet given to the public, derived from all the work of the coast survey. (2)

Grant that in this way we could not obtain minute accuracy, still it would reduce the present uncertainty to within very narrow limits, and the navigator would direct his course with comparative security.

Let it not be supposed that these remarks are intended to show that this mode of *improving* our charts should be substituted for a *correct* survey. This is by no means what is intended. (Page 9.) We want a survey as accurate as it can be made, and there can be no question but that the most correct mode is by triangulation, where this is practicable. Our Eastern and part of the Middle States undoubtedly admit of this mode of surveying, but it must be left to scientific men to devise the ways and means of getting the best survey of our Southern flat coast.

But we want an immediate survey, for immediate use, to correct the gross errors in our charts; and the method above suggested would effect this object at trifling expense, and produce an approximation that might again be corrected when we get more certain data, by a more tedious, but, at the same time, more accurate process.

Since the above views were committed to paper, the recommendation of a former Secretary of the Treasury (58 bis) has been met with. It will be seen that the views contained in each are identical as to the general plan, and the only difference is in the above going somewhat into the details. We have therefore the support of one whose position at the time gave him the best opportunity of judging.

13.

The whole of the observations, charts, &c., connected with the works of the coast survey, are concentrated in an ordinary building, exposed to the risk of fire. (59) For the same reason, they are exposed to robbery; and a more valuable offering could hardly be made to a foreign nation, meditating an attack upon that part of the coast. Consequently, the fire of a single night might destroy the whole; or, still worse, the whole might be off in one night, moving, with all the force of steam, to some foreign Power.

14.

The fullest assurance of the accuracy of the maps should be produced, and means given whereby to judge of and correct errors, if any should be found to exist.

This confidence, or certainty of the accuracy of the charts, cannot be produced without publishing the data, or in some other way placing them out of the hands of those whose characters, as scientific or practical men, are concerned in their accuracy.

If these data or observations be withheld until the work be verified, the operator will be enabled to "force results." (60)

Mr. Hassler says that the operator would not be able to force results. (61) True, he cannot if he keep to his data; but every common country surveyor knows how to "force results," and make his survey look well *on paper*, so that it shall accurately meet and describe *a* piece of ground, although he may not be able to make a correct survey, and describe *the* piece it is intended to represent. The fact is, as stated by Mr. Hassler in his reports of 1842–'43, we have nothing to depend on but the "moral strength of confidence," if all the observations are kept secret until he measures his "verification base on the Chesapeake," which he expects to "reach" "in a *few* years."

The discrepancy in the results obtained in France by Mechain having caused him to conceal his manuscripts, and even hastened his death by distress, it is evident that there would be a strong temptation to conceal an error. (62)

To preclude all doubt on the score of authenticity in the observations, the French require copies of all the notes to be sent regularly from the ground to the department at Paris, and in some cases the original manuscript, signed on each leaf by the observer and his assistant. (63)

Mr. Hassler objects to allowing any of the documents (64) to go out of his sight until the work shall have been verified, although in the original agreement (4) it appears as if the Secretary intended to pursue the plan as described in France, (63) and although most of the notes are in duplicate. (59)

We shall therefore have no certainty until the work is completed, and even then have nothing but the "moral strength of confidence" to depend on for its accuracy. (65)

The numerous instances of deception daily occurring should warn every individual holding a responsible post to make such arrangements as to preclude the possibility of his being even suspected of deception, and therefore that every possible check should be adopted to preserve undoubted confidence in the authenticity of the coast survey. This cannot be effected without a publication of the observations as they progress, or else placing the notes or copies, duly authenticated, beyond the reach of those who would have an interest in concealing an error. (63)

15.

That Mr. Hassler is not infallible is proved by one of his extracts from the coast survey, containing a very defective representation of Newark bay.

Although this map is far from being "complete, and of use in itself," as stated by Mr. Hassler, (2 and 66) still it might have received but a passing

notice, except that it has assumed a collateral importance, by showing the character of the superintendent, and giving rise to some pointed remarks on the floor of this House. We shall therefore examine the subject at length.

The three maps of Newark bay, herewith presented, were in evidence before the committee. They are marked, respectively, "A," "B," and "C."

The first, marked A, is the original manuscript, having the scale marked "3 inches to the mile." (70)

The second, marked B, is the copperplate copy of the same, with the original scale cut out and another substituted with the pen, (67, 70) marked $\frac{1}{10000}$, presented to the committee by Mr. Ferguson.

The third, marked C, is an impression from the same plate as B, (70, 67) but having the scale unaltered, and, like the original manuscript, "3 inches to the mile." (70) It is one of the House documents, of which copies are bound up with the other documents of 1838–'39.

Mr. Ferguson is in error respecting this map having been "printed at the request of the collector of Newark," (68) as the documents of the House prove, since this map was furnished to the House of Representatives on motion of Mr. Aycrigg, (69) and Mr. Hassler states that there were but three maps published, (66) viz: New Haven, Newark, and Bridgeport; consequently, we must conclude that he depended on erroneous information, even without the additional evidence (68) from the collector, that Mr. Hassler refused to let him have this map that he requested. From the manner in which Mr. Ferguson's testimony is written down, the appearance to the eye, on seeing the fractional representations of the scale, might lead to the erroneous impression that these figures are found on the map. (67) We therefore give the exact description of the three scales.

On the original manuscript ("A") (70) we find in the middle of the map, immediately below its title, the following: "Scale of three inches to the mile;" and immediately below it a line marked off into thirds and quarters, the quarters having the figures $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$. The thirds are not numbered.

This scale, representing one mile, is *exactly three inches long.*

The distance from Shuter's island to the head of Newark bay measures, on this map, 2 feet $11\frac{3}{8}$ inches, or in inches and decimals 35.375. Consequently, since there is *nothing* on the map but the above *scale* by means of which we can ascertain the distance, we find the length of the bay 11.80 or nearly 12 miles long.

On the unaltered copperplate copy ("C") we find the scale marked as in the original manuscript (67, 70) "THREE INCHES TO THE MILE" in small capitals.

The scale itself is about one per cent. shorter than the original, being 2.965 inches long, and divided and marked as in the original.

The map is likewise about three-tenths of an inch shorter than the original, (70 bis) giving the length of the bay about the same as the original manuscript. This is the House document, of which copies are found in the bound volumes, while the rest of the impression has been distributed, all showing the length of the bay 11.80 miles.

The map, ("B,") with an altered scale, was presented to the committee by Mr. Ferguson, one of Mr. Hassler's assistants. (67 and 70)

This map has the original scale cut out, and a small piece of paper pasted underneath, to fill the opening. Immediately above this opening is the word "scale," on the small piece below "$\frac{1}{10000}$," and below this, on the

original paper, a graduated scale with the quarter miles marked ¼, ½, ¾, and below the scale are the words "1 English mile."

This scale measures on the paper 6.17 *inches.* Let it be kept in mind that this is not the original scale of "3 inches to the mile," but the corrected scale.

This map, with the exception of the scale, is identical with the former; and Mr. Ferguson informs us (67) that, according to this, the length of the bay "is 5.82 statute miles, but that this map has an erroneous scale attached to it," and that "the actual distance between the two points specified is 5.623 miles, obtained by me [Mr. Ferguson] by measuring on the original topographical map."

Whence comes this last "miswriting of a fraction?" (71) Turn to the length of the corrected scale for one mile, and we see that its length on the paper is 6.170 inches, while the note above, on the same map, says, "scale $\frac{1}{10000}$." Now, 10,000 times 6.17 inches will not make 5,280 feet, or one mile, but it requires 10,000 times 6.336 inches; consequently, the *corrected* scale requires *correction*, and to be made 0.166 or one-sixth of an inch longer before it will be *actually* correct.*

Since these three maps are presented with this report, any member of the House can satisfy himself in a few minutes that the above statement is correct, without depending upon any thing but his own eyes and a common carpenter's rule.

A similar examination will show that one of the members, at least, was deceived by incorrect statements, which led him to remark, on this floor, that, "while the original, and the copy, too, as far as it is a copy, were perfect in every part, the scale of 3 inches on the margin, placed there by the copyist, errs in giving 3 inches instead of 6 inches to the mile—an error which Mr. Hassler hastened to correct;" since we find that the only correction in any of these maps is the *single* map "B," (70) in which one incorrect scale, with an error of 3 in place of 6.336 inches, as it ought to have been, (that was exactly *copied* from the original,) was cut out, and another *incorrect* scale, with 6.17 in place of 6.336, substituted *with a pen on the single copperplate copy.* So that, after *two attempts* from the coast survey, we can ascertain nothing from any of these *maps* but the picture proportions, since none of the scales on the maps are correct, as we ascertain from the investigation before the committee. (67)

Fortunately for the engraver, he had preserved the original manuscript, which was not known by the committee to be in existence until six weeks after the altered copy had been produced.

It is a serious question for the House to determine whether a person is fit to conduct the coast survey whose mind is in such condition that he denies his own map, in a circular over his own name, (71) (distributed among the members,) and charges one of the committee with doing him a *wilful injustice*, (which, taken in connexion with the context, means that he has made a false and malicious statement, to injure Mr. Hassler,) although Mr. Hassler had a full knowledge of all the circumstances connected with the history of this map, not only from recollection and from the notes in his own office, but from the printed documents quoted in the notes, (69) and when the whole circumstances of the case, as described by him, are proved

* If, in forming the corrected scale, it was intended to allow for the shrinking of the paper, and consequently to reduce the length of the scale that would have been placed on the manuscript, then the length of this scale should have been 6.27 inches, or 1-10th of an inch longer.

by these maps, now presented to the House, to have been impossible. It is also very remarkable that Mr. Hassler has suppressed the date of this map in the statement (2) which he gave to the committee, and which is ascertained, by re-examination, to be correctly copied from the original "183–." And, again: in his late circular, printed at Philadelphia, the same date is given still more indefinitely, "18 ," at page 26. This map, whose date he has forgotten, and apparently cannot discover, is one of the only three maps that have been published, and one of the eight which are all that Mr. Hassler shows have been produced by the coast survey. The remaining five have never been published. (2)

But, in his enumeration, (2) he has forgotten to mention a ninth map, being a chart of the upper end of Newark bay, on a scale of about 13 inches, or one French foot, to the mile. The map is on file among the documents of the House, having been officially sent there by the Secretary of the Treasury, who received it from Mr. Hassler; but, like the other five maps, it has never been published. (69 bis.) These omissions of Mr. Hassler are noted without further comment.

Copies of the printed map were distributed, in 1840, among those who navigate that bay, but, fortunately, it was so extremely inaccurate that no one was deceived by it, and it has fallen stillborn from the press, having neither latitude, longitude, compass bearings, nor divisions, along the margin; and the top of the map is not north, but northwestward, so that we have nothing but a picture with a scale showing the length 11.80 miles, in place of 5.623, which Mr. Hassler calls "an accidental miswriting of a fraction by one of his [Mr. Gedney's] subalterns," (71) unless he refers to the second error in the altered scale, making the bay 5.82 miles long.

Is Mr. Hassler to be excused for presenting, officially, a false map, because the error was made by an *assistant's assistant?* If so, what becomes of our confidence in the coast survey?

It was stated on this floor that this was "but a solitary fact in a survey which has been going on for the last ten years."

Things unseen are judged by those that are seen. We have, besides the map not noticed by Mr. Hassler, but eight "facts" from the whole work; and this one fact, after having been *corrected*, still requires the *correction* to be *corrected*, besides being in other respects useless, on account of *omissions*!

The other charts have not been examined by the committee.

16.

The system of triangulation contains within itself an inherent defect, that is avoided in a measured survey. In the latter case, each course (or azimuth) and distance is entirely independent of that which preceded; so that, if we commit an error in one line, it does not affect those that succeed; but in a system of triangles we get nothing but proportions, after we leave the measured base. Consequently, if an error be made in any part of the work, that error vitiates all that follows, unless the place of the error be discovered; and, without a double series of triangles, we cannot discover that there is any thing wrong, until we get to the verification base. Still, a trigonometrical survey is far superior to a *measured* survey, where the country is adapted to the former, because the three angles of every main triangle being measured, (19 and 45) and the dimensions of the earth being very nearly known, the sum of the three observed angles, when compared

with what they should be, according to calculation, will show if there is any material error. But when we reach a flat country, without any natural elevations, (78) we may reasonably doubt whether much confidence can be placed upon a survey *without linear measurement*, when that survey is to be made by measuring two angles, or even only one angle of a triangle, and calculating the others from data furnished by astronomical observations—thus reducing a triangulation into what we might term a *biangulation*, or an *une-angulation*. Hence we may infer the cause of the difficulty that Mr. Hassler found in making the committee *comprehend* what he meant by "mixed astronomical and geodetical observations," and that caused him to send in the communication containing the *une-angulation* problem. (78 bis.)

17.

Mr. Hassler commenced by taking the primary triangles with sides 30 or 40 miles long. (22, 52) It has been said on this floor that stages can be erected and the trees cleared away. If the trees are to be cleared, it will be a Herculean labor, for the length of the lines of the primary triangulation alone will be about three times the length of the coast surveyed, if the survey is to be accurate; and to see the station points, for the secondary triangulation, will require the woods to be cleared away to a still greater extent. Neither will the erection of stages be so small a matter as might be supposed at first sight. If we wish to take a sight of 40 miles, it will require a stage at each end about 400 times eight inches high, or 266 feet; if 30-mile sights, then the stages must be 225 times eight inches, or 150 feet; if 20 mile sights, the stages must be 100 times eight inches, or 66 feet high, even supposing no irregularity of the ground between the points rising to a higher level than the station points.

But this is not the only difficulty. After we erect a stage of 150 feet high for the theodolite, and another 150 high for the heliotrope, for a sight of 30 miles, we are *just* able to see along the surface at half the distance between the points, even supposing the ground to be as level as the ocean, and clear of brush.

If any obstruction exist, *each* stage must be raised that much higher, and we are then just able to *see* over the top of the intervening object. But something more than this is required. We must see accurately. The extracts from Mr. Hassler's papers on the coast survey, published after the suspension of the work in 1818, show the difficulties that he met in taking observations on objects but a few miles distant. (52 bis and 50) We may hence infer the quality of the observations that would be obtained by long sights, sweeping along close to the surface of the earth half way between the extremes, and leaving the surface but eight inches for the first mile, thirty-two inches for the second, and so on as the square of the distance, each way from the centre, amid the irregular refraction produced by the boiling, eddying currents of air of unequal density, that are almost universally met with near the surface either of earth or ocean.

Now, it is through difficulties such as these that Mr. Hassler proposes to carry on his survey entirely by angles, without any linear measurement. (78)

The undersigned will not undertake to say that this is not all right in principle. But we hold it to be our duty, as men of common sense, to call

a halt, and, by application to the scientific and the practical men of the country, to ascertain whether our Southern coast admits of triangulation, or whether we shall not waste a large sum of money annually (41 bis) in carrying on a survey that will be much inferior to one which might be made in less time, and at a vastly reduced cost, even supposing the present superintendent to work more rapidly in the midst of difficulties than he has thus far done, where the country was suitable to a survey by triangulation. (78)

The total report of 1842 is given in the notes, (90) as far as it contains any information respecting the coast survey, that part being comprised in *sixty-nine* lines of Document 23, exclusive of a few lines respecting the appropriation of "$100,000," (for the next year's work,) "which several of the latter years have proved to be exactly adequate," &c. (41 bis.)

Of this same report, *sixty-seven* lines are occupied by a description of a dividing instrument (88) for his *machine shop*, about which *he* made some great mechanical improvement!

The House will judge whether this report of generalities, in return for $100,000 expended, is in accordance with the directions of the Secretary of the Treasury, (4) and whether Congress would be justified in passing an appropriation bill for $100,000, without any estimate being submitted, solely because Mr. Hassler says that it is "exactly adequate." (41 bis.)

18.

The next question that presents itself is the organization necessary to carry on an extensive survey; and, to settle this point, we must trace its progress of triangulation from the beginning to the end. The object of the primary survey is to connect the extremes by a series of triangles, (24) having the sides of the most approved length, and so that the angles may be as nearly equal as possible. This gives us the greatest accuracy, both in the extreme and intermediate points. The secondary triangles, founded on the primary, must depend for their shape upon the country to be surveyed. The angles of the secondary triangles are necessarily irregular in many cases, and consequently, independently of their being more numerous, they are not as accurate as the main triangles, which are chosen with especial reference to their being as nearly equilateral as the country admits. But this error in the secondary triangulation is not continued through the survey further than to the next points of the main triangulation, where a new start is to be made from the main triangle points. The plane table comes in and fills up the details on land, and the naval parties take the soundings at sea.

Now, the *field work*, in all these operations, requires very little *science*. For the primary triangles, any man of common sense can choose points that will fulfil all the conditions required; and, when the points are fixed, it requires nothing but *good eye-sight*, and a knowledge of the mechanical use of the theodolite, (which can be acquired in a very short time by any one acquainted with graduated instruments,) and care and attention in making the observation. It would certainly be no objection that the observer should be able to reduce his observations, but this is not necessary. He may furnish the best of observations for the use of the mathematician, although he may understand nothing of the scientific principles that govern the *result*. The same is true of the secondary triangulation, and of the soundings, whether in sight of land or in deep water. The plane-table

operations (35) are so simple that any common surveyor could do the work, which is in fact much less difficult that many questions that occur in a farm survey.

There is therefore no positive necessity of having any person of high scientific attainments engaged in the *field work*, to collect the *data* for calculation. (24) The observations require mainly the attention of careful men, who possess both mental and physical activity sufficient to keep themselves and assistants in motion, that the data may be collected with the greatest accuracy, in the least time, and in the most economical manner. These observers can be kept in constant motion. During the summer they can operate at the North, and during the winter at the South. Their observations not being reduced by themselves, they cannot *force results*, (60 to 64) for they will not know what will be the result; and their work being reduced by others, who would have no interest in concealing an error, they would feel the full importance of being accurate, since any error would certainly be exposed.

The observations thus made might be regularly transmitted to this city, (4, 63, and 59) and placed in the hands of a mathematician, who, with his office assistants, should be constantly engaged in reducing the work, and preparing draughts for the engraver. (40)

As to the engraving, there can be but little doubt but that it would be best executed by one who has made this trade the study of his life, and that there are many engravers in this country who can put accurately on copper all that the draughtsman can put upon paper.

We should then have the survey conducted on a system of practical utility, and moving *right* end foremost; (33) we should not be compelled to wait, as in the case of Mr. Hassler, yet a "few years" (41, 54) before we can get any full account of the work; while, in place of attending to the main triangulation, which he claims as his exclusive property, he is concentrating about himself his workmen in his foundry, his machinists for the manufacture of weights and measures, (88) his machinists for making instruments, (88) his engravers, (88) his copperplate printers, (88) besides all the persons engaged in the coast survey, (28) mixing up the several branches of mechanics that are ordinarily looked upon as separate trades, each of which requires the separate attention of any ordinary man. Perfection in any thing requires the undivided attention of the individual; and the "division of labor" is carried even into the European observatories, where one man takes the observations, for others in the same room to reduce by calculation. The observer and the mathematician are different persons. This is the mode in which the operations are conducted in a *single stationary* observatory in *Europe*.

Compare this with the mode of conducting the *American* coast survey.

There is no inclination to detract any thing from the reputation of Mr. Hassler as a man of science. (19.) We are willing to assume all that his friends claim for him on that score. We might even grant more than they ask; but this will not alter the position of the question at issue. Without undertaking to judge of his mathematical knowledge, our duty is to take a common sense, practical view of the subject; it is not necessary to decide whether he is *capable* of conducting the work properly, but whether he has actually done so. That this is not the case has been already shown, from his own testimony and that of his assistants.

19.

The objection to a scale of "so many miles to the inch" is not very evident. (91) If we formed our scales with reference to the actual mile, it might be correct; but, since we use the small measures for a small scale, and since the scale is theoretically of no importance as long as it is in proportion to the map, it becomes a mere question of convenience, whether we shall adopt the scale of $\frac{1}{10000}$, which requires 6.336 inches to the mile, and consequently is not only a difficult scale to form accurately, but, not being in general use, must be formed expressly for these maps.

It is also a little peculiar that our survey is calculated in French metres. (92) It is a measure not usual in the country, and, with the exception of a few metres that have strayed into this country, must in general be deduced from our foot or yard measure. The English used their own measure; but, after all the expense of constructing standards for this country, it seems that the very individual who had charge of this work rejects his own measure. These two points are of no great importance; but it is an important fact that our standard measure, as constructed by Mr. Hassler, contains nothing but yards and decimals, and has neither a *foot* nor an *inch* marked on it.

If, then, we desire to ascertain the length of the foot, we must divide the standard yard into *three* parts, which is not a very easy matter, if we desire accuracy, while it might have been done in the first instance with as much ease as to make the decimal divisions by means of the expensive apparatus used for the construction of the standards.

It also appears that, in addition to the innovation of using a difficult scale for the construction of the maps, of using the French measure as the basis of our calculations, and of forming a standard without containing the most common measures in use, we must also calculate in *triangular* miles, (93) since the research of the committee "exceeds itself again, when it comes to determine the square miles covered by triangles which have but three corners." (For other peculiarities, see note 71 bis.)

20.

In conclusion, the following suggestions are submitted:

That the President be requested to take such measures as may preserve the measured base, and also the actual base, if, in his opinion, the same be practicable; and to inform this House, at its next session, of the existing condition and the prospects of the future preservation of the same, together with such suggestions as he may deem advisable.

That the President be requested to procure information from the best sources, both scientific and practical, as to the best mode of surveying the different districts of the United States coast, and the proper organization of the corps of surveyors and mathematicians, in order that the work may be done in the shortest time and at the least expense consistent with the greatest accuracy and certainty in the results; and that he cause the same to be transmitted to this House at the next session, in order that the field work be resumed and prosecuted with the greatest vigor, in accordance with such provisions as the wisdom of the next Congress may establish, after being in possession of the scientific and practical information which the late investigation proves to be requisite to enable Congress to act judiciously on the subject. Also, that all who take an interest in the proper

organization of the work be invited to transmit to the Clerk of this House such hints as they may consider useful, to be endorsed "coast survey," in order that the House may be in possession of all the information that can in any way be obtained.

That the office of the coast survey be no longer devoted to the mechanical operations of manufacturing surveying instruments, of engraving, and of printing, but, leaving these to be performed by those who devote their time entirely to these trades, the office be used exclusively for the scientific purposes of reducing the observations and protracting the charts for the engraver.

That all the duplicates now in the office of the coast survey be signed by those who made the observations or reduced the same.

That duplicate copies of all the works in the coast survey office be immediately transmitted to the Secretary of the Treasury, signed by those who are responsible for their accuracy.

That all the observations that have thus far been made be reduced to their final results, and manuscript charts protracted from the same, giving the latitude, longitude, and compass bearings, as near as they can be ascertained from the data as known at present; and that the extreme error that may possibly exist be marked on the face of said charts; and that the said charts, when finished, and containing all the information that has been collected, be transmitted to the Secretary of the Treasury, who shall cause the same to be engraved, in part, and published for immediate use; and that the Secretary of the Treasury retain the plates and manuscripts, in order that the engraving may be finished as soon as it is ascertained that they are correct, or what corrections require to be made; (89) and that the publication of said charts be done by contract, according to specimen, and with the condition that the copy shall not vary from the original beyond a minute fixed limit, so as to be *practically* identical with the original; and that the plates now in the hands of the engravers, in the office of the coast survey, be considered as coming under the same condition as the preceding.

In the mean time, that the vessels now engaged in the coast survey (after devoting about two months in order to finish the soundings in those places where the signals are now standing) be furnished with charts, chronometers, and other necessary instruments, from the depot, to be allowed to refit from the public stores, and to be employed in determining the latitude, longitude, and compass bearings of all the light-houses, capes, headlands, islands, sand bars, and other important points along the coast—to be employed at the South in winter and at the North in summer; to transmit monthly returns of all their observations and results, signed by the officer who takes and calculates the same, with a note as to the confidence that he places in his own observations; and that the public be informed through the newspapers of all the inaccuracies in our charts as soon as they are ascertained, giving the name of the individual upon whose observations the determination rests.

Also, that these nautical observers be directed to take such soundings as may be of immediate importance, in order to correct the errors in our charts, and that the same be published in like manner, to warn the navigator of a hidden danger.

Also, that observations be made, so as to connect the points, whose position

in latitude and longitude have been ascertained, with some fixed conspicuous objects in the neighborhood, in order that the identical spot may be found by any other observer at any future time, when the survey of the coast shall be carried over that district.

That the Topographical bureau be directed to take all the detail surveys on land, including the military information necessary for the defence of the country, from points furnished by the general survey of the coast, and that the draughts prepared from the same be preserved in the War Department, for the exclusive use of the Government, while the navigator's chart shall exhibit no more of the inland districts than such as shall be necessary for the navigator, according to the system pursued in preparing the sea charts by the Governments of France and England.

That, in future, detailed estimates of the expenses be made to this House, and that no appropriation be made hereafter, in the form of one grand contingency of $100,000; and that the Secretary of the Treasury be required to transmit an annual statement, in detail, of the expenditure of the appropriation.

That there be a revision of the salaries and emoluments of the persons engaged in the coast survey.

And, finally, that the superintendent be appointed by the President, with the sanction of the Senate; that all officers receiving more than $1,000 per annum (exclusive of the officers detailed by the Topographical bureau, as above stated) be appointed by the superintendent, with the consent of the President; and that the number, duties, and compensation of all the subordinates be submitted by the superintendent to the President, and sanctioned by him, before they be employed by the superintendent.

Respectfully submitted.

JOHN B. AYCRIGG.

NOTES.

[The references to Document No. 43, January 12, 1843, being the journal of the proceedings of the select committee on the coast survey, are simply marked with the name of the individual under examination, and the page of the document on which it will be found.

The references to Hassler's Coast Survey show the pages from which the extracts are taken, from "papers on various subjects connected with the survey of the coast of the United States by F. R. Hassler, extracted from the American Philosophical Transactions, vol. 2, new series, Philadelphia, 1824."

The references to the documents are principally to the reports of Mr. Hassler.]

NOTE (1.)

16. Question. Are we not greatly deficient in knowledge of soundings in Buzzard's bay, Nantucket shoals, Cape Cod, and Massachusetts bay?

Answer. Yes.

17. Question. Is not a knowledge of those soundings of the greatest importance to navigation?

Answer. Yes; it is more wanted there than any where else. More tonnage passes. Most vessels from Europe, for New York and Philadelphia, come between the Gulf stream and Nantucket shoals, in addition to the navigation north of Cape Cod. Most of the coasting trade comes through the Vineyard. [*Blunt, p. 23.*

Note (2.)

List of the individual maps executed and delivered.—[*Hassler, p.* 62.

1843

No.	Maps.	By whom made.	Scale.	Date.	Remarks.
1	Harbor of Bridgeport, Ct. - -	Lt. G. S. Blake -	1-10,000	1835	Engraved.
2	Newark bay, N. J. - -	Lt. Th. R. Gedney -	1-10,000	183–	Engraved.*
3	Harbor of New Haven, Ct. -	Lt. G. S. Blake, and Wm. M. Boyce.	1-10,000	1838	Engraved.
4	Country between the Thames and Niantic, from the sound up to Mohigan creek.	F. H. Gerdes -	1-10,000	1840	Treasury Department, for the honorable J. W. Williams.
5	Sandy Hook bar - - -	C. Renard - -	1-10,000	1841	Treasury Department, light-house, Mr. Pleasonton.
6	Thames river, topography and hydrography.	F. H. Gerdes -	1-20,000	1842	Treasury Department, for Senator Huntington.
7	Sandy Hook bar - - -	H. L. Whiting -	1-10,000	1842	Topographical bureau.
8	Fisher's Island sound, and the entrance of New London harbor, Ct.	F. H. Gerdes -	1-20,000	1842	Treasury Department, for the honorable J. W. Williams.

* N. B. Mr. Hassler has forgotten the date, 1839. (See page 20 and note 69.)

NOTE (3.)

AN ACT to provide for surveying the coasts of the United States.

SEC. 1. *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the President of the United States shall be, and he is hereby, authorized and requested to cause a survey to be taken of the coasts of the United States, in which shall be designated the islands and shoals, with the roads or places of anchorage, within twenty leagues of any part of the shores of the United States; and also the respective courses and distances between the principal capes or head lands, together with such other matters as he may deem proper for completing an accurate chart of every part of the coasts within the extent aforesaid.

SEC. 2. *And be it further enacted,* That it shall be lawful for the President of the United States to cause such examinations and observations to be made, with respect to St. George's bank, and any other bank or shoal, and the soundings and currents beyond the distance aforesaid to the Gulf stream, as in his opinion may be especially subservient to the commercial interests of the United States.

SEC. 3. *And be it further enacted,* That the President of the United States shall be, and he is hereby, authorized and requested, for any of the purposes aforesaid, to cause proper and intelligent persons to be employed, and also such of the public vessels in actual service as he may judge expedient, and to give such instructions for regulating their conduct as to him may appear proper, according to the tenor of this act.

SEC. 4. *And be it further enacted,* That, for carrying this act into effect, there shall be, and hereby is, appropriated a sum not exceeding fifty thousand dollars, to be paid out of any moneys in the Treasury not otherwise appropriated.

[*Approved, February* 10, 1807.]

AN ACT to carry into effect an act to provide for a survey of the coast of the United States.*

SEC. 1. *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That for carrying into effect the act entitled "An act to provide for surveying the coasts of the United States," approved on the tenth day of February, one thousand eight hundred and seven, there shall be, and hereby is, appropriated a sum not exceeding twenty thousand dollars, to be paid out of any money in the Treasury not otherwise appropriated; and the said act is hereby revived, and shall be deemed to provide for the survey of the coasts of Florida, in the same manner as if the same had been named therein.

SEC. 2. *And be it further enacted,* That the President of the United States be, and he is hereby, authorized, in and about the execution of the said act, to use all maps, charts, books, instruments, and apparatus, which now or hereafter may belong to the United States, and employ all persons in the land and naval service of the United States, and such astronomers and other persons as he shall deem proper: *Provided,* That nothing in this act, or the act hereby revived, shall be construed to authorize the construction or maintenance of a permanent astronomical observatory.

[*Approved July* 10, 1832.]

* See volume 4, page 79.

NOTE (4.)

The Secretary of the Treasury, August 3, 1816, says: "You will make frequent reports of your progress to this Department, and deposite here all the surveys, draughts, notes, charts, maps, journals, and documents, in anywise belonging to the survey of the coast; and you will return the public instruments and books to such place as shall be directed, when they are no longer required for the business of the survey."

"If at any time it should be necessary to explain the nature of your engagement," &c., "the articles submitted by you on the 12th of July, 1816, will be resorted to" particularly.

July 12, 1816, Mr. Hassler proposes "to make, himself, the principal part of the general large triangulations and the consequent calculations." That he shall receive $5,000 per annum for all his expenses, except those of a public nature, and (if understood correctly) that the following shall be, excepted from the other expenses of the work, viz: "The clear executed copies of maps and charts, either general or particular, which will be required by the proper authorities, or prepared for publishing." Observe the concluding sentence—"*or prepared for publishing*."

On the reappointment of Mr. Hassler, August 9, 1832, the Secretary of the Treasury says: "You will receive, in full for all your services, a compensation at the rate of $3,000 per annum, and for all your personal expenses an allowance at the rate of $1,500 per annum," &c. "In all other respects than those indicated by this letter, the terms and nature of your employment will be the same as were fixed by the letter addressed to you by this Department on the 3d of August, 1816."

NOTE (5.)

"Survey of the coast" "must present the localities of all the passages and gorges that lead to these valleys, &c., because it must contain all that is needed for the proper defence of the coast in the case, of any attack whatsoever, just as much as the outlines of the coast and the soundings, because, like these, furnish the guide to the navigation," &c. (See this extract—military purposes, statistics, and article 47, for use of State surveys, 1834–'35, Doc. 2, page 372.) [*Hassler.*

NOTE (6.)

"In the years 1793 and 1794, Mr. Gardiner and the gentlemen of his department accompanied us in the survey of the coast of Hampshire and the Isle of Wight, and have since finished the military description of both, drawn on a scale of three inches to the mile; but these plans, together with one of the country round Tunbridge, and another of that around Bagshot and Farnham, are lodged in the Tower, for the use of the Government, and not submitted, from obvious motives of policy, to public inspection." (Preface to Mudge's Trigonometrical Survey, vol. 1, page 12.)

NOTE (7.)

"Both works" (*i. e.*, the coast survey and weights and measures) "are equally in the interest of commerce, and have no reference to the navy.

The accurate survey of the coast is made with the view to protect the property afloat on vessels from shipwreck, and the regulation of the weights and measures is to," &c. (1835–'36, Doc. 2, page 385, vol 1.)

NOTE (8.)

The aim of the coast survey is, and has always been considered to be, by all the successive administrations since its existence, to furnish, with the fullest accuracy possible, all the geographical, topographical, and hydrographical data that may in any way be needed for the navigation and the defence of the coast, in their generality, and to the extent of the country in the rear of the coast, to which the valleys extend, that empty their waters into the Atlantic, and are thus separated from it by some chain of mountains, or what may be called the nearest chains of elevations separating the interior from the coasting countries; and that this work should also furnish the elements to any future map of the country desired, as it is by its nature so extensive, and so situated, as to furnish the elements of maps of all the States. In fact, some States have already united in the work, to extend these elements to the advantage of an accurate map of these States. (Doc. 28, page 3, 1841–'42.) [*Hassler.*

NOTE (9.)

96. Question. Do you regard the survey as a great scientific enterprise, embracing delicate problems of geodetic research, beyond what is necessary to an accurate but rapid survey of the coast for nautical purposes?

Answer. There is not a single movement in all I do which is not necessary for the honorable and faithful execution of the work.

97. Question. Is it intended as the basis of a topographical, military, and statistical survey of the whole United States?

Answer. That is the Government's business, and not mine.

98. Question. Is the survey conducted now with a view to any such ultimate purposes?

Answer. That is not given in any charges by the Government; therefore I do nothing with it. [*Hassler, p.* 11.

NOTE (10.)

31. Question. Of what use are the plane tables, so far as regards navigation?

Answer. I do not consider it of any use to extend the survey any further back than the slope of the hills at the head of navigation.

32. Question. Are the plane tables further back?

Answer. I do not know how far back. I presume they are. [*Blunt, p.* 24.

NOTE (11.)

"The limitation to any determined distance from the coast would require that the mountains, which are indispensably necessary for the station points of the survey, be within that distance." [*Hassler, p.* 46.

16. In general, a limitation to three miles from the coast, as has been

talked of, is a virtual abolition of the work itself, as well from the side of the natural as the moral difficulties it would suscitate, and the impossibility of giving to the work the required accuracy; nor would any other limitation be less injurious. [*Hassler, pp.* 54, 55.

17. The shore line of a coast is never seen from a ship approaching it; the picture of the elevated land is what presents itself to the sailor; in this he is guided by so much of the topography as can be seen at a reasonable distance at sea, and this lies back in the country at distances which are not determinable but by actual survey; thence the only rule is that which I have followed, and long ago stated, namely: the "topography must go to the ridge of mountains which determine the heads of the coasting rivers or creeks, or their passage through such mountains, what is called in France, technically, '*le versant de la Vallie côtiere*,' or '*le voisant de la cote*.'"

Such it has always been understood and proved.

18. My rule of action, and guide in the work, must be my contract to make the work "*honorable* and *permanently useful, to the nation*:" the way to obtain the aim must be left to me; if I was to be guided by any foreign direction, except mathematical principles, some of my assistants might even rise up against me, refusing to do what they might think to exceed my powers, and I would either have to dismiss them for such refusal, or the work would become impossible. [*Hassler, p.* 55.

NOTE (12.)

101. Question. Cannot the survey of the bays and rivers be postponed, without injury to the general work, till the survey of the coast proper is completed?

Answer. It is impossible, because no accuracy could be got for the coast. [*Hassler, p.* 11.

NOTE (13.)

79. Question. What benefit results to navigation by having all the details of the topography of the country?

Answer. There is no more topography in the maps than what is necessary for that object.

80. Question. Cannot a portion of the topography be dispensed with without detriment to the object of a knowledge of the coast for navigation?

Answer. Not to that extent to which it is carried now. I could not dispense with any of the topography as it is now done. [*Hassler, p.* 9.

NOTE (14.)

81. Question. Do not the hydrographical parties have to wait for those engaged on the topography?

Answer. They cannot go six inches without it, but they do not wait; the topographical part has always been ahead. [*Hassler, p.* 9.

NOTE (15.)

30. Question. Are you able to keep up with the triangulation?

Answer. Yes; and I have been in advance of the plane-table parties.

31. Question. Are the plane-table parties necessary to the soundings?

Answer. Yes. [*Gedney, p.* 40.

NOTE (16.)

10. Question. Can a topographical map, so constructed as to give in detail a full and self-explaining picture of the country, that, with the map before the eye, the military operations may be properly judged and guided in the cabinet, be obtained, in carrying on the coast survey, without adding greatly to the expense, and materially delaying the execution of the work?

Answer. No, it cannot. [*Blake, p.* 41.

NOTE (17.)

27. Question. Is the topography of the country within the coast of any importance to navigators?

Answer. It is not, except for four or five miles, or where there is any remarkable eminence or other object inland.

28. Question. Is it customary to lay down the topography of the country on the charts of navigators?

Answer. I have never seen it in any charts except of islands. In charts of the West India and other islands it is sometimes given; but in those cases it is not necessary for purposes of navigation. [*Gedney, p.* 39.

59. Question. What necessity is there of plane-table parties, except near the coast?

Answer. No absolute necessity, except for the secondary triangulation near the coast.

60. Question. How far in from the coast have plane-table parties gone on the survey?

Answer. I cannot say precisely. They are carried on by Mr. Gerdes, Mr. Sands, Mr. Boyd, Mr. Dickens, and Mr. Werner.

61. Question. Do the plane-table parties require much science?

Answer. They require practical skill. [*Ferguson, p.* 18.

NOTE (18.)

"It is now necessary to execute, if possible, in continued regular succession, all the topographical part of the country that is now covered by primary and secondary triangulations."—(1835–'36, vol. 1, Doc. 2, p. 383.) [*Hassler.*

NOTE (19.)

The surveys made in Europe, of sufficient note to apply to them the mathematical and physical sciences, which are, in principle, to be applied, and without which *success is directly impossible*, were all begun in the last century upon similar plans of triangulation; varied as they all are in the methods and mode of the detail execution, they all agree in that principle.

Austria began already, after the times of Cassini and Liesganig, (1768,) using the triangles of Liesganig, made for the determination of degrees of the meridian, in Austria and in Hungary, as the primary mathematical elements of her future maps.

Russia began under Catharine II, and has since constantly either taken up at different points or extended the triangulations successively made,

with always more perfection of men of science. Now, these triangulations form a fully connected series from north of the arctic circle to south of Dorpat. The work goes now on, with a great abundance of means, as well in persons as money, for the topographical and hydrographical parts, to which the triangles give the foundation, principally around the Baltic.

Sweden has similarly taken advantage of the trigonometrical operations of Svanberg, in Lapland, for a measurement of a degree of the meridian begun in 1801, for its maps and the charts of its coast.

Denmark began, under Bugge, before 1784, for its peninsula; and not many years ago the part of Holstein was triangulated, in conjunction with Hanover.

The kingdom of Hanover has been triangulated by Professor Gauss.

Prussia, having taken advantage of the extension of the French triangulation in Germany over its present Rhenish provinces, has not only extended this triangulation over a great part of its dominions, but has added new measurements of degrees all over, until lately, Mr. Bessel, astronomer royal of Königsberg, joined these works with those of Russia just quoted. All these works have been, and are still, used as elements for the geographical, topographical, and hydrographical surveys of the country.

Swabia was triangulated by my university friend, Professor Bohnenberger, of Tübingen, and I accompanied him, in 1795, in the junction of his triangles with mine in Switzerland.

The operations of the triangulation of Bavaria are well known and fully described.

All the States of Germany have either made triangulations upon their own base lines, independent of the French triangulations, which were constantly carried on in the rear of the French armies, during the whole of their campaigns, from 1791 onwards, or used these very triangulations; and the different States have grounded upon them the maps of their countries.

The same is the case with Italy, where the triangulations of Boscovich, Beccaria, Zach, Nouet, the joint Austrian, French, and Sardinian commission, and others, from before the French Revolution, during the same, and since, have been, and are, constantly used as foundation to any maps or charts that are constructed.

Naples and Sicily proceeded in the same manner; and the whole was executed *without any naval officers* being employed in it.

In 1791 I had already begun myself in Switzerland a similar operation, by the measurement of a base line of about 7½ miles long, upon which some triangles were grounded. The several subsequent revolutions interrupted the work, but it was taken up again repeatedly, by me and others, upon the same plan, and with these *my* very same *first elements*. According to the latest accounts, the topography has now been completed. It was the notice of that work of mine, which came to this country about the time of my arrival, in 1805, which occasioned first the proposition to me to do the same here: thence the law of 1807, and the call for plans of operation, of which mine, now proceeded upon, was selected from among thirteen, by the unanimous vote of a special committee assembled in Philadelphia, and by the President himself. (See the historical part of the printed documents, vol. 1.)

France began its first map, after the triangulation of Cassini, in the early part of the last century. The defects which this work presented in its detail

execution, which was not made with the care now used, and the improvements of the sciences that progressed rapidly after those times, produced first in 1786 the triangulation to join the observatories of Paris and Greenwich, under Cassini, the third in France, and General Roy in England. Immediately upon it followed the decision of measuring 12 degrees of the meridian, to serve equally as a base to the establishment of standards of weight and measure, upon an unit of length derived from the quadrant of the meridian of the earth, and by the most accurate principles of natural philosophy, applied to the capacity measures, and the weights.

Only after these works had passed the ordeal of approbation of the men of science sent from all the continental nations of Europe, assembled in Paris in 1800, (England alone refusing to take a share in a *scientific useful aim*, while it employed its arms and treasures to the destruction of the continent of Europe,) the French, as well as the foreign members of this scientific convention, reporting jointly and unanimously—only then, the accurate elements thus obtained were decided to be applied to the construction of a new map of France and to the charts of its coast.

When all the interior that had been done by the triangulation and the topographical works, which always must form the base of the hydrographic operations, had been executed, the western coast was begun in 1816, and account rendered of it in 1829. The coast of the Mediterranean, as far as hitherto known, is not yet finished; but, during the whole of the wars of the Revolution, the triangulations whose bases laid in the French works were carried on as their armies proceeded.

England grounded the first starting of its survey upon the very base line measured in 1789 by General Roy, on the occasion of the junction of the observatories mentioned above, and has continued it ever since upon the same plan. Several volumes of the work are extant, but the whole is not yet completed. About the year 1818, according to English accounts of that time, upon the part of the work in Ireland, "above 600 persons, of different conditions, were and are continually employed," &c. According to later verbal accounts, the work goes on now from Dublin, south, towards Cork.

In the East Indies, the English began already, in 1800, trigonometrical surveys, upon which the topographical and hydrographical details are grounded and carried on, like all the rest, upon the same principles as the survey of this country now is, but with immensely greater expenses, and a *personel* far more numerous. The work is proceeding now, always upon the same plans and principles, having been extended many degrees of latitude north in the new territories, under Lambdon, Everet, &c.

Europe is covered with well-connected series of triangulations, from the south of Sicily to past the north polar circle; from Ireland, through England, France, Germany, to the interior of Russia; from Bordeaux to the frontier of Turkey, and in all the intermediate parts: so that no map need be, nor actually is, attempted without the elements of these triangulations. The works which I have made in Switzerland are included in this series. (Dec. 28, 1841–'42, pp. 12, 13, 14.) [*Hassler.*

Surveys of all the countries of Europe have been or are being made by the system of triangulation, to wit: Austria, Russia, Sweden, Denmark, Hanover, Prussia, Swabia, Bohemia and the States of Germany generally, Italy, Naples and Sicily, Switzerland, France, England, the British possessions in India, and the French colony in Algiers.

"Europe is covered with well-connected series of triangulations—from the south of Sicily to the polar circle; from Ireland, through England, France, Germany, to the interior of Russia; from Bordeaux to the frontier of Turkey, and in all the intermediate parts."

To the question, "Whether no other mode exists by which accurate results can be obtained within less time than they can be furnished by a trigonometrical survey," the answer is, *No.* There is no *short* method by which these results are attainable.

Usually, the experience of the world is justly considered when any great object is to be attempted or effected. Why should it be excluded from the category, in judging the merits of this magnificent work? We have the combined testimony of all the science of Europe in favor of making surveys by triangulations, and, in fact, the positive assertion that it is the *only* proper method. Why should we not adopt the conclusions of nations which, to say the least, are older in these matters than we ourselves are, rather than to resort to methods which are a century behind the age we live in? [*Swift, p. 35.*

"It might be desirable that they" [*i. e.* the signals and secret marks placed in the ground] "could be properly protected by a special law, as that is the habit in Europe, where such well-secured triangulations exist, and are still daily making from Sicily to Lapony, and from Brest and Ireland to Turkey and Petersburg." (1835–'36, vol. 1, page 383, Doc. 2.)

To the question, whether the mode of making the survey of the coast by triangulation is better than any other, it may be said to be the *only* truly correct method which can be pursued. It is the only method by which a *connexion* in the work can be preserved. Of its accuracy the proofs are continually before the observer, and an error need not be extended beyond a single triangle. The three angles are measured in every principal triangle of the work; and, as this is all the *measurement* which takes place after the base is determined, it is obvious that the observer has his proofs of correctness continually at hand. There can be no *cooking* of observations, as is sometimes practised in astronomical determinations.

An idea of the exceeding accuracy attainable in works of the nature referred to may be formed by referring to the account of the measurement made by the French astronomers of the arc of the meridian between Dunkirk and Cabrera, for the determination of the figure of the earth, being 12 degrees of latitude in extent. After a great number of triangles had been measured, and an extent of about 500 miles upon the meridian determined, (between Melun and Perpignan,) a base of *verification*, as it is denominated, was measured at Perpignan. This verification consisted in *measuring* with the greatest accuracy one of the sides of a triangle in the series, which had been previously determined by computation from the original base. The difference between this computed side and the actual measurement was less than 2 feet. [*Swift, p. 34.*

NOTE (20.)

7. When I could join my assistants upon the beach, in the beginning of July, though by no means in a good state of health, and after having visited the projected lines, the difficulties they presented decided me to try to lay off a straight line upon the outward sandy shore of the ocean, between the sea and the sand hills, which appeared to present a nearly

straight line, little different from parallel to the shore. This succeeded so well, that a line was laid out starting from a sand hill of moderate elevation, somewhat southeast of the light-house, and extending over eight miles upon the sandy beach, only in a few instances edging the sand knolls, and some others going between the high and low water mark on the seaside; the lowering of the first as much as needed, it was easy to accomplish; and the second apparent difficulty was equally easily overcome by so regulating the work, as to meet these places during low tide.

8. This line was then laid out accurately straight by means of a transit instrument, and measured, preliminary, by the same chain of 20 metres which had been used in 1817, for the preliminary measurement of the base line in English Neighborhood, and which serves now for the detail plane-table survey of the south side of Long Island. At every 400 metres a peg was driven into the ground, bearing the mark of the distance; these precautions are always required as a great means of security against mistakes, by the omission that might happen of inscribing a measuring bar-box in the registers, as thereby constant verifications are presented.

9. During the months of August, September, and October, this line was then measured in forty-five days, of which, twenty-seven in August, fifteen in September, and three in October; the other part of that time being taken up either by interruption from unfavorable weather, or such days as were necessarily employed for the moving of our encampment along the line, for which it was always necessary to employ all the helps otherwise engaged at the manual part of the base measurement, there being never any doublets of men engaged in our work; and I must add, near the end of it, also, my own increased state of sickness was unfavorable.

10. At every 400 metres, as determined by the accurate measurement, and at every 1,000 metres, strong pegs were driven in the ground, marked by their distance from the west end; and every 2,000 metres was besides furnished with one of the stoneware cones that are always used at the station points; these are intended as fixed points, from which the detail points of the soundings in the sea that they border are to be determined.

11. Both ends of the base line thus resting upon two sand knolls that will, by their position, in all appearance, always be secure from the sea, have been marked by two monuments, each consisting of a Newark red sandstone, about four feet high, hewn square for about eighteen inches from the top, with an even top of one foot square, and a round hole in the centre; under the square cut part a frame was fixed in, consisting of four pieces of hard wood scantling, embracing it closely by grooves made expressly in the stone, the lower part being left rough. These stones were sunk entirely even with the sand, together with their frames, which, by their extending about twenty inches on each side further in the ground, will make them stand more solid, and maintain their perpendicular position.

12. The distance between the monuments will exceed 14,050 metres, or $8\frac{34}{1000}$ miles; the accurate number will result from the calculations that I shall make next winter upon the reductions needed for.

1st. The varied state of the temperature.

2d. The elevations and depressions that the localities of the ground obliged to make in many places.

3d. The reduction of the line actually measured upon the shore sand, to that between the monuments, for which all the data have been determined upon the place. (Doc. 2, vol. 1, p. 377, 1834–'35.)

"No material alteration will be found in General Roy's account of the measurement on Hounslow heath, if we except a correction of about eight inches in the reduction of the base, which was 27,404.7 feet, instead of 27,404.01. For this reason all the sides of the principal triangles to the 14th, and the distances depending on them in the account of the operation in 1787, 1788, are reduced in the proportion 27,404.7 to 27,404.2; the latter being the mean of the two measurements." (p. 138.)—[*Preface to Mudge's Trigonometrical Survey*, vol. 1, p. 7.

Besides, in all cases where the triangulation is to serve for geographical purposes, it may most generally be expected that several base lines will be measured in the course of the work. [*Hassler's Coast Survey*, p. 166.

"It is necessary that the stations of a work of the nature of the coast survey shall be preserved for future times and uses, in any other surveys, to which the determinations made by it will serve as fundamental units." (1834–'5, vol. 1, Doc. 2, p. 366, sec. 14.) [*Hassler's Rep.*

NOTE (20 bis.)

OFFICE COAST SURVEY, *February* 7, 1843.

SIR: I find that the distance between the eastern extremity of the measured line and the monument, which is in the direction of Ruland's, is 162.02 metres.

The measured line has been encroached upon in one place by the tide, but the line between the monuments is considered perfectly safe from such encroachments.

The preservation of the monuments is intrusted to the light-house keeper at Fire Island, who corresponds occasionally with the superintendent. At the last advices, the monuments were secure. No additional local surveys have been made, to show the encroachments of the tide upon the measured line.

Very respectfully, your obedient servant,

GEORGE S. BLAKE.

Hon. Mr. AYCRIGG.

HOUSE OF REPRESENTATIVES U. S.,
February 6, 1843.

SIR: I will be obliged to you to furnish me with a copy of the draught herewith returned, showing the high-water mark and the low-water mark of Fire Island, upon which the base line was measured; also, the position of the measured base line, as thereon shown, and the connexion of its eastern end with the monument.

Nothing more is desired than the lines above described; and, for the purpose of expedition, a copy drawn with a pen, upon tracing paper laid over the map, will answer the purpose, if you find it most convenient. I wish also to have a scale attached to this, showing any given distance; also, to state the year to which this map refers, as to the condition of the beach.

Also, a sketch of the beach from the western end of the island to the eastern end of the base, showing its present condition with reference to the measured base, and to its condition at the time the base was measured

Should its present condition not be known, the latest accounts are desired, and a statement of the year to which the sketch refers. These sketches are not desired to be finished drawings, but merely outlines sufficiently accurate to be measured so as to give a general idea of the subject, and such as may be furnished in a few hours.

Also, a draught of the connexion between the eastern end of the measured base and the monument at the eastern end of the actual base, giving simply the lines, showing which are measured and which are calculated; to be on a large scale, with a scale attached to it.

I also wish you to state the length of your measured base, the distance from the eastern end of the measured base to the monument on the sand knoll; the height of the monument above the measured base, and the distance between the said monument and the monument at the western extremity of the measured base.

I also desire to know whether the length of the actual base, or, in other words, the distance between the western end of the measured base and the monument on the sand hill (in the direction of Ruland's) near the east end of the measured base, was measured or calculated, and whether the actual base admits of actual measurement.

Also, whether the eastern end of the measured base has been positively fixed by a permanent monument; and whether the position is now covered at ordinary high tide, and above the water at low tide, or permanently covered at low water, in consequence of the washing away of the sand; and if so, how deep.

In case the eastern termination of the measured base has not been permanently marked by a monument, and it should be desired at any future time to remeasure the base, how would that point be ascertained? If by taking angles to any distant station, in what manner has that distant station point been permanently fixed?

Would it be possible in the present state of the beach to remeasure the measured base?

That the object of the above may not be misunderstood, it is proper to remark that no minute details are desired, but merely a general description, such as may be prepared and ready for me by to-morrow morning.

I have received from different sources very different information respecting the above points. I therefore write to you for information, since I understand that you correspond with the keeper of the light-house, who has the base under his charge, and since the other points must of necessity be well known to you.

Your obedient servant,

JOHN B. AYCRIGG.

F. R. HASSLER, Esq.,
Superintendent Coast Survey.

The following letter was received in answer to that of the 6th instant, after the report was presented. It is here inserted, simply noting, that the changeable nature of Fire Island is very strongly described; that the difference of "*less than a tenth of an inch* in a distance of 8¾ miles," which "is certainly not worth a *cavil*," is not understood to signify a difference between two separate *measurements*, but either an error in the numerical calculation, or in the theory of reduction from the *same measurement*;

and, finally, that there have been no confidential communications with Mr. Hassler, but that the information was requested by the undersigned as one of the members of the committee of investigation, and, consequently, that the letter containing this information belongs to the House.

WASHINGTON CITY, *February* 7, 1843.

SIR: The direction of the tides being always from east to west, and reverse, alternately, and the coast of Long Island presenting to this direction a resistance under a small angle, the effect of the tides upon the washing, therefore the alteration of its south coast is only proportional to the versed sine of this small angle.

The effect of the currents occasioned by the relative position of the coast of Long Island and of New Jersey, which are met by the whole weight of the North river, occasion a recoil of the movable sands at the offings of New York bay, which occasion deposites on the Long Island shore, which have often little consistency, and, of course, are at all times variable.

Thence arises, that the south coast of the island, till up to the more elevated sand hills, is so variable that no distinct *high* or *low* water line can exist which could be marked upon a map. The breadth of the line between the two, varies according to the more or less declinity of the *sand bank*, which lies between the sand *hills* and the *water*, from 10 to 30 and 40 feet about. But even this indication is only stating a mean of what was the case at the time when I measured the base line, and its great variation was proved by six or eight wrecks being yet in the length of the base line when I measured it, and two new ones brought in by the sea during the time of our measurement.

Temporary irruptions of storms act of course here, like on all shores, uncertain extraordinary results, which to enumerate would be endless and useless.

The base line lies in that part of Fire Island beach, which, by its situation towards these currents, and their direction, appears the least liable to encroachment. The nature of the hills show that; particularly the two between which the determined base line lies, upon which the triangulation rests. The encroachment across the line measured upon the sandy beach has been trifling, and I suppose also only temporary, as happened even once while I was actually engaged in the measurement, occasioning that I had to wait for the low tide to pass on in the direct line.

On the western side the land is actually making so much, that the end of the Fire Island beach, which ended rounding off towards Grassy beach, has now advanced westerly for half a mile, and turned into the entrance of the Great South bay, so as to form a commodious harbor, as you have seen by the additional paper, which Lieutenant Blake handed to you, *and which I must request you to return to this office.* [It is now received.]

From all this it is evident that no map with the requisite of your question, which could show the high and low water line, *at this locality*, would be possible, that would fit any other month, perhaps week, or day, than the one in which it was made; to make it for the instant, for *instantaneous only it can be*, would require to place simultaneous observers at every quarter of a mile distance along the whole line. That such a map would be of not the slightest utility, cannot but strike you at once; the sand hills form the invariable unit, as far as any sea shore may be considered so.

In 1833, when the coast survey was resumed, the distances were, of course, grounded upon the base measured through English Neighborhood, in New Jersey, starting from Weasel mountain and Harrow hill, the two last determined points, to Buttermilk hill, by means of an operation which I have mentioned in another place; that base had been measured prelimarily in 1817 with a metre chain, constructed in my house at Newark, under my direction.

This base line was not so convenient to measure, particularly by the apparatus I had provided, for obtaining the greatest accuracy, on account of watery, marshy parts, which it had to pass. Therefore, I was all the time of 1833, observing closely where I might meet with a better adapted locality.

When upon Ruland's and Westhill's station, I observed by the shape which Fire Island beach presented to me, parallel about to these two points; that, without doubt, there must be a possibility to locate upon it a proper base line, from which this distance would be determinable under the best conditions for accuracy; these points furnishing what is called "a mountain base," that is, a distance upon eminences of about the same elevation as the mountains of that part of the country are, which is to be surveyed.

These circumstances made: that early in 1834, I sent immediately the whole apparatus for the measurement of the base, with all the assistants, to the west end of Fire Island beach, with direction: to survey the beach preliminarily, investigate, and project, whatever line they might think could be found measurable to the best advantage, and prepare some mechanical parts for the execution of the base measurement, while I in Newark prepared yet some other parts.

My assistants had in their different excursions projected several lines, which all, on examination, presented considerable difficulties for an accurate execution of the measurement. Therefore I took at once a start across the beach from the northern shore, where they had encamped, to the southern shore; meeting it at about the broadest part of the sandy beach, between the sand hills and the sea, at near ¼ of the present base line, from the western end, in the measurement's beginning of the base; there seeing in both directions the sea and the sand hills running out, so: that I could place myself in a position where it presented itself like a double row of parallel trees, in the middle of which I stood; I placed a stake, and sent forwards an assistant to place another, at about hailing distance, in the place where I should direct; thence we proceeded easterly in the same straight line till we met the side of a sand hill which the line would have cut into, if continued; this happened a short distance before the hill called: *Head and Horns;* here I turned off so much as I thought was needed to avoid all cutting in the hills; then giving a direction backwards the line was staked off westward, until it met a secure somewhat elevated point for the beginning of the base. Such a point was found, very well, and opportunely, situated, and the most eligible point of it was selected.

A monument was now buried at that point, consisting of a Newark red sand stone, cut square at the top, and for about 20 inches downwards, presenting at the upper part, which was made level with the ground, a square of 12 inches side, with a round hole in the centre of 2 inches diameter; at the lower end of the square cut part the four sides are cut in for about 3 inches, to receive a jointed frame of hard wood, of about scantling

size, presenting horizontally 8 arms to about 18 inches from the corners. The lower part, of about the same length as the upper, is left rough, to give the stone an overweight under the above frame, for better solidity, and perpendicularity, while the side arms prevent its sinking by this support, assisted by the support of the frame thus—

[There are two diagrams here.]

From the centre of this hole the actual measurement started exactly.

The line was now laid off exactly, with a transit instrument, and measured preliminarily with a chain, placing marks in the ground at every thousand metres, which gave, of course, a preliminary guide, and check, for any case of accident that might occur in the actual measurement, a directing stake was placed near these marks.

The apparatus with which the final measurement was made, is described in my papers upon various subjects connected with the survey of the coast, printed in the Transactions of the Philosophical Society of Philadelphia, and quoted in the review of these papers, more especially favorably, by Chevalier Bessel, of Koenigsberg, the astronomer, now holding the first rank in Europe, (who since then remained in constant correspondence with me,) in the Astronomical Journal of Mr. Sachumher, of Altona, a translation of which is found in the 1st volume of printed documents upon the coast survey, page 66.

The double-focus microscopes of my invention, the arrangement, and accurate determination of the bars, and the whole apparatus, has been described in the above papers, and belong again to the final account which is to be given, in due time, of the main triangulation, when once included between two base lines; all previous statements are out of place, because they forestall a part of the system which should appear in one whole mass of the scientific exposition of the whole system of the work of the coast survey, upon which ultimately the work must depend.

The journal of the base measurement contains, in three folio volumes, the statement of every individuality that are proper to be recorded, the hour and minute at which every bar was laid off, the temperature of 8 thermometers of each laying off of the bars, the indication of each small elevation or depression of the bars laid off when not exactly horizontal, with their reduction, &c., &c. I may remark that there were in this base line far less reduction than in any other known.

At every 1,000 metres of the so microscopically measured line, an earthen cone was dug deep into the sand, as a mark of accidental reference if needed, and for the detail survey.

Thus was proceeded uniformly until to the crossing of the line which would pass from Ruland's hill, through the centre of an earthen cone, placed upon the small hill called *Head and Horns*, which was marked and noticed particularly in the journal, out of precaution, in case not a sufficient length could be measured to meet another more advantageous point affording the same advantage for the intersection of a line from Ruland, with an advantageously placed hill.

Such a point was found about 110 boxes, that is 880 metres further east. A monument, similar in all respects to that placed at the beginning of the measurement, was placed in the middle of that hill, and the measuring continued until to a certain point between high and low water, which was marked by a peg, as well as several of the preceeding near ends of the far

boxes, yet falling upon the part above high water, as in the figure A and B.

A theodolite was then placed over the centre of this monument directed upon Ruland, and by inverting the telescope the line was prolongated to the intersection of this prolongation with that of the last box of the measurement, made by means of a brass bar of a beam compass; this determined the point R, in the figure.

To multiply the means of accurate reduction to this monument, last placed, I measured a separate base from R to Z again with the same microscopic apparatus that had served for the long measurement, and of such a length and in such a position as formed a favorable triangle for this determination. An earthen stoneware cone was buried at Z, like at a triangulation station point. Thus a combination of triangles was formed between the monument's place and the points A, B, R, and Z, of which all the angles were measured, grounding upon different bases, and affording a variety of combinations, each giving a special determination of the actual base line intended to be determined between W and E, or west and east end of the line that forms the base of the triangulation.

In reverse again the determination of the distance E R (—) 162.0224m., can serve at any time to point out with the same certainty this point R, where the measurement with the metre boxes, with complement, lies, whether it be dry or under water when it may be desired.

My operations at that point were of course made at low water, when the point was accessible.

This point is given 13997m., 637052718 from the beginning at W by the final result of all reductions; in this the decimals after the 3d are evidently insensible.

The line between the two monuments, which forms the actual base line, to be employed in the survey, was determined by my calculation= 14058.9862m.

As it was desirable, a second calculation of the whole was made of the reduction of the measurement by Captain Swift, and of the reduction to the eastern monument in somewhat a different form, by Mr. Dahlgren, lieutenant of the navy, then an assistant in the work, the result of which was 14058.9878m., both reduced to the temperature of 32° Farenheit, or so called, freezing point of temperature; the difference between the two results of 0.0016m., *or less than a tenth of an inch* in a distance of 8¾ miles, is certainly not worth a *cavil.*

In point of the scientific standing and advantageous particulars and position of this result, I am *perfectly allowed* to claim preference over the greatest number of the base lines measured for large surveys, as will at once strike by the diagrams of a variety of such bases, which I will join here to be compared with it.

A verification of the result was obtained immediately the next year, by deducing from this base line that of the base in English Neighborhood, New Jersey, measured in 1817, the calculation being carried upon this old line measured only with the chain, though somewhat carefully, from the new accurate base, coincided within the limits of the expansion of the iron, between the two different temperatures under which they were measured.

By two well-conditioned triangles, the base between the monuments upon the beach, is transferred to the distance between Ruland and West-

hills, which form, what I called above, the mountain base of the triangulation.

The point upon West hills is secured by a stone monument, exactly similar to the two placed at both ends of the base line. That of Ruland's hill is marked by a stoneware cone, buried under ground sufficiently to prevent its being disturbed.

I may be allowed here to add: that it is even *improper*, that the particulars of the monumental marks be publicly discussed, and made known, in any other way: but by *the journal*, in order not to awaken the attention of *mischievous persons* to attempt their destruction, *as has been done with some of the marks of* 1817. The proper way to make these marks, is entirely under ground, and deep enough to be unattainable by any plough.

The base monuments, you know, are given in charge to a public officer of the United States, whom besides I know as well disposed. The proper measures have been, and are still, taking, to increase the hills upon which they stand, in the manner habitual in that part of the country to increase the land, and preserve it. I have myself begun it at both ends, at the time when I measured the angles at the base ends, to full success. (See addition.)

These data to which I could still add more, *if you should desire*, will however, I hope, be sufficient to convince you that the contradictory reports, which you state to have received, upon the subject of the main base of the coast survey, measured upon Fire Island beach, are, what all contradictory *reports* are, namely, *untrue;* for *truth* is *but one*, and in mathematics there is no possibility of cavil with its decision.

I have only to regret: that you, in the situation of a member of the *select* committee of investigation upon the coast survey, (though your application is not made in that capacity, or with that authorization,) have suffered yourself to be misled by such reports, which may oblige me to make your and this letter public, which I think you might have a considerable interest to keep between us, by *fairly* and *decidedly* turn friendly to the work, as you stated at first, but which you have so much attacked, and to let me alone; who certainly have done nothing that could in any way in the world be taken ill in me, neither in the work, nor against you, unless you should think: that I have no right of self-defence, which belongs, by natural right to all, even the dumb creation, and I therefore shall not give up, having so plenty means for it on hand. Within *two days*, I hope to get your decision upon *this point*, because I am not sure of the use you mean to make of the information, which I herewith give to you, in the fullest candor, I am decidedly obliged to act, and so to act, that neither this country nor Europe can remain in doubt upon the subject of your questions; you cannot but see, that the subject you attack, (namely, the accuracy of the base line,) belongs to the scientific world, which is not limited by the boundary of the United States, even as settled by the last treaty; that mathematics furnishes means to ascertain truth, which even politics cannot, (for even the decision of large assemblies by plurality of votes, has been calculated by mathematicians—see "Condouet" Probabilité' des decisione par la pluralité des voix.)

Besides, please to observe, that every stroke you may think to do at the coast survey, by raising doubts upon its accuracy, and reviling it, may be also a stroke at some vessel, bearing, perhaps, a friend or relation of

yours, whose groans will cry vengeance upon you, for having prevented, or discredited, the execution of an accurate survey of the coast, upon which you may be long in search of his corpse.

With best wishes, your obedient servant,

F. R. HASSLER.

Hon. JOHN B. AYCRIGG, *Member of Congress.*

ADDITION.

You will find, herewith, a sketch of the base line and the beach, upon tracing paper, as you desire; it will exhibit what you seem to wish, namely, the manner in which the triangulation base is connected with the actual measurement along the sand hills, and with the main triangles. It cannot escape any man, understanding the subject, and having any practice, to see by the inspection of the figure: that this reduction was eminently favorable, both by the nature of the locality, and by the manner in which it was made, and the verifications which it affords; besides the details of the results given so eminently prove.

To afford a comparison, I caused the diagrams of several of the most important base measurements, and their reduction, and connexion with the triangulation, to be copied upon a separate paper, by which you will see, for instance, that the two principal bases of the French survey are broken lines, with very obtuse angles, and to reduce them to the monuments, needed superstructures of small triangles at both extremities. The English bases I suppose you know.

The bases of Prussia, Russia, and India, were of very small size, and thence needed to go through a number of smaller triangles before they could determine any actual triangle side, one as much as five triangles. While in the coast survey the very first triangle, at the base to Ruland's, is immediately available for large distances; and the second presents a line upon two independent eminences which furnish a sufficiently large line, to serve as a base line over the sound. The elevation of the monuments over the sandy beach upon which the measurement is made, has nothing to do with the horizontal determination which is the only one needed, it is therefore not determined, as it is not intended to make a railroad there to be graded by it.

The sketches of the base line of the coast survey I must take the liberty to request you *to return to me*, as they are communicated without any proper authorization, in confidence; and their spreading in the public in this form, would not be appropriated to the security of the work by copying, &c., and they would be liable to be abused, for the destruction of the monuments, by indicating their locality, &c., as stated before from experience, which is a *danger to be decidedly avoided.*

The scale of the base line sketch is sufficiently evident, from the marks of the every thousand metres upon the measured line: the logarithm of the base in metres is = 4.147954029335477.

Constant logarithms for reduction of the metres: in yards = 0.0389834
in miles = 6.7935392

The bases for the East India surveys are only measured with chains of the form of Ramsden's; no special detailed account is given of their measurement. The situation of my base line measured in Switzerland towards the triangulation, can be seen in a map of the country which I have here.

F. R. HASSLER.

NOTE (21.)

30. Question. What is the present condition of the place of the original base line?

Answer. I have not been there since 1836. Then the beach was considerably washed, but the points were undisturbed. Now, I understand, the beach is changed, and the base in danger; but the elements of it will be preserved by the mountain base, inland from the original base.

[*Ferguson*, p. 16.

The dunes or sand hills which extend along the coast of Holland, from Dunkirk, nearly without interruption, to the Helder, are formed entirely by the action of the wind blowing up the sand of the sea shore; they are a source of good and evil to the country; they serve as a natural barrier to keep out the ocean; a benefit which, but for the ingenuity and contrivance of man, would be more than counterbalanced by the injury done by their progress inland. On the sea shore they are mere loose heaps, driven about by every blast, like snow-wreaths on the Alps; and, were they not restrained, would move onward year by year, and inundate the country. In passing over a desert of this kind at Schevening, on a windy day, the atmosphere appears dim with the particles of sand blown like smoke through the air.

The height of the dunes depends on the fineness of the sand, as the wind has of course the most power in transporting the minuter particles. Campendown, memorable in the naval annals of Britain, is one of the loftiest on the whole coast, for this reason.

To check the dispersion of the sand, and put a stop to this evil, the dunes are sowed regularly every year with plants congenial to it, for even sand has a vegetation peculiar to itself, which may be called luxuriant; but a species of reed grass, which grows near the sea, (arundo arenaria,) is principally employed, and to great advantage.—*Murray's Handbook for Travellers on the Continent*, p. 13.

Light-house establishment, 1842.

That some of our light-houses should be undermined by the encroachment of the sea, and have to be taken down and removed further back, is not strange; it is a circumstance they will always be liable to. It is no fault of those who selected the sites or built the light-houses. I have had an opportunity of observing the encroachment of the sea on our whole coast for thirty years, visiting every light-house in the United States once every year for sixteen years. Capes, with the ocean on one side, and the rapid current of some river on the other, as Cape Henlopen and Cape Henry, are the most liable to wash away; but your light-houses must be located at those capes, and must not be set too far back from the shore. The shore continuing to recede for a series of years will oblige you to remove some of your light-houses further back. This cannot be avoided. There are many places, particularly in bays, where light-houses have been built, at which a work might have been constructed at the time to prevent the sites from washing away; but there were no funds for it, the appropriation being barely sufficient to build the light-house and keeper's dwelling.

NOTE (22.)

33. Question. What is the signification of the words "primary triangulation?"

Answer. They signify the main series of triangles on which any work to be surveyed is based, extending as far as possible throughout the work.

[*Blunt*, p. 24.

1. The main or *primary triangulation*, upon which all the work depends, is made up of triangles, having sides of from 10 to 50 miles in extent. The angles in these triangles are all measured by Mr. Hassler.

[*Swift*, p. 35.

The principle upon which the survey of the coast is conducted is, essentially, that which is known as the trigonometric method. By the relations which subsist between the sides and angles of a triangle, we are enabled, from certain known data, previously determined by actual measurement, to compute certain other parts which are unknown. For example: in a given triangle, by measuring one of the sides and the angles, the two remaining sides can be determined by computation. These computed sides then serve as bases for other triangles, and subsequently, by measuring the angles *alone* in the triangles thus formed, the work is extended *ad libitum*. This is called a triangulation, and may be made upon any part of the earth's surface upon which a line of a given extent can be measured.

[*Swift*. p. 33.

5. Question. Is there any essential difference in the scientific principles of the primary and the secondary triangulation; and if so, what?

Answer. The primary requires an instrument of great power, and of nicer graduation; there is no other difference. There is no difference in the mathematical elements. [*Ferguson*, p. 14.

NOTE (23.)

It is necessary to ascertain the true position of the district or country triangulated upon the earth's surface—that is to say, its latitude and its longitude. The first of these is independent, it being simply its distance from the equator; while the second is not independent, but refers to the position of some other point on the earth's surface, and under another meridian. This latter place, or meridian, may be assumed at will; and the question then to be determined is simply the difference *in time* between the two places of observation; and this, being converted into degrees, constitutes the longitude, or rather the difference of longitude between two places.

For these determinations, observations upon the heavenly bodies must be resorted to. It is not necessary, however, that celestial observations should be made at every point determined by the triangulation; on the contrary, a few well-determined positions, ascertained by a long series of observations, often repeated, are sufficient, the connexion between the same being determined by the triangulation; hence the survey of the coast, as now conducted, is made by combined or mixed geodetic and astronomical observations. [*Swift*, p. 33.

In the triangulation the two kinds of observations, astronomical and geodetical, are *disconnected*, each operation is *separate*, and they are only compared to draw conclusions upon one another, for a new, different re-

sult, required to place the survey in general in its proper place upon earth; therefore the astronomical parts are only made at a few properly selected places, and with general views for the work, not for details, like in the other case, so as I have stated in my answer to question 5, article 3, of my report of December 2d, 1841. [*Hassler*, p. 53.

To 10, 11, 12, 13, add: These stations were not exclusively astronomical stations; the astronomical observations were intended more for preliminary determinations at the beginning, to guide the work, and to take advantage of the presence of the assistants, who were all present, to introduce them and to exercise them in this kind of observations. The main aim of these stations was the determination of main triangulation points.

To 12 add: There also a solar eclipse was observed.

To 14 add: Upon the station of Weasel mountain all the means for astronomical determinations and azimuths were united, and a regular system of these observations executed, with its appropriated combinations, upon peculiar methods, which I made and prescribed, and which succeeded to satisfaction. The isolated observations of the preceding stations were of course reduced to this by way of comparison. [*Hassler*, p. 49.

91. Question. Of how many points in the United States have the latitude and longitude been ascertained and verified in the course of the survey?

Answer. The calculation of the triangles in my work gives, in ultimate result, the latitude and longitude of each point of the triangle, primary and secondary, according to my special form of the work. [*Hassler*, p. 10.

Question 5. "The astronomical observations made for the determination of latitude and longitude."

Upon this question it must be at first observed that the ultimate clause of the renewed coast survey law of 1832 has cut off the most favorable means by the phrase—"provided, that nothing in this act, or the act hereby revived, shall be construed to authorize the construction or maintenance of a permanent astronomical observatory." This proviso forms an unfortunate limitation of the work. The disadvantages therefrom arising for the acceleration and easing of the accuracy, by the determination of ever-standing points of reference for the whole work, is too evident for men acquainted with its scientific requisites to need being treated here.

That the very object prohibited by this clause must unavoidably, however, once be established in this country, is easily seen, as it is one of the requisite tools for a nation having a navy; if done early enough to let the coast survey enjoy the benefit of it, the expense would be comparatively trifling, and immediately recovered by the advantages arising from it in this *national work* of the survey.

Circumstances have not yet allowed to supply this absence fully, nor is it the time, as yet, nor appropriate, nor *possible* in the state of the work within the present limits of it, to do more than what has been done, namely, the following:

1st. In 1833 and 1834, the first years* of the new operations in the coast survey, observations for latitude with the sun, and with stars, were made upon every station of the main triangulation, with an astronomical repeating circle of 18 inches diameter, and with 10-inch reflecting circles, upon my own plan of construction, which is such as to compensate all the errors reflecting instruments may be subject to. At several of these stations, also, azimuths were observed with the sun.

* N. B. The first years.

2d. A special station was made in 1838 upon Weasel mountain, near Paterson, N. J., for latitudes and azimuths; and a solar eclipse, occurring just at that time, gave occasion for an observation of longitude at the same place.

3d. Every solar eclipse that has occurred during the time the work has as yet lasted, has been observed at some one of the survey stations.

It is well known that all those results are to be† united, in due time, with those of future times, into one general result, by means of the primary triangulation; while the results obtained hitherto, being for the immediate use of the geographical works of the survey *only*, must be preserved within it until this union into a regular system is accomplished. It would be highly *improper* to give them to the public earlier, as well according to good principles of science, required in the work, as in obedience to a positive, and very proper prohibition, stipulated by Government in my original contract of 1816, confirmed in 1832.

The results of the coast survey constitute a property of the nation at large, which it acquires by the labor and expense bestowed upon the work; for which compensation will, in proper time, be obtained by the *authentic publication* of the results. All interference of private publications are directly *unjust*, and *derogatory to the lawfully acquired property* of the *nation*, and *the ultimate proper utility* of the work. The garbled publications which would be occasioned by partial communications would interfere with very unjustly, if not destroy entirely, the advantages of the future authentic publication of the work in its appropriate connexion, turning the public expense into profit for the private pockets of single individuals, having no exclusive claims to its benefit; and the *public* would be *deluded* by being presented with results falsely set up as *authentic*. It is self-evident that none but the maps published by *authority*, as results of such a work, either deserve or will ever obtain, the confidence which is an indispensable requisite in the estimation of the public. The Government that undertakes such a work takes by that act the *engagement* towards the public to provide such maps as shall deserve full and exclusive confidence; therefore, also, it must *discountenance* all that might have any tendency to occasion *doubts*. These considerations were made by all the Governments of Europe which have executed such works. They have followed, in full, all the principles here exposed. It is a very essential consideration for the public *security*, *aimed at* by the work, to prevent all possible abuse.

[*Hassler*, Doc. 28, p. 5, 1841–'22.

The indispensable observations of latitude are of course to be referred to the permanent observatory of the country, if such a one exists; if not, they also become necessary at such stations more particularly as are made for the series of latitude. [*Hassler's Coast Survey*, 1818, p. 179.

NOTE (24.)

For the main triangulation, those stations have been occupied by me which bind up the station points of the works of 1833 and 1834, and unite the secondary triangulation of the eastern side of Long Island and Rhode Island on the east, and of the Jerseys, below the bay of New York, on the southwest, with proper extensions. [*Hassler*, 1837–'38, Doc. 14, p. 2, vol. 2.

† N. B. Are to be.

Diagram of triangulation for the survey of coast in 1817 and 1833, and secondary triangulation 1833 and 1834. (1834, *Doc.* 2, *p.* 381.)

To 40, 41, and 42, add: The main triangulation determining large distances with greater accuracy than the secondary triangulation, it serves as element and groundwork for the latter. [*Hassler, p.* 51.

41. Question. Who conducts the main triangulation?

Answer. I myself, according to positive stipulation. [*Hassler, p.* 7.

Though the mathematical theory of such works is fully treated and well known, their practical application is left completely to the practical man; and the success and accuracy depend in a great measure on the organization and different details of arrangement which such a work requires.

[*Hassler's Coast Survey*, p. 165.

NOTE (25.)

A triangulation may be complete in itself, and, when the necessary corrections have been made for the figure of the earth, the actual distance between two points can be accurately determined. [*Swift, p.* 33.

60. Question. What difference is there in the mathematical elements of primary and of secondary triangles?

Answer. The larger triangles require more attention to the figure of the earth and to the mathematical elements arising from it. [*Hassler, p.* 8.

"If therefore in the state of the country and the nature of the demand upon the work, it cannot begin by the determination of degrees of the earth's surface, upon which all works of that nature are now habitually grounded, the work would, however, be positively shamed out of the annals of the science and of such works, unless its results would be used in future proper time, according to any future desire or exigency, to contribute their proper share to the determination of the figure of the earth *in this country*. This very last result will form one of the principal means for its ultimate proof and credit for accuracy."

[*Hassler's Report, Doc.* 28, *p.* 14, *Jan.*, 3 1842.

To 55, 56: It is very natural that in this, like in every other subject of science, or knowledge, the acquirements and improvements are gradual; they develope themselves as the occasion for them is given, and with a considerable and proportional consummation of time. So much so, that even in Europe this branch of science is not so much spread, as it is pretended, to be already in this country, where it has never yet been employed at all; for the detached small surveys, made so abundantly, do not come at all in comparison, nor under the principles of science, which is absolutely required for such an extensive work as the coast survey, especially in the form and in the locality of the earth in which it lies. *Hassler, p.* 52.

16. Question. You have exhibited to the committee abstracts of the whole work on the coast, from Point Judith to Cape May; what objection is there to the publication of those abstracts?

Answer. The first objection is, that no base of verification has yet been measured; the second is, that we are uncertain as to the difference in any meridian in this country and any in Europe, to a minute and a half in longitude; and the third is, that we have not yet determined the ellipticity of the earth. (See note 23.) [*Ferguson, p.* 15.

NOTE (26.)

The oblateness of the earth at the poles is however a fact so well established by more extensive measurements, that we must suppose either that some error has been committed in the observations—a thing, however, not probable—or else, what is more probable, that, by inequality in the density of the strata producing a local attraction, the plumb line of the sector has suffered a deflection at some of the stations. [*Encyc. Brit., vol.* 1, *p.* 143.

NOTE (27.)

76. Question. What is the object of the second base line?

Answer. *The verification of the whole work, which is in the system of* all such works.

77. Question. If the object be to verify the survey, and suppose it does not agree, what is the consequence?

Answer. That the error, if any, is to be investigated. [*Hassler, p.* 9.

70. Question. What is the object of the proposed second base line?

Answer. To verify the work. [*Ferguson, p.* 19.

NOTE (28.)

34. Question. What is a secondary triangulation?

Answer. It is a series commenced within the primary triangles, extending in whole or in part through the same, and dependent on the primary series.

35. Question. Is it possible for a series of secondary triangles to exist where there are no primary ones?

Answer. No. [*Blunt, p.* 24.

1. The main or *primary triangulation*, upon which all the work depends, is made up of triangles, having sides of from 10 to 50 miles in extent. The angles in these triangles are all measured by Mr. Hassler.

2. Within these main triangles, smaller triangles are formed; this constitutes the *secondary triangulation; the sides of these vary in length* from 2 to 10 miles. [*Swift, p.* 35.

NOTE (29.)

The survey cannot be carried into its details until such a portion of the above work shall be executed and actually calculated, as will serve to occupy two or three detail surveyors in a certain district.

The same is to be observed with respect to the nautical survey, which is to extend from the coast as far as any object important to navigation may occur. It will be most proper to use in these parts of the work well-informed officers, brought up at the military academy, and naval officers. [*Hassler's C. S., page* 17.

When I had executed the station at Mount Carmel, the extreme eastern one, to which I had intended to extend my observations that year, I considered myself authorized to form two parties to carry on the secondary triangulation within the limits of the country that my main triangulation embraced, as the triangles could all be sufficiently determined to allow the verifications required in future. Keeping, therefore, only two of my assistants

(Captain Swift and Lieutenant Bell) with me, Mr. Ferguson was directed with the assistance of a secondant to fill up, with secondary triangles, all the parts included between the main northern triangle points and Long Island sound ; and Mr. Blunt with another secondant was directed in a similar manner, for all that related to both shores of Long Island; both equally proceeding from the eastern extremity of our work towards New York. (*Doc. No.* 2, 1834–'35, *page* 369.) [*Hassler.*

NOTE (30.)

"Captain Swift has extended the triangulation," &c., "so far eastwardly as the main triangulation would allow."

"Mr. Ferguson has made the secondary triangulation, which is included in my main triangulation of 1817," &c. (1835–'36, *vol.* 1, *Doc.* 2, *p.* 382, same page.)

NOTE (31.)

"All the secondary triangulation and topographical parties" are engaged "at filling up the details within the main triangulation of former years." (1836–'37, *vol.* 1, *Doc.* 13, *p.* 41.) [*Hassler.*

NOTE (32.)

38. Question. When you commenced, was not the secondary triangulation intended to be, as the name imports, secondary to and within a primary triangulation ?

Answer. Yes.

39. Question. Is it so now ?

Answer. East of New Haven I have extended a main triangulation to Newport, and filled up the same with a secondary series of triangles. [*Blunt, p.* 24.

14. Question. Did you use the main triangulation as the basis of your work (the secondary triangulation) when you commenced ?

Answer. Yes.

15. Question. Do you not in fact proceed in the secondary triangulation at present in the same manner as in the primary ?

Answer. The only difference is the difference of the instruments. [*Ferguson, p.* 14.

42. Question. Why is not the main triangulation carried as far eastward as the secondary ?

Answer. Because it was not needed.

43. Question. When will it be needed ?

Answer. So soon as the junction is made with the base line on the Chesapeake.

44. Question. When that junction is made, do you propose to suspend the work south, and go back east, or to have two parties ?

Answer. When the junction is made, while the secondary triangulation goes on south, I shall continue the primary triangulation east.

45. Question. Cannot the main triangulation be carried on except under your immediate personal supervision ?

Answer. Not in the present state of things.

46. Question. Why not ?

Answer. Because there is no body to do it, and the circumstances are contrary.

47. Question. Is there nobody else attached to the survey who can do it?

Answer. Not now. [*Hassler p.* 7.

"The works of the preceding years had filled up with main and secondary triangulation, and the topographical as well as hydrographical detail, most part of the district from the Jersey shore of the Raritan and New York bay, till towards the east end of Long island, the sound and opposite islands, the shore of the main land of New York, Connecticut, till Black point," &c.—1839–'40, Doc. 20, p. 2.

"Only over a small portion at the east end the primary triangulation does not yet reach, but the secondary triangulation is accurate enough, and near enough to the main triangles upon which they are grounded to secure against all doubts upon sufficient accuracy for the detail operations of topography and hydrography. When the main triangulation will be again carried to that side of the work, it will soon cover it over."—1839–'40, Doc. 20, p. 3. [*Hassler.*

6. Question. Cannot any scientific person, who is competent in and well practised in the secondary triangulation, perform the primary?

Answer. The primary requires more mathematical knowledge than the secondary, and greater knowledge of practical means; but to the whole question, I answer, yes.

7. Question. If Mr. Hassler should die, must the survey stop, for want of any person in the survey, or in the country, to take it up and carry it on?

Answer. No.

8. Question. Which has proceeded furthest in advance, the primary or the secondary triangulation?

Answer. The secondary. I add, that the secondary is necessarily imperfect, inasmuch as it depends on the primary for its verification.

9. Question. If the primary had preceded the secondary, might not the latter have been verified as it proceeded?

Answer. Certainly.

10. Question. Why has the primary been allowed to remain in arrears of the secondary triangulation?

Answer. I cannot say. [*Ferguson, p.* 14.

NOTE (33.)

62. Question. When a secondary triangulation precedes the primary, is it not a second without a first?

Answer. Technically, it is.

63. Question. Is it not working wrong end foremost for a secondary to precede a primary triangulation?

Answer. I think not, because the secondary loses none of its accuracy by the primary following it.

64. Question. Can you ascertain what the errors of the secondary are until you have the primary?

Answer. No. [*Ferguson, p.* 18.

NOTE (34.)

3. The secondary triangulation, in turn, forms the basis of the plane-table or topographical surveys; these include all the details of the ground, outline of the coast or shore, courses of bays, rivers, roads, &c. [*Swift, p.* 36.

NOTE (35.)

36. Question. Is not the use of secondary triangles for plane-table parties to furnish detailed points?

Answer. Yes.

37. Question. If in any work there be but one series of triangles, does any such fact exist as primary and secondary?

Answer. No. [*Blunt, p.* 24.

59. Question. What necessity is there of plane-table parties, except near the coast?

Answer. No absolute necessity, except for the secondary triangulation near the coast.

60. Question. How far in from the coast have plane-table parties gone on the survey?

Answer. I cannot say precisely. They are carried on by Mr. Gerdes, Mr. Sands, Mr. Boyd, Mr. Dickens, and Mr. Werner.

61. Question. Do the plane-table parties require much science?

Answer. They require practical skill. [*Ferguson, p.* 18.

NOTE (36.)

4. The hydrographic determinations are made entirely by the naval assistants of Mr. Hassler. Points on shore are furnished by the triangulation, both main and secondary, together with the coast or shore line from the plane-table surveys. By this means the sounding parties are enabled to determine the true position of their soundings, by measuring the angles subtended between stations previously established upon the shore. [*Swift, p.* 36.

NOTE (37.)

Here, then, is the essential difference between a survey by triangulation and astronomical determinations, or even the so called "chronometric survey," (a misnomer, by the way, for it is not a *survey*.) One consists in a *connected* work, carried on upon the earth's surface, and made by means of an uninterrupted series of triangles; while the other is composed of a collection of observations upon the celestial bodies, made at detached points, each place of observation being independent of the other. In the first method the connexion is complete, while in the others there is no connexion whatever. [*Swift, p.* 34.

NOTE (38.)

"The secondary triangulation east of this has been continued, joining the parts reported upon heretofore, and extending further to Block island, and over the shores of Rhode Island and onwards, grounding upon the eastern side of the main triangulation, made for its guide. In a similar

manner, the secondary triangles south in New Jersey have been properly multiplied between the sea shore and the Delaware, and extending southerly to the neighborhood of Philadelphia, grounding upon the lines of the main triangulation, laid out for that purpose, between Neversink and the neighborhood of Springfield mountain, which had already been a station point of my triangulation in 1817. (1837–'38, Doc. 14, page 3, vol. 2.

"The extension of the secondary triangulation over New Jersey, between the Raritan bay, the Delaware, and the sea shore, for which the accurate first elements are given by the main triangulation, carried entirely to the same extent, and from the southern line stated above, for all other works were carried in advance of the main triangulation, with the view at the same time to explore for the main triangulation the most favorable points," &c.—1839–'40. Doc. 20, p. 4, vol. 2.

Two secondary triangulation parties were engaged this year, as habitual, the one following mainly the country west of the Delaware, and southerly to the head of the Chesapeake bay, over which triangles are laid out further south than last year, the irregular conformation of the elevated parts of that country, and their generally more extended flat tops, lead naturally to equally irregular combinations of the triangles. These works, therefore, include all the State of Delaware, and parts of Pennsylvania, New Jersey, and Maryland.

The other secondary triangulation party was engaged in the southern part of New Jersey, laying out a triangulation from some lines of the other party near the Delaware, towards the Atlantic to the east, and towards the southern extremity to Cape May.—1840–'41, Doc. 14, page 3, vol. 1.

"South of Neversink, the secondary triangulation has been carried," &c. "in advance of the main triangulation," [see details, p. 56—gives no sketches.]—1836–'37, page 56, vol. 1, doc. 13.

In the work of the survey of the coast, the *secondary* triangulation now encompasses the southern part of the State of New Jersey, from Staten island to Cape May; one series of triangles was carried around on the east or coast side, while a second was carried down the Delaware river and bay, uniting near the southern point of the State. The length of the side of the triangle which was common to both series was, of course, determined by each chain of triangles—one by the coast, and the other by the Delaware bay; the difference between the two determinations was two metres, or about six feet.* In the primary triangles this difference will, from present appearances, be less than one foot.† [*Swift, p.* 34.

19. Question. What objection is there to publishing the details and mathematical elements of the work, as completed, from Point Judith to New York harbor?

Answer. The main triangulation has not been completed so far as Point Judith, but only the secondary. The main triangulation has been completed only between Friar's Head, opposite New Haven, and Mount Carmel, in Connecticut, eastwardly, and Mount Holly, New Jersey; and Yards, (Newton township, near Philadelphia,) southwestwardly. Th secondary triangulation has been completed from Point Judith to Cape

* N. B. This is the difference of two triangulations, not of triangulation and actual measurement.—(See note 19)—A.

† How is this ascertained?—A.

Henlopen on the coast, and from New York across to the head of the Chesapeake. [*Hassler, p. 5.*

40. Question. Why is not the main triangulation up with the secondary?

Answer. On account of the difficulty of finding suitable elevations on both sides of the Delaware.

41. Question. Who conducts the main triangulation?

Answer. I myself, according to positive stipulation.

42. Question. Why is not the main triangulation carried as far eastward as the secondary?

Answer. Because it was not needed.

43. Question. When will it be needed?

Answer. So soon as the junction is made with the base line on the Chesapeake.

44. Question. When that junction is made, do you propose to suspend the work south, and go back east, or to have two parties?

Answer. When the junction is made, while the secondary triangulation goes on south, I shall continue the primary triangulation east.

[*Hassler, p. 7.*

(NOTE 39.)

Upon the question of limitation of the works for the survey of the coast.

1. The limitation to any determined distance from the coast would require that the mountains, which are indispensably necessary for the station points of the survey, be within that limited distance.

2. This is well known not to be the fact; therefore, also, the limitation not adapted to the nature of the country; hence this limitation would become impossible to be observed, if even decreed.

3. If even smaller elevations were found within these limits, which, it might be said, are fit to substitute instead of the greater ones, it would be improper to use them otherwise than so as they are used now, namely: for secondary triangles and the plane-table operations.

4. These smaller elevations, from their too great proximity to each other, would occasion triangles by far too small to give the accuracy required for the connexion of the work.

5. The multiplication of the triangles would evidently also require a much greater length of time to execute them, because every one of them would require as much time and trouble as one of the large triangles, which might cover six or twelve of these small ones.

6. With this increasing of the operations, the necessity of cutting through woods, &c., increases actually in still greater proportion than the triangles themselves, and these cuttings are one of the great difficulties of the work.

7. Such smaller triangles are even much more tedious to make properly than the large ones; therefore, they consume each more time, and, of necessity, retard the work, by limiting the greater strides which the freedom of the work at present admits. The improper increase of the expenses is self-evident. [*Hassler, p. 53.*

NOTE (39 bis.)

To guard against the errors which might accumulate on the last sides of a long trigonometric net, attached to a single base, the whole of the

triangulation of France shall be attached to the bases of Melun, of Perpignan, and of Ensisheim, as well as the three others that shall be measured, &c.—*Memorial du Depot de la Guerre*, vol. 1, p. 29.

The extremities of the new arc were at Mallörn and Pahtawara. The distance was found to be 92,778 toises, and the difference of the latitudes 1° 37′ 20.3″; whence 1° = 57,196 toises. This agrees much better than the result of Maupertuis (57,422 toises) with other measures; but the difference which implies an error of 12″ in the latitude of Kittis, as determined by the French academicians, has not been satisfactorily accounted for; so that there is still some doubt about the length of a degree in that latitude.—*Encyclopædia Britannica*, vol. 9, p. 550.

NOTE (40.)

5. Question. Are you acquainted with hydrographical surveys in England?

Answer. Yes.

6. Question. Do they publish results as soon as ascertained?

Answer. They are published in sheets so soon as completed, to be useful to navigation.

7. Question. Can copies or information be obtained by individuals?

Answer. Yes; I have known copies to be obtained repeatedly for my brother, who is a chart seller; as from the Thunder and from the Blossom.

8. Question. Does the hydrographical office in England derive any profit from the sale of the charts?

Answer. I think £200 or £300 per annum. The charts are published under the direction of the Admiralty, with the seal of the Admiralty to authenticate them.

9. Question. Have you applied at any time, as an individual, to the hydrographic office?

Answer. Captain Beaufort offered to give me personally any information I desired. This was when I was a private individual, before being connected with the survey. [*Blunt, p.* 22.

6. Question. Have you, in the examination of Delaware bay, discovered any great errors in the supposed location of any shoals?

Answer. Yes; very great.

7. Question. In what cases?

Answer. In that of Cross ledge, especially; but there is no proper chart of Delaware bay; the only one extant is a mere rude sketch. The error in the case of Cross ledge was four miles, I think.

8. Question. Is it not important that these errors should immediately be made known, and a correct chart of the bay published?

Answer. Yes, undoubtedly.

9. Question. Do you know of any reason for withholding from the public a knowledge of the soundings of Delaware bay, as far as verified by you?

Answer. I know of none. [*Blake, p.* 41.

110. Question. Have the grossest errors in the position of places, stated in one of your reports to have been ascertained by you during the survey, been pointed out by you, for public information?

Answer. They have not yet been made public, but will be when the works relating to those places are published. [*Hassler, p.* 11

19. Question. Did you sound the new channel, commonly called Gedney's channel?

Answer. Yes.

20. Question. Would you have been able, with the ordinary facilities for sounding, to ascertain that channel, without the previous trianguiation of the coast?

Answer. Yes; I could have buoyed it out so far as to make it equally useful to navigation.

21. Question. Is the knowledge of that channel of great importance to the shipping of New York?

Answer. I think it is.

22. Question. Could not a master of a vessel, when employed off the harbor of New York, with such information as a good chart of the harbor would furnish, run his vessel in with tolerable safety by that channel?

Answer. Yes.

23. Question. Do you know any reason why a chart of that channel has not been published?

Answer. I do not know any, unless it be that it was not ready. Mr. Hassler has charge of that; I have not.

24. Question. When did you sound out that channel?

Answer. In 1835. [*Gedney, p.* 39.

11. *Question. What is the chief occasion of wrecks on Long Island?*

Answer. When vessels are running in, and are caught by a heavy southeaster, it is difficult to get out, from the trending of the two coasts of Long Island and of New Jersey, and the current setting from the New Jersey coast, by reason of which vessels, being thus embayed, are apt to be driven on shore.

12. Question. Have you sounded Jamaica bay?

Answer. Yes, in 1835.

13. Question. What depth of water did you carry into that bay?

Answer. Six feet at low water, eleven and a half at high water, in common tides. At the present time, the depth at low water is seventeen feet.

14. Question. Would not the knowledge of the actual depth of the water in the channel leading into Jamaica bay be useful to a vessel which was unable to claw off the coast?

Answer. Yes; it might preserve a vessel from being stranded.

[*Gedney, p.* 38.

35. Question. Do you know any reason why the soundings taken by you should not be published?

Answer. I do not. [*Gedney, p.* 40.

NOTE (41.)

16. Question. You have exhibited to the committee abstracts of the whole work on the coast, from Point Judith to Cape May; what objection is there to the publication of those abstracts?

Answer. The first objection is, that no base of verification has yet been measured; the second is, that we are uncertain as to the difference in any meridian in this country and any in Europe, to a minute and a half in longitude; and the third is, that we have not yet determined the ellipticity of the earth.

17. Question. Is either of those things necessary to give practical utility to the soundings and distances in particular bays or harbors?

Answer. Perhaps not; but the superintendent will of course take care of his character as a man of science.

18. Question. In your opinion, ought the practical use of the work, by its publication, to mariners, to be deferred indefinitely, for the supposed purpose of allowing the superintendent to take care of his character as a man of science?

Answer. No. [*Ferguson, p.* 15.

28. Question. Have the mathematical elements of the charts of Bridgeport, New Haven, and Newark, been published?

Answer. No; that will come into the general account.

29. Question. When do you propose to publish such a general account?

Answer. So soon as I shall have reached the verification base on the Chesapeake.

30. Question. When do you expect to reach that point?

Answer. In a few years. [*Hassler, p.* 6.

93. Question. Have you determined the latitude and longitude of any points on the coast; and if any, how many and what?

Answer. I have ascertained the latitude and longitude of points on the coast as well as inland, according as the triangle fell.

94. Question. Why have not these important points on the coast, thus determined, been made public?

Answer. The time of the publication is when the general account of triangulation is given, before which it will be of no use. [*Hassler, p.* 10.

31. Question. Will a minute and a half's difference between the European and American meridians show on ordinary maps?

Answer. Yes; it would be about a mile.

32. Question. Why has not this difference, in the course of the ten years since the resumption of the survey, been ascertained?

Answer. I cannot answer that. We have observed eclipses of the sun. We have made no other observations for the longitude.

33. Question. Have the observations thus made been reduced?

Answer. Yes, and calculated. I add, that, if we had considered it a sine qua non to determine the longitude, the time occupied in this way might have retarded the other work.

34. Question. But you have previously said that the want of the determination of this fact was one of the objections to publishing any part of the work.

Answer. I said it was an objection, but I did not mean to be understood as saying that it was an insuperable objection. [*Ferguson, p.* 16.

1. Question. Do you know any sufficient reason why maps and other results of the survey should be withheld from the public knowledge?

Answer. None, when they are in sufficiently complete state to be useful to navigators. [*Blunt, p.* 22.

NOTE (41 bis.)

120. Question. Do you think that, under the most favorable circumstances, and with continuance of a yearly appropriation of $100,000, the survey of the coast can be completed in twenty years?

Answer. Perhaps. The progress is slower at first, and the means increase as the work proceeds. [*Hassler, p.* 12.

Classification of the expenses.

The whole amount expended for the survey of the coast from the *appropriation* therefor, for the year 1841, was $96,174 98.

1. Of this sum, the general expenses of the work, including the main triangulation, compensation of all persons employed therein, instruments and books, and all expenses not enumerated in the items below, amounted to -	$32,671 09
2. The secondary triangulation, including compensation of persons therein employed, 3 parties - - -	19,352 06
3. The hydrographic surveys, including the cost of repairs of the vessels, boats, &c., and allowances to officers for expenses, 2 parties and 4 vessels - - - -	25,459 16
4. Plane-table or topographical surveys, including compensation of all persons employed therein, 6 parties - -	18,692 67
	96,174 98

[*Swift, p.* 36.

With reference to the appropriation to be proposed to Congress for the coast survey for this session, I take the liberty to suggest the propriety: that it shall be again one hundred thousand dollars, which several of the latter years have proved to be exactly adequate to the proper, and in proportion to its effect, and success in the results, most economical amount of expenditure; though it must be considered that it will have to provide for two spring's outfits of the going into the field of the surveying parties, and that the expenses are of course increased by the whole amount required for the engraving and printing of the map of New York, &c. But on another side, the nature of the field work will, it is hoped, allow some slight reduction in the amount of expenses; and that at the time the appropriation will be made, a small balance of the present appropriation may yet remain disposable.—1842–'3, Doc. 23, p. 5.

NOTE (42.)

B.

Remarks upon the survey of the coast of the United States.

1. The law authorizing the survey of the coast was passed February 10, 1807.

2. Circular letters were addressed by the Treasury Department to various scientific men in the United States, asking for a plan of operations. Thirteen such were received, and submitted to a committee of learned men in Philadelphia, with the late Professor Patterson at their head. After full consideration, the plan proposed by Mr. Hassler was adopted.

3. From the passage of the law until 1811, no active steps were taken, in consequence, principally, of the unsettled state of the country.

4. In August, 1811, Mr. Hassler was sent to England to procure instruments, in accordance with the plan proposed by him in 1807. These instruments had all to be *constructed;* and, for the purpose of superintend-

ing the same, he remained in England until 1815, at which time he returned to the United States, with all the instruments and appendages requisite for the work. The war, want of remittances for payment of the instruments purchased, the difficulty of procuring suitable artists to construct the same, &c., conspired to protract his stay in England nearly two years beyond the time which he had allotted to this part of his labor.

5. In August, 1816, Mr. Hassler was appointed to superintend the survey of the coast, under the law of 1807. The necessary preparations for the work, including reconnoitring, &c., consumed the time between August, 1816, and April, 1817. At that period a proper locality for a base line was discovered in New Jersey, and in July of the same year the actual triangulation was commenced. [*Swift, p.* 30.

11. July 10, 1832, the law of 1807 was revived, and the employment of such "astronomers and other persons" as the President should deem proper was again authorized.

12. At the request of the Treasury Department, Mr. Hassler submitted a plan of operations for the work, being, in fact, the same which he had proposed in 1816. On the 9th August, of same year, he was again appointed to the survey, and to carry into effect the law of July 10. Prior to this period he had been employed by the Treasury Department in making comparisons of the various weights and measures in use at the several custom-houses, with a view to the construction of uniform standards of the same for the Union.

13. The two works, of the coast survey and that of the construction of standard weights and measures, being, by their nature, intimately connected, and the means of accomplishing each being in many instances the same, Mr. Hassler was charged by the Treasury Department with the execution of both; and, since the period referred to, the two works have received his whole attention.

14. Since 1832 the survey of the coast has been diligently prosecuted. The remainder of the season, between August and December of that year, was employed in reconnoitring and other preparations; and early in the following year (1833) the triangulation was recommenced, and has been making steady progress from that time to the present. In 1834 a new base line was measured on Long Island, and the secondary triangulation, hydrographical work, and plane-table surveys, have also been in active progress, *pari passu.* *Swift, p.* 32.

NOTE (43.)

Another addition, particularly useful to navigation, was to obtain a complete series of observations of the variation of the magnetic needle over the whole extent of the coast.

I intended that the magnetic bearings should be observed at all the stations every day, by an assistant, the needle being stationary in one point for that purpose; but during the short time that I worked, the multiplicity of my other occupations, and other circumstances, hindered me from doing more than just to observe it once myself at the close of each station.—*Hassler's Coast Survey, p.* 175.

A second will act as an assistant observer in such observations as require it, observe regularly at stated hours, and, at the time of every observation requiring it, the barometer and thermometer, of which he will keep a reg-

ular journal, make the observations of the magnetic needle, in cases where it is of interest, as in the survey of a sea coast—*Hassler's Coast Survey, p.* 174.

Mr. Hassler says: He made certain observations "last summer" "on the declination of the magnetic needle of one foot length, arranged for inversion, and constructed for this purpose already in 1813;" that he "had intended to carry on constant observations" "upon this important element of this guide of the navigator, but the general press of the work not allowing to devote time for this purpose, the plan was abandoned after the first year."—1840–'41, Doc. 14, p. 5, vol. 1.

NOTE (44.)

20. Question. What reason is there for concealing from the public the elements of the work between Friar's Head and Mount Holly?

Answer. None.

21. Question. Has it been published?

Answer. No; it is not proper.

22. Question. Why is it not proper?

Answer. Because it will introduce imitations of the work, to the detriment of its validity.

23. Question. Imitations by whom?

Answer. By common chart sellers, or others. [*Hassler, p.* 5.

To 107 and 108: It is *well known* that the finer style of topography is not in practice yet in this country; my duty required, that this part of the execution of the work should be of the best quality, to answer honorably the aim of the work, in its final appearance in the public: therefore I procured, with authorization of the Treasury Department, two men known in Europe already in this line, from the quarter in best renown for the appropriated style of these works, which will guide the style of the work, also with the engravers, to be engaged hereafter. [*Hassler, p.* 61.

To 20, 21, and 22: For concealing. But it would be of no use whatsoever to any body except copyists, who would, by abusing the public property in the work, degrade it. It would be, therefore, an expense not only useless, but very detrimental. It will, besides, all appear in the account referred to in the addition to 19; in fact it would be highly improper to do it, before the publication of the more extensive system, of which it shall form a part in proper time. There is however no concealment about it.

To 23 add: It is the duty of the Government to let no parcelling out be possible, under penalty of seeing the Government's own work ultimately discredited; such a desire cannot be fairly entertained.

To 24 add: This quality of being official is absolutely required to give confidence to the public, therefore security to the navigation, (see question 5, in my report of December last.) [*Hassler, p.* 50.

NOTE (45.)

Delambre and Mechain remeasured the arc of the meridian of Paris, and extended it from Dunkirk to Barcelona, a distance comprehending altogether an arc of about 9 degrees. This work occupied the years 1792, 1793, and 1794; the triangles amounted to 115 in number. Each of the three angles of every triangle was separately observed with a repeating circle.—*Encyclopedia Brit., vol.* 9, *page* 550.

NOTE (46.)

Mudge's primary stations	1792 =	12.
	'93 =	15.
	'94 =	6, and base measured.
	'95 =	8.
	'96 =	17.
	'97 =	22.
	'98 =	13.
	'99 =	26.
1800, '1, '2, '3, '4, 5, '6, '7, 8, '9	=	107.

19) 226 (11.9, nearly 12 per annum.
[*Mudge's Trigonometrical Survey.*

NOTE (47.)

116. Question. You stated in your printed report that you had accomplished more in a shorter time, and at less expense, than had been done in any other work of a similar kind; with what works do you make this comparison?

Answer. The English general survey of England, Ireland, and Scotland; the French survey of the inland and coast of France. [*Hassler, p. 12.*

NOTE (48.)

Times of going to the field work, and returning from it, each year.

In 1832.

September 25. Having received the instruments, I left Washington the 26th September, at 8 o'clock, A. M., to reconnoitre for the continuance of my works of 1817, towards the east of it; returned to Washington the 31st January, 1833, in the evening.

1833.

April 5th. Left Washington for the first beginning of actual primary triangulation; returned to Washington the 3d January, 1834, in the evening.

1834.

After having finished all the preparations and comparisons for the measurement of the base line, I left the 29th May, at 9 o'clock, A. M., having made also stations; returned 21st January, 1835, in the evening.

1835.

There being much calculation to be made, and many arrangements for the organization of the parties, the State of Maryland having offered an arrangement, to join the survey of that State with that of the coast survey, I went out only at different intervals, to reconnoitre the country in Maryland, and until Washington, and the outer bays, accompanied by Mr. J. H. Alexander, of Baltimore, until late in the fall and winter.

1836.

The present office was established. I left 17th August, and returned the 8th January, 1837.

1837.

I left Washington 4th June, and returned 5th January, 1838.

1838.

I left Washington July 19th, and returned 24th December, 1838.

1839.

I left Washington the 9th June, and returned the 5th January, 1840.

1840.

I left Washington the 17th September, 1840, and arrived again at Washington the 20th January, 1841.

1841.

I left Washington 29th August, 1841, and returned 22d December, 1841.

This enumeration shows how the office work has increased since the beginning, when the elements for it were first to be collected in the field. In the progressed state of the work, the calculations, making of projections, to take to the field for the topographic and hydrographic works, their plotting, and working out, &c., require as much, and in most cases even more, work in the office than out of doors, so that indeed the going out for the field work is considered a real relief from the harder and tedious works of the office.

For the time of the going out or returning of the assistants, for their part of the work, they must be called up themselves individually; it is easily comprehended that they depend entirely on the favorable or unfavorable season for the going out as well as for the return.

F. R. HASSLER.

WASHINGTON CITY, *March* 30, 1842. [*Hassler, p.* 12.

[To be annexed to Mr. Ferguson's testimony.]

1833—Buttermilk.
Round.
Bald.
Tashua.
Mount Carmel.
Ruland.
West Hills.
1834—Base measured.
1835—Reconnoissance in Maryland.
1836—West Hills.
1837—Ruland.
East base.
West base.
Harrow.
1838—Weasel.
Springfield.
1839—Beacon Hill.
Disborough.
Stony Hill.
Mount Rose.
Newtown.
Willow Grove.
1840—Willow Grove.*
Mount Holly.
1841—Yard.

[*Ferguson p.* 21.

25. Question. Was any body else engaged in Maryland in 1835?

Answer. Only Mr. Hassler, with Mr. James H. Alexander, as a mere reconnoissance. [*Ferguson, p.* 15.

* The station of Willow Grove was occupied both in 1839 and 1840.

NOTE (49.)

"Only ten years were employed in the actual work; of which the two first, 1816 and 1817, were rendered useless" "by the overthrow of the work in 1818."—Doc. No. 28, page 3, 1841–'42. (See note 51.)

"The results of the coast survey will furnish for the future regular systematic data to ground any detail surveys upon."—Doc. No. 28, page 11, 1841–'42.

NOTE (50.)

All the works here stated have of course required considerable of my personal attention and attendance: they are now in full, active, and regular progress. Adding to this the propriety of finally executing and comparing the number of standard yards, upon which I have had the satisfaction to report to the Treasury Department the 10th of July last, there was sufficient good ground for me to delay my going out in the field to measure angles for the main triangulation until later in the season; some of my assistants being engaged during that time in reconnoitring preliminarily for appropriate station points for these triangles, at the same time that they pursued the secondary triangulation, a work which would have cost me *a considerable loss of time in travelling about the country*, which I considered far better employed in the manner I did.

This latter part of the season in which I am now engaged at the main triangulation, has hitherto been very favorable, and promises to continue so still onwards; this is so much more desirable, as the nature of the country presents considerable difficulties by its configuration. If the weather of the coming season will allow it, I shall keep the field for the measurement of angles for the main triangles as long as ever possible; after which, I intend still, under the favor of the woods being free of leaves, to reconnoitre myself for the discovery of more southern points for the main triangulation.

The denser atmosphere of the lower countries, and particularly the circumstance consequent thereto, that the rays of light between distant objects pass nearer to the surface of the earth, form a considerable impediment to the good vision required for the work.—(1840–'41, Doc. 14, p. 2, vol. 1.) [*Hassler.*

19. Question. What sum is allowed to Mr. Hassler, annually, for expenses, exclusive of compensation?

Answer. Salary $3,000, and expenses $3,000.

20. Question. For what expenses is this $3,000 designed? Is it for personal expenses?

Answer. I suppose it is the expenses of living.

21. Question. Is he paid for other expenses when he goes into the field?

Answer. He is furnished with an instrument carriage and horses for the instruments and himself, and a baggage wagon besides, for instruments, at the public expense.

22. Question. Is it the same carriage which he is accustomed to use in Washington?

Answer. Yes.

23. Question. Are horses and men paid at the public expense for the carriage and wagon through the year?

Answer. Yes; four horses, one permanent driver, and one other man, who also assists about the office. [*Swift, p. 26.*

NOTE (51.)

Questions of the resolution of Congress of June 24, 1841, relating to the survey of the coast of the United States, with the answers to the same, by F. R. Hassler.

Question 1. "The progress which shall have been made in the survey of the coast."

The works of the survey of the coast cover now upwards of 11,000 square miles, with primary and secondary triangulation, topography, and soundings; from the east end of Rhode Island to the neighborhood of the Chesapeake and Cape May.

This is evidently a great progress for the time that the work has as yet lasted; particularly if it be considered that every thing was to *be created*—even the ability of the assistants, they being at first new in the business. It is actually *much more than has ever been done in any similar work before;* for it must be recorded: that since the first law of 1807, nineteen years were entirely unproductive for the work, by postponement and interruption; five years were used in procuring the necessary instruments, and in preparations, as before that time there was not a single instrument in this country applicable to such a work. Only ten years were employed in the actual work; of which the two first, 1816 and 1817, were rendered useless, and the expenses made became a bill of loss, by the overthrow of the work in 1818; so that the whole work now producible is the result of hardly about eight years actual work.—(Doc. 28, p. 3, 1841-'42.)

Question 19. What objection is there to publishing the details and mathematical elements of the work, as completed, from Point Judith to New York harbor?

Answer. The main triangulation has not been completed so far as Point Judith, but only the secondary. The main triangulation has been completed only between Friar's Head, opposite New Haven, and Mount Carmel, in Connecticut, eastwardly, and Mount Holly, New Jersey, and Yards, (Newton township, near Philadelphia,) southwestwardly. The secondary triangulation has been completed from Point Judith to Cape Henlopen, on the coast, and from New York across to the head of the Chesapeake.

[*Hassler, p. 5.*

NOTE (52.)

To the question of the committee, "How many points were determined in 1833 in the main triangulation, and what distance were they apart; what extent of country did they cover; what number in 1834, 1835, 1836, 1837, 1838, 1839, 1840, and 1841; and what extent of country do they cover?" Mr. Ferguson answers:

That the part of the qmestion *as to the distances "apart"* is answered by giving, in the following schedule, the length of the longest and shortest lines of the survey each year; that it is difficult to divide the works of successive years from each other; and that the computations are given in gross in square statute miles, presuming that the committee merely wished an approximate and comparable estimate.

In 1833,	length of longest line, miles	41.3	Square miles covered, 1,350
	length of shortest line, miles	7.2	

In 1834, 1835, and 1836, though other stations were occupied, the primary triangulation did not cover any additional space.			
In 1837, length of longest line, miles	20.69	Square miles,	318
length of shortest line, miles	8.73		
In 1838, length of longest line, miles	38.41	Square miles,	300
length of shortest line, miles	23.29		
In 1839, length of longest line, miles	31.00	Square miles,	1,070
length of shortest line, miles	10.93		
In 1840, length of longest line, miles	18.51	Square miles,	209
length of shortest line, miles	12.30		
In 1841, length of longest line, miles	31.02	Square miles,	730
length of shortest line, miles	17.07		
Square miles covered by whole primary triangulation			3,577

[*Ferguson, p.* 20.

The work of the principal survey will be to form a chain of triangles, with sides of about thirty miles in length, along the whole extent of the coast, so as to join the distant parts by the shortest and most accurate lines possible, and to determine the azimuths of the sides of the triangles, and the latitudes and longitudes of their angular points. Within these, a series of triangles, with sides of about ten miles, will be formed to join them, part of which it will sometimes be possible to carry on simultaneously with the large ones. The object of these will be to furnish an ample number of determined points to which the survey may be referred in all its details.

[*Hassler's Coast Survey, p.* 15.

NOTE (52 bis.)

In the fall, the atmosphere of the low countries, particularly the sea shore, becomes very untransparent, and the time of the day favorable for accurate observations so limited, that it can hardly ever be expected to take a full series of angles consecutively. For instance: from my station at the east end of the verification base, near Gravesend, in December, 1817, the large light-house off Sandy Hook, only about nine miles distant, was never visible a whole hour in the morning or evening; and as soon as the ground was warm in the morning the signal at the west end of the verification base, near five miles off, moved about irregularly, in a circle of about one minute. [*Hassler's Coast Survey, p.* 167.

The sand hills on the low sea shore, and the looming which takes place upon them, would have rendered necessary for these places the construction of a stand of about 24 feet elevation, solid, and firmly attached to the ground, upon which the instrument, with its stand, might be placed.

[*Hassler's Coast Survey, p.* 169.

NOTE (53.)

It is but fair, and perhaps also necessary, to state to the committee that the effect of the primary triangulation, in the progress of the survey, is not properly estimated by the number of square miles within the polygon which it makes, but by the quantity of secondary triangulation for which it afford

ed the bases. In this view of the subject, the number of square miles covered in each year would be much increased. [*Ferguson, p.* 21.

NOTE (54.)

"The work seems to gain so much in interest and credit, that it must be expected the anxiety of the public to enjoy its results will increase." "With these views, I shall early this winter cause a considerable part of the work to be brought together, to enable me to combine, as early as admissible, plans for the future creditable publication under the authority of Government."—(1837–'38, Doc. 14, p. 5.) [*Hassler.*

NOTE (55.)

33. Question. Does the work on the weights and measures occupy any of your time, which might be appropriated to the survey?

Answer. No. It does not take any of my time.

34. Question. How much of your time is devoted personally to the coast survey?

Answer. All the time, except the inspection and reporting on the weights and measures.

35. Question. How much time does it take to inspect and report upon the weights and measures?

Answer. About half an hour in the morning and half an hour in the afternoon of the day, but not of each day. This is only while I am in the office. I am generally in the field from the middle of May to that of December; sometimes I am in the field to the end of December.

36. Question. At what time in the spring do the different corps start on their duties?

Answer. Generally in April, remaining until the middle or end of November.

37. Question. Did you lose part of a year last year; and if so, why?

Answer. I lost the most of last year's work, in order to answer the resolution of the House of Representatives on the coast survey of June 24, 1841, and by the fever which seized me in October.

38. Question. At what time did you take the field last year, and how much of your time did the resolution occupy?

Answer. I did not take the field until the middle of September. The resolution occupied me three or four weeks. I was also detained to make a report on weights and measures. [*Hassler, p.* 6.

NOTE (56.)

15. Question. Is the main triangulation in arrears of the secondary; and if so, why?

Answer. It is. I am not aware of the reason, except the illness of Mr. Hassler, and his inability to do it, caused thereby.

16. Question. Cannot that work be performed by one of his assistants

Answer. Yes.

17. Question. How long has Mr. Hassler been so ill as not to be able t attend to that work?

Answer. It was in October of last year that he became ill. He was also ill the preceding year, in September.

18. Question. What prevented his taking the field and performing the work in the spring and summer of those two years?

Answer. I am unable to say. [*Swift. p.* 26.

NOTE (57.)

20. My age dates from 6th October, 1770. It is with life or age, like with all other things, it lasts the longer and remains the longer effectif, the better it is used and husbanded. [*Hassler's pamphlet 10th January*, 1842.

NOTE (58.)

And I dare to assert, with full confidence, that never so much actually valuable work was obtained in the same space of time, and for the same proportional amount of money, in any other survey whatsoever. (1834–'35, vol. 1, page 380, Doc. 2.) [*Hassler.*

45. Question. Cannot the main triangulation be carried on except under your immediate personal supervision?

Answer. Not in the present state of things.

46. Question. Why not?

Answer. Because there is no body to do it, and the circumstances are contrary.

47. Question. Is there nobody else attached to the survey who can do it?

Answer. Not now.

48. Question. What are the contrary circumstances spoken of?

Answer. Want of money; that is, of a larger appropriation.

49. Question. Must the main triangulation be suspended eastward until you can take it up personally?

Answer. In the present state of things, yes. [*Hassler, p.* 7.

NOTE (58 bis.)

In two campaigns at sea, with M. De la Bretonniere, he [Mechain] traced the description of 100 places on the coast, from Nieuport to St. Malo. [*Biographie Universelle, vol.* 28, *p.* 49.]

The survey of the coast, before alluded to, has, since the last annual report, been transferred to the charge of the Navy Department, with which it seems to be more intimately and appropriately connected. With this survey, the situation and utility of the present light-houses, already being 199 in number, besides 29 light-boats, and the necessity for others from time to time, would seem to be in some degree fitly associated. As a measure likely to lead to economy, in not extending the establishment of light-houses beyond the real wants of the country, and in fixing their exact locality, so important to the safety of our navigation and navy, it is respectfully recommended that, in the survey now in progress, Congress should require the latitude and longitude of every light-house to be carefully ascertained and published—the importance of its position to be inquired into, and that no new one be hereafter erected till a report is made in respect to its public benefits by the two collectors, and the commander of the navy yard nearest the proposed site.—(*Rep. of Hon. L. Woodbury, Secretary of the Treasury*—Doc. No. 3, 1834–'35, vol. 1, page 20.)

NOTE (59.)

6. Question by Mr. Aycrigg. You refer in your report (Doc. No. 28) to a number of volumes in which the work is contained; is the work in those volumes reduced?

Answer. They are reduced.

7. Question by Mr. Mallory. Where are these papers kept?

Answer. In my office.

8. Question by same. Are they safe from fire?

Answer. Yes. [*Hassler, p.* 3.

13. Question by same. Suppose the house should be burnt, and papers destroyed, would not Government sustain great loss?

Answer. Yes; but I conceive the house completely safe, proper measures being taken to guard against fire. The houses have been slated with this view. For better security, the roofs have been slated; and, in general, every arrangement made for convenience and security. [*Hassler, p.* 4.

7. In every one of the three buildings, which connect all through with one another, two persons at least sleep; these are assistants, clerk, workmen, and I myself, so that the buildings are well watched all night.

8. The maps and many other valuable objects, are placed so that even in the extreme case of fire, they would be saved with the greatest ease. [*Hassler, p.* 44.

9. Question. In whose possession are those facts and *data* at this time?

Answer. They are at the office in Washington, so far as completed, and except so far as parts of the work now in progress are in the hands of the assistants.

10. Question. Are there duplicates of the observations, measurements, and other unpublished elements of the survey?

Answer. There are of parts, but I think not of the whole.

11. Question. Are the elements of the base line, and of other primary and essential parts of the work, in such form and situation as to be secure from loss by fire or otherwise, and be capable of being handed over to and understood by any competent successor of Mr. Hassler?

Answer. All this is in duplicate in the office, accessible to the assistants, and susceptible of being understood and used by them. No part of this has been published except the final result of the base measurement. The details have not been published. The papers are subject to the hazard of fire; but not more so, and perhaps less, than in some other buildings in Washington.

12. Question. Is there any objection to depositing one of the duplicates in each case in the safes of the Treasury Department?

Answer. No.

13. Question. Would not this be proper, to guard against accidents?

Answer. It certainly would add to the security. [*Swift, p.* 25.

39. Question. Where are the results of the work, so far as completed, now kept?

Answer. In the depot of the survey, at Washington.

40. Question. Are they in duplicate?

Answer. Some; not all. The primary triangulation is all in duplicate. Of the secondary, mine is not. As to the rest, I do not know.

41. Question. Of that which is in duplicate, are both parts kept at the depot?

Answer. Yes.

42. Question. Several of the public buildings at Washington have from time to time been destroyed by fire; is the depot a fire-proof building?

Answer. No; it is not.

43. Question. If the results and other matters in the depot should be destroyed by fire, must not the work be done over again?

Answer. Yes. Precautions have been taken to enable the speedy removal of the papers, if the building take fire, by their being in cases on the ground floor.

44. Question. Of the work in duplicate, why is not one copy deposited for safe keeping in the Treasury Department?

Answer. I do not know.

45. Question. Is all the work in such a state that, if Mr. Hassler should die suddenly, it may be used, and reduced or calculated immediately by others?

Answer. Yes. [*Ferguson, p.* 16.

NOTE (60.)

"Every time that a certain systematically full part of the work between two base lines and two astronomic stations will be executed, a full report will be made," "until that time, they (the documents and data) *must remain* in the office in which they originate." [*Hassler p.* 45.

17. In a general point of view it must be here observed, that improper advantage might be taken of such communications, if printed as documents of Congress, to transform them into a disgraceful plagiarism of our work, which would forestall the public patronage in an undue and unmerited manner, to the great detriment of the proper future publications, which will, undoubtedly, be made by the Government, whose positive property the results of the coast survey are. In proper time, I should take the liberty to propose a properly calculated and adequate plan to make such publications in that creditable manner, which alone can prevent disgrace. Even the granting of extracts from our work, for the advantage of special localities, must be done with precaution. (Doc. 13, p. 58, vol. 1, 1836–'37.)

NOTE (61.)

24. Question. How is the survey injured by individuals publishing charts copied from those of the survey?

Answer. Because the maps would not be official.

25. Question. Would not the publication of the data with the maps enable scientific men to judge of the accuracy of the work?

Answer. Of course.

26. Question. Would not the withholding of the data until the completion of the survey enable the operator to force results?

Answer. No; in the manner in which the work is carried on it cannot be.

27. Question. Can scientific men judge of the accuracy of the work unless the mathematical elements of it be published?

Answer. No. [*Hassler, p.* 6.

(NOTE 62.)

Delambre, in his biography of his associate, Mechain, says that he was "one of the two astronomers appointed to determine the terrestrial and celestial differences between the parrallels of Dunkirk and Barcelona." Mechain made a mystery of the discrepancy that he found; refused, for a long time, to communicate his registers; exhibited an invincible repugnance to showing his observation; was oppressed by "melancholy, of which they were far from divining the true cause;" "full of the idea of returning to Spain; communicated to the bureau his project of extending the meridians to the Balearic islands." "His idea was approved." They wished to send another astronomer. "To their great astonishment, the bureau listened to Mechain, who claimed the ownership of this project with the greatest earnestness, who asserted that no one knew the means of succeeding as well as himself," &c. He guards his manuscripts with the greatest care. He becomes sick. "In his delirium, he demands, at each moment, his manuscripts, with anxiety." He dies. "His manuscripts are brought to us; his secret is known by the very means that he adopted to deprive us most certainly of the knowledge." "We there see the observation of Barcelona, and the the three seconds in which it differed from Mountjouy. His whole conduct is explained to us, and we see with regret that so trifling a cause" "had poisoned his last years and hastened his end."

[*Biographie Universelle, vol.* 28.

What was the nature of the work on which Mechain was engaged? Precisely the same as the main triangulation in the coast survey. The object was different, but the work was the same.

NOTE (63.)

A certain, systematic, and constant form must be observed in them. They must be written with such regularity and perspicuity, that any man, with the proper theoretical knowledge, could execute the calculations, though he might have been unconnected with the work itself.—*Hassler's Coast Survey, p.* 171.

If assistance enough could be had, it would be proper always to make two fair copies from the first journal, kept under the direction of the observer.—*Hassler's Coast Survey, p.* 171.

The general orders for conducting the French triangulation, contained in volume 6, Memorial du Depot de la Guerre, contain the following:

Page 11. "In order to avoid the loss of the registers, which would be prejudicial to this great operation, and to be able to guaranty the authenticity of the geodetical and astronomical observations; perfect and certified copies of all these observations, as well as of all measures that shall have been taken, shall be sent from the stations themselves to the director of the Depot of War, to be there deposited and registered among the geodetical archives."

Page 12. The engineer shall preserve carefully his "notes during his stay in the field, and send them in on his return."

Page 16. "The engineers of the Cadastre shall keep a fair copy of their registers of observation and of the results of their calculations, and shall send to Paris the originals or notes, certified on each page."

Page 17. "In fine, after the verification of the large dimensions on the

ground," (of the details,) "it shall be addressed, together with the canevas and the trigonometrical register, to the administration of the Cadastre. This, having taken all the means to assure itself of the accuracy of the pieces, shall send them to the Depot of War."

Page 32. Order similar to that at page 11, except requiring the name of the assistant also. This is a repetition of the regulation.

NOTE (64.)

9. Question by same. Are there any duplicates of these papers?

Answer. Some; of the greater part.

10. Question by same. Of what papers are there duplicates?

Answer. Of all, except the last year's work.

11. Question by Mr. Aycrigg. Is the Government in possession of any of the data, or are they in your possession?

Answer. They are in the office—a house rented by the Treasury Department—and under the care of persons in the employment of Government.

12. Question by Mr. Mallory. Whom do you mean when you say "persons in the employment of Government?"

Answer. Myself and my assistants. [*Hassler, p.* 3.

9. Question. In whose possession are those facts and *data* at this time?

Answer. They are at the office in Washington, so far as completed, and except so far as parts of the work now in progress are in the hands of the assistants. [*Swift, p.* 25.

113. Question. What reason is there why all the *data* must remain in your office?

Answer. Because they are in daily use there. [*Hassler, p.* 12.

9. The whole of the coast survey work must, in all cases, and at all times, be of the easiest access, nay, present, during the whole time that the work is going on, still more so than in any other office such may be required. [*Hassler, p.* 44.

25. Question. Would not the publication of the data with the maps enable scientific men to judge of the accuracy of the work?

Answer. Of course.

26. Question. Would not the withholding of the data until the completion of the survey enable the operator to force results?

Answer. No; in the manner in which the work is carried on it cannot be.

27. Question. Can scientific men judge of the accuracy of the work unless the mathematical elements of it be published?

Answer. No. [*Hassler, p.* 6.

7. Question. Has the work of mensuration and triangulation connected with the maps of Bridgeport, New Haven, and Newark, been published with them?

Answer. No.

8. Question. Has any part of the mensuration of the survey, and of the other scientific elements of the work, been published?

Answer. No.

9. Question. Has any systematically full part of the work between two base lines and two astronomical stations been completed as yet?

Answer. No; the locality of the coast hitherto surveyed has not permitted it. [*Hassler, p.* 4.

13. Every time that a certain systematically full part of the work, between two base lines, and two astronomical stations, will be executed, a full report will be made, and it is hoped published by Congress, which will rest that part forever, and then the documents of that part may be placed into some specially selected place of deposite, as original record, but until that time they *must remain* in the office in which they originate. [*Hassler, p.* 45.

WASHINGTON CITY, *March* 23, 1842.

SIR: Among the questions put to me in the committee's meeting, there was one, at least, which appeared much insisted upon, and by circumstances was rather discussed than answered.

It seemed to put in doubt the propriety of the journals, and other works of the coast survey, to remain in the coast survey office, and requesting them to be delivered to the Treasury Department for safety. I will here supply more distinct answers.

1. This office here is one of the offices of the Treasury Department, exactly as much as any of the rooms in the Treasury building itself.

2. The extension of the Treasury Department works has obliged to have a number of other offices out of the yet unfinished Treasury building proper, so is this office. [*Hassler, p.* 44.

14. It would be the most effective mode of clearing up any subject whatsoever, that may be desired, and come in question, if the committee would be so kind to come over to the office, which is so near the Capitol, and visit all the parts of the work, as they are in activity, and constantly in evidence for every visiter.

F. R. HASSLER

Hon. F. MALLORY. [*Hassler, p.* 45.

NOTE (65.)

92. Question. Of the points of latitude and longitude thus determined, how many have been made public?

Answer. None; because it is not yet the proper time. [*Hassler, p.* 10.

29. Question. When do you propose to publish such a general account?

Answer. So soon as I shall have reached the verification base on the Chesapeake.

30. Question. When do you expect to reach that point?

Answer. In a few years. [*Hassler, p.* 6.

4. Question. Is there any objection to the publication of definite and successive parts of the work as they may be completed, as the map of New York now in the engraver's hands?

Answer. No, not in the least, so soon as the engraving is finished.

[*Hassler, p.* 4.

To 4 add: It is necessary on the part of the Government to take proper measures to give, with the publication, guaranty to the public, for the authenticity of all that is published. (See answer to question 5 in my report of December, 1841.) [*Hassler, p.* 48.

"For there can, by nature, not be any control upon any observation intrusted to an assistant, or over the assistance rendered in an observation, except the moral strength of confidence." 1834–'35, *Doc. No.* 2, *p.* 374; *Hassler.*

NOTE (66.)

14. Question by same. Have any other maps or charts been published, besides those of New Haven, Newark, and Bridgeport?

Answer. No other. [*Hassler, p.* 4.

1. Question. Have any maps been prepared and completed, so as to be ready for publication, other than the three published; and if so, what?

Answer. Yes: 1. A complete map of New York harbor is engraving. 2 A partial map of the entrance of New York has been prepared and delivered to the Auditor for the light-house bureau. 3. One of the Thames river, in Connecticut, nearly ready for delivery, on order of the Secretary. 4. One for the Topographical bureau, for the site of fortifications of the entrance of New York harbor, at Sandy Hook. 5. One of the north shore of Long Island sound, at New London, called for by the Secretary of the Treasury. The four last named were prepared for the offices.

2. Question. Is either of the eight maps above named so far correct and complete in itself as to be of any utility in and for the localities to which it applies?

Answer. To be sure; each is complete, and of use in itself.

[*Hassler, p.* 4.

NOTE (67.)

48. Question. There is shown by you a published chart of Newark bay, purporting to be an extract from the United States coast survey; is there any meridian on the map? (Annexed, and marked B.)

Answer. No.

49. Question. Is the latitude or longitude of any part of it given?

Answer. No.

50. Question. What is the length of Newark bay, as stated in this map, from Shuter's island to the confluence of the Passaic and Hackensack rivers?

Answer. It is, by the scale of the map, five miles and eighty-two-hundredths. But the scale is an erroneous one, and was not published or verified by the superintendent. The actual distance between the two points specified is five miles and six hundred and twenty-three thousandths, obtained by me by measuring on the original topographical map.

51. Question. Please to inspect the map of Newark bay, which is now shown to you, marked C.

Answer. Itappears to be the same map, engraved from the same plate as B; but the scale is different, and is at the same time erroneous. It seems to be written $\frac{1}{20000}$ instead of $\frac{1}{10000}$, or erroneous in the proportion of 2 to 1, or about that. [*Ferguson, p.* 17.

To the question of the committee, "What is the distance between Shuter's island and the point at the confluence of the Passaic and Hackensack rivers, and what the mean width of the bay of Newark?" Mr. Ferguson answers:

That the distance between the above points is 5.623 statute miles, and the mean width of the bay of Newark 1.37 mile.

That on a map of the said bay, printed at the request of the collector of Newark, the distance between Shuter's island and the point between the Hackensack and Passaic is 5.82 statute miles; but that this map has an erroneous scale attached to it, and was not published or verified by the

superintendent of the survey. The map appears conformable to the original of the survey, but the scale given for it is incorrect. [*Ferguson, p.* 20.

NOTE (68.)

NEWARK, *April* 18, 1842.

DEAR SIR: Your letter of the 16th I received this morning. I am not in possession of any map of Newark bay furnished from the coast survey. A short time after that survey was completed, I addressed the Secretary of the Treasury, requesting such a copy, for reasons then mentioned; he referred my letter to Mr. Hassler, who replied, that the coast survey being a public work and property, such extracts should not be given except upon call of Congress; and such work being under his charge and responsibility, he should be called upon by the proper Department, &c. I very much regretted that it could not be furnished, as our vessels were subject to repeated accidents and delays, by reason of the shoals, which could have been avoided by such information. I presume that Mr. H. would be willing to facilitate any mode you may take to procure such extract, as he expressed himself to me.

I am, dear sir, very respectfully, your obedient servant,

ARCHER GIFFORD.

Hon. JOHN. B. AYCRIGG. (*P.* 21.)

NOTE (69.)

The following is the history of these maps, or of the original and copies:

By reference to House Journal 25th Cong., 3d session, p. 400, it will be seen that, on the 28th January, 1839, Mr. Aycrigg submitted the following resolution: "That the Secretary of the Treasury be directed to furnish this House with a report and extract from the coast survey, containing Newark bay, in the State of New Jersey, and the bars in its vicinity."

January 30, 1839, the Secretary of the Treasury writes to Mr. Hassler: (N. B. This letter is found among the documents of the Department, from which this copy was obtained:) "I enclose, herewith, a copy of a resolution of the House of Representatives of the 28th instant, calling upon this Department to 'furnish the House with a report and extract from the coast survey, containing Newark bay, in the State of New Jersey, and the bars in the vicinity.' I will thank you to have the information called for prepared and reported to me as soon as may be practicable."

February 11, 1840, the Secretary of the Treasury says: "I have the honor to transmit, herewith, a chart prepared by the superintendent of said work."—(House Doc. No. 182, p. 1, 3d sess. 25th Congress.)

February 9, 1839, (same page,) Mr. Hassler says to the Secretary: "Herewith I have the honor to forward to you the chart of Newark bay, extracts from the coast survey work called for by a resolution of Congress, and your letter relating to the same. I join also a copy of the printed report made upon that subject by Lieutenant Gedney, at the time of handing in the first copy of this map." (N. B. This first copy is on file, but was never published, and has nothing to do with the present question.)

The following relates to it:

NOTE (69 bis.)

December 30, Mr. Gillet, from the Committee on Commerce, reported the following resolution, which was laid on the table one day under the rule, viz :

Resolved, That the Secretary of the Treasury be directed to communicate to this House a survey of the bar and obstructions to the navigation of the Passaic river below the city of Newark, in the State of New Jersey, made by Lieutenant Commandant Gedney, together with his plan and estimate for the removal of the obstructions to the navigation of said river. (House Journal 2d sess. 24th Cong., p. 149.)

January 3, 1837. The resolution reported by Mr. Gillet, from the Committee on Commerce, in relation to the navigation of Passaic river, was agreed to by the House. (House Journal 2d sess. 24th Cong., p. 162.)

Mr. Hassler to the Secretary of the Treasury, 26th January, 1837, says: "According to the request of your letter of the 14th instant, an extract from the works of the survey of the coast of the part near Newark, New-Jersey, has been made, and is herewith presented to your Department, by Lieutenant Gedney, of the navy." (1836–'37, Doc. No. 110, vol. 3, p. 1.)

NOTE (70.)

MONDAY, *May* 30, 1842.

Present : Mr. Mallory, Mr. Aycrigg.

Mr. W. J. Stone's examination.

1. Question. Map marked exhibit C being shown, witness is asked if he recollects the map.

Answer. Yes.

2. Question. Who engraved the map?

Answer. I did.

3. Question. Is that an exact copy of the original sent to you from the House of Representatives?

Answer. It is.

4. Question. How long did it take you to engrave and print this map?

Answer. In from seven to ten days it was fully executed and delivered to the House.

5. Question. With what person connected with the coast survey did you communicate at the time you engraved this map?

Answer. Mr. Hassler. I called on him, and had a conversation on the subject.

6. Question. Exhibit B being shown and examined, he is asked if that is an impression from the same plate.

Answer. Yes.

7. Question. Will you please to examine exhibit B, and see if there is any difference between this and exhibit C?

Answer. The only difference that I can perceive is, that another scale has been put in the place of the one engraved by myself, which was copied from the original.

8. Question. In what manner was that alteration made?

Answer. By cutting out the engraved scale and inserting one with the pen. The engraved scale on exhibit C is 3 inches to the mile; while the scale inserted with the pen is $\frac{1}{10000}$th, being, in fact, 6 inches to the mile, instead of 3.

9. Question. Have you the original extract sent to you from the office of the coast survey?

Answer. I have. (P. 41.)

6. Question. Please to look at the map hereto annexed, and marked A. William J. Stone, and state whether it is the original map sent from the House to you, and from which you engraved the map of Newark bay, as mentioned in the first part of your testimony.

Answer. It is.

7. Question. What is the scale on that manuscript map?

Answer. Of three inches to the mile, as on the map I engraved. (P. 41.)

NOTE (70 bis.)

The scale on the copperplate copy, and the map itself, are both shorter than the original, but in the same proportion as the original. This is neither an error of the engraver, nor can it be avoided. The difference arises from the shrinking of the paper about one per cent. (as it appears) on drying, after the impression is taken. All that is necessary is that the scale shall be in *proportion* to the map.—A.

NOTE (71.)

COAST SURVEY OF THE UNITED STATES.

1. In the last discussion upon the appropriations, it has pleased Mr. Aycrigg, and one more of the members of a committee of five Representatives in Congress, to throw out the broadcast accusation, that I was mentally and physically incompetent to that task which I have now performed for ten years, with full approbation and even praise, on the part of the men of science of Europe and of this country.

2. This statement was made, not only without producing any proof, but also in full contradiction to abundant facts, and without producing the report which the committee is bound to make to Congress with the documents in support, namely: the examination of myself and assistants upon the coast survey, and my report asked by the very member upon my works for the establishment of uniform standards of weights and measures for the United States.

3. As it is impossible that an assembly of the representatives of a whole nation should possibly be guided by mere empty words without any proof, it appears not necessary to go into an actual refutation of an assertion, the nullity of which can be well dismissed, and will be proved, by Congress calling for the examinations, &c., quoted under 2d. So much the rather, as luckily my well known state of mental and physical capacity cannot possibly depend upon the decision of a committee of Congress, and are now in full good state, as they have been observed by the gentlemen who have favored the coast survey office with their visit.

4. I will, therefore, limit myself here to two statements made under the denomination of facts, but which are related in a manner completely different from what they actually are.

5. The wrong scale upon a map of Newark bay, by Lieutenant Commandant Gedney. This fact stands thus:

6. When Lieutenant Gedney was sounding Newark bay, he communicated uncautiously, without any communication with me, and against the regular order of the work, a chart of his soundings, to some persons pressing him for it. When informed of it, I had to call him to the regular order of the work, that nothing should be delivered unknown to me, and without orders previously obtained from the Treasury Department; this to get caused some delay, while local contending interests in Newark were impatient. This Mr. Aycrigg reproached to me, in the committee, that he had so long to ask for it. When the whole summer's work was brought in the bureau, Lieutenant Gedney had a map made as desired, and more extensive, under his direction, wherein the fraction of the scale was mistaken, which map *was never exhibited to me until at the time of the committee*, when he complained to me *that such a great crime was made to him out of an accidental miswriting* of a fraction by one of his subaltern officers. I believe he then told me that the error was corrected; I properly remonstrated with him that this accusation was the reward for his hurrying a work with unreasonable impatience, and without any communication with me. Mr. Aycrigg, who takes up this subject as an accusation against me, is *completely aware of every particular*, as Lieutenant Gedney explained it all to himself, he can therefore not be otherwise but perfectly aware that he does me a wilful injustice.—[*Hassler's Pamphlet, December* 23, 1842.

NOTE (71 bis.)

The following extracts will show his peculiarities as an individual. They have been collected from the documents, while examining them for more important information. They are given, not because they show the peculiarities of Mr. Hassler as an individual, but as indicating the disposition of one who has long held one of the most important offices in the country, and who, by some unaccountable means, has produced on the minds of many the impression, not only that he is identified with the coast survey, which must cease, of necessity, if he be detached from it, but, also, that he is peculiarly fitted for the station.

The House will be able to judge whether these extracts indicate the cool, deliberate, common sense that is required in conducting an extensive operation like that intrusted to Mr. Hassler.

His disputes with the Secretary of the Treasury are not introduced to show that he desired more pay, but for the other matters that the extracts contain. (72)

In 1836, it will be seen that the President had called the "attention of Congress to the entire subject of the coast survey, as well as the weights and measures, including future as well as past compensation, and the *general supervision of their future progress.*"

In 1837, the Secretary of the Treasury (Hon. Levi Woodbury) writes a plain business communication, such as his duty required of him as a public officer. But, because he does not immediately accede to all of Mr.

Hassler's demands, he is answered in such style that we might have imagined Mr. Hassler would have been immediately dismissed for disrespect to his superior. (73)

We find an "Enumeration of sacrifices which I made for the coast survey"—1836–'7, vol. 1, Doc. 13, pages 21, 22, 23, 24.

A lecture on republican government, next article.

Next article repeats his demands for higher pay, July 30, 1836.

Next article is a communication from the Secretary of the Treasury, August 2, 1836, in which he says: "But, in closing this communication, I feel bound, in frankness, to apprize you that the President will, on his return, be requested to excuse the head of this Department from the further supervision of the subject of the coast survey, and to devolve the care of it again either on the Navy Department or some board of officers with ample powers and greater leisure to supervise a work so important in itself, and so fruitful in difficulties and embarrassments." P. 40.

Page 42, Mr. H. says he cannot go out until he gets arrearages paid up, and $6,000 for future.

Page 44, Mr. Woodbury answers: "If you are not able or willing to proceed with the survey in the manner suggested, and on the terms above stated, until Congress can act on the whole subject of compensation, it is desirable the Department should be apprized of it at the earliest convenient day."

Page 46, Mr. Hassler says: "It is a curious phenomenon, that while from all the better-informed public, both of Europe and of this country equally, I receive almost daily testimonials of the interest and value put in the work in which I am engaged," &c., "the public Department under which it stands should refuse every proper means, and propose every means of destruction." Again: "Difficulties never subdued me in my life, though I can affirm that I have subdued difficulties. My means are moral and intellectual; that is, stronger than money, or money considerations."

From Mr. Hassler's remarks in relation to one of the questions put to him by the committee, (74) it appears that he draws a very broad line of distinction between the industry required of the "hirelings *by the hours*," who must do their full day's work for their dollar or fifty cents, while it is a disgrace to the scientific man, who receives his ten or his twenty dollars per day from the public Treasury, to inquire whether he does a reasonable amount of work, or whether he receives a high salary without returning an equivalent.

The conclusion drawn by Mr. Hassler is not very evident. (75)

He appears to have his own peculiar modes of doing almost every thing; whether they are *better* than the plans pursued by others, (76) we have no means of judging, unless he will inform the scientific world what his peculiar forms are.

(77) On reading this remark, we would hardly imagine that the article contained in note (19) came from the same individual, showing that nearly the whole of Europe had been triangulated.

The chairman of the committee, in consequence of the desire of Mr. Stone, the engraver, to see the chart, before he could give an estimate of the expense of engraving, (79) gave him a note to Mr. Hassler. The peculiar reception of Mr. Stone is described by himself. (80) The appended

letter was next sent in; (81) and on the next page we have a reference to the same matter. (82)

And, again, we have Mr. Hassler's remarks on the same subject, in his circular, (over his own name,) sent to the members. (83) The fact mentioned by himself, that Mr. Stone "measured it with a two-foot rule," shows that his "examination" referred entirely to the expense of engraving.

We need hardly stop to inquire whether a man of Mr. Stone's well-known abilities as an engraver, would, under any *ordinary* circumstances, allow that he could not put on copper all that Mr. Hassler can put on paper. (84)

Still Mr. Hassler asserts that his office is the same as the Treasury office, and his work open to inspection. (64) Would his superior, the Secretary of the Treasury, meet a note from the chairman of a regular committee of the House of Representatives in this manner?

Mr. Hassler reads us several extra lectures on the impropriety of our conduct. (85)

It appears, also, that Mr. Hassler finds great difficulty in agreeing with the persons respecting his operations on their land. (86) The appended note will show that "they do these things better in France." (87.)

NOTE (72.)

"This amount [$1,500 for expenses] does but scantily cover the half of the difference between the life of a stationary home and that which I have to lead in that work, which is, of course, what is to be compensated by this allowance." [1835–6, vol. 1, Doc. 2, p. 384, *Hassler's report.*

"In consequence of a difference of views existing between the President and the superintendent, (Mr. F. R. Hassler,) in regard to an allowance of arrearages of pay claimed by him for himself and assistants, as also for an increased rate of compensation for the future, this Department was directed to bring the subject to the notice of Congress," &c. "Congress having adjourned without taking any legislative action in the matter," &c., "consequently he [the President] has, in his annual message, invited the attention of Congress to the entire subject of the coast survey, as well as of the weights and measures, including future as well as past compensations, and the general supervision of their future progress."

[1836–'37, vol. 1, Doc. 13, p. 1, *Sec. Treas.*

NOTE (73.)

Read the whole of Mr. Hassler's letter to the Secretary of the Treasury, 1836–'37, vol. 1, Doc. 13, April 30, 1836. The extracts would be too voluminous; but he complains that the Secretary refuses to propose an alteration in the amount of his extra pay for expenses, unless vouchers are produced, or the opinions of persons acquainted with such expenses are given, and calls it "inquisitorial," "as novel as it would be unbearable by any man," and hopes that the "summer's campaign may not be crippled, like the former ones have been, by difficulties which hitherto it has been the unfortunate habit to throw in the way of the work every spring."

NOTE (74.)

"5th. I was asked how many hours the assistants worked per day; I answered, as many as the day allows, (*the work cannot be made in office hours.*) This addition, I believe, has been omitted to be written down; in fact, all my assistants, like I, work from interest for the work, and not as *hirelings by the hours*, it would be a disgrace to treat the actors in a scientific work with such illiberality." [*Hassler, p.* 63.

NOTE (75.)

"Without the constant attendance to my works, at any hours that can be used for them, my task would be positively inexecutable; this is evidently the state of the establishment, and the works produced." [*Hassler, p.* 50.

NOTE (76.)

"The calculation of the triangles in my work gives in ultimate result the latitude and longitude of each point of the triangle, primary and secondary, according to my special form [corrected page 60, '*formula*'] for the work." [*Hassler, p.* 10.

"Upon the station of Weasel mountain, all the means for astronomical determinations and azimuths were united, and a regular system of these observations executed with its appropriated combinations, upon peculiar methods which I made and prescribed, and which succeeded to satisfaction." [*Hassler, p.* 49.

NOTE (77.)

"It is very natural that in this, like in every other subject of science or knowledge, the acquirements and improvements are gradual; they develop themselves as the occasion for them is given, and with a considerable and proportional consummation of time. So much so, that even in Europe this branch of science is not so much spread, as it is pretended to be, already in this country, where it has never yet been employed at all, for the detached small surveys, made so abundantly, do not come at all in comparison, nor under the principles of science, which is absolutely required for such an extensive work as the coast survey, especially in the form and in the locality of the earth in which it lies." [*Hassler, p.* 52.

NOTE (78.)

95. Question. Did the French, in the triangulation of their country, use mixed geodetical and astronomical observations?

Answer. Not in the form in which I have stated in the first part of my written explanation. [*Hassler, p.* 10.

26. Question. Has there been any difficulty in procuring suitable points for observation as far as the main triangulation has proceeded?

Answer. Yes; since we entered the valley of the Delaware.

27. Question. Where first?

Answer. At Mount Rose, near Princeton, in New Jersey; some in opening the line from Newtown; then at Willow Grove and at Stony Hill;

some difficulty in connecting Mount Holly with the point below; a good deal at Yards. These obstructions could not have occupied more than five months. [*Hassler, p.* 15.

66. Question. How long before the survey will reach Cape Hatteras?

Answer. It is impossible to say—it is too vague a guess.

67. Question. Have you any personal knowledge of the location of the Southern coast?

Answer. I have never been any further south than Norfolk.

68. Question. You have said that it was difficult to find suitable elevation on both sides of the Delaware, which cause prevented the main triangulation from keeping up with the secondary, (No. 40:) how do you propose to obviate similar difficulties on the flat coast of the South?

Answer. By care and assiduity, and by the methods used on the Jersey sea coast.

69. Question. Is that work on the Jersey sea coast a primary or a secondary triangulation?

Answer. It is secondary triangulation.

70. Question. What is the peculiarity of the methods used on the Jersey sea coast, where there is a deficiency of natural elevations?

Answer. By adapting the triangulation to any locality which may be found favorable.

71. Question. You do not specify any of the means you propose to recur to at the South, in the absence of natural elevations. Do you decline to state what they are?

Answer. No.

72. Question. What are they, then?

Answer. By mixed astronomical and geodetical observations.

73. Question. Why were not such means used to overcome the impediments to the completion of the main triangulation on the Delaware?

Answer. Because they would not apply with propriety. There are better means.

74. Question. What are those better means?

Answer. By meeting those localities by triangulation from the south side of the locality.

75. Question. You say that the peculiar methods by which you propose to overcome the difficulties on the Southern coast are mixed astronomical and geodetical observations; are not such the general means used every where in the survey?

Answer. The means of both are different in the two cases.

Hassler, pp. 8, 9.

WASHINGTON CITY, *March* 30, 1842.

I must add a more detailed answer to that question which asked me "How I would proceed in the Southern coast, where marshes, woods, &c., presented peculiar impediments?" I answered to it: "By mixed astronomical and geodetical observations." This question was followed by that: "Is that not more or less the case with all the coast survey?"

This question showed that the nature of the scientific principles to be applied and indicated by my answer were unknown. I must therefore *explain*: what is called, in mathematical practice, MIXED astronomical and geodetical observations, is, when both these elements concur in the *same individual determination*; this is the case in the application of a problem of

practical mathematics, which I have applied in Switzerland and in this country, on Weasel mountain, (to the full knowledge of my assistants,) to obtain the junctions of my works of 1817 with those of 1833, in the beginning, when I had not yet a new base line nor sufficient angles; it was equally successful in both cases.

It consists in "one goedetic line being given in position and length, the latitude of either point being known, the latitude and the angle, the line subtends from a third point, being observed, together with the azimuth of either end point, to determine the place of observation." From such a result new connexions are then opened further onwards; other similar problems may be made.

This is what I was beginning to express when I was stopped, under the denomination of entering into arguments, which Mr. Cushing refused to hear.

That I should expose it from its elementary principles, is what I am sure the committee cannot intend, because it is a problem which, joining both branches of science, would require long deductions of principles, almost an elementary work, for persons not acquainted with the science.

In triangulation, the two kinds of observations, astronomical and geodetical, are *disconnected;* each operation is *separate*, and they are only compared to draw conclusions upon one another, for a new, different result, required to place the survey in general to its proper place upon earth; therefore the astronomical parts are only made at a few properly selected places, and with *general views* for the work, *not* for *details*, like in the other case, as I have stated in my answer to question 5, article 3d, of my report of December 2, 1841.

F. R. HASSLER.

73. Question. On what part of the coast, North or South, can the work be carried on most easily?

Answer. At the North, by reason of the nature of the coast.

[*Ferguson*, p. 19.

"The direction in which the first extension of the work was, by preference, to be made," &c., was "that I might be enabled to present, at as early period as possible, an actually executed full scheme and example of the work. For these views the continuation of the work eastwardly, over Connecticut and Long Island, presented, evidently, advantages over that southerly, through Jersey," &c. [*Hassler's Report, May* 17, 1834–'35, *vol.* 1, *p.* 367.

NOTE (79.)

13. Question. How long will it take to engrave the map of the harbor of New York, and what will it cost?

Answer. I cannot answer without examining the chart.

The chairman then gave Mr. Stone a note to Mr. Hassler, of the following tenor, as near as remembered, viz: requesting Mr. Hassler to permit Mr. Stone to examine the manuscript chart of the harbor of New York.

The committee then adjourned. [*Stone, page* 42.

NOTE (80.)

15. Question. Did you, as requested by the committee, call on Mr. Hassler, and present the note of the chairman?

Answer. I did.

16. Question. What occurred?

Answer. The interview was so disagreeable, that I would rather not describe it, unless it be insisted on by the committee.

The chairman therefore propounded to the committee the following question: Shall Mr. Stone be required to state what occurred in his interview with Mr. Hassler? and it was determined in the affirmative—Mr. Mallory, Mr. Aycrigg, and Mr. Cushing, present, and voting.

The question being again propounded to Mr. Stone, he answered as follows:

I went to Mr. Hassler's office, and knocked at the door. A servant showed me into his room, and asked me to sit down, and in a minute or two Mr. Hassler came in. I then handed him Mr. Mallory's letter. Mr. H. read it, and immediately fell into a violent rage, and swore that I should not see the map, neither should the committee have it. After much rudeness and violent language, both towards the committee and me, Mr. Farley came in, and Mr. H. handed him the letter. After some further conversation, Lieutenant Page came in, and Mr. H. showed him the letter, and further conversation ensued. At length Mr. H. permitted me to examine the map, which I did; and on my departure, he handed me a letter for the chairman of the committee, which I delivered to Mr. Aycrigg. This letter is annexed, and marked C, F. Mallory. [*Stone, page* 43.

NOTE (81.)

WASHINGTON, *May* 30, 1842.

SIR: The unprovoked *insult* offered to me, by sending the engraver Stone to me to inspect the work of the coast survey in the map of New York, is too much, as well for the powers of the committee, as for the feelings of an honest man.

You know that the maps of the coast survey cannot be engraved but in the office under my own inspection. You know that the map in question is already cut up in plates, two of which are under the engraver's hands, nearly finished; two others just beginning; for two more the drawing is nearly finished; and two more are half finished drawings.

You know that the engraver Stone is in no way qualified to do such work, nor that I could be made responsible for any of his doings.

Hence you cannot otherwise but conclude that the measure you begin is destructive to the work, therefore to the execution and expenses hitherto incurred, therefore directly opposite to the aim professed by the committee to favor the coast survey work.

No man can expect that I, who am answerable for the work, could be compelled to give the final execution in the hands of a man in whom I have not the slightest reason to have any confidence whatever.

I consider the sending of Stone to *inspect my work, as he said first, as an unmerited insult*, and I am certain that every member of the committee, placed in my situation, would consider it so.

With best respects and good wishes, your obedient servant,

F. R. HASSLER.

Hon. FRANCIS MALLORY,
Chairman of the Committee on the Coast Survey.

[*Page* 47.

NOTE (82.)

I suppose Mr. Stone will have made his report upon his *examination* of the manuscript map of New York, for which he has been sent to me in the name of the committee. [*Hassler, page* 48.

NOTE (83.)

12. The letter of Mr. Mallory, requesting me to give the map of New York to Mr. Stone, *to examine*, (please consult Johnson's dictionary for the real meaning of this word)—an operation which would require, of course, a good mathematician, conversant with the principles and practice of the works of the coast survey ; I felt very hard to be subjected to the *examination* of a man whom I know incompetent for that task. I even told him directly "you are not capable to put this map upon copper;" he immediately answered "I know that very well."

THE MAP WAS, HOWEVER, SHOWN TO HIM IMMEDIATELY, in presence of several assistants, and he measured it with a two-foot rule, as if to order the coffin for it of proper size. Those of my assistants who were present at the time, were as much displeased with the circumstance as myself, and I found it necessary to state on that occasion, a limit which I had hoped would not be stepped over; Stone himself felt that he had overstepped his limits. [*Hassler*.

NOTE (84.)

4. Question. Is there any difficulty in procuring competent map engravers in the United States?

Answer. None.

5. Question. Do you know of any special superiority of German engravers over those of the United States?

Answer. No; I consider the American workmen better, cleaner, and more rapid. [*Stone, page* 42.

NOTE (85.)

To 37 and 38 add: These are sufficiently explained as for the fact, but it must be added here, that the speaking disreputably and inimically against the coast survey work in Congress, occasions ignorant men in the country, who read these things, to lay impediments in the way of the work, and to ill-treat us, which is a great loss to the work, and its economy. [*Hassler, page* 50.

21. The attempt to find causes for change in my arrangement, by the resolution of the last Congress session, and the present committee, has already caused a great damage. [*Hassler, page* 55.

To 94 to 98, inclusive: These answers I consider as self-evident, and entirely of the domain of the science, in one respect, and of the decision of the Goverment in another; I have said upon it what was to be said by me, in its proper place, in my report of last December. If the work is not carried on, with all the means that science dictates for its execution, *it is worse than useless, and discreditable.* I consider myself always bound to such a course, as I have hitherto pursued, and have found myself al-

ways approved in this view, by those men *best able* to judge, and by those in the *proper stations to decide upon it.* [*Hassler, page* 61.

To 120 add: But the constant persecution to which the work has been exposed, and especially *now is*, impede its progress very much; there is a damage now incurred by the propositions of the last Congress session, and the present investigations, which have been occasioned by it, of positively upwards of $50,000, in delay of the work, and accessories; besides the discouragement occasioned by it, in all those persons who are engaged in the work, by their seeing their liberal exertions rewarded by *throwing out suspicions* against them, these occasion a still greater damage. The discredit thrown out in the public occasions impediments with the people in the country, with whom we come in contact, they consider themselves equally authorized to ill-treat us, which makes the work difficult, and increases the expenses beyond reason, to no good purpose, and subject to uncertainty. [*P.* 64.] F. R. HASSLER.

NOTE (86.)

To 50 and 51 add: It must be remarked upon these articles that, the putting me in jail at Mount Holly by a warrant of Judge Dayton, of Trenton, given upon the oath of a *clergyman* of the name of Brown, who *swore* his damage was over $200, because I had refused to pay, at first presentation, instantly, a bill presented to me by a, so called, Judge Haywood, for $25 damages, because I found it overrated and asked an impartial estimate, to legitimate me to direct the payment to be made, (the accounting officer being absent;) that such a circumstance, I say, I considered as neither *decent* nor agreeable; such acts go to the direct overthrow of the work, the court concern following; it cost both sides useless, but I had to stand the disagreement, and the Treasury Department had to defend the suit, which awarded the *reverend* Mr. Brown with difficulty, as a highest extreme, the $25 claimed, most of the jury voting first for $10, $15, or $20, instead of the hundredth which he had *sworn to.* It was necessary to stand this legal transaction in self-defence—the documents upon it can be exhibited.

At Yards the same impudence is now repeated, damages asked of more than double the value, and impudent letters written upon it, &c.

Such things not only cost money, but have a tendency to give apprehensions upon the safety of our station points, and signals, to the great annoyance of the work.

To 52 add: We have been obliged to make a special agreement with the owner of the land of the station next after Yards, to avoid difficulties if possible, by a contract for the use of the land for three years.

[*Hassler, page* 51.

NOTE (87.)

"We recommend to the engineers the greatest reserve in the means to be employed to unmask the signals. If it shall become indispensable to trim or cut down certain trees, they should at first propose to treat with the proprietors by mutual agreement, and to offer to them a suitable indemnity; in case of difficulty they should refer to the local administration, and even, if it be necessary, to the superior authorities." (General orders for the con-

duct of the French triangulation, from "Memorial du Depot de la Guerre," vol. 6, page 21.)

NOTE (88.)

4. Question. What proportion of instruments have you had made or repaired at the office in Washington?

Answer. I have seldom had any sextants or glasses repaired there; but a large part of the drawing instruments have been made there, to the value or cost of say $500 at any private establishment, that is, during the whole time I have been in the survey. [*Blake, page* 40.

For expenses of the instrument maker's shop, including the compensation of the persons employed therein, and the cost of tools and materials purchased for same - -	$2,318 11
For compensation and expenses of the persons employed in engraving the chart of the harbor of New York - -	2,011 14

[*Swift, page* 28.

18. Question. What amount of work or repairs have you had done in the office here to instruments?

Answer. Nothing but the mounting of one telescope, which came from Europe without a stand. I have had no difficulty in obtaining repairs elsewhere, if needed.

19. Question. Should you think it necessary to have a mechanician with you in the field?

Answer. To measure the base line it might be desirable; not otherwise. [*Blunt, page* 23.

57. Question. Where are the instruments used by you repaired?

Answer. At different places, but generally at the office of the survey here.

58. Question. Have you had any difficulty in procuring repairs at other places?

Answer. I have scarcely ever had occasion for repairs; I should think not exceeding five dollars in amount since 1833, when I entered the survey. All my instruments are of European manufacture. They are good instruments. [*Ferguson, page* 18.

108. Question. Cannot American engravers put on copper all map engraving which can be put on paper?

Answer. No. [*Hassler, page* 11.

15. Question. What amount of repairs of instruments have you had done at the office of the coast survey?

Answer. I cannot say.

16. Question. Have you had other repairs done elsewhere; and if so, by whom, and to what amount?

Answer. I have had repairs done for our, or my, party, the last year, to the amount of forty or fifty dollars, by Mr. Montandon, and by George Blunt, of New York, it having been convenient to have this done on the spot there. [*Gedney, page* 38.

102. Question. How many plates are now in the hands of the engraver?

Answer. Of actual copperplates, two.

103. Question. Do these contain the whole map you are now getting ready for publication?

Answer. No; the map of New York harbor will cover eight such plates.

104. Question. Why are not more preparing for publication?

Answer. They are in work; in a few days we can cut off a few more.

105. Question. How many engravers have you in employ?

Answer. Two; I would have more if I had the money.

106. Question. How long have these two been employed, and at what salary?

Answer. Since last January or December; one at $1,800, and the other at $1,300, per annum.

107. Question. Where did you procure the copper for the above engraving, and where the engravers?

Answer. The copperplates used were procured from Keim, in Philadelphia; the engravers from Hamburg, because they were the best, and best recommended. [*Hassler, p.* 11.

A copperplate printing press has also been procured, which has been employed hitherto, and will, also, for some time yet be employed, for the necessary intermediate proof sheets, by which the gradual progress of the work is successively tried and directed, with some improvements which will be added to it, it will then also serve for the ultimate execution of the final printing of the plates.

These operations require just as much the constant attention, and the eye of the superintendent, as any other parts of the works of the survey itself, therefore the whole must necessarily be carried on in the office of the coast survey itself, by an appropriated establishment.

Proper time, care, and an adequate portion of the appropriation, must of course be devoted to it, and much attention and time is required to procure the various materials, as copperplates, paper, and others, of that superior quality, which can alone be considered as satisfactory for a work of the character which the coast survey shall, also in its outwards appearance, present to the public. [1842–'43, *Doc. No.* 23, *p.* 3.

When, in 1832, the coast survey began again, it was found necessary that an establishment should be in it: to enable to keep the instruments required in it, always in good repair, not only, but also to construct entirely new ones; for this a dividing engine was evidently required, as the necessity to recur to any mechanician, not habituated to the wants of the coast survey work, would never give results appropriated to our use, and keep the work itself back by delays, which would be out of our control, and very costly.

Therefore the acquisition of such an engine was immediately authorized by the President, and in consequence it was ordered immediately, and upon my plan of the modified construction, which I have just described.

Mr. Troughton, and Mr. Simms, whom he had in the mean time associated with himself, received the order to that effect; but Mr. Troughton died before the engine was finished, and it ultimately arrived here in the course of last summer, after a delay, which affords again a proof: that, when a work is to be done, requiring mathematical accuracy to a high degree, and to an honorable useful result, the time to be consumed for it, can impossibly be limited, as little as the extreme care and assiduity.

The engine is unique in its kind in this country, and of great value even for the general progress of the art of the mechanicians in this country, besides the services the coast survey will derive from it.

[1842–'43, *Doc. No.* 23, *p.* 4.

Since then, the works for the balances intended for the State Governments, have principally occupied the mechanical part of the establishment, the final adjustment of the dry capacity measures, of half bushels, will, as I have stated there, be begun as soon as the season will be favorable for it, their mechanical execution is complete.

[1842–'43, *Doc. No.* 23, *p.* 5.

NOTE (89.)

23. Question. Can good copper for engraving be procured in this country?
Answer. Yes.
24. Question. Have you had any practice as an engraver?
Answer. Yes.
25. Question. Can impressions be taken from a plate in an unfinished state, to show the progress of the work?
Answer. Yes.
26. Question. Can impressions be taken from the plates now engraving in the survey?
Answer. Yes, without injury to them.
27. Question. How long will it take to furnish the eight plates of the harbor of New York, with the present force, at the rate it now goes on?
Answer. I cannot state by conjecture. I should think about three years.
28. Question. Is it not possible to have the work done accurately and more rapidly than at present, if more hands were put on the work?
Answer. Yes. [*Blunt, page* 23.

NOTE (90.)

The works of the coast survey have, since my report of 2d December of last year, continued in all the different branches, with steadiness and assiduity, the same as has always been habitual, on the part of every one engaged in the work, notwithstanding the difficulties arising from the nature of the ground, and other causes, which have required increased attention, and from the intermittent fevers, which have more or less attacked every party of the work at different times. This latter difficulty being local, and well known to increase in proportion as the work proceeds southerly, will, in a year or two, oblige to change the time of the year to be used for the field works, approaching it always nearer to the winter season; this will, however, make but a slight difference in the general organization of the work, the nature of the changes that may arise from this, or any other accessary circumstances belonging to the detail administration of the work, are so much less to be detailed here, as they are only prospective, therefore, as yet, undeterminable.

The present organization of the work, being the same as since many years, is of course fully known; the grounds of it have been deduced in my numerous former propositions for the work, and the series of my yearly reports; it would therefore not be proper to dwell here again upon it.

The tasks executed by the last summer's works in the field, are as follows:

For the main triangulation: the extension of a more general scheme of larger triangles southerly on both sides of the Delaware, over those that

have been made with the view to topographical and hydrographical use, and which forms their final element and union.

For the secondary triangulation: to extend preliminary triangles over the upper part of the Chesapeake, which will lead also to the discovery of a proper locality for measuring the second principal base line, and to complete the triangles about both sides of Delaware bay, establish those up to the neighborhood of the head of the tide waters of the Delaware river, about above Philadelphia, &c.

The plane-table parties have filled up the greatest part of the ground now intended to be surveyed on both sides of the Delaware, and in other parts of New Jersey.

One of the naval parties has continued the soundings in the Delaware, parallel with the works of the topographical parties on its shores; the other has been extending the soundings out of sight of land, in the quadrangle, which is formed between the coast and the parallels and longitudes of Block island and Cape Henlopen, forming the outer approaches of both the New York harbor and the Delaware bay.

This investigation was carried out till to the Gulf stream, and in soundings till 650 fathoms depth, keeping samples of the nature of the bottom below. The officer operating in this work, expressed his full satisfaction with the methods indicated to him, the means he was provided with for that purpose, and the results obtained.

The consideration of the peculiarity of these works can alone make them appreciate, the nature of the ground over which they extend, the marshes abounding on both shores of the river, and the great multitude, and variability of the channels, shoals, and other impediments, which the Delaware presents, multiply in an equal proportion, the works and the difficulties of them, thence the necessary care, assiduity, and exertions, for both the topographical and the naval parties in that part of the work.

It was of interest to find out the exact place, where the observations of the transit of Venus over the Sun, was observed in 1769, at what was then called Cape Henlopen; therefore, on my visit to that neighborhood, I made proper inquiry, and was very kindly shown the place by the oldest inhabitant of Lewiston, Mr. Rodney, formerly Senator for the State of Delaware in Congress, who recollected it, from his having been at the tents of the observers at the time, when he was about five years old.

This place was, therefore, determined by the topographical party operating in the neighborhood, and the results for the astronomical position of the place, will become comparable with that, which will result in time from the present survey.

In a great part of the early season the weather was very much averse to the works; the fine weather in the fall, though favorable for the works, requiring no distant views, was far less so to the works of the main triangulation than its appearance would have led to expect; the constant dense fogs, particularly over the Delaware, which the greatest number of the large triangle sides, now in operation, are crossing, caused considerable loss of time. (Total description of the year's work.)—1842–'43, Doc. No. 23, pp. 1, 2, and 3.

NOTE (91.)

To 111 and 112: The principles of my action in this respect, are fully exposed already in my printed papers upon the coast survey, quoted before. The reduction, to any other measure, consists only in the addition of a constant logarithm, as for instance, that for the yards, and even for the miles, is given in my printed logarithmic and trigonometric tables. As all the scales of the maps are expressed by their fractional value, the distance upon the maps can be ascertained in any measure whatsoever, and by that means is really given in any measure whatsoever, which is widely different from the *bad method* so many miles to the inch, which has no regular comparable proportion. [*Hassler, p.* 63.

NOTE (92.)

111. Question. Are the measures in the survey taken in French metres? If so, why?

Answer. Yes, because it is the only absolute standard; but the results are given in yards and metres both.

112. Question. In what parts of yards?

Answer. In decimal parts only. [*Hassler, p.* 12.

65. Question. How are your distances measured?

Answer. In French metres. It is not the standard of the country, but it is the standard best authenticated, and best known in geodetic operations. Our standard is the English yard. The foot is the most common measure used in this country, both for scientific and practical purposes.

66. Question. Is the metre in common use in this country in any way?

Answer. No.

67. Question. Is it not as easy to convert yard measure into metres as metre measure into yards?

Answer. It is the same thing.

68. Question. In that case, what benefit is there in having the work of the survey in metres?

Answer. None but what I have given before.

69. Question. What is the standard used in the English survey?

Answer. Either the English yard or foot. [*Ferguson, p.* 18.

NOTE (93.)

The answers to questions 69 till 74 must have been highly instructive for the committee, as they offer much field for speculation without bottom. The discussion upon the Newark bay map, requested so minutely from Mr. Ferguson, shows evidently a high degree of research upon mathematical accuracy, and similar subjects, which exceeds itself again, when it comes to determine the square miles covered by triangles who have but three corners, as well explained at the end of the article. [*Hassler's critique on the examination by the committee, dated January,* 1843, *p.* 9.

The following information respecting the wearing of the coast at Cape May has been received from Colonel T. Jones Yorke, the present member of this House from New Jersey.

NOTE (94.)

HOUSE OF REPRESENTATIVES U. S.,
Washington City, D. C., February 15, 1843.

DEAR SIR: In answer to your inquiries, "of the effect of the wash of the ocean on the main land at Cape Island," I now enclose you a copy of the record kept at the Atlantic Hotel and Congress Hall, upon the island. The Atlantic Hotel was built in 1804, and you will observe the record shows the annual wear, with few exceptions. The whole amount, however, is shown for twenty-six years, which is 334 feet, being an average of $12\frac{30}{100}$ feet annually—(the house was then moved.)

In the years 1831 to 1834, inclusive, there was no record.

From 1835 to 1843, the measurement has been made from Congress Hall, (on a different site,) and embraces eight years: whole amount, 76 feet—making an average of $9\frac{25}{100}$ feet annually.

The whole amount of wash is 410 feet in 34 years, averaging $10\frac{73}{100}$ feet per year.

If the years 1831 to 1834 were included, it would make the total greater, but perhaps would vary the average very little, if any.

I am informed that the wash has changed within the last two years, and has cut off the *point* formed by the ocean and the Delaware bay; and is now working into the bay, and cutting away the main land upon which the light-house stands, (which is about one-half of a mile within the bay;) and, further, that the beach is making above the light-house.

I hope these answers will be satisfactory; if not, I shall be pleased to give any further information in my knowledge.

Very truly, &c.
T. JONES YORKE.

HON. JOHN B. AYCRIGG,
House of Reps. United States.

Effect of the wash of the Atlantic ocean upon the main land at Cape Island, ascertained by measurement, of which a record has been kept.

Atlantic Hotel.				Congress Hall.				
Year.	Distance from the beach.	Wash.	Average.	Year.	Distance from the beach.	Wash.	Average.	Total wash.
	Feet.	Feet.	Feet.		Feet.	Feet.	Feet.	Feet.
1804 -	334			1831 to 1834	No record.			
1805								
1806 -	324	10						
1807 -	294	30		1835 -	540			
1808 -	273	21		1836 -	528	12		
1809 -	267	6		1837 -	526	2		
1810 -	266	1		1838 -	515	11		
1812 -	256	10		1839 to 1843	464	51		
1816 -	225	31						
1817 -	210	15						
1818 -	204	6						
1819 -	186	16				76	$9\frac{25}{100}$	
1820 -	180	8						
1821 -	174	6						
1827 -	64	110						
1830 -	–	64						
26 years -	–	334	$12\frac{30}{100}$	8 years -	–	334	–	410

RECAPITULATION.

Wash opposite Atlantic Hotel, from 1804 to 1830, inclusive, being 26 years - - - - - -	334 feet.
Wash opposite Congress Hall, from 1835 to 1843, inclusive, being 8 years - - - - - - -	76 "
Total wash for 34 years - - - -	410 "
Average wash - - - -	$10\frac{78}{100}$ feet per year.

The documents from which the above extracts are taken, being within reach of all the members of the House, any individual can satisfy himself (by referring to the originals) upon any point on which he may entertain a doubt.

ORIGINAL CONTRACTS

FOR

THE SURVEY OF THE COAST.

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ORIGINAL CONTRACTS.

TREASURY DEPARTMENT, *June* 20, 1842.

SIR: I have the honor to transmit the following communication, in answer to the inquiries made in your letter of the 31st ultimo, in behalf of the special committee "on the coast survey."

First. Respecting "the contract between the Government and F. R. Hassler, superintendent of coast survey," of which a copy is asked by the committee, I beg leave respectfully to refer to the accompanying papers, (marked A, B, C, and D,) as containing all the information in possession of the Department, in reference to the engagement of the services and the terms on which Mr. Hassler undertook to perform the work, in the year 1816, and on its revival in 1832.

Second. In reference to the inquiry, "under what authority was Mr. F. R. Hassler employed to make a set of measures for the United States?" I would respectfully refer the committee to the copy of a communication, herewith sent, from Mr. Secretary Ingham, under date of the 30th of April, 1831, (marked C,) by which it appears he was employed by the Treasury Department, with the sanction of the President, to superintend the manufacture of weights and measures for all the custom-houses of the United States.

Third. In regard to the inquiry, "when was the work commenced, and how much has been expended, yearly, from its commencement up to the present time, specifying the sums, to whom paid, and for what purpose?" it is to be remarked, in answer to the first branch of this inquiry, that on the 29th of May, 1830, the Senate of the United States adopted a resolution directing the Secretary of the Treasury "to cause a comparison to be made of the standards of weight and measure now used at the principal custom-houses in the United States, and report to the Senate at the next session of Congress." To comply with the requirements of this resolution, it appears Mr. Secretary Ingham deemed it expedient to engage the services of Mr. Hassler to make the necessary comparisons, as shown by the accompanying copy of his letter to that gentleman, dated 12th June, 1830, (marked B,) and inviting him to come on to Washington to perform that duty. To institute the comparisons mentioned, it became necessary to require the collectors of the principal ports to forward their standards to Washington, which occasioned some unavoidable delay in the commencement of the work. The proper tests and comparisons were accordingly made by Mr. Hassler, and the determined results were submitted to the Senate, in reports from the Department, under dates of the 3d of March, 1831, and 20th June, 1832, which will be found in Senate documents, 2d session of 21st Congress, 2d volume, document 74, and Executive documents, 1st session 22d Congress, volume 6, document 299.

As the results of these comparisons exhibited serious discrepancies between the standards used at the respective ports, the Department gave directions to Mr. Hassler to superintend, in this city, the manufacture of standard weights and measures for all the custom-houses. These directions were given in April, 1831, but, as many arrangements had to be made before the work of fabricating these standards could be properly entered upon, such as the collection of materials and the preparation of re-

quisite machinery, some time elapsed before it went into complete operation. There is no data in the Department by which the precise time when the work was commenced can be fixed.

In reply to so much of the second branch of the inquiry under consideration as relates to the amount "expended yearly, from its commencement," I beg leave to refer to the statement prepared by the Register of the Treasury, and transmitted to the committee on the 15th instant, in compliance with the request of Mr. Aycrigg, a member of the committee.

Fourth. As to the inquiry, "from what source or sources have the funds thus used been derived?" I have to state that the funds have been derived from the accruing revenue, under the authority believed to be given in the 21st section of the general collection act of the 2d of March, 1799, requiring surveyors of the customs, from time to time, and particularly on the first Mondays in January and July, in each year, to examine and try the weights, measures, and other instruments, used in ascertaining the duties on imports, with standards, "to be provided by each collector, at the public expense, for that purpose." The construction given by the Department to this provision of law seems to have been sanctioned by a special committee of the House of Representatives, of which the Hon. Horace Binney, of Pennsylvania, was chairman, as shown by their report, No. 132, vol. 1, second session of the 23d Congress, which closes with the following resolution, which was adopted by the House:

"*Resolved*, That it is highly expedient that the Treasury Department should complete, with as little delay as practicable, the fabrication of standards of weights and measures, for the supply of the different custom-houses of the United States, upon the principles set forth in the reports of the Secretary of the Treasury to the Senate on the 3d of March, 1831, and 20th June, 1832."

Both Houses of Congress subsequently sanctioned the source from which the expenditures were made, by a joint resolution of the 14th June, 1836, directing the Secretary of the Treasury to finish a complete set of all the weights and measures adopted as standards, for the respective States; and by the 7th section of the act "for the support of the military academy," &c., passed the 7th July, 1838, the Secretary of the Treasury is directed to cause to be made, under the superintendence of Mr. Hassler, one standard balance for each State, and, when completed, to be delivered to the respective Governors, for the use of each of the States.

Fifth. In regard to the inquiry, "how many complete sets of weights and measures have been delivered to the Treasury Department, and how have they been disposed of?" I beg leave, in answer, to refer the committee to the statement herewith sent, (marked D.) by which it will be found that two hundred and seven sets of large weights, forty-four sets of ounce weights, and forty-one yard measures, have been delivered by Mr. Hassler to the Department; that, of the former, there have been distributed to custom-houses and States, &c., one hundred and nineteen, of the second twenty-three, and of the latter thirty-four.

Sixth. In respect to the inquiry, "when is it probable the work will be finished?" I would remark, that the Department is not possessed of such information as to enable it to fix any precise time when the work will be finished; but, as it is informed that the capacity measures, and the balance of the ounce weights and yards, have been fabricated, and are now undergoing their final comparison, it is not supposed that much time will elapse

before their final completion. It is understood that the balances designed for the States are also in a state of forwardness. It is deemed proper to observe, in conclusion, that it is not contemplated to furnish the respective custom-houses with balances or ounce weights, they being designed for the respective States alone.

I have the honor to be, very respectfully, your obedient servant,

W. FORWARD.

Secretary of the Treasury.

Hon. F. MALLORY,

Chairman of Select Committee on Coast Survey.

WASHINGTON, *July* 12, 1816.

SIR: Herewith I have the honor to deliver the more detailed articles of the agreement between the Treasury Department and myself, relative to the survey of the coast, as desired by the letter of the Secretary of the Treasury, under the 5th instant.

You will judge if I have expressed myself clearly upon the subjects under consideration, or not, and dispose, in consequence, as you find most proper.

I have the honor to be, with respect and esteem, sir, your most obedient, humble servant,

F. R. HASSLER.

——— JONES, Esq.,

Treasury Department, Washington City.

Articles of engagement between the Treasury Department of the United States and F. R. Hassler, relative to the survey of the coast of the United States.

A. Mr. Hassler engages to bestow all his time, labor, and attention, to the work of the survey; as well to make, himself, the principal part of the general large triangulation, and the consequent calculations, as to superintend and direct the establishment of the observatories, and the officers of engineers, or naval officers, who will be engaged under his orders, in the detail parts of the work, and give them proper instructions to that effect, according to the plan proposed by him, under the 15th May, 1816.

B. He will, to that purpose, have the use of such instruments and books of the collection he has procured, or which are yet to be procured, for the use in this work, as he may find necessary for his objects, and give directions relative to those which are to be used by the officers under his direction.

C. He will be provided from the corps of engineers, on his application to the general of said corps, with the following assistance to his own works, or such part of the same as he may deem necessary, according to circumstances, viz:

1. Two officers of engineers, topographical or others.
2. Some cadets of said corps, in number according to the circumstances.
3. Twelve men of said corps, for the most part artificers, with corporal or sergeant.
4. One large baggage wagon, with four horses, or two smaller ones, as he may require, with the necessary drivers to them.

5. Two saddle horses.

6 Tents for the accommodation of himself, the above-mentioned officers, cadets, and men, and the shelter of the instruments.

7. The necessary field utensils, as well for the personal accommodation of the company as for the works occurring, not comprehending Mr. Hassler's private equipment.

D. Under Mr. Hassler's orders, the officer first in rank accompanying him will have the chief command of the above military assistance, and act as treasurer upon the funds, which will be given to said officer to defray all the expenses of a public nature occurring or ordered by Mr. Hassler; and said officer will render account upon these funds to the Treasury Department.

E. The following are to be considered expenses of a public nature, viz:

1. The keeping in order and securing from injury of the instruments belonging to the Government, their stands and boxes, and the fitting them up for use.

2. Such additions to the collection of instruments and books as may be found necessary by Mr. Hassler in the progress of the work, as well to complete the collection from time to time as to furnish a sufficient number of them for the use of the detail surveyors.

3. The construction of the signals and signal lamps, and their attendance and protection

4. The preparations of the stations, for the convenience of observations, and the securing of them for future utility.

5. The transport of the instruments and the baggage of the company.

6. All expenses consequent or relating to the keeping in order and maintenance of the military assistance stated in article E.

7. All expenses for the establishment of the permanent or temporary observatories, to be erected according to Mr. Hassler's plans.

8. The printing of blank formulas of journals and calculations, for the detail surveyors, if such are found advantageous, as it is probable.

F. Mr. Hassler will receive, as compensation for his personal work in the survey, his superintendence and direction of the whole, and all his personal expenses consequent thereof, the sum of five thousand dollars annually, *to be paid quarterly, on his drafts upon the Treasury Department,* or otherwise.

G. It is understood that the work shall not be carried on in the form of a bureau or office; but that Mr. Hassler himself, as well as the officers under his direction, shall execute such work as devolves upon them, or are ordered to them in the field, by defraying their own personal expenses, and at home in their private quarters. Therefore, no accounts will be admitted upon room hire, fire wood, stationery, or smaller drawing implements, not provided by the collection of the Government. The above-mentioned compensation is to be considered compensating all his personal expenses, in his absence from home, in the work of the survey, and the items here mentioned, required for his personal use in this work, exclusive only of the expenses stated as of a public nature in article E.

H. The appointments to be made in future, to officers undertaking separate parts of the work, will be fixed so as to comprehend the same articles, and to follow the same principles.

I. If, therefore, Mr. Hassler shall at any time require officers to work under his direction in his quarters, it will be at his option, and entirely a

matter of his private arrangement; otherwise, every officer is to be understood to execute his house work in his own quarters.

K. From these regulations are excepted:

1. All expenditures relating to the use of vessels or shipping, for soundings and the nautical part of the survey, for which proper arrangements will be made in time by the Treasury Department, upon propositions to this effect.

2. The clear executed copies of the maps and charts, either general or special, which will be required by the proper authorities, or prepared for publishing; for which proper draughtsmen will be appointed, and paid according to separate arrangements, to be made with men who may have applied to such works with particular success.

3. All expenses and consequences of engraving, printing, publishing, or executing such number of copies of the maps or charts as may be required for this purpose, or desired by the Government, or the officers to whom it may belong.

F. R. HASSLER.

WASHINGTON, *July* 12, 1816.

TREASURY DEPARTMENT, *August* 3, 1816.

SIR: The correspondence and documents relative to your being employed as superintendent of the survey of the coast, under the act of Congress respecting that object, have been submitted to the President, and your services are engaged, on the following terms:

1. The whole of your time, labor, talents, and attention, shall be given to the work, as well in relation to the superintendence of the duties to be performed by military or naval officers and assistants, or by draughtsmen and engineers, as in relation to the parts of the work which are to be executed by yourself.

2. You will be provided with competent assistance of officers and men, from the corps of engineers and from the navy, with tents and field equipage, with baggage wagons and horses; and you will have the free use of the public instruments and books, for the purposes of the survey.

3. The party of officers, men, and assistants, accompanying you, will be ordered to conform to your instructions; and all the incidental expenses of the survey, which are of a public nature, will be defrayed by the Government; but your own personal expenses are to be defrayed by you, whether you are employed at home or abroad.

4. Funds will be placed, from time to time, upon your requisition, in the hands of the chief officer accompanying you, to be disbursed, upon your order, in the payment of the expenses of a public nature, and to be accounted for by him at the Treasury once at least in every three months.

5. You will receive, in full for all your services, a compensation at the rate of $3,000 per annum, and for your personal expenses an allowance at the rate of $2,000 per annum, to commence on the 18th day of June, 1816, and to be paid quarterly at the Treasury, upon your drafts.

6. You will make frequent reports of your progress to this Department, and deposite here all the surveys, drafts, notes, charts, maps, journals, and documents, in any wise belonging to the survey of the coast; and you will return the public instruments and books to such place as shall be directed, when they are no longer required for the business of the survey.

7. If at any time it should be necessary to explain the nature and extent of your employment and engagement, your communications to this Department, and particularly the articles submitted by you on the 12th July, 1816, will be resorted to.

It only remains to repeat the President's solicitude for a successful and speedy execution of the great national work which is thus confided to you, and to assure you of the esteem with which I am, sir, your most obedient servant,

A. J. DALLAS.

Mr. F. R. HASSLER,
[*To the care of Robert Patterson, Esq., Director of the Mint, Phila.*]

Copy certified conformable to the original.

F. R. HASSLER.

Upon the articles of agreement between the Treasury Department of the United States and F. R. Hassler, relative to the survey of the coast of the United States.

1. Mr. Hassler engages to undertake the direction of the survey of the coast of the United States, according to the law to that effect of 1807, and the act to put the same in activity, passed in 1832, as well by performing such of the principal parts of the same as will require his own personal work, as by directing and superintending the work of such officers of the army and navy, and also civil engineers, as will be appointed, upon his recommendation, in the other parts, and the detail surveys, the determination of soundings, and such like.

2. He will, for that purpose, have the use and disposition, for himself or his assistants, of the instruments and all other necessary implements, books, &c., that have been procured in time for that purpose, and such others as will be procured successively for the same use.

3. He will also be provided with the proper means of safe conveyance of these instruments and other objects, either by land or by water, according to the arrangements which he will make at proper times for that purpose.

4. He will receive the assistance of such officers, cadets, midshipmen, or other men of the military or naval service, as will be appointed upon his request, and who will be provided with all their necessary field equipments, &c.

5. All the assistants and men, military, naval, or civil, that will be appointed for this service, will be ordered to conform to his instructions and directions, and, in case of their refusal, he will have the liberty to order them to report for other services, or dismiss them.

6. He will have the sole and free disposition of the carriages or other means of conveyance, and other objects or implements appertaining to the equipments for this work.

7. He will be provided with tents for the instruments and for the accommodation of himself and his assistants, with the necessary tools for preparing stations, placing signals, and the other necessary works for the encampment on the stations, and mending implements, &c., that might be in

need of it, the necessary means for signals, and for the preservation of the stations of the survey.

8. One of the assistants will act as accountant for all public expenses made upon the orders of Mr. Hassler, and will receive from the appropriations made for the survey such sums, at different times, as shall be agreed upon. He will account for them, at stated times, to the Treasury Department, for which service he will receive a compensation.

9. All drawing, plotting, execution of maps, or such like, will be done by the assistants, upon Mr. Hassler's orders, either in their private quarters or in an office, as may be judged best adapted to the case; the office expenses will be paid by the accounting officer, on public account.

10. All the stationery needed in the work, as well for Mr. Hassler as for any of the assistants, will be provided by the accounting officer, at public expense, in the field or at home.

11. Officers or engineers, detailed out by Mr. Hassler for separate works, of detail parts or others, will conform to the instructions which they will receive from him upon their work; they will be furnished with such instruments, implements, and assistance, as he will direct; and their expenses of a public nature will be accounted with the accountant above stated. They will report to Mr. Hassler, as he will direct; for such works they will receive adequate compensation.

12. Mr. Hassler will receive, for compensation of his services, $3,000 per annum, and in lieu of his private personal expenses $2,000 per annum, to be paid together quarterly, upon his draft, bill, or otherwise, unless, in the progress of the work, he should be obliged to make voyages at greater distances, when an allowance, by the way of mileage, will be determined.

13. Mr. Hassler will be provided with an ostensible public paper, stating his employment, and the nature and object of the same, to support him in his actions and transactions in any part of the country he may have to go for the purpose of his work, to serve equally for his assistants and the persons employed under him.

F. R. HASSLER.

WASHINGTON CITY, *August* 6, 1832.

Instruments, implements, and assistance required.

1st. These cannot be very essentially different from what they were in 1817. In the present state of the instruments and their accessories, it will be best to give them under detailed inventory, as stated in its place, to the disposition of the chief of the work, to take the best advantage of them that they will afford, to have them put in as good order as possible, and to allow him to replace the missing accessories as best he can.

2d. The carriage made purposely for the transportation of the principal instruments was sold, but is yet on hand, and can be made serviceable until a new one may be constructed, which would most likely delay too long at present. For the other parts of the transportation it will be easy to get a Jersey wagon, as has been used before.

3d. Horses and harness it will be necessary to purchase—the first strong and sure; the second simple, but strong. The mode of transportation of the instruments by a proper carriage, made of a size exactly to serve as a box

for them, and upon springs and thorough-braces, has been found more secure and economical for this country than the transportation by hand. It admits, therefore, also, to reduce the number of laboring hands for the work of the triangulation.

4th. The whole party in the work must be supplied with the necessary tents for their encampment in the field, and other necessary field equipments, besides axes, pickaxes, spades, and other tools, required for the placing of signals, preparing stations, and keeping every thing in good order. (I have even always such tools with me as are proper for keeping the instruments in good order, and repairing lighter accidental damages.)

5th. It must be observed, that the proper provision and arrangement of the accessories, and even the ease of an observer, are essential elements of accurate observation, as well as attentive and intelligent assistants; both favor the unimpeded and proper progress of the work, and are therefore essentially economical. A defective state of these parts is very detrimental.

6th. It is expected that none of the chronometers will be in a serviceable state; that defect may be supplied by the loan of a second-pendulum clock at West Point, (of Troughton's arrangement,) made expressly for transportation, which is not expected to be in use there; even a circular instrument of Troughton's, which is there, most likely in the same predicament, might be borrowed with advantage for the secondary triangles mentioned in the proper place.

7th. The selection of the assistants, in officers or other able men, must of course belong to the chief of the work, who will recommend them, and they will receive their appointments from the Department, but, if necessary, removed upon the proposition of the chief of the work. For the present first beginning, to execute the part stated for the immediate work, three such persons will only be required, whom I wish to name, besides what accidental help I shall have to call my son in for, on account of his acquaintance with the former work.

8th. The number of laboring men will vary at different times. When the base lines are measured, fifteen to twenty will be required for the simple triangulations, particularly that proposed at present in completion and extension of the triangulation made in 1817. Six or seven may be sufficient, besides the drivers for the carriages and what may be needed for detail triangulations, if they are undertaken simultaneously.

9th. The best manner of getting this part of the assistance in laboring men is to take them from the military, where they may be easily spared from some garrison or other. Their habit and regulation of discipline, and their being placed under the order of an officer, introduces much easier the necessary regularity, and they stand for their conduct under proper regulation.

10th. The pay and maintenance, in every respect, of the officers and men taken from the army and navy, is in all cases to be provided for and paid by the army corps to which they belong, or the navy in general, according to the regulations in which they otherwise stand; so, also, they will receive all their equipments. They must, in general, be considered as coming to this service in the same manner as to any other in their line to which they might be ordered.

F. R. HASSLER.

WASHINGTON CITY, *August* 6, 1832

TREASURY DEPARTMENT, *August* 9, 1832.

SIR: With the President's approbation, you have been appointed to make, under the superintendence of this Department, the survey of the coast of the United States, directed by the acts of the 10th February, 1817, and 10th July, 1832.

The act last mentioned having authorized the employment of other persons as well as those in the land and naval service, such assistants, of either description, as may be necessary in the work, will be provided at your request.

Funds will be placed, from time to time, upon your requisition, in the hands of one of your assistants, to be disbursed for such expenses of a public nature as may be properly chargeable to the appropriation for the survey of the coast, and he will render his accounts, approved by you, quarterly, to the First Auditor.

Those expenses of the persons in the military and naval service employed in the survey, which are chargeable to military and naval appropriations, will be defrayed by the officers of the respective Departments, and accounted for under the direction of those Departments.

You will receive, in full for all your services, a compensation at the rate of $3,000 per annum, and, for all your personal expenses, an allowance at the rate of $1,500 per annum, payable quarterly, to commence on the 2d of August, 1832, you having been employed since that time in the necessary arrangements of the instruments and other preparatory works. It is to be understood, however, that you will still continue your services in the construction of weights and measures for the custom-houses, as far as may be compatible with your duties in the coast survey, without any other compensation than what is allowed for the coast survey.

In all other respects than those indicated by this letter, the terms and nature of your employment will be the same as were fixed by the letter addressed to you by this Department on the 3d of August, 1816.

The plan of operations and methods formerly adopted by you in the coast survey having been approved of, you will recommence and continue the work in conformity with them, including such modifications as are suggested in your report of the 6th instant.

I am, respectfully, your obedient servant,

LOUIS McLANE,
Secretary of the Treasury.

F. R. HASSLER, Esq.

WASHINGTON CITY, *August* 12, 1832.

MOST HONORED SIR: I have the honor to acknowledge the receipt of your favor of the 9th instant, by which you are pleased, with the authorization of the President, to give into my charge and direction the important national work of the survey of the coast of the United States, with a compensation of $3,000 annually for my services, and an annual allowance of $1,500 for my personal expenses, to begin from the 2d instant.

I am too well aware of the great importance of the work, its exigencies and nature, and the magnitude of the task, not to appreciate duly the value of the confidence you place in me by this trust. I shall call up all my exertions to prove these feelings, by conducting the work in a manner as

honorable as permanently useful to the country; for which it presents so valuable means, that I feel highly honored by the occasion thus given to me to contribute my exertions toward such an aim.

The diminution of the allowance for my personal expenses, from what they had been rated at in my first appointment in 1816, is not such that within the limits of such estimations, made beforehand, its effects could be distinctly foreseen; I could only say, that while I was in activity in this work in 1817, my annual expenses in my absence from home amounted to about $2,000. What effect the now somewhat changed prices of things may have in this respect is of course impossible to foretell; therefore this is so much less an objection with me, as in any case I am certain it is not the intention of the Government to put me to pecuniary loss, and that, therefore, in case it should be found appropriate, this part may easily be modified to the exigency of unforeseen circumstances.

I shall also attend to the standarding of weights and measures, in which I have hitherto been engaged. I have taken such arrangements as will enable my assistant in it, Mr. Schmid, to prepare the works to the last stage of their adjustment, which I shall then make myself next winter, after my return from this year's field work in the survey. His acquaintance with the subject, and his practice in that part during his presence in all my former operations, render him fully capable to the task; and his work will abridge mine so as to bring the necessity of my personal attendance within such limits of time as will be compatible with my work in the survey.

With thanks for the honor of your confidence, I remain, with perfect respect and esteem, most honored sir, your most obedient servant,

F. R. HASSLER.

Hon. LOUIS MCLANE,
Secretary of the Treasury of the United States.

X

24

ORIGIN AND HISTORY OF THE ATTACK OF MR. CUSHING UPON THE COAST SURVEY, AND OF THE SELECT COMMITTEE OF INVESTIGATION, OR EXAMINATION, UPON THE WORK.

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1. The first *occasion* to the inimical move in Congress, was taken from the proposition of Mr. King, from Georgia, to order the printing of some maps by the Navy Department, of some southern harbors, surveyed (so said) by Lieut. Glynn, which the Navy Department did doubt of being worth it.

2. Lieut. Glynn had at that time, as before and since, visited about the members of Congress and the libraries, to preach up his merits, and a plan of chronometric surveying, which had already in 1832 been tried to be put up, in opposition to my plan, (I have the copies) but which is actually incapable of giving a result in the case, as well known in science; chronometers are good seamen's tools, but incapable of surveying, because they give no determination of distances, &c.

3. Lieut. Glynn's intermixture is proved by himself, by the anecdote, that, Mr. Everett having said in the course of his opinion, "he could attribute the course of Mr. Cushing, only to a want of information of what had been done, and to the promptings of some discontented lieutenant of the navy."

Lieut. Glynn went to Mr. Everett, telling him that his statement must have meant him; to which Mr. Everett answered, "that he had not known him, nor heard him mentioned before that time;" this of course unveiled Lieut. Glynn's co-operation, by his own conscience.

4. The whole attack of Mr. Cushing was directed against me, personally; his other discussions betrayed the most complete ignorance of mathematical science, and of the work to which it was to be applied. He used unbecoming expressions, against which many members of Congress were so kind as to take my defence in a generous way. He betrayed it in a very low manner, by saying, after repeating a call for a committee; "if it should be found that *no one but a Swiss*

could do the duty, he would waive his objection, *and not till then.*" This is evidently too distinctly stating, that I should be ejected, *if it could be done,* to leave the slightest doubt upon the case, that *private interested intention,* without regard to public good, lay in his motives.

5. In general, all the low and bad language which Mr. Cushing used on the occasion, is the fullest proof of his complete want of decency, and respect for the assembly whom he addressed, and of the fullest absence of all self-respect.

6. How Mr. Mallory could let himself be induced to be the cat's-paw of Mr. Cushing, who was himself already a mere cat's-paw, is only explainable by his not in the least understanding the subject, and being made to believe that he could earn glory by helping Mr. Cushing to pull down that public work, under his control or guidance.

7. In the examinations of the committee, all the above proved itself still fuller, by the conduct of Mr. Cushing, who at that time very soon was seconded by Mr. Aycrigg; Mr. Mallory, as chairman, forgetting the dignity of his situation, to keep up decency in the examination, to which I was subjected, in a form worse than criminal, (for at least I, as attorney-general of the higher and supreme courts in Swisserland, did positively and strongly reprove the inferior courts, when an examination of a criminal was not conducted with propriety and decorum, though none ever went so low down in language as Mr. Cushing came with me in the committee, with the sufferance of Mr. Mallory.)

8. The following is the history, and some facts of my examination.

At the first meeting, Mr. Mallory began by saying to me: "We know the respect due to age; we know that you are very industrious." I augured well from that; he and Mr. Aycrigg both said then, they were friendly to the work. Mr. Wise was present also, who had already spoken friendly in Congress, and otherwise; a few questions only passed as such, otherwise only conversation, which, if persisted in friendly, instead of what occurred after, would have been able to give all proper information upon any part of the work, that might have been desired.

9. But, next day, were present Mr. Mallory and Mr. Aycrigg only; when Mr. Cushing entered furiously, stretching his arms over the table, around which we were all three sitting, loudly exclaiming, "You know, gentlemen, we have agreed that, unless publications be made, we would vote for keeping back the appropriation." This at once unveiled to me, that no objection to the

appropriation was intended, as there was evidently no time lost to change any thing.

10. Then, Mr. Cushing, *turning his back to me*, as he did *during the whole three days'* examination, began in a vociferating tone, to address me the questions in my examination up to about No. 50 or 60.

The questions being set mixed, or unclear, I, of course, began sometimes by wishing to separate them, clear them up, and explaining, but Mr. Cushing, turning round to me in an angry tone, said most generally, "that is argument, I will not that—I want '*yes* or *no*,'" which could of course convey no information to a man ignorant of the first elements of the subject he inquired into.

Often, when I began only to speak, at the first word he exclaimed to his colleagues, "Always evasive answers, you see," or other offensive provocations.

11. I pass various questions, placed evidently only as catches, as upon danger of fire, of falsifications, &c.; most of them are contained in the 120 questions, which are recorded, and to which I have since extended the answers.

This unbecoming turn of the examination occasioned me to write a letter to Messrs. Holmes and Wise, complaining of the unbecoming conduct towards me, and desiring their presence, as a check; both came the third day of my examination, but staid only a short time, Mr. Cushing always pushing his rough language, and impeaching my answers. I stated to them at last, "Gentlemen, I will answer you any question, but do not impeach my answers, that I do not admit." Then, Mr. Mallory said to me, "take it easy"—while, however, he left full sway to Mr. Cushing's angry and unbecoming language to me; it appeared, however, Mr. Cushing gave a little in, though his conduct was never what I could call decent.

12. In the first meeting I was alone; in the two others Captain Swift, the accounting officer of the Coast Survey, was present; he, after both examinations, on the return, acknowledged to all the other assistants, accidentally present, that the examination, questions, &c., were *evidently inimical*, and they found it the same, as every man who has seen them.

13. After me, Captain Swift, Messrs. Ferguson, Blunt, Blake and Page were examined, and, as I had expected, all treated with more kindness; for it seemed to be intended to hide the manner in which I had been treated, and to gain their good will against me, if possible; this I had expected, *and told beforehand to my assistants*, that it would be the case; for Mr. Mallory giving me in the first

meeting the occasion to mention, that the trial of making me appear a man difficult to live with, was idle, as every man whoever dealt with me could state the contrary, he said, "it must not be so bad, for all your assistants like you." Their examination I know nothing of.

14. The trial evidently made, repeatedly, to frighten or provoke and irritate me, was a foolery, as I have no fear in my character. That the appropriation would not be withheld, I said to my assistants, because I said, it is not the question of *saving money*, but *to get* the very money for the *favorites of Mr. Cushing, and those concerned.* This proved itself fully by the fact, well known and recorded for the public, in Mr. Cushing's rising for it, and by the very words he used.

15. I might have asked the questions to be given to me in writing, to answer them more leisurely; but under the distrust which Mr. Cushing showed, by the whole proceeding, I was willing to leave him all the advantages which he might collect from ready answers, which I was just as able to give, provided he would consider the truth, that he was only master of the questions, and that I was so of the answers, as it is undeniable, but which he so completely disregarded.

A member of Congress may claim the immunity to *scrutinize* a subject freely in the house, but he *has no right to abuse*, if he has any thing to investigate.

16. The puerile questions, of how much time the Weight and Measure work took of me, show evidently that they were prompted by the desire of putting somebody for that alone, to *distribute offices* in greater number, &c. It shows, that the task which I undertook, to perform two works for one income, was considered as introducing a bad habit, and not consonant with the genius which I have heard advocated: to make room for as many as possible, to give incomes, without regard to the work to be done.

17. Mr. Mallory once took up my last report, upon which the Committee was established, to go regularly in the order of its articles, but Mr. Cushing immediately broke through, continued his disconnected random questions, and Mr. Mallory gave way to him. Upon my answer to question 38, Mr. Cushing said, "Such reports as you make, we make in an evening." This was hardly worth the smile of ridicule which I gave to it.

18. Upon my answer to question 56, Mr. Cushing bursted forth with outstretched arms, "I know 500 men who can do it full as well as you, that I can lay my hand upon at once." A smile at this would have followed, if the next question had not made me lift the

shoulders, as it showed that with all the French, and other publications, which Mr. Cushing quoted in Congress, as on hand *to be learnt from*, the knowing to read, and the understanding the subject read upon, were so very far away from one another.

19. The object of question 58, is one of the complaints put up in the most unjust manner; I am obliged to remark upon that: I am promised in my contract with government, *assistants;* these to select I have the proper liberty, by my second agreement of 1832. But with the best wishes, and selections, as was naturally to be expected for a work so entirely new in the country, I must instruct them always, so as I answered, "as much as they will admit;" but the less instructed being also those who are the least prone to ask for information, and to learn, it appears as if some one had complained, that I did not act enough the schoolmaster with him, to get ultimately after much trouble the answer, habitual in that case; "Oh, that I knew long ago!" when he even did not understand it yet, as any man who has, as I have, been engaged in teaching, may know, as well as I. In short, the accusation *is false.*

20. Still, I might add, that I contracted with the government for my *work*, the capacity to which is one of the results of *my* knowledge, *acquired at my father's and my expense, and assiduous study of many years;* to this my knowledge itself, the government has *no right*, having not paid for it, nor has any of my assistants, it is my *private property;* whatever of it I may be willing to give, is my liberal gift, which should be exercised only towards the *deserving*, and which such a man will duly acknowledge, as actually some of my assistants do. The right of the government goes, strictly speaking, only upon my work, as *results* of my knowledge in that branch; so it is considered all over Europe; thus Mr. Bessel expressed himself in his review of my Coast Survey papers—"Mr. Hassler *gives us* also *his means*," as a distinction from others.

21. The most of the questions testify by themselves to the incapacity of the questioner, and to his desire to (what was called) "stump me:" see questions 63, 64, 66—76. All that relates in any way to the actual work, I had explained in full at other places; the most remarkable defeat of their questions was, when thinking to find me not able to answer, exactly, the time of my going to the field work, and returning here, every year, since 1832. I could indicate the hour, and half hour, of my departure and arrival in every year; upon which Mr. Mallory was himself *obliged to laugh* at Mr. Aycrigg, who had proposed the question, in high hopes of a catch, if it was in any way reflected.

When, by mere conversation at the beginning with Mr. Aycrigg,

I stated to him, that I had even to reduce the zinc from the ore in the beginning, Mr. Cushing bursted out at once, "You might just as well have an iron mine, too." What reproach should that convey? What reasonable aim could there be in it?

22. When the three members present appeared to consider nothing as work of mine, except my part of the work in the field, I observed, that the administration of the whole business, ordering and distributing of the works, &c., gave considerable work, Mr. Cushing turned round to me, speaking violently in my face, "What administration have you?" Nearer to enter into the subject with a man, who could not see that a work requiring scientific and mechanical operations of all kinds, and the guidance of a considerable number of men, of very different qualifications and dispositions, must necessarily have even a considerable administration concern, was altogether useless, therefore, this was not answered in any way. Of the amount of this administration, the 17 or 18 volumes of my manuscript Documents give fully sufficient proofs.

23. Let it be enough of samples of politeness, good manners, and sagacious, wise investigation, with only the remark, that my assistants were all highly scandalized at it. Upon me it made a painful effect, which has now vanished.

When I, therefore, was dismissed and my assistants also, it should have been hoped, that the three inquisitive members of the Committee had become wise, and over wise in the subject, but mistaken!!

24. Mr. Mallory directed to me an undertaker in engraving, Mr. Stone, to *examine* (consult the dictionary upon the meaning of the word and its sequels,) my map of New York in MS. This man I and my assistants knew too well, to be inimical to my engraving arrangement; however to him, of course, the map was shown; but I told him directly he was *not able to put this map of mine upon copper*, to which he had to confess—"*I know that very well;*" he measured the map with a foot rule, like an undertaker, to make a coffin for a dead body; while there is upon one square foot of it positively more work than upon two square yards of the most full map ever given out under his name, and I have not any confidence in him; he is, in fact, no actual engraver; besides that, there is much of the map done, and in a far superior style. It would be as uneconomical, as improper and unreasonable, that an intermediate *engraving undertaker* should be between me and the man *who must work* always positively under my instruction.

25. This occasioned me to write to Mr. Mallory, that the sending of *such a man*, to *examine my work*, is an unprovoked *insult*,

stating my reason, which would certainly be considered so by any member of the committee, if it had been done to him.

Mr. Mallory, to whom I sent shortly after the first sketch of the questions of my examination, sent me word by the messenger who returned them, that this my letter spoiled all, &c.; if they choose to step out in the public with that, I am ready to meet them, but they and Stone both do best to let it rest.

26. As the wish of the committee, to show him the map, was executed, notwithstanding *he had seen it before already*, all the committee *could claim was done;* and I had, as a private honest man, the right to complain, when a man was sent to me whom, in my opinion, I did not find admissible under circumstances so highly obnoxious.

27. It appears evidently, that the harvest of faults desired to be found with me, was not satisfactory in the Coast Survey researches; therefore, the committee took hold of my works, for the establishment of uniform Standards of Weight and Measure for the Union. Mr. Mallory sent me word not to go away, that I would be called to be examined upon that work also!

28. As Mr. Mallory left for Norfolk, Mr. Aycrigg wrote to me under the 9th of June, a letter, calling me up, *forthwith* to give a *concise account* of my works in that line, *without referring to any of my former reports;* the style of it being too far from what, in old free Switzerland, would be considered becoming in public business, it presented a sample of style new to me; but I answered it by a full, still very abridged report, dated 29th June last.

29. Nobody will doubt, that if those members of the committee, who proposed to themselves to fight to destroy the work, had, instead of the blind passions and interested action, actually intended to make themselves acquainted with the subject, they would have begun, as Mr. Woodbury did when the Coast Survey came under him in the Navy Department, that is, by reading first all that was printed upon it; he, therefore, then also took the right and just course at once.

On the contrary, Mr. Cushing positively declined all reference to documents, as did after also Mr. Aycrigg; even when Mr. Mallory tried to lead the questions of Mr. Cushing, by those proposed to me by *his resolution*, as answered in my report of 3d December last. Mr. Cushing rejected it.

31. Messrs. Wise and Holmes, evidently disproving the course taken by Messrs. Cushing and Aycrigg, to whom Mr. Mallory gave way, kept away from the committee, expecting that the part of the committee which aimed at the majority, by involving Mr. Mallory,

should some day or other make an exposition of what conclusion they would come to; but nothing yet came out from them; I hope they abandon further persecution.

32. However, every part of my work being grounded upon laws, and my positive contract with the government, they cannot propose *insinuations* to any actual effect, &c.; if a law should be proposed, the sense of Congress will have to discuss it, and truth will come out.

33. Accounts were called in from the Treasury Department for every penny since 1807, which have occupied and confused a clerk in the Treasury Department, to take out of the Documents, since last January, and will still more confuse the Committee, which is not in any way in the case of drawing correct conclusions from them.

34. This whole attack of Mr. Cushing with its consequences has, taking all together, cost one whole year of my work in the Coast Survey, and disturbed all the other works very much; the cost of this move is, therefore, of considerable consequences in respect to money; but that is trifling in comparison to the harm it has done to the work in general, which to discuss is not here the place. But it may be observed, that this Survey work can never be, for the chief, a money concern of any moment, nor that the pushing to making the work, with a view to making money, can possibly give an honorable result.

35. The Committee was evidently in the position of a coroner's jury, which ought to have inquired into its subject, by direct personal inspection of the office, in which the work is established; I requested this repeatedly in writing, and verbally, but could never obtain it; so, *no actual investigation* was ever made there. Mr. Holmes made a short visit, Mr. Wise came several times; both in a friendly way, but the other three principally *active members paid no attention to the office, where every thing could have been shown and easily explained.*

36. It must strike any observer, that these ways of interrupting the Coast Survey, occasion a great deal of writing, that might well be spared, and which unfortunately takes *away my own personal* time, which is so much required for every branch of the work. Therefrom has arisen, that the primary triangulation has remained behind the secondary, by which this becomes a preliminary or reconnoitering work, which, by the nature of it, must be subject to change of form in its application, by which there is a damage done, even prospective, by doubling the calculations in future. There is

no remedying to that consequence, because mathematical principles decide peremptorily, and without appeal or cavil.

37. It cannot escape the most superficial observation, that these interruptions are very costly, because, during the time which the subjects are discussed, the compensations and the current expenses of the whole establishment go on, as well as if the time were employed in the work, which of course cannot possibly go on with equal success, during the time that these impediments last, and engross the attention, and absorb to a great degree the labor of all the persons engaged in the work.

F. R. HASSLER.

Pinehill, 21*st December*, 1842.

Notice of the Impediments and Delays which the Survey of the Coast has encountered previous to 1842.

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1. When, in 1816, I had agreed with Mr. Dallas, Secretary of the Treasury, about arrangements for the funds to be given to Major Abert, the then accounting officer for the Coast Survey, Mr. Dallas resigned immediately after, and Mr. Crawford, succeeding in the Treasury Department, refused the funds; this occasioned that I had to wait, to move the instruments from Philadelphia to Newark, New Jersey, where they were to be used, until I had money of my own to pay the expenses myself.

2. In the spring of 1817, a similar occurrence made again, that I had to start upon my own means. Mr. Crawford all that year answered none of my letters requiring dispositions, by which arrangements were lost which would have helped the work a great deal.

3. In the Senate, session 1817, '18, a proposition was made, and passed both houses, *the representative unobserved* even, limiting the law to the sole employment of naval and military officers, which, by abolishing my connection with the work, broke up the work! The attempt then made by the Navy Department, under the direction of four divisions of the navy, occasioned the expenditure of several hundred thousand dollars, but produced no work that dared to be shown or honorably exhibited. Witness, and other proofs, to these facts are yet producible.

4. When the law for the Coast Survey was renewed in 1832, the influence of navy officers, who had joined to advocate a so called chronometric survey plan, occasioned such circumstances as were expected to break up the agreement with me, directed by the President, which delayed the agreement; when it was concluded it was set up, that no advance of money could be given to me, without the special permission of the President, just then absent.

I vanquished that by asking only the proper papers, and with them, as proof of my position, I got personal credit in the Bank of the United States, in Philadelphia, for $3000, with which I began

the work again at my expense; after two months, upon sending in accounts, I got a check upon the United States Bank at New York.

5. In 1838, a proposition was started to establish a committee to regulate the work, to be composed of a Naval Commodore, the chief of the Topographical Department, and the under Secretary of the Treasury. I said immediately that I could not work under such circumstances, because the committee could not possibly direct me in the work, and I had no time to lead the committee. A trial, by my meeting the naval and engineer officers who were to be the members of the committee, which lasted but about an hour, showed by their disagreeing in principles, the inapplicability of the committee, and it was of course dropped.

6. In the mean time I could never get either a hearing or an answer upon my letters from Mr. Taney, then Secretary of the Treasury, and the Coast Survey was transferred to the Navy Department, where I knew it could not prosper, and said so immediately to the President, who promised me his protection, when I informed him of that, but the sequel proved me in the right.

7. In 1834, a violent attack was made against the accounts of the Coast Survey, my competence in doing what was required for the work, &c., and I was charged *unjustly* with payments of expenses of coming from the field work to Washington.

This was carried on under the name of Amos Kendall, Auditor, who having before already passed the account, turned upon his heels, and served as *cat's-paw in the trial* to subvert the work.

8. By wrong application of the funds of the Coast Survey in the Navy Department, the amount of appropriation had been reduced below the necessary means to go out to the field work in 1835; it took some time to obtain the return; besides that Mr. Dickerson, the then Secretary of the Navy, took a decidedly inimical turn; in direct change of the very fine manner in which he had defended the work in 1818.

9. The documents of 1835 show how much of my exertions of this year was still wasted upon the discussion of the difficulties raised, until I obtained from the President the re-transfer of the work under the Treasury Department, then in the hands of Mr. Woodbury, at the same time the works upon the Weight and Measure Standards were discussed, planned and begun.

10. Through 1836 shows itself the influence of all the preceding state of disturbance; the inability to pursue certain parts of the work, on that account, occasioned to pursue that year only the means of junction of the Maryland Survey, with the Coast Survey.

11. The little bickerings in journals, newspapers and insinua-

tions from various sides, that always go on, produced only disagreeable feelings, but the former experiences had of course occasioned precautions to be taken, in all measures and arrangements, which had a bad effect upon the celerity of the progress, which would otherwise have been possible.

12. It appears that the credit acquired by the work in this interval of half peace, was not to be suffered unmolested. Mr. Cushing rose as champion of a new tournament, which is now playing.

13. This constant persecution, and the groundless reproaches, heaped upon a work of science, and public utility for the country, which is universally acknowledged to go on in the best manner possible, to the complete success of the results aimed at, becomes ultimately discreditable. It would be a bad and painful result, if the ignorance and jealousy of a private few should be able to produce a national harm and disgrace, by Congress being once more misled to espouse them.

F. R. HASSLER.

Station, Pinehill, N. J., 21*st December*, 1842.

House of Representatives,
Committee on Naval Affairs, Feb. 25, 1828.

Sir: The House has directed the Committee on Naval Affairs to inquire into the expediency of carrying into effect the provisions of the act to provide for surveying the coasts of the United States, approved February 10, 1807.

I am instructed by the committee to ask of your Department information on the following points:

1. What maps and charts of the coast of the United States the Government possesses; by whom and when the surveys were made, so far as these and other facts connected with these maps, charts, and surveys, can be given without injury to the public service; and what progress has been made in or toward the survey contemplated by the act referred to?

2. Whether, in the opinion of the Department, such survey ought to be made; and if so, what further, if any, powers are deemed necessary to its due execution?

3. The best plan of making it; the instruments on hand to make it; the instruments, and their cost, necessary to be procured; and the appropriations deemed necessary to the work, in the whole, and for the current year.

I would add, that the committee, in calling your attention to these particulars, do not desire to limit you to them, but solicit the fullest information on the whole subject referred to them.

With perfect esteem, I am, sir, your humble servant,

MICHAEL HOFFMAN.

Hon. Samuel L. Southard,
Secretary of the Navy.

Navy Department, *April* 14, 1828.

Sir: I have had the honor to receive your letter, making certain inquiries respecting "the expediency of carrying into effect the provisions of the law to provide for surveying the coasts of the United States, approved 10th February, 1807," and respectfully submit my answers, in the order in which the questions are propounded.

1. "What maps and charts of the coasts of the United States the Government possesses; by whom and when the surveys were made, so far as these and other facts connected with these maps, charts, and surveys, can be given without injury to the public service?"

The enclosed papers, A and B, furnish lists of the maps and charts in the offices of Navy Commissioners and Engineer department. In addition to these, there have been made, within the last three years, surveys of the harbors of Baltimore, Charleston, Savannah, Brunswick, and Beaufort, under the direction of the Navy Department, and by authority of resolutions and laws of Congress. They furnish the materials for charts and maps of those harbors, which will exhibit the depth of water, particularly on the bars at their entrances, and their fitness for naval purposes.

Of the whole of the maps and charts in possession of the Government,

it may be remarked, that they do not furnish a satisfactory survey of the coast, for the following reasons:

1. They exhibit detached parts, unconnected with each other;

2. Are generally confined to the shores, and do not extend sufficiently far into the ocean;

3. Were many of them made by incompetent men, with incompetent means;

4. They were govered by no fixed and certain principles or guides, in ascertaining the latitude and longitude of the principal points and positions;

5. They do not embrace the whole coast.

For these and other reasons, they are unsafe; and, in many instances, useless and pernicious.

2d. "What progress has been made in or towards the survey contemplated by the act referred to?"

The law was passed on the 10th February, 1807, under the auspices of the then President Jefferson. Immediately after its passage, he directed Mr. Gallatin, the Secretary of the Treasury, to make the proper inquiries into the best mode of executing it. Communications were made by him to several of our most scientific citizens; and their views having been obtained, and submitted to a commission of scientific men, a plan was adopted in July, 1807.

To execute this plan, it was necessary to procure from Europe a variety of mathematical instruments, especially those which were required for one or more observatories, which formed one of its leading and prominent objects. An agent, Mr. Hassler, whose views upon the subject had been adopted by Mr. Jefferson and Mr. Gallatin, was sent to Europe by President Madison, in 1811, and he procured the instruments, a list of which is enclosed, marked C. You will perceive that a portion of these instruments was designed for use in the observatories, and are without value for any other purpose; their cost was about $17,167 61. But little use has been made of them, and they are now chiefly in good order, under the care and in the office of the Engineers, attached to the War Department.

The sum of $29,720 57, of the original appropriation, was carried to the surplus fund on the 31st December, 1814, and reappropriated on the 16th April, 1816, (vol. 6, page 57,) which enabled the Executive to direct the survey to be commenced. It was accordingly commenced in the fall of 1816, under contract with Mr. Hassler, and was terminated by the act of 14th April, 1818. For both the plan, and extent of the work done under it, I beg to refer you to reports of Mr. Hassler. It would not be practicable to condense them to any useful extent, nor could it be profitable to attempt it. It may be sufficient to remark, that the time during which he was employed, and the speedy repeal of the law, did not permit him to exhibit practical results in such a way as to enable the public to test the fitness of his plan *by them;* nor to execute any part of the work, so as to present a complete survey or chart of any portion of the coast.

It is believed, however, that he accomplished all that was possible, within a short period, and that his observations and work will be useful when the survey shall be resumed. I would respectfully refer you to papers published by him in 1824, "on various subjects connected with the survey of the coast of the United States," to be found in the 2d volume of the American Philosophical Transactions, and also, it is presumed, in the library of Congress.

3d. "Whether, in the opinion of the Department, such survey ought to be made?"

Upon this point, no doubt is entertained. It is called for by regard to our commercial and naval interests, and to our means of national defence. I do not understand that you require a statement, in detail, of the reasons for this opinion. They will readily suggest themselves to every mind.

4th. "What further, if any, powers are deemed necessary to its due execution?"

I do not suppose that any further or other powers are necessary, than those given by the law of 1807, with an appropriation adequate to the object. The work being authorized, it will be the duty of the Executive to see that it is executed in the best manner which the pecuniary and scientific means within the control of the Government will permit.

5th. "The best plan for making it."

The plan under which the survey was commenced, in 1816, was adopted, after prudent deliberation, and by intelligent men, perfectly acquainted with the state of science in this country at the time. Since that period, much has been added to the acquirements and skill of many of our citizens, but especially of our officers, to whom duties of this kind would be properly assigned. Several other plans have been proposed, but I am not prepared to express a decided opinion which should be adopted; and beg to suggest to you, that a decision on this point should be the result of deliberate investigation by the Executive, to whom the execution of the law would be intrusted. In the performance of the work, under any plan, officers of the army and navy would afford assistance, and thus diminish the expense. But it is proper to add my conviction, that it never can be perfectly and satisfactorily done, without the aid of an observatory.

6th. "The instruments on hand to execute it."

Paper D furnishes an answer to this inquiry.

7th. "The instruments, and their cost, necessary to be procured."

These must necessarily depend upon the plan which shall be adopted; and, therefore, a safe list cannot, at this time, be furnished. It is probable that their cost, and the expense of procuring them, will not be less than four or five thousand dollars. Should you still wish lists under the different plans which have been suggested, I will attempt to furnish them in a few days.

8th. "The appropriations deemed necessary for the work, in the whole, and for the current year."

It is a work of great labor, and of long continuance. In attempting to estimate its cost, with the present lights upon the subject, there would be much more danger of misleading than of directing the judgment.

The cost of an observatory, of the necessary instruments, and the pay of the officers employed, would be the principal items. For the first, I would respectfully refer you to an estimate furnished by the Department of War, in a communication to Congress, on the 6th of March, 1826; and would only remark, that I believe the expenditure, both for its erection and support, may be made somewhat less than the estimate. The pay of the officers employed will create a comparatively small burden on the Treasury, as they are already in the service, and will be detached from other duties to execute this.

An appropriation of thirty thousand dollars, for this year, would be amply sufficient.

I am, very respectfully, &c.

SAMUEL L. SOUTHARD

Hon. MICHAEL HOFFMAN,
Chairman of the Committee on Naval Affairs,
House of Representatives.

[From the North American Review of April, 1842, p. 446 *et seq.*]

ART. VIII.—*Letter from the Secretary of the Treasury, transmitting a report of F. R. Hassler, Superintendent of the Coast Survey, showing the progress made therein up to the present time.* (*Doc. No.* 28, *House of Representatives*, (*Treasury Department*,) 27*th Congress*, 2*d session*

By this valuable communication, as well as by information, reaching us from various sources, we are warned that the great public work of the survey of the coast is in danger of being again abandoned, or, what we should regard as still more unfortunate, of being superseded by some other plan of operations.

In a former number * we presented a concise view of the nature of geodesical operations, and of the principles upon which they are based. The remarks there made upon the subject we conceived were sufficient to show the futility of any scheme for arriving at the perfect knowledge of any extensive portion of the earth's surface, for constructing a map, or correctly determining and connecting a number of distant situations, by any other rules of procedure than those which the science of geodesia prescribes. They also afforded some data for a comparison between the American survey, as far as it had then proceeded, and similar works in Europe; such as, whether applied to the progress or the character of the work, might well gratify national pride. Our present purpose is to submit a few remarks, not of a character to interest the scientific reader, but designed rather to arrest the attention of men, who being necessarily uninformed upon matters of strict science, are nevertheless called upon in their high places to exercise judgment, and exert authority, upon questions in which the highest science is involved. It is our present aim to secure a clear and impartial investigation; to correct misrepresentations; to counteract the designs of scheming speculators; to defeat, if necessary, the instigations of ill will; and to uphold the scientific reputation of the country, which is in some measure dependent upon the successful prosecution of this great national undertaking.

The question first in importance with regard to the coast survey is, whether any other mode can be adopted—this mode having for its object the greatest amount of useful information, in the shortest time, and at the least expense. In discussing this question, so much has been said, and is still urged, concerning the use of chronometers, and the substitution of them for the present system of triangulation, that it seems worth while to say a word upon this subject, premising, that the serious consideration we here give to it does not arise from any idea of the value attached to such a suggestion in the minds of scientific men.

The chronometer in the hands of modern artists has, it is true, attained a degree of excellence which admirably adapts it to the general purposes

* See North American Review, vol. XLII, p. 75 *et seq.*

of navigation, and supplies to seamen the most useful means of solving the problem of longitude. Still it is far too imperfect an instrument to be relied on implicitly. It possesses an inherent and constant liability to error; and although its accuracy may be preserved through any short period, this liability is so multiplied by time, and the chances of accident, as to deprive even those which are most carefully constructed of all claim to perfect confidence. In cases where their use is indispensable, as in detached and local surveys, in the cursory examination of distant and inhospitable regions, or in carrying a chain of longitudes around the globe, and generally where strict and careful measurement is for any reason forbidden, their imperfection is in some measure remedied by numbers. Acting as checks upon each other, the amount of error is reduced, and the observer is enabled to fix, with a degree of precision sufficient for the security of ordinary navigation, the simple position of certain points and headlands. This, however, is regarded only as the palliation of an evil; the evil itself is fundamental, and admits of no complete remedy.

In determining differences of time between meridians widely separated, chronometers have sometimes proved remarkably successful, and have exhibited results of surprising accuracy. The reverse of this proves to be the case in the adjustment of minor differences, where the essential defects of the instrument are particularly displayed. There is no space, however small, of perceptible magnitude, which may not be submitted to trigonometrical measurement; but it will be readily understood, that there are points, at minute distances asunder, between which no difference of local time can be estimated. If it be asserted, which we are by no means prepared to admit, that such distances are unimportant in a geographical view, it will appear that they are of the highest topographical value when we come to consider the character of our Southern coast.

If chronometers, however, could be implicitly relied on, and the determination of longitudes by means of them admitted of greater exactness, still it is to be borne in mind that their use, in connexion with the sextant, goes so far only as to decide a certain number of fixed points.

This cannot in any strictness of language be called a *survey*. It still remains to fill up the intermediate spaces by some sort of measurement, and the mode and result of this operation are questions of serious importance. We need not enter into any detail to show that a survey of this kind must content itself with the bare outline of coast, harbors, islands, &c., neglecting all the valuable details belonging to physical and statistical geography, differences of level, and the distribution, limits, and peculiarities of the country under inspection, all of which are included in the operations of a geodesical survey.

We are told that despatch is one of the recommendations of the chronometric plan. Numerous parties will probably, therefore, be immediately employed, and it will remain afterwards to harmonize their labors by joining the distant points of observation. To do this, will, we conceive, be no easy task; and, if such a plan be adopted, we shall not be astonished to learn hereafter that the attempted meeting of these unconnected operations is likely to break up in the most admired disorder.

We do not mean, in any thing we have said, to underrate the value of chronometers in their legitimate sphere. They might, undoubtedly, be advantageously employed in the preliminary determination of important points on the coast, which are known to be erroneously laid down.

Their accuracy may be depended upon within a mile, and even this imperfect knowledge will be in some degree a relief to navigators, where errors of alarming and uncertain magnitude are known to exist in their charts. Mr. Hassler has, in his letter to Mr. Gallatin, given to this proposition all the consideration it merits.* If such occasional use should be made of them, and the present system of survey should be continued, subsequent comparisons will abundantly prove, that even the simple determination of geographical positions by chronometers (omitting all question of a connected survey,) however skilfully and expensively conducted, is unavoidably defective.

In a matter that may be subjected to rigid mathematical investigation, results are anticipated, and conclusions distinctly enunciated. But perhaps it will enforce our argument to exhibit some facts that have immediate relation to the present inquiry. We select such as are nearest at hand. An attempt was made to determine the place of the Capitol, by means of chronometers, by Mr. Paine, of Massachusetts, a gentleman distinguished for his zeal and ability in these calculations. He carried three chronometers from Boston to Washington, through Philadelphia, and back, observing the difference of meridians of the three cities, both going and returning. The results of these are spoken of as important. The difference of his two longitudes of Washington, by Philadelphia and by Boston, is 14."25. The difference between the mean of his observations and the adopted longitude of Washington is 12."9; whilst Mr. Paine's longitude of Washington differs from the mean of seven results of astronomical observations, solar eclipses, and occultations, by 41."1.†

In the trigonometrical survey of the State of Massachusetts, begun in 1831, and concluded about a year since, embracing a territory of 8,230 square miles, we find an exemplification of our argument at once pertinent and conclusive.

A letter from Mr. Simeon Borden, the superintendent of this survey, to the American Philosophical Society, in addition to an account of the work, gives a "comparison of his own results with those obtained by Robert Treat Paine, Esquire, from observations with a Troughton's sextant and mercurial horizon, and chronometers transported to different stations."

In the longitude of Pittsfield the chronometers exhibit a difference of 28."98, nearly one half of a mile; yet thirty-nine chronometers were used in thirteen journeys. The meridians of Cambridge and Dedham are 3.'30."43 apart by trigonometrical measurement; the chronometers give the difference of longitude 3.'11."10, making an error of 19."33. In the case of Cambridge, twenty chronometers were used in six journeys, and in that of Dedham twenty-three chronometers in seven journeys. Gloucester and Plymouth, both seaport towns, which ought therefore to be known correctly, coincide in longitude within 2."10. The chronometers have increased that difference to 8."55. This instance illustrates what we have before said of the incapacity of chronometers to note minute differences of local time with the requisite accuracy.

Williamstown, where twenty-eight chronometers were employed in ten journeys, is placed 19."24 to the west of its true position. We have al-

* *American Philosophical Transactions*, new series, vol. II, pp. 238, 239.

† *Determination of the longitude of several stations, &c.*, reported by Sears C. Walker. See *American Philosophical Transactions*, vol. VI, p. 265, *note*.

ready remarked, that Pittsfield is 28."98 in error. The sum of these two variations is 48."22, or eight-tenths of a mile, and one-third nearly of the difference of longitude of the two places.

The longitudes of Williamstown and Dedham, as decided by the chronometric method, present a discrepancy of 29."32, or one-half a mile nearly. Fifty-one chronometers, in seventeen journeys, were used to fix the position of these two towns. Other instances might be added to this list, but the table of comparative *latitudes* demands a passing notice.

The determination of this element, as is well known, is much less liable to error. A combined difference of 9."86, or one-sixth of a mile, appears in the latitudes of Boston and Squam light; and here the industry of Mr. Paine accumulated no less than four hundred and eighty altitudes for the determination of these two places. Three hundred and ten altitudes place Amherst 8."70 south of Cambridge; but an error of 4."80, more than one-half the difference of latitude, is proved in these observations, by Mr. Borden's measurement.

The two greatest errors in this table are 7."30 and 7."81, the sum of which makes the possibility of error amount to 15."11, or one-quarter of a mile.

We will add one more case. Mr. W. C. Bond, the distinguished astronomer of Harvard College, whose remarkable accuracy and skill in the use of instruments place him by the side of the best European observers, says, in a paper now before us: "In June, 1839, I had observations with a transit circle, the illuminated end of the axis east and west, on the 16th, 17th, 20th, 21st, 23d, 24th, and 25th. These observations gave for the latitude of the instrument, 42°.19.'16."9." Reduced by the measurement of Mr. Borden, they determine the latitude of the State House, in Boston, to be 42°.21.'30."3'''. Mr. Paine's observations with the sextant and artificial horizon give 42°.21.'22."7'''. Four hundred and forty-two altitudes were taken by Mr. Paine, yet these insufficient instruments, in the hands of one perfectly skilled in their use, and guarded as far as possible against error by multiplied observations, fall short of the truth 7."6. Mr. Borden's latitude of the State House differs three-tenths of a second from that of Mr. Bond's.* The comparison of the precision of the two methods afforded by the Massachusetts survey is highly favorable to sextants and chronometers. It would be too tedious and expensive to apply to a great extent of territory, including a large and indented sea coast, the reiterated and laborious processes of Mr. Paine.

The survey of a portion of the earth's surface is a work which comes within the domain of the mathematics. It may safely be said that any determination of a place, in which the mathematical theory is disregarded, must be fundamentally defective. A reference to this theory brings us to an argument which, we trust, no misapprehended views of science, and no preconceived notions of utility or expediency, will overlook.

The system of triangulation, conducted upon the principles in physics which direct this department of science, takes into consideration the spheroidal form of the earth, and enables the surveyor to construct such a map of that portion of the spheroid which is comprised in his labors, as will be an exact representation of its real figure. This mode of surveying, and this only, regards the earth as it actually is, in its irregularly elliptical form,

* *Proceedings of the American Philosophical Society*, May and June, 1841.

delineates its surface correctly, and treats of the true measure and configuration of the planet on which we live. Topography, and many of the details of physical geography, come within its province; as the courses of rivers, the direction and elevation of mountain ridges, the nature of the land, &c.—knowledge which is essential to the defence of the coast, to the construction of fortifications, and to all the duties of the military engineer. It furnishes the most accurate and convenient bases, from which a network of triangles may be thrown over any of the States through which it has passed. Some of them have already united their local operations with the general survey, to their great advantage. We may add, finally, in relation to this topic, that, when we are called upon hereafter to make our contributions to the common treasury of similar knowledge, this work will supply the requisite data for the measurement of degrees on the earth's surface, and for the "accurate determination of the elements of the terrestrial spheroid."

It promises also to be of especial value in giving future security to the intricate navigation of the Southern shores, a part of the coast of the United States rendered particularly dangerous by numberless reefs, shoals, and sandspits. It is well known that these are variable in their limits and condition, gradually forming in some places, and in others changing their extent and direction, under the influence of violent winds and strong currents. In order to acquire a permanent and useful knowledge of their character, and to provide an accumulation of facts that will lead to an understanding of their probable formations, dispersions, and changes, a certain knowledge of their present state is indispensable, beyond that which can be reached by sextants and chronometers. Rigorous observations upon these and similar subjects in Europe, by geologists and other men of science, have resulted in great benefits to navigation.

The increasing commerce at the South, the future establishment of naval stations there, and the close and hazardous sailing that must be pursued, both by merchant vessels and men of war, in the event of foreign aggression, make it desirable that the *in-shore* navigation of the Southern coast should be well understood.

We have already shown what degree of reliance may be placed upon the chronometer under favorable circumstances and in skilful hands. We are justified, we believe, in saying, that longitudes by chronometers cannot generally be relied upon as correct within less than one mile. But shoals of light and unstable sand, beaches widening and narrowing, and downs accumulating and dispersing, under the action of local and general causes, demand accurate measurements of feet and inches, by means of which the operations of nature may be carefully studied, future obstructions be prevented, present ones be removed, if possible, and an effectual security be given to the pilotage of the Southern coast. A trigonometrical survey, made with all the fidelity that the improved state of the science ensures, is the only method adapted to the attainment of all these desirable objects.

Some complaint has been made against the superintendent of the coast survey, because its results have not been published, from time to time, as they have been determined. The power and duty to direct both the manner and the time of their publication rests with Congress, and to that body such a complaint may be appropriately referred. A full and sufficient reply to this charge is contained in the report. We may add here, however, for general information, that engravers are now employed upon the first sheets, which will probably be issued in the course of the coming summer; and,

if the work is continued, the publication will hereafter take place regularly, as the plates come from the hands of the engravers. When these charts, executed with precision and elegance, under the sanction of public authority, are produced, we shall, for the first time, be able to look upon similar works, contributed by the English and French Governments to the safety of commerce and navigation, without envy and shame.

Much is said of the expense of the survey as at present conducted. In this matter we are not particularly careful to answer. An honest and prudent appropriation of the public money we are willing to leave in the hands of those to whom it is legally intrusted. In this case, at least, we may be contented to confide in their integrity. Economy, it is true, is a virtue; but mere saving is not always economy—it may be the most imprudent waste; and, being satisfied of the paramount importance of this work, both to the public interest and to the national honor, we might say, without further comment, that it should not be interrupted. It is in accordance, however, with our previous remarks, to add, that this is one of those cases in which economy is not identical with retrenchment. If chronometers possess in themselves an insurmountable tendency to error, the survey undertaken by their means, and dependent on their results, is not likely to be ever completed. What is certain to-day may be doubtful to-morrow. Subsequent observations may bring discredit upon those which have gone before; and it is to be apprehended, that, however multiplied they may be, so far from ultimately removing the difficulty, they will only serve to strengthen doubt and increase perplexity.

Besides this, experience will prove that the repeated transportation of numerous chronometers will be attended with but little less expense than a regular and scientific survey. As some ground for this opinion, we shall refer again to the high authority of Mr. Paine. In a letter to the *Bureau des Longitudes* at Paris, he gives the longitudes of several towns in Massachusetts, the results of his own observations, and adds:

"These longitudes have been generally determined by the transportation of time repeated several times with numerous chronometers. Thus, between Northampton and Boston, I have carried seventy-four chronometers in twenty-four journeys; between Amherst (the college) and Boston, or Northampton, twenty-seven chronometers in nine journeys; between Barnstable and Boston, fifty-nine chronometers in sixteen journeys; and between Gloucester and Boston, sixty chronometers in sixteen journeys."*

We have here an example of the manner in which chronometers are employed in the hands of a skilful observer. In estimating their use for a survey of the coast, the additional risk of transportation by sea is to be added to this account.

The financial department of the coast survey does not, however, present any thing so startling as to render these statements necessary for its defence. They are in themselves valuable facts and considerations, tending immediately to elucidate the subject, and weighing heavily against the proposed change; but they are not, we imagine, essential to vindicate the present plan of operations from a suspicion of waste and extravagance.

Since the year 1832, sixhundred and twenty thousand dollars have been appropriated to this service, one hundred and twenty thousand dollars of

* *Connaissance des Temps*, 1843. Additions, p. 95. The *Additions et Corrections sur les Tables des Positions Géographiques*, by Mr. Daussy, will repay a critical examination.

which remains on hand, in the form of vessels, instruments, and other property, leaving a balance of five hundred thousand dollars to be charged to the survey. When we consider that this expenditure extends through a period of ten years, that it has been bestowed upon a great national work, of the highest importance to the commerce and defence of the country, that it is a contribution to knowledge, and that its investment in this way has gone further than any thing yet done to establish the character of the country abroad for a liberal patronage of science, we are not disposed to regard it as an expense which the strictest economist may not approve.

As to the amount of money and probable length of time required to complete the survey, we cannot do better than to say, that these questions are ably and properly treated in the documents before us. "With the advancement of the mathematical and physical sciences, the means of acceleration of any work grounded upon them also increase. All that is needed is, that the whole work be carried on in the most economical manner." (p. 11.) We are satisfied that its progress will compare favorably with that of any similar work in Europe; and we are not willing to be behind the old world in accuracy, and in honorable and permanently useful results.

The course pursued has already met the approbation of men abroad eminent in science, and practised in such works, whilst at home the survey has more than repaid the sums drawn from the Treasury by the benefits it has conferred upon two of the largest commercial cities, New York and Philadelphia. It ought to be a sufficient argument for its continuance, that it has discovered what other operations, though often repeated, failed to find out; and its success here was owing to strict conformity to the principles of surveying, which alone a severe science recognises. It is needless to say, that the duration of the work is indefinitely protracted by the frequent interruptions to which it has been subjected. If it were permitted to enjoy the friendly and intelligent patronage of Congress and the Government, the greatest number admissible of assistants would be employed, and all the rapidity of execution consistent with accuracy would be secured. Mr. Hassler has given a list of similar works which have been executed, and are now in progress, in Europe; from which it appears that not only flourishing kingdoms, but even petty principalities, have made their triangulations. When we contemplate the wealth, extent, and dignity of this vast empire, we feel that the hope is not unreasonable which looks for enterprises suited to its condition. But science, which knows no limits either of power or national boundary, finds a home among the thrones and insignificant dominations of Italy and Germany; and, if it be rejected from the councils of this nation, will confer upon their humble princes a distinction before which we must be content to bow. The abandonment of this work will not fail to be regarded in Europe both as a calamity and a dishonor. The impress of instability, which seems to be stamped upon every public measure, might at least be removed from this, in which all parties and all prejudices may unite and harmonize. The survey of the coast has already created a distinguished school of topographical and hydrographical engineers, thus overcoming one of the early difficulties in the undertaking; it will further contribute to erect a standard of science, the practical value of which we cannot now discuss. Should some other mode be adopted for the time, there can be small doubt that the present method, the only one which strict science approves, will be hereafter resumed; and "the chances

of an accumulation of errors upon such a long extent of sea coast as that of the United States, particularly in the direction in which it lies, will be too great, and the consequences of a want of system and care too glaring, not to bring discredit and shame upon a less accurate operation."*

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* *Papers relating to the Survey of the Coast. American Philosophical Transactions,* new series, vol. II, p. 400.

XIII

27

REMARKS

UPON THE

Survey of the Coast of the United States.

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1. The law authorizing the survey of the coast was passed February 10, 1807.

2. Circular letters were addressed by the Treasury Department to various scientific men in the United States, asking for a plan of operations. Thirteen such were received, and submitted to a committee of learned men in Philadelphia, with the late Professor Patterson at their head. After full consideration, the plan proposed by Mr. Hassler was adopted.

3. From the passage of the law until 1811, no active steps were taken, in consequence, principally, of the unsettled state of the country.

4. In August, 1811, Mr. Hassler was sent to England to procure instruments, in accordance with the plan proposed by him in 1807. These instruments had all to be *constructed;* and, for the purpose of superintending the same, he remained in England until 1815, at which time he returned to the United States, with all the instruments and appendages requisite for the work. The war, want of remittances for payment of the instruments purchased, the difficulty of procuring suitable artists to construct the same, &c., conspired to protract his stay in England nearly two years beyond the time which he had allotted to this part of his labor.

5. In August, 1816, Mr. Hassler was appointed, to superintend the survey of the coast, under the law of 1807. The necessary preparations for the work, including reconnoitring, &c., consumed the time between August, 1816, and April, 1817. At that period a proper locality for a base line was discovered in New Jersey, and in July of the same year the actual triangulation was commenced.

6. April 14, 1818, that part of the law which authorized the employment of persons other than those belonging to the army and navy was *repealed,* and thus was Mr. Hassler's connexion with the coast survey closed.

7. Up to this period, the whole amount expended for the work was $55,634; of this amount, $37,549 had been expended for instruments and the expenses of procuring the same, leaving about $18,000 for the cost of the survey, equipment for the field, &c.

8. In 1819, Mr. Hassler presented to the American Philosophical Society of Philadelphia his papers upon the coast survey, describing the method and means by which it had been designed to conduct the work, together with full descriptions of the instruments, with drawings of same, examples of the journals of observations, &c. These papers were published by the Society, in their volume of Transactions for 1825, and are now in the Library of Congress; they contain much valuable and interesting information upon the subject. They were reviewed by the principal astronomers of Europe—Bessel, Struve, Schumacher, Ferrusac, Francoeur, Krusenstern, &c.—all uniting in the opinion that the plan of Mr. Hassler was of the first order, and that the instruments were in every manner adapted to the purpose for which they were designed. In 1832, a distinguished astronomer

of France, now employed by the Government of the United States, declared that the instruments planned by Mr. Hassler for the coast survey, and executed under his eye, were, when constructed, *twenty years in advance of the science of Europe.*

9. In 1827, the survey of the coast, after a lapse of ten years, again excited public attention. The Secretary of the Navy, (Mr. Southard,) in describing certain surveys which had been made by naval officers for an especial purpose, stated in his annual report that "the time within which it was supposed desirable to make them, [the surveys,] and the means granted by the appropriation, did not permit them to be so made as to furnish perfect surveys and charts of those harbors; *nor can such surveys be made without the aid of the means contemplated by the act of* 10*th February*, 1807, *to provide for surveying the coast of the United States.*"

In 1828, the Committee on Naval Affairs addressed a letter to the Secretary of the Navy, (Mr. Southard,) asking information in reference to the survey of the coast, to wit: whether it ought to be made; the best plan for making it; what progress had heretofore been made, &c. In reply, he proceeds to say, after referring to a list of maps and charts, "of the whole of the maps and charts in possession of the Government, it may be remarked that they do not furnish a satisfactory survey of the coast, for the following reasons:

"1. They exhibit detached parts, unconnected with each other.

"2. Are generally confined to the shore, and do not extend sufficiently far into the ocean.

"3. Were many of them made by incompetent men, with incompetent means.

"4. They were governed by no fixed and certain principles or guides, in ascertaining the latitude and longitude of the principal points and positions.

"5. They do not embrace the whole coast.

"*For these and other reasons they are unsafe, and, in many instances, useless and pernicious.*"

10. In answer to the question, "Whether, in the opinion of the Department, such survey ought to be made?" the Secretary replies: "Upon this point no doubt is entertained. It is called for by regard to our commercial and naval interests, and to our means of national defence. I do not understand that you require a statement in detail of the reasons for this opinion; they will readily suggest themselves to every mind."

11. July 10, 1832, the law of 1807 was revived, and the employment of such "astronomers and other persons" as the President should deem proper was again authorized.

12. At the request of the Treasury Department, Mr. Hassler submitted a plan of operations for the work, being, in fact, the same which he had proposed in 1816. On the 9th August, of same year, he was again appointed to the survey, and to carry into effect the law of July 10. Prior to this period he had been employed by the Treasury Department in making comparisons of the various weights and measures in use at the several custom-houses, with a view to the construction of uniform standards of the same for the Union.

13. The two works, of the coast survey and that of the construction of standard weights and measures, being, by their nature, intimately connected, and the means of accomplishing each being in many instances the same, Mr. Hassler was charged by the Treasury Department with the

execution of both; and, since the period referred to, the two works have received his whole attention.

14. Since 1832 the survey of the coast has been diligently prosecuted. The remainder of the season, between August and December of that year, was employed in reconnoitring and other preparations; and early in the following year, 1833, the triangulation was recommenced, and has been making steady progress from that time to the present. In 1834 a new base line was measured on Long Island, and the secondary triangulation, hydrographical work, and plane-table surveys, have also been in active progress, *pari passu*.

15. By the official statement of the Secretary of the Treasury, (Doc. 57, H. R., Jan. 31, 1842,) it will be seen that the aggregate amount expended from 1808 to 30th June, 1841, is $512,731 68; of this sum, by the same statement,* $33,723 05 has been expended for the purchase of "instruments, books, and repairs of instruments." This, with various sums expended for 5 surveying vessels, 20 boats, with all the requisite accompaniments, and the necessary equipment for the several parties engaged in the secondary triangulation and plane-table work, makes a gross sum which exceeds $120,000, for objects of a *permanent* nature, now the property of the coast survey. This would reduce the amount expended upon the work itself to $392,731 68; if to this sum be added the whole amount of the estimate of the Secretary of the Navy, for difference between shore pay and sea pay of the officers, and for pay and rations of the crews of the several vessels, from 1834 to 1841, ($114,584,) we shall have a total sum expended of $507,315 68, for about 11 years of actual work, or about $46,000 per annum.

16. When the operations of the coast survey, under Mr. Hassler, were suspended in 1818, by the repeal of a portion of the law, the system which he had adopted was also suspended, and thenceforward detached portions of the coast were assigned for survey to naval officers, from time to time. Indeed, this same system, which was condemned so thoroughly by Mr. Southard in 1828, and for which the sound reasons quoted from his report, at the 4th page of this paper, were given, is still pursued—at what expense exactly we have not the means of stating. An approximate estimate may be formed, however, from the following facts: The direct expenditures, as exhibited by the printed statements in the office of the Register of the Treasury, from 1818 to 1841, are $63,520 20; the incidental or indirect expenditures do not appear, but perhaps an idea of the extent of the same may be formed upon the following data: In 1832 $5,000 were appropriated for the survey of Narragansett bay, in Rhode Island. There were employed in this work, 1 post captain, 3 lieutenants, 5 passed midshipmen, and 18 seamen, for one season, say six months. This appropriation of $5,000 is nearly $\frac{1}{13}$th of the whole amount of *direct* expenditures. Adopting the same principles in computing the cost of the work chargeable to the naval establishment, which the Secretary of the Navy adopted in stating $114,584 as the amount properly chargeable to the coast survey, for difference between sea and shore pay, and subsistence of officers, and pay and rations of seamen, we shall have a gross sum, for six months, of upwards of $4,000. Therefore, for every $5,000 expended directly for the work, we should add $4,000; and this, for the $63,520 20, amounts to

* There is an error in this part of the Register's statement; for the *original* collection of instruments cost $37,549, and additional instruments have since been procured.

$50,800. I infer, also, that nothing is included in the above $63,520 20 for purchase or repairs of vessels, equipment, &c., these being provided, as usual, in the general expenses of the naval establishment; on the contrary, both purchases and repairs of vessels, boats, furniture, &c., is chargeable upon the coast survey fund, for all which now belongs to the work. Here, then, we have a sum of $114,320 as the cost of some detached surveys of portions of the coast. Surveys of this nature, and those which are executed upon proper principles, are so unlike in character that they do not admit of comparison.

We proceed now to state briefly the principles upon which the survey of the coast is conducted.

The principle upon which the survey of the coast is conducted is, essentially, that which is known as the trigonometric method. By the relations which subsist between the sides and angles of a triangle, we are enabled, from certain known data, previously determined by actual measurement, to compute certain other parts which are unknown. For example: in a given triangle, by measuring one of the sides and the angles, the two remaining sides can be determined by computation. These computed sides then serve as bases for other triangles, and, subsequently, by measuring the angles *alone* in the triangles thus formed, the work is extended *ad libitum*. This is called a triangulation, and may be made upon any part of the earth's surface upon which a line of a given extent can be measured.

A triangulation may be complete in itself, and, when the necessary corrections have been made for the figure of the earth, the actual distance between two points can be accurately determined. But this, alone, is not all that is required; it is necessary to ascertain the true position of the district or country triangulated upon the earth's surface—that is to say, its latitude and its longitude. The first of these is independent, it being simply its distance from the equator; while the second is not independent, but refers to the position of some other point on the earth's surface, and under another meridian. This latter place or meridian may be assumed at will; and the question then to be determined is simply the difference *in time* between the two places of observation; and this, being converted into degrees, constitutes the longitude, or rather the difference of longitude, between two places.

For these determinations, observations upon the heavenly bodies must be resorted to. It is not necessary, however, that celestial observations should be made at every point determined by the triangulation; on the contrary, a few well-determined positions, ascertained by a long series of observations, often repeated, are sufficient, the connexion between the same being determined by the triangulation; hence the survey of the coast, as now conducted, is made by combined or mixed geodetic and astronomical observations.

Here, then, is the essential difference between a survey by triangulation and astronomical determinations, or even the so-called "chronometric survey," (a misnomer, by the way, for it is not a *survey*.) One consists in a *connected* work, carried on upon the earth's surface, and made by means of an uninterrupted series of triangles; while the other is composed of a collection of observations upon the celestial bodies, made at detached points, each place of observation being independent of the other. In the first method the connexion is complete, while in the others there is no connexion whatever.

To the question, whether the mode of making the survey of the coast by triangulation is better than any other, it may be said to be the *only* truly correct method which can be pursued. It is the only method by which a *connexion* in the work can be preserved. Of its accuracy the proofs are continually before the observer, and an error need not be extended beyond a single triangle. The three angles are measured in every principal triangle of the work; and, as this is all the *measurement* which takes place after the base is determined, it is obvious that the observer has his proofs of correctness continually at hand. There can be no *cooking* of observations, as is sometimes practised in astronomical determinations.

An idea of the exceeding accuracy attainable in works of the nature referred to may be formed by referring to the account of the measurement made by the French astronomers of the arc of the meridian between Dunkirk and Cabrera, for the determination of the figure of the earth, being 12 degrees of latitude in extent. After a great number of triangles had been measured, and an extent of about 500 miles upon the meridian determined, (between Melun and Perpignan,) a base of *verification*, as it is denominated, was measured at Perpignan. This verification consisted in *measuring* with the greatest accuracy one of the sides of a triangle in the series which had been previously determined by computation from the original base. The difference between this computed side and the actual measurement was less than 2 feet.*

In the work of the survey of the coast, the *secondary* triangulation now encompasses the southern part of the State of New Jersey, from Staten island to Cape May; one series of triangles was carried around on the east or coast side, while a second was carried down the Delaware river and bay, uniting near the southern point of the State. The length of the side of the triangle which was common to both series was, of course, determined by each chain of triangles—one by the coast, and the other by the Delaware bay; the difference between the two determinations was two metres, or about six feet. In the primary triangles this difference will, from present appearances, be less than one foot.

Surveys of all the countries of Europe have been or are being made by the system of triangulation, to wit: Austria, Russia, Sweden, Denmark, Hanover, Prussia, Swabia, Bohemia, and the States of Germany generally, Italy, Naples and Sicily, Switzerland, France, England, the British possessions in India, and the French colony in Algiers.

"Europe is covered with well-connected series of triangulations—from the south of Sicily to the polar circle; from Ireland, through England, France, Germany, to the interior of Russia; from Bordeaux to the frontier of Turkey, and in all the intermediate parts."

Some of the practical benefits which have resulted from the coast survey are already apparent. The discovery of the ship channel into the harbor of New York, the better determinations of the channels into Delaware bay, and the detection of the grossest errors in the existing charts of that bay, constitute a portion of the advantages which have already been derived from this work.

The engraving of the chart of the bay and harbor of New York, with the country adjacent to the same, within a circuit of twenty miles, is now

* La Place.

in progress; two sheets, embracing the entrance to the harbor, with the channel delineated thereon, are already in a state of great forwardness, and, in all probability, will be completed by the 1st of June, 1842.

To the question, "Whether no other mode exists by which accurate results can be obtained within less time than they can be furnished by a trigonometrical survey," the answer is, *No.* There is no *short* method by which these results are attainable. It is not the "quantity" of triangles alone which determines the industry or skill of the observer, but the quality. To make the triangulation of a given district of country with the least possible number of well-conditioned triangles, is one of the important problems to be solved; quality, again, and not quantity, is the essential requisite.

Usually, the experience of the world is justly considered when any great object is to be attempted or effected. Why should it be excluded from the category, in judging the merits of this magnificent work? We have the combined testimony of all the science of Europe in favor of making surveys by triangulations, and, in fact, the positive assertion that it is the *only* proper method. Why should we not adopt the conclusions of nations which, to say the least, are older in these matters than we ourselves are, rather than to resort to methods which are a century behind the age we live in?

Why, with the great advantages which the "chronometric system" is said to possess, is it not adopted by those who are best capable of judging it by its merits? Rather let the whole work be destroyed, than to suffer it to be done discreditably. If we cannot make it in a manner which shall bear the scrutiny of the scientific world, let it rest for another fifteen years. Sextants and chronometers are invaluable instruments in their proper sphere, but they certainly do not furnish the means by which triangulations are to be made, or corrected, or superseded, as some would seem to desire.

Organization of the work.

1. The main or *primary triangulation*, upon which all the work depends, is made up of triangles having sides of from 10 to 50 miles in extent. The angles in these triangles are all measured by Mr. Hassler.

2. Within these main triangles, smaller triangles are formed; this constitutes the *secondary triangulation;* the sides of these vary in length from 2 to 10 miles. The angles of these triangles are measured by the assistants of Mr. Hassler; two and sometimes three parties are engaged in this part of the work; usually they enter the field in March and April, and leave the same for the calculations, &c., in the office in December.

3. The secondary triangulation, in turn, forms the basis of the plane-table or topographical surveys; these include all the details of the ground, outline of the coast or shore, courses of bays, rivers, roads, &c. This portion of the work is distributed among 5 or 6 parties, each having a district of country allotted to it. A party consists of 1 assistant and 5 or 7 hands, according to the nature of the country to be surveyed. These parties usually take the field in April and May, and return to the office, to make up their plottings and maps of the work of the season, in November.

4. The hydrographic determinations are made entirely by the naval assistants of Mr. Hassler. Points on shore are furnished by the triangulation, both main and secondary, together with the coast or shore line from the plane-table surveys. By this means the sounding parties are enabled to

determine the true position of their soundings, by measuring the angles subtended between stations previously established upon the shore. Two parties are engaged in the hydrographic part of the work, each being furnished with the necessary assistants from the navy, and with vessels, boats, &c., belonging to the coast survey. These parties are engaged in their labors upon the coast from April or May to November, according to the character of the weather; in the winter months they are employed in laying down upon their charts the results of the work of the season.

The triangulation now extends from Narragansett bay, Rhode Island, to Cape Henlopen, Delaware, on the coast, and from the neighborhood of New York to the head of Chesapeake bay, covering an area of about 11,000 square miles. The hydrographic surveys cover 5,600 square miles, and the topographical or plane-table surveys 4,200 square miles. This work is represented upon upwards of 200 maps and charts, of various scales, according to the nature of the work, from $\frac{1}{5000}$ to $\frac{1}{100000}$; that is to say, one foot in extent upon the map will represent, according to the scale used, 5,000 feet or 100,000 feet upon the earth's surface.

The actual length of coast line, (including Long Island,) already determined and laid down upon the map, is - - -	631 miles
Do. of the larger bays, rivers, and islands - - -	697 "
Total of shore line, coast, bay, &c. - - - -	1,328 "

Classification of the expenses.

The whole amount expended for the survey of the coast from the *appropriation* therefor, for the year 1841, was $96,174 98.

1. Of this sum, the general expenses of the work, including the main triangulation, compensation of all persons employed therein, instruments and books, and all expenses not enumerated in the items below, amounted to - -	$32,671 09
2. The secondary triangulation, including compensation of persons therein employed, 3 parties - - -	19,352 06
3. The hydrographic surveys, including the cost of repairs of the vessels, boats, &c., and allowances to officers for expenses, 2 parties and 4 vessels - - - -	25,459 16
4. Plane-table or topographical surveys, including compensation of all persons employed therein, 6 parties - -	18,692 67
	96,174 98

The conclusions which are deducible from the preceding remarks may be summarily stated thus:

1. Availing ourselves of the experience and practice of all European nations, it is just to conclude that the survey of the coast can only be made (if it shall be accurately executed) by a triangulation.

2. Conceding the ground that it is by a triangulation alone that exact results can be obtained, it may be shown, by a reference to the history of similar works, that the methods pursued in executing the survey of the coast of the United States are, in principle and in details, in accordance with the best of those adopted by other nations.

WASHINGTON, *February* 25, 1842.

XIV

[TRANSLATION.]

New topographical map of France, adapted to all the public services and combined with the operations of the cadaster.

The project of the operation to which the attention of the Chambers and the public are herewith called, has been submitted to the examination of a committee of fourteen members, presented by the Ministers of the Interior, of War, of the Navy, and of the Finances; and the first dispositions agreed upon by this committee have already been honored with the approbation of His Majesty.

An undertaking presented under such happy auspices might be dispensed with, quoting other suffrages; as, however, this undertaking belongs to the exact sciences, we shall here begin by presenting an abstract of the opinion of the Marquis of Laplace upon the project of the law relating to the finances, for the service of the year 1817. The striking coincidence which will be observed between the general views of this illustrious mathematician and the whole of the plan here proposed, no doubt, will make, that no man will view the expenses as useless that are necessary to put it in execution, particularly when considering that rigorously made calculations show that the publication of the work would produce several millions over and above the expenses.

Extract of the opinion of Marquis of Laplace (Chamber of Peers, session 1816, *Friday,* 21*st March,* 1817.)

"To survey with accuracy the map of a kingdom, there is but one method, which unfortunately has not been followed in the operations of the cadaster. It consists in forming two great lines perpendicular to one another, the one north and south, the other east and west. The whole space or country to be surveyed is covered by a net of great triangles, that are attached to these lines. Subdividing afterwards these large triangles by secondary ones, the work is brought down into the details of the communities, (townships, etc.) Thus the partial surveys are restricted in their deviations by the triangles that circumscribe them; the faults of the surveyors are discovered and corrected. By this is obtained a system of operations good in its details and perfect in its union. France has, for the execution of such a system, all the means that may be desired; the men of science the most able to direct it; a very well informed corps of geographical engineers, who have already made what exists the best in this kind of work, and to which officers of artillery and engineers can be joined. The cadaster offers them the most favorable occasion to exercise themselves in those operations which they shall execute in time of war. In this manner Prussia continues upon the other side of the Rhine the topographical works of our engineers; it cannot follow better models.

"Already one of the fundamental lines of which I have spoken traverses France from Dunkerque to Perpignan. A perpendicular directed from Strasbourg to Brest is begun; the first of these lines, traced with the utmost accuracy, has been extended over the Pyrenees till to the island of Formentera, in the Mediterranean sea. By the favor of the liberal cares of the Minister of the Interior for the progress of the sciences, this line will be extended to the north till to Yarmouth. Colonel Mudge, who surveys

the map of England and Scotland, upon the plan that I have quoted, with equal zeal and ability, will unite with the French men of science in protracting jointly our meridian. The extent of this system comprehends an arc of about one-seventh of the distance between the equator and the pole. The latitudes of its extreme points have been observed, and those of several intermediate points, and the length of the second pendulum corresponding to these points has been measured, which gives a great deal of light upon the figure of the earth and the *inequalities of its degrees*, and of the gravity.

"I wish the Ministers may please to take into consideration the plan that I propose. It is possible to adapt it to the part of the cadaster already done, and to execute the same without delay in the operation and without increase of expenses. Perhaps even the great number of geographical engineers, which our present state of peace allows to employ in this work, to which it is painful to see them strangers, would render its execution more prompt and less expensive.

"But a commission appointed by Government, to give its light upon this subject, would take the proper necessary information for its decisions. It would examine how far the reproaches of negligence and incapacity, made to various agents of the cadaster, are grounded; it would indicate the means to accelerate and perfection it.

"After having, in the formation of the great map of France, given to other nations an example, which they follow carefully, let us not be inferior to them; let us not retrograde while they advance. Let us retain among us the glory of the sciences, and of the fine arts; this glory, sweet and peaceable, has the advantage to be susceptible of increase without diminishing foreign glory, and to interest all nations by procuring to them new enjoyments."

The Marquis of Equevilly, director of the general depot of the War Department, has equally called the solicitude of the Chamber upon the undertaking of so high an importance as an accurate topographical map of France is for all the public services, at the epoch when he presented the plan, of which a sketch will be given hereafter, the same as the immortal author of the Mechanic of Heavens; and his station has rendered him the most able to judge upon this subject by the various public services to which he has been called.

The survey of a coast, thence the coast of the United States, differs from that of whole compact country, only by the *greater difficulty* of its being approachable only from one side.

F. R. HASSLER.

WASHINGTON CITY, *January* 6, 1843.

28th Congress, 1st Session. | Doc. No. 97. | Ho. of Reps. Treas. Dept.

XV

COAST SURVEY.

LETTER

FROM

THE SECRETARY OF THE TREASURY,

TRANSMITTING

A report of the late F. R. Hassler, relative to the operations and condition of the coast survey.

JANUARY 31, 1844.

Read, and laid upon the table.

TREASURY DEPARTMENT,
January 29, 1844.

SIR: I have the honor to submit, herewith, the report of the late F. R. Hassler, upon the operations and condition of the coast survey. It will be seen that very considerable progress has been made in the work, and that several important charts are in such a state of forwardness that their speedy publication may be expected.

As the report now transmitted was made before that of the principal assistant, Mr. James Furguson, was received in relation to his operations south of the Chesapeake, referred to by Mr. Hassler, the account of these operations is also herewith transmitted.

Very respectfully, your obedient servant,
J. C. SPENCER,
Secretary of the Treasury.

Hon. J. W. JONES,
Speaker of the House of Representatives.

Report of F. R. Hassler, as superintendent of the survey of the coast of the United States, and the construction of standards of weights and measures, upon the progress of the coast-survey works in 1843.

My last report to the Treasury Department, of the 17th November, 1842, has given the full standing of the work at that time, together with all such informations as would clear up and answer the questions which had been raised upon that work in general, and communicated to me.

Blair & Rives, printers.

The first task to go through, after the parties of the coast survey had left the field, was the attendance of myself, and of several assistants, upon the committee of investigation, established by Congress February 19, 1842, to answer the questions presented by the different members of the committee, which appeared to have been all fully satisfactory as to the administration, conduct, and mathematical principles upon which the work had been conducted. But the committee members not agreeing upon a report to make to Congress, they proposed ultimately the establishment of a temporary board, consisting of some assistants and officers of the corps of topographical engineers, to discuss the plan of operation and organization.

In the mean time Congress having changed the beginning of the fiscal year, thence the consequent terms of the appropriation, and the first half year's appropriation having been withheld, the expenses to keep the work in its ordinary train until July 1st, beginning of the new appropriation, were nearly fully supplied by the funds on hand from the last appropriation. The management of that part having heretofore always been so as to secure the means of setting the work in activity in the spring, whenever, by the long sessions of Congress, the appropriation should be made later than the opening of the season for field-work required funds; it reached so near, that, if one of the vessels of the hydrographic parties, being no more necessary, the amount of its value had become disposable, the balance of expenses might have been fully covered up to the period when the new appropriation became available.

The board in its deliberations declared, as the first principle on the outset, the plan of the work originally proposed by me in 1807, 1816, and 1832, as fundamental and constant rule for the work, such as it had at all epochs allied the approbation of the first men of science in the country; nor could this be otherwise, consistently with the existence of the work, the scientific character and principles of it being indispensable to the success of the work and of its acceleration. Mathematics and nature cannot be commanded; their laws are imperious above all command; thence, in all such works as require their application, the merit consists in the invention of the best and proper methods to a given aim. My methods have been equally approved, and successfully applied.

But a variety of alterations in detail parts were made, which have been considered as not specially given in charge to that board, the majority of the members having by their situations, naturally, not sufficient detailed knowledge of the work in all its parts and connexions. How far this influence may go, is left to the further experience to be made, under the more *calculated* regulation of the Treasury Department, now in activity upon it since a few months only.

My remarks upon the report of the board, and the Treasury Department regulations, handed in at that time, have explained this fuller, and do not belong here to repeat.

The field-works of the secondary triangulations, the plane-tables, and the two hydrographical parties, as well as the main triangulation, were, however, put into activity, each as soon as possible, and not for any remarkable time delayed behind the habitual time of the season.

The following was the distribution of the works, and their results as far as hitherto known; to which I must only add the remark, that the

season not having been fully closed yet, more results may still be expected in some parts.

The main triangulation having reached a point of considerable importance—namely, the place of division of the triangles easterly to the mouth of the Delaware, and westerly to extend over the Chesapeake—it was necessary to arrive with longer lines appropriated to both these directions, reaching over the largest part of the Delaware valley, over water and woods, which occasion great terrestrial refraction; it became necessary to observe upon the stations from higher stands, then may be in use, when abrupt heights can be selected, and also to elevate the heliotropes in still greater proportion over the too variable lower refraction.

This very circumstance of large terrestrial refraction, with its nearly regular variation at different times of the day, which has been the subject of special scientific investigations, I have made constant use of now two seasons, to overcome the difficulties which would otherwise prevent the establishing triangles of the proper size and proportion in the present locality of the main triangulation. *Triangular* scaffolds, solidly braced, from twelve to thirty feet high, are erected over the station points, having the central point corresponding with the centre of the station, upon which the centre of the heliotrope is placed, to direct to the station of observatión.

The heliotropic signals alone make this triangulation possible, as no other object, not reflecting the rays of the sun with brilliancy, is visible at these distances in that atmosphere; they are seen in an atmosphere so hazy as to render the hill itself invisible. The permanency of this reflection is necessary for the advancement of the work; the reflecting tin cone signals, which I invented, and used at first in the work over Long Island sound, being not permanent enough in these regions.

The stations in New Jersey, directly engaged in the scheme of the triangulation, which shall join the two bays of Delaware and Chesapeake, have been executed, though under very great impediments and delay, from the well-known eminently rainy season of this year. Those which lie in the States of Pennsylvania, Delaware, and Maryland, are now in work; but before the station of Meeting-house hill can be completed, I shall have to make special reconnoissances southerly, to procure points corresponding properly to an accurate system for the future work.

I had always thought desirable to establish some work south of the Chesapeake as soon as admissible. I had therefore, myself, proposed in the board, to establish some preliminary works this season, and while for the northern parts the execution of the maps in drawing, engraving, and printing were carried on, so as to present fully executed works. The union of these two measures—of surveying in one section, and printing the work from the other section—which would in time alternate, appeared to me best adapted to the general interest of the country in the work of the coast survey, at the same time that it was executable within the limits of the hitherto habitual appropriation; in that idea I had been approved by several Presidents.

An assistant was therefore directed to the southern part of the country, to begin the preliminary reconnoissances and other operations; but fear of sickness of the southern regions determined him to continue the verification, and the further laying out of a few secondary triangles in the Chesapeake during the summer, and to defer the works in the south till begining of October. The account of his operations is still to be expected.

This operation is the beginning of the changing of the field-works in the south, from the summer to the winter, which I have quoted in my last report as natural consequences of the locality and the climate; it is therefore expected, and proper, that the party shall stay out all winter and next spring, which will be fully required to present some proper systematic beginning.

The second party of secondary triangulation has been at the east end of Long Island, and upon the Rhode Island shore, engaged principally in taking up some of the stations determined by previous works, with a view to further continuance. But, as well this part of the works, as the preliminary triangles in the Chesapeake made last summer, cannot be applied immediately as bases to the topographical and hydrographical detail works of the survey, on account of their greater distance from the main triangulation and the necessity of nearer details. Two other secondary triangulations—the one from the headwaters of the Delaware to Philadelphia, and the other from Philadelphia to the junction of a similar one made below last year—are all equally intended to extend the previous secondary triangles into the details which the localities required. They have well succeeded under two other assistants.

I am obliged to observe, that the reliance upon a tertiary triangulation, which has been occasioned by the insufficiency of the secondary triangulation, never laid in the plan of the work, as it leads evidently to considerable loss of time. The secondary triangulation, *properly conducted*, shall furnish sufficient points for the topography.

The plane-table works in these districts are now going on as rapidly as they can be carried on, to furnish to the hydrographical party in the Delaware the means to finish its work this season.

The plane-table party engaged at the east shore of the Delaware has finished its task; it has been directed to the assistance of the one just stated, below Philadelphia, to secure the completion of its task.

Another plane-table party has been engaged in the part of the country lying between the Delaware and the Chesapeake bays, necessary for the connexion of the work to an unity. This work has given occasion to determine approximately the latitude and longitude of the northernmost point of the Mason and Dixon meridian, with relation to the coast survey. It is intended to bring a secondary triangle to bear upon that point, for its closer junction with the coast-survey work.

The hydrographic party engaged upon the Delaware bay and river is expected to continue its operations, without interruption or regard to the season, up to the head of the tide; the parts of the bay and the main river below Fort Mifflin being already completed.

The triangulation of the coast survey having, as it seems, for the *first time*, determined the breadth of the river, and the proper situation of even the principal points and light-houses on the river, very great difference has been discovered with the best older maps. The publication of the results of the coast survey will therefore, in this case, like in the survey of the New York harbor, prove to furnish a very valuable acquisition for the navigation. The directions for sailing in the river, which are (I hope) now making, will show the full use to be made of it.

The remainder of the outside shore soundings along New Jersey, from Barnegat inlet to Cape May, is reported as completed; so that from that side remain only the inside of that bay, and the two Egg Harbor bays,

and the nearer details of the inlets, to be sounded. Account is just now received that the shoals at sea, and out of sight of land, opposite to that shore, have been investigated, as I had requested.

For both the hydrographical parties, stations of observations, of magnetic bearings, of the tides, and of all the meteorological observations, have been simultaneously established for the inner party at Cape Henlopen light-house, and for the outer party at Cape May light-house, the results of which shall furnish valuable guides for the shipping in entering the Delaware bay. It is expected that all the final reductions of the naval part of the work, into charts, will be finished this winter in the office. The bad weather with which the after season introduces itself, may, however, refuse the realization of some of the hopes that were placed upon it, for the small completions of works.

To continue the systematic order of bringing the results of the coast survey into practical utility, the maps of the neighborhood of the beginning of the work have been continued to be reduced to the proper scale for publication, as had been begun *last* years, namely: New York bay and harbor, Long Island sound, and part of the southern shore of Long Island. The Delaware bay and river will be taken in hand, with the same view, as soon as the survey is completed. The outside shore of New Jersey must be delayed until some further junctions of it are executed by a triangulation across New Jersey.

Of the maps so reduced for publication, there have *been engraved* the following *eight sheets*, viz:

1. A map (in one large sheet) of the harbor of New York, with its approaches, from as far outside as east of Rockaway, in the east, and below Long branch, at the south, until to the middle of New York, and to outside of Hellgate, *with all its inner bays.* This map will be finished engraving, so that it can be given to the public, this winter. It contains all the soundings necessary for navigation.

2 The detail map of New York, upon a larger scale, viz: $\frac{1}{30000}$, containing all the minuter topography of New York, the port, its entrances, all its approaches, and the neighborhood, which will cover eight sheets, or plates, of which six are in a considerable state of forwardness.

3. The first sheet of the map of Long Island southern shore, which is in a very advanced state.

4. I might quote here, as results already given to the public, the maps delivered upon calls of Congress, some of which have been published; but the memory of them seems unfortunately to be obliterated, when results of the coast survey are called for. They were eight in number in December, 1841. They are, however, no less results of that work, which have cost time and labor, and have come into public utility at an early time, by which the ready progress of the work became always evident.

Engraving, particularly of maps, where mathematical accuracy is required, cannot go on rapidly like other fancy engraving; the task is arduous and fatiguing; and the very minute care to be taken, consumes, of course, a proportional length of time. This part of the work has, in general, been continued assiduously, with the same means and system as last year.

It appears here to be the proper time and place to call forth the regulation of the mode in which the maps resulting from the works of the coast survey shall be brought into the public in a proper manner, that will se-

cure both the property of the nation in the work, and the public confidence, which they must command by the authority with which they are presented, as well as by their well-known scientific value and accuracy. It cannot be otherwise but fully evident that the Government has the duty to secure both the above aims. I would take the liberty to suggest, as a secure means to these aims:

1st. That the final maps, when ready to come into the public, be signed by the superintendent of the work, and stamped with the seal of the office.

2d. That then there be always a number of copies distributed to the collectors of the seaports, by them to be sold to any applicant, at a certain fixed price, which shall be marked upon the stamp, for each individual map.

3d. That the price of the maps shall be determined so as to cover the expense of printing and of the paper with certainty, without any ulterior benefit, in order to make them easy accessible, to seamen particularly, and to prevent contrefaction, (as they could never be imitated at that price.)

To secure the best impressions of the maps, and at the same time secure the plates from deterioration, it was necessary to procure an appropriate press, and the other necessary implements, as a large *paper* press, &c.: this has been done. A well-constructed copper-plate press, with a paper roller, and with new, well-calculated arrangements, has been put up in the office of the coast survey; and also an appropriate paper press; they are ready for use, and have served already for proof impressions, such as are always needed to keep account of the progress of the engraving.

The authorization of the Treasury Department to procure paper purposely made, and appropriate for the impression of the maps, has also been executed under the most favorable auspices. The paper is announced to arrive in due time for the actual use in the final printing.

These statements will show that full preparations are everywhere made to cause the coast survey results to step properly into the public. To give them their proper standing, their final execution in drawing, engraving, and printing, must necessarily bear the same stamp of science, care, and assiduity, which has been put in the direct mathematical part of the work, from the elements up to the determination of all the results that are to be presented to the public. No part of the work can leave the eye which has watched over its beginning.

To allow to each of the works the indispensable proper time, is one of the principal requisites; pressing and hurry would actually delay the work; steady, reflected work, will alone produce the proper and creditable results in the shortest time possible. The laws of nature, which dictate paramount in all such works, cannot be set aside with impunity. All these principles have always been worked upon in the whole process of the coast-survey work, with steady assiduity. The results are therefore following with the proper celerity, and could actually not be more accelerated by any other means.

With respect to the appropriation which it will be proper to propose to Congress for the next year, I believe that more than the (of late years) usual amount of $100,000 could hardly be obtainable, and that the arrangements of the work must be made to fit within these limits; for this

particular I wish I may be allowed to state the proper arrangement, at the time when the next year's distribution of the work will have to be decided upon. One of the main points will, of course, be to keep within the limits of the appropriation which will remain on hand at that period; for, in any case of overreaching our means, the interruption for want of funds would fall in the time of the most active work; thence of the greatest and most pressing expenses, and cause the most deleterious interruptions.

F. R. HASSLER.

STATION BETHEL, PENNSYLVANIA,
November 12, 1843.

WASHINGTON, *January* 10, 1844.

SIR: The observations at the station of Bethel were completed on the 13th of December, and on the day following I sent the great theodolite to the room occupied by Lieutenant Blake, in the Exchange of Philadelphia. This disposition of it was made, instead of sending it to the mint, for the reason that I was then uncertain whether an apartment could be appropriated for it in that building. I have since heard from the director that he has a room to spare for the purpose, and which he will place at our disposition at any time we may wish. Of the other apparatus in use at Bethel, part was sent to Washington, and a part placed in the public store of the custom-house at Wilmington, as the most secure depository near the points of the survey where they are next to be used. Inventories have been kept by Mr. Hein, and are now in the office of the survey at Washington.

The occupation of the station of Bethel interfered, as I have already apprized you, with the reports of the reconnoissances of the southern survey. They are now all complete, and the following papers have to-day been delivered at the office of the survey:

(1.) Two journals of observations and results of the station of Bethel —one, the original, kept at the station by Mr. Hein; the other, a copy.

(2.) A journal of Mr. Neilson of the reconnoissance of Albemarle sound; in which the most appropriate location of a base for the southern survey has been found. This journal contains detailed topographical sketches of the coast.

(3.) Accompanying this, are two maps—one, of the site of the base; and the other, a scheme of the triangulation in Albemarle sound.

(4.) A map by Mr. Cutts, on a scale of $\frac{1}{400000}$, exhibiting the whole of the reconnoissance from Cape Henry to Cape Lookout. On this are indicated the lines which must be cut for the triangulation, and the visibilities of which we are now certain, in the broad parts of the Pamlico sound.

(5.) A book of signals, (C, 3,) found in the instrument box at Bethel.

(6.) L. M. Z—3, containing ordinates of points in the Delaware and Chesapeake bays, calculated in 1843.

In the reconnoissance of the Pamlico sound, which was executed by myself, I have deemed it unnecessary to make any detailed description of the points which may come into the triangulation. They are indicated with sufficient distinctness on the map, (No. 4.) The distances from point to point, in the broader parts of the sound, have, in general, been deter-

mined by the run of the vessel in which we sailed. As a general description, however, I may say, that the shores on both sides of the sound are low—those on the west side wooded and swampy. There is, therefore, some doubt in the broader parts of the sound, whether (without waiting for particular states of the atmosphere) it may not be impossible to see from one shore to the other, without rather expensive constructions. States of the atmosphere sufficiently favorable for the most distant observations required in the survey, are said often to occur in these waters. On the 16th of November last, the low banks above Ocracoke were seen distinctly from Swan quarter nearly the whole afternoon; the distance being certainly greater than any other to be expected in the triangulation. Without, however, trusting to such favorable circumstances, there are shoal places—even bare rocks at distances of from two to seven miles from the shores—which would afford sufficient security to an observer or a signal, except in the heaviest gales.

I have mentioned in a preceding communication to the department, that, in regard to health, the months to be used in this part of the survey are October, November, and from February till June. It will therefore be essential, in furthering this part of the work, that arrangements be made at an early date.

The journals and maps enumerated, and already delivered, will, it is believed, give all the preliminaries necessary in this part of the survey.

I am, sir, very respectfully, your obedient servant,

J. FURGUSON.

Hon. JOHN C. SPENCER,
Secretary of the Treasury.

27th Congress, 2d Session. | Doc. No. 57. | Ho. of Reps. Treas. Dept.

XVI

COAST SURVEY.

REPORT

OF

THE SECRETARY OF THE TREASURY,

IN REPLY

To the resolution of the House of Representatives of 24th June, 1841, respecting the expenditure, &c., for the survey of the coast of the United States.

JANUARY 31, 1842.

Read, and laid upon the table.

TREASURY DEPARTMENT,
January 25, 1842.

SIR: I have the honor to make the following report, in obedience to the resolution of the House of Representatives of the 24th June last, directing "the Secretary of the Treasury" to "communicate to this House, at the commencement of the next session of Congress, a statement of the progress which shall then have been made in the survey of the coast of the United States, including the number, location, and length of the several base lines measured for the triangulations, the stations occupied therefor, the observations made for, and the corrections applied to the same; the astronomical observations made for the determination of the latitude or longitude; the work done by each corps employed in the service, and a descriptive list of the charts published, if any."

"Also, the amount of money expended on the survey of the coast, from time to time, since its commencement, showing what sums have been appropriated for the purchase of instruments and books; the names of all persons employed upon the survey, distinguishing such as may have been of the army or navy, together with their salaries or other compensation, and by whom appointed to the service; exhibiting as well the direct appropriations for the survey of the coast as the indirect expenditure upon it, by reason of the employment therein of the public vessels and officers."

"Also, the probable length of time and amount of money required to complete the survey of the coast, in the mode heretofore pursued, with suggestion of any other mode of surveying the same, which shall have for its object the acquisition of the greatest amount of useful information in the shortest time, and at the least expense."

As the report from the superintendent, submitted by the Department to the House of Representatives on the 30th ultimo, and contained in printed document No. 28 of the present session, gives, probably, as satisfactory information as it is in the power of the Department to furnish, in answer to so much of the resolution as relates to the progress and extent of the work already completed, and other details therein called for, I beg leave respectfully to refer the House to the report before mentioned for an answer to these portions of the resolution.

In addition, I take occasion to remark, in reference "to the probable length of time required to complete the survey," that nothing definite can be given in answer to this inquiry; but perhaps some approximation to the period of time may be reached by comparing the relative extent of the coast yet to be surveyed with that already executed, and the time occupied in the completion of the latter. In instituting the comparison, however, due allowances must be made for many unavoidable delays incident to the commencement and proper organization for such a work, such as procuring instruments and other necessary equipments needed for its successful prosecution. It will be proper, also, in forming a judgment of the time required to complete the work, to bear in mind that many of the results already obtained can be used in subsequent operations; and due consideration, at the same time, should be given to the fact that important practical knowledge and experience have been gained by the principal assistants of the superintendent, and others immediately connected with the survey. These, together with the means already obtained, and the complete organization now existing throughout its various branches, would, all combined, no doubt tend greatly to accelerate the completion of the remaining portion of the work.

A similar comparison of that portion of the work already finished, and the cost of executing the same, with that still to be performed, might, it is believed, furnish a tolerably correct idea of the "probable amount of money required to complete the survey of the coast," provided the same means and facilities be extended to the future operations of the work as have been heretofore and are at present afforded for its prosecution. An augmentation of these means and facilities would doubtless expedite its completion, and probably diminish the expense.

As, however, for the foregoing reasons, the Department could furnish nothing more than conjectural answers to these inquiries, it is deemed most respectful and advisable to refrain from the expression of an opinion based upon such uncertain data, and dependent upon contingencies of the nature referred to.

In regard to the "suggestion of any other mode of surveying the same, which shall have for its object the acquisition of the greatest amount of useful information in the shortest time, and at the least expense," I would remark that this Department is not possessed of the requisite information to enable it to make any satisfactory suggestion on this subject, involving as it does both a theoretic and practical knowledge of a branch of the sciences foreign from its appropriate duties, and to which its attention has not been specially given. But, as stated in the report of the superintendent, before referred to, it would appear that this survey is conducted on the same scientific principles, with the benefit of modern improvements, as similar works undertaken by most of the Governments of Europe. It would seem that no new mode, embracing the same scientific principles and accuracy of results, has, if discovered, been yet adopted by those Governments.

The accompanying statement No. 1, prepared by the Register of the Treasury, exhibits "the amount of money expended on the survey of the coast, from time to time, since its commencement, showing what sums have been appropriated for the purchase of instruments and books, the names of all persons employed upon the survey, distinguishing such as may have been of the army or navy, together with their salaries or other compensation, and by whom appointed to the service."

It is to be observed that the compensations of the superintendent, assistants, and others employed in the work, have been fixed by the President for the time being. The pay from the coast survey appropriation of some of the officers of the navy, as also of the lower grade of persons employed in the field operations, ceases during the winter months.

The communication herewith sent, numbered 2, furnished by the Navy Department, is designed to answer that branch of the resolution calling for "the indirect expenditure upon it, [the survey,] by reason of the employment therein of the public vessels and officers."

On this head, it is deemed proper to remark that, as the laws providing for the survey of the coast authorize the President to employ "such of the public vessels in actual service as he may judge expedient," and "all persons in the land and naval service, and such astronomers and other persons as he shall deem proper," it becomes questionable whether these expenditures ought properly to be considered, to their full extent, as chargeable to the coast survey. These vessels, with their officers and men, would, if not employed in this special duty, have still remained a charge on the service to which they belonged. Their transfer to the survey would doubtless increase the expense in some degree, but it is respectfully suggested whether this entire charge can be fairly thrown upon the expenditures of the work under consideration.

All which is respectfully submitted.

W. FORWARD,
Secretary of the Treasury.

Hon. JOHN WHITE,
Speaker of the House of Representatives.

No. 1.

Statement of money expended, out of direct appropriations by Congress, and accounted for by settlement in the office of the First Auditor of the Treasury, for the survey of the coast of the United States, from its commencement, in 1808, *to* 1818; *in* 1832 *and* 1833, *and from* 1836 *to June* 30, 1841; *showing what sums have been paid for the purchase and repairs of instruments, and for books; the names of all persons employed upon the survey, designating such as have been of the army and navy, together with their salaries or compensation, and by whom appointed.*

Periods.		Expenditures for the purchase of books & instruments and repairs of instruments.	Aggregate amount of expenditures.
	1808	$715 75	$715 75
From July 27 to November 1,	1811	–	1,105 62
From November 1, 1811 to July 1,	1818	17,531 64	54,869 21
	1832	136 75	3,824 16
	1833	3,844 84	16,485 91
	1836	6,076 35	39,704 95
	1837	785 25	90,702 62
	1838	1,540 14	86,120 69
	1839	738 21	87,023 62
	1840	460 91	67,857 97
First and second quarters of -	1841	147 98	34,031 94
Expenditures by the hydrographic parties from April 22, 1835, to May 17, 1841 -		1,745 23	30,289 24
Total - - - -		33,723 05	512,731 68

Names of persons employed on the survey.	Salaries or compensation.	By whom appointed.
F. R. Hassler -	$6,000 per annum* -	President of the U. States.
James Ferguson -	4,000 do -	Superintend't, with approval of the President.
E. Blunt -	4,000 do -	Do do.
C. M. Eakin -	3,000 do -	Do do.
C. Renard -	3,000 do -	Do do.
W. M. Boyce -	2,000 do -	Do do.
J. J. S. Hassler -	2,000 do -	Do do.
John Farley -	2,000 do -	Do do.
F. H. Gerdes -	1,500 do -	Do do.
H. L. Dickins -	1,500 do -	Do do.
T. W. Werner -	1,500 do -	Do do.
S. Hein -	1,000 pr. an. & board	Superintendent.

* $3,000 for compensation, and $3,000 for his expenses.

STATEMENT No. 1—Continued.

Names of persons employed on the survey.	Salaries or compensation.	By whom appointed.
L. Muller -	$800 per annum -	Superintendent.
W. Werdeman -	800 per ann. & board	Do.
C. Flint -	50 per mo. & board	Do.
Thomas McDonnell	600 per ann. & board	Do.
W. Jacobi -	2 50 per day -	Do.
T. A. M. Craven -	750 per annum -	Superintend't, with approval of the President.
T. J. Page -	500 do -	Do do.
T. A. Jenkins -	500 do -	Do do.
T. R. Gedney -	627 do -	Do do.
Richard Bache -	1 per day	Superintend't, with approval of Secretary of Treasury.
A. A. Holcomb -	1 do -	Do do.
Mid. Crawford, (dead)	1 do -	Do do.
Lt. W. S. Young -	1 do -	Do do.
Mid. Patterson -	1 do -	Do do.
Lt. J. B. Dale -	1 do -	Do do.
Mid. E. Jenkins -	1 do -	Do do.
Lt. C. W. Morris -	1 do -	Do do.
W. B. Whiting -	1 do -	Do do.
Lt. Chandler -	1 do -	Do do.
J. K. Mitchell -	1 do -	Do do.
Lt. G. S. Blake -	627 per annum -	Superintend't, with approval of the President.
D. D. Porter -	1 per day -	Superintend't, with approval of Secretary of Treasury.
Lt. Todd -	1 do -	Do do.
S. C. Rowan -	1 do -	Do do.
Lt. G. M. Bache -	1 do -	Do do.
Surgeon S. Sharpe -	1 do -	Do do.
H. C. Flagg -	1 do -	Do do.
C. W. Chauncey -	1 do -	Do do.
J. I. Boyle -	1 do -	Do do.
H. S. Stilwager -	1 do -	Do do.
D. F. Dulaney -	1 do -	Secretary of the Treasury.
Mid. Lowry -	1 do -	Do do.
Mid. Sands -	1 do -	Do do.
Mid. Ring -	1 do -	Do do.
W. H. Swift, disbursing officer.	2 50, per comm.	
B. Gluck -	25 per mo. & board	Superintendent.
S. Conrad -	44 cents per day	Do.
J. Shiras -	25 per mo. & board	Do.
James Campbell -	20 do -	Do.
James Paul -	18 do -	Do.
S. Bunce -	18 do -	Do.

STATEMENT No. 1—Continued.

Names of persons employed on the survey.	Salaries or compensation.	By whom appointed.
G. H. Bishop -	$18 per mo. and board	Superintendent.
Joel Griffis -	18 do -	Do.
Joel Soper -	18 do -	Do.
H. Stoddart -	18 do -	Do.
P. V. De Grawe -	18 do -	Do.
Conrad Hoffman -	50 cts. per day do	Do.
H. L. Whiting -	25 per mo. and board	Do.
Aaron Vanderbelle	18 do -	Do.
M. Risby -	18 do -	Do.
Z. Scull -	18 do -	Do.
L. Scull -	18 do -	Do.
Robert Leeds -	18 do -	Do.
Enoch Higbee -	6 do -	Do.
J. T. Smith -	18 do -	Do.
William Johnson -	20 do -	Do.
Joseph Lees -	18 do -	Do.
James Trainer -	18 do -	Do.
James McKnight -	15 do -	Do.
Patrick Murlin -	18 do -	Do.
P. Donohoo -	15 do -	Do.
A. Smith -	18 do -	Do.
P. Smidt -	25 do -	Do.
Gustav's Werdeman	25 do -	Do.
Edward Sweeny -	18 do -	Do.
William Greason -	18 do -	Do.
E. Krafft -	18 do -	Do.
T. S. Fillebrown -	18 do -	Do.
M. O'Brien -	18 do -	Do.
O. McQuard -	18 do -	Do.
T. McGurren -	18 do -	Do.
D. Convoy -	18 do -	Do.
A. Convoy -	18 do -	Do.
John Smith -	18 do -	Do.
Tho. Robinson, pilot	40 do -	Do.
Robert Williams -	18 do -	Do.
Joseph C. Fuller -	25 do -	Do.
J. Farrell -	10 do -	Do.
Joseph Milford -	16 do -	Do.
B. Conway -	1 50 cts. per day do	Do.
A. Symington -	18 per mo. and board	Do.

TREASURY DEPARTMENT,
Register's Office, January 20, 1842.

T. L. SMITH, *Register.*

No. 2.

NAVY DEPARTMENT, *December* 30, 1841.

SIR: Agreeably to the request contained in the letter of your predecessor, the Hon. Thomas Ewing, of the 30th July last, I have the honor to transmit, in answer to the resolution of the House of Representatives of the 24th June, 1841, (so far as the inquiries therein relate to this Department,) a list of the officers of the navy who have been employed on the survey of the coast of the United States; and, also, to state that the sum indirectly expended upon the coast survey, by the employment of a part of the naval force therein, from the month of September, 1834, to November, 1841, amounts to one hundred and fourteen thousand five hundred and eighty-four dollars, viz:

The difference between the leave of absence pay of the officers employed, and their pay at sea -	$25,725
Amount of officers' rations - - -	9,222
Pay of the crews of the vessels employed -	54,379
Rations of the crews - - - -	25,258
Total - - - - -	114,584

I am, &c., sir, your obedient servant,

A. P. UPSHUR.

HON. WALTER FORWARD,
Secretary of the Treasury.

List of officers who have been employed on the coast survey, from September, 1834, *to November,* 1841.

Names.	Names.
Commander T. R. Gedney	Lt. David D. Porter, (as pd. mid.)
Lt. J. T. McLaughlin, (as pd. mid.)	Lt. F. Clinton
Lt. Francis Huger, do	Lt. J. Sterrett
Lt. B. W. Hunter, do	Lt. Richard Bache, do
Lt. A. S. Worth, do	Lt. S. C. Rowan
Lt. T. A. Jenkins, do	Lt. Richard Wainwright, do
Lt. W. J. H. Robertson, do	Lt. George M. Bache
Lt. Joshua Humphreys, (as mid.)	Lt. C. P. Patterson, do
Lt. John Rodgers, (as passed mid.)	Surgeon M. C. Delaney
Lt. George M. Totten, (as mid.)	Lt. Charles W. Chauncey
Lt. John L. Ring, (as passed mid.)	Lt. J. I. Boyle
Lt. Levin Handy, do	Lt. D. F. Dulaney
Lt. Albert Griffith, do	Lt. J. K. Mitchell
Lt. B. F. Sands, do	Lt. William Chandler
Lt. A. A. Holcomb, do	Lt. E. G. Parrott, do
Lt. R. W. Meade, do	Passed Mid. H. H. Lewis
Lt. William A. Ball, do	Midshipman T. H. Stevens

LIST—Continued.

Names.	Names.
Lt. Stephen Johnston	Midshipman Henry Oaks
Lt. John Mooney, (as passed mid.)	Midshipman William E. Newton
Lt. H. S. Steelwagen, do	Passed Mid. John J. Almy
Lt. Henry Moore	Passed Mid. and Lt. W. B. Whiting
Passed Mid. W. A. Bartlett	Passed Mid. John F. Mercer
Surgeon S. Sharp	Passed Mid. and Lt. Wm. S. Young
Lt. Com'g George S. Blake	Passed Mid. O. H. Perry
Passed Mid. J. P. McKinstry	Passed Mid. William C. Lambert
Lt. and Passed Mid. Oliver Tod	Passed Mid. C. C. Barton
Lt. and Passed Mid. B. J. Moeller	Passed Mid. Luther Stoddard
Passed Mid. T. A. Budd	Passed Mid. Francis Lowry
Passed Mid. T. A. M. Craven	Passed Mid. John Hall
Passed Mid. Z. Holland	Passed Mid. T. M. Brasher
Passed Mid. William Blecker	Passed Mid. and Lt. John B. Dale
Midshipman William Craney	Passed Mid. D. R. Crawford
Midshipman A. McLane	Passed Mid. and Lt. Ed. Jenkins
Passed Mid. H. J. Paul	Passed Mid. and Lt. R. C. Cogdell
Lt. and Passed Mid. H. C. Flagg	Passed Mid. S. D. Lavallette
Lt. and Passed Mid. C. W. Morris	Passed Mid. J. N. Barney.