GREAT FLOODS IN THE OHIO 160 YEARS AGO.

By HENRY PENNYWITT, Meteorologist.

[Weather Bureau, Pittsburgh, Pa., Dec. 15, 1922.]

The library of Mrs. Mary Darlington, of this city, contains an account of a great flood in the rivers at Pittsburgh, on January 9–11, 1762. The account is found in a letter of Col. Henry Bouquet, commander of Fort Pitt, to Gen. Amherst, commander in chief at New York, dated January 12, 1762. The letter follows:

FORT PITT, *January 12, 1762.*

To GEN. AMHERST,
Commander in Chief, New York.

SIR: I have to inform your excellency of the great damage this fort sustained by an extraordinary flood the 9th instant. We had snow almost every day in December, and from the beginning of this month clear and cold weather. Both rivers were low and clear of ice. The 8th we had a rain that continued that night and next day with a universal thaw. The 9th the rivers were 10 feet over the banks, which had not happened in any flood since this place was built. The water came upon us through the drains, gate and sally ports, and boiled out of the ground in several parts of the area.

I had the battoes brought into the fort, loaded them with provisions, and as we had 4 feet of water in the area and 9 in the casements I sent part of the garrison which could be of no further service, to the upper town upon rising ground, and kept only so many in the fort as I could carry off in the battoes should we be reduced to that extremity.

The two rivers, entirely covered with ice and trees, had joined above the fort, but the most rapid current continued on each side. We remained in that situation till 1 o'clock in the morning, when we were unexpectedly relieved by a sudden frost. The water was then upon a level with the top of the rampart at the NW. side, where there is no parapet, and did not begin to fall till the next day at 10 o'clock.

The 11th we could discover part of our disaster. All the sod work of last year and part of the year before tumbled down and a number of pickets washed away. The curtain on the Monongahela, finished two years ago, has suffered less, though part of the sod is gone. The part reset with brick does not appear much hurt except the parapets.

The long barracks built in 1759 for the Artillery and all the houses upon the bank of the Allegheny beyond the epaulement have been carried off, and several in the lower town. No lives have been lost, though most of the effects of the traders were, by the suddenness of the flood, though we gave them all the assistance in our power.

Common depth of the Allegheny at low water 4, 5, or 6 feet. Perpendicular height on the 9th, 39 or 41 feet. Rise in the flood 34 to 35 feet, which is 10 feet over the bank. I am, sir,

Your most obedient and humble servant,

(Sig.) H. BOUQUET, *Col.*

The account of the March, 1763, flood is contained in a letter from S. Ecuyer to Col. Boquet;[1] it follows:

FORT PITT, *March 11, 1763.*

To Col. BOUQUET.

SIR: I send you the returns of the past month, with an account of the inundation of this post. The 6th of March the two rivers being somewhat swollen, but with *little ice*, the 6th, 7th, and 8th great rain. The 7th in the morning the berme or turf of the flank of the bastion off the south and a part of the stone edging had fallen into the fosse. The river continuing to swell, I had the provisions removed from the ground floor and the various ammunitions; worked all day closing the drains, preparing everything against inundation as best I could. At 10 o'clock in the evening the two rivers united and the water around the fort increased 1 foot an hour. On the 8th at 2 o'clock p. m., the flats and boats had been drawn to the bridge. At 4 o'clock in the morning 6 inches of water in the fort and the Allegheny full of ice. Two hours after midday I detached 2 officers and 30 men to the upper town with 15 days provisions for all the garrison. At midnight I brought all the boats and flats into the fort and prepared to save all and abandon the place the following day, but happily on the 9th at 8 o'clock in the morning, the water was at its greatest height and at midday it fell 2 inches (the highest means 22 inches higher than last year).

All provisions and ammunitions are saved and in good condition. I have followed your plan as best I could. Here is an account of our losses. The shop of the blacksmith is entirely gone; the little wood gathered for the construction of the boats has followed several houses of the lower town; I believe our garden is lost by the fault of the sergeant, who did not inform me of the danger; all fences of the garden carried off by the ice; the poor deer has had its leg broken. We are occupied in repairing the little devastation in the interior of the fort. Tomson, the tanner, and Sheperd, the carpenter, are drowned, the first at Turtle Creek, and the other at Two Mile Run.

I have the honor to be your very humble and obedient servant,

(Sgd.) S. ECUYER.

[1] Fort Pitt and Letters from the Frontier, J. R. Weldin Co., Pittsburgh, 1892.

The account of the third flood copied from Pittsburgh Gazette, dated January 13, 1787, is as follows:

The heavy rains and constant thaw for this some time past swelled the Allegheny and Monongahela Rivers to a very great height. Several Kentucky boats passed down, the latter adrift, all of them loaded.

The Allegheny overflowed its banks to such a degree that a great part reserved tract, opposite this place, was under water. The inhabitants of the ferry house were obliged to leave it, and it was with the greatest difficulty they escaped as the flat, canoes, etc., had been carried by the water to what is called the second bank; a great distance from the usual bed of the river. We have not yet received an account of the damage done, but judge it must be considerable.

Col. T. P. Roberts, of the United States engineers, of Pittsburgh, has made a careful survey of the elevation of the old block house and fort, with the conclusion that the flood of January 9, 1762, reached a stage of 36 feet above the zero of our present gage, or 0.5 foot above the great flood of March 15, 1907. A drawing of Col. Roberts' survey is given as figure 1 below.

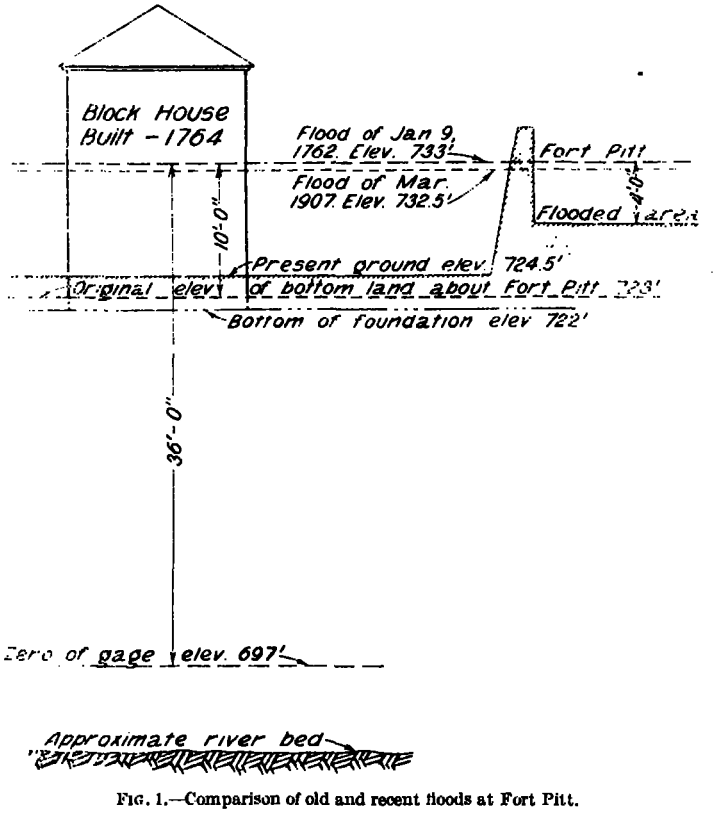

FIG. 1.—Comparison of old and recent floods at Fort Pitt.

If the estimate of S. Ecuyer is correct, the flood of March 6–9, 1763, attained a stage of 37.9 feet above zero of our present gage.

The foregoing records of great floods in the Ohio at Pittsburgh are of great interest because the floods occurred at a time when the drainage areas above Pittsburgh had not been cut over and must have contained large areas of forests in their virgin state.

The two floods above cited were greater than any that have since occurred.

No less interesting, as showing the prevalence of lengthy periods of extremely low water before the forests were removed, is the evidence of the "pictured" rocks in the bed of the river a short distance above Steubenville, Ohio. These large flat rocks lie on the bed of the river, and have been seen but a few times by white men and then for but a short time. On these rocks are cut pictures of men, animals, birds, and fish. The pictures were evidently cut a long time before white men settled in that section. Considering the crude cutting instruments which must have been available to the Indians or their predecessors a long time must have been required in the cutting, which could be done only at times of very low water.

The bottom lands in the forks of the river are usually level. On the strength of Col. Bouquet's statement that the overflow was 10 feet deep during the flood of January, 1762, an idea may be had of the elevation of the flood. The old blockhouse foundations are at an elevation of about 722 M. S. L.

The ground appears to have been raised about 1½ feet about the blockhouse walls since 1764. These assumptions are taken to be approximately correct, and from them it follows that the 1762 flood was about one-half foot higher than the flood of 1907. The area of the fort was probably raised about 6 feet above the bottom land with the material obtained from the wide and deep moat excavated along the three sides of the fort.

THE IMPORTANCE OF WIRELESS WEATHER REPORTS FROM GREENLAND.[1]

By V. BJERKNES.

[Bergen, Norway, Nov. 23, 1921.]

To the EDITOR:

I take pleasure in submitting to you a translation of a letter from Dr. V. Bjerknes, Bergen, Norway, to the Danish explorer, Mr. Einar Mikkelsen, referring to the importance of daily weather aerograms from Greenland. The letter was written at the request of Mr. Mikkelsen, who intended to publish it in the Copenhagen newspaper, *Nationaltidende*. On October 23, 1921, a storm had caused great damage and loss of life in the Danish waters, mostly because the storm had not been forecast by the meteorological institution. This brought the newspapers to discuss the possibility of increasing the efficiency of the weather forecasts, and especially the importance of a wireless station on Greenland. The letter from Bjerknes not only shows the importance of such a station for the forecaster in northern and middle Europe, but it also outlines several of the valuable results as to the formation and movements of cyclones across the Atlantic Ocean, recently obtained by Bjerknes and his collaborators. These results have been of great value for weather forecasting in Norway. It may thus be mentioned that the storm of October 23 was duly predicted from Bergen and Stockholm, where Bjerknes's methods were in use.

In sending me a copy of the letter, Prof. Bjerknes gave me permission to translate it to English and eventually to publish it. I therefore submit a translation to you, hoping space may be found for it in the MONTHLY WEATHER REVIEW.

Respectfully,
H. U. SVERDRUP.

WASHINGTON, D. C., *January 9, 1922.*

At your request for an expression referring to the value of daily weather telegrams from Greenland and related questions, I desire to make the following statement:

A line drawn from the south point of Greenland to the British Islands is crossed in one year by about 200 single depressions, all of which originate to the south or the west of the line and disappear to the north or the east. Every depression reaches an average age of about one week, and can be identified by a typical region of precipitation accompanied by a characteristic distribution of temperature, wind and barometric pressure. This distribution changes in a typical way with the age of the depression, so it is always possible to tell whether a depression is new born, developing, developed to full strength, or dying. A new-born or dying depression moves slowly, but one which is in the period of full strength can move very rapidly; the velocity may reach 150 kilometers an hour, which is sufficient for covering the distance from the south point of Greenland to Denmark in 21 hours. In this phase of development the depression in its structure reminds one of the tropical cyclones, hence the name cyclone, which is commonly used in the meteorological literature.

One of the most important observations during the last years is that these cyclones occur in well-defined groups. Each group consists of 3 to 6, usually 4, single cyclones. On the Norwegian weather maps the groups are now indicated with a number, and the single cyclones in the group with one of the letters, *A*, *B*, *C*, etc. The *A*-cyclone has its path most northerly, the *B*-cyclone is following a path a little more to south, the *C*-cyclone goes still more southerly, and so on. The *A*-cyclone of the next group appears then far north, the *B*-cyclone follows along a more southerly path, and the performance is repeated. A group of cyclones usually passes by in about 6 days. From January 1, 1921, until to-day, November 23, 59 cyclone groups have crossed the line from the south point of Greenland to the British Islands.

The coast of Norway, which has a long extension from south to north, is touched by practically all cyclone groups and usually by every cyclone in the group. The *A*-cyclones can as a rule be designated as arctic cyclones, which is of most consequence for the northern part of the country. The following cyclones, *B* and *C*, are pressing more against the coast, so that *C* often forces its way across the mountains and continues its path over Sweden and Finland. The *D*-cyclone does the same thing, or it chooses the way south of Norway over Denmark, the southern part of Sweden and the Baltic Sea. The *E*-cyclone takes usually a still more southerly path, if it is formed. The cyclone which brought the devasting hurricane over Denmark on October 23, thus, according to the Norwegian list, was an *E*-cyclone, No. *53E*, formed on October 21 west of the British Islands. *D*-cyclones and the following *E* and *F* may have effects as far as to the Mediterranean.

Within the frame of these constant laws the cyclones and groups of cyclones display great mutual differences in strength, velocity of progression, choice of path, and so on. These are the circumstances which make the forecasting of the weather so difficult. If this is to be made with desirable certainty, then the forecasting meteorologist at any time must have a full view not only of the nearest cyclone but of the whole group and its dispositions. One main defect of the weather maps with which the forecaster now has to be content is that they are of too small geographic extent to render this full view of the situation.

[1] Dr. H. U. Sverdrup, who communicated this translated letter, is temporarily in Washington on scientific work relative to the Amundsen polar expedition. This expedition, which contemplates a drift across the Artic Ocean from a point northwest of the Bering Strait to a point between Greenland and Iceland, has been temporarily delayed by an accident to the propellor of the *Maud*, and the vessel is now in dry dock at Seattle. A new start is contemplated in June.—*Editor.*