PREVENTION OF HAIL BY CANNONADING.

Several articles have appeared during the past year in American newspapers and journals urging that some trial be made in this country of the new system of cannonading devised by Mr. Stiger in order to prevent destruction by hail. Mr. Stiger is a burgomaster of Windisch-Feistritz, Styria, who conceived the idea that by shooting a vortex ring upward into the cloud he could so disturb the process of the formation of hail as to protect his own vineyards. Within the past five years thousands of the special form of cannon used by him for this purpose, and particularly those devised by G. Suschnig of the manufacturing firm of Karl Greinitz and Nephews at Gratz, have been established in northern Italy and southern Austria. Although it is claimed that by firing these cannon frequently, and when placed quite close together, storms have been diverted, yet the details thus far published are too meagre to afford a basis for any rational opinion as to whether or no the Stiger system is useful. Inasmuch as there is no reason to believe on *a priori* grounds in its efficacy, we must rely wholly upon a careful discussion of the recorded observations in order to ascertain the efficiency of the cannonading. Such a discussion has not yet come to hand and will, in fact, be very difficult to make, owing to the absence of the long-continued records that are needed in order to establish normal values. Meanwhile, in order to respond to the popular interest in the subject, the Editor has appealed to Mr. Suschnig for information as to the expense and other details attending a fair trial of Stiger's method, and the reply is given below. The printed pamphlets describing the special shooting apparatus manufactured at the forges at St. Katharein on the Lamming, near Bruck on the Muir in Styria, enumerate the following types:

						Crowns.
No. A-200,	cannon	standing	2.8	meters	high, price complete,	110
" B-250,	"	"	2.9	"	"	130
" C-300,	"	"	3.3	"	"	160
" D-350,	"	"	3.9	"	"	200
" E-400,	"	"	4.5	"	"	240

These prices include all the apparatus required in the experiment. It must not, however, be supposed that a single cannon or shooting station is sufficient to produce any decided effect. On this point Mr. Suschnig writes, as follows:

In regard to your question as to where the apparatus can be obtained in America, I must reply that we have not as yet sent any of the apparatus to America because none have ever been asked for from that country. We have only delivered apparatus on our own continent because on the other continents interest has not yet been awakened in this important matter. The only exception is the Asiatic Indian government which has announced to us the visit of its delegates for inspection on their way to the Paris Exposition. We believe that the installation of an observing region of 40 square kilometers, with 40 apparatus in 4 lines would be necessary in order that your Government should obtain reliable studies as material for investigation. We would recommend placing in the first of these lines the apparatus of type E-400; in the second line, type D-350; in the third line, type C-300; and in the fourth line, type B-250; we believe that type A-200 can only be used to advantage at places of high altitude (700-1000 meters above sea level).

The apparatus can be sent to America by us either via Genoa and Gibraltar or via Hamburg.

We consider that the various types of cannon should be adapted to he altitude of the station above sea level. The larger cannon for the ower stations about as shown in the following:

For altitude 0-200 meters	Type E
For altitude 201-350 meters	Type D
For altitude 351-500 meters	Type C
For altitude 501-650 meters	Type B
For altitude 650 and upwards	Type A

It would seem that if there be any small region in this country peculiarly liable to destructive hail the Stiger method could be satisfactorily tried by covering this region with forty firing stations arranged in four lines each 10 kilometers long and 1 kilometer apart, so as to cover 40 square kilometers. A kilometer is about 0.62 mile, so that 10 kilometers would represent a little over 6 miles. The cost of the apparatus would be about 7,300 crowns in Austria. Probably if we include all other expenses it would cost about $10,000 to start the experiment at any convenient place in the United States. The annual cost of maintenance would depend upon whether each farmer attends to the apparatus himself or whether several persons are employed to see that the experiment is carried on properly and fairly. We do not recommend any such experiment since we know of no region of this small size in this country that is troubled frequently by destructive hail and it might easily happen that one would have to wait fifty years before having a good chance to try the efficiency of Stiger's vortices. The frequency with which destructive hail occurs at any spot in this country is about the same as the frequency of local tornadoes and with hail, as with the tornado, it is more reasonable and cheaper to insure one's self against the financial loss that may be incurred rather than to protect one's self against the material loss that may occur. In either case, we have to spend money and the loss of money and destroyed material is eventually distributed through the community, just as in the case of fire. Experience has shown that, although up to a certain point, it is wise to protect against fire, yet beyond that point one may waste his money in attempted protection and will do better to spend it in insurance against the inevitable accidents of life.

While the above remarks apply more directly to the economy of Stiger's method of preventing hail, they are not to be considered as implying any doubts as to the scientific correctness of his method. On that point we know too little, either for or against, to justify any very decided opinion in this matter.

Inasmuch as we know that hailstorms are usually accompanied by rapidly ascending currents within large cumulus clouds, it may plausibly be supposed that if the vortices from Stiger's cannon could materially interfere with these currents, they might also interfere with the formation of hail. Stiger himself at first supposed that the calm period that preceded the severe local storm was the feature favorable to the formation of hail, and that his cannonading so greatly disturbed this calm as to prevent the hail from forming, but subsequently he thought that his vortices affected the cloud itself.

Our own conviction is that the energy of the movements within the vortex is too slight in comparison with the energy within a hail cloud to justify us in expecting any appreciable mechanical disturbance. On the other hand, the descriptions of the European experiments show that the Stiger vortex is essentially a white cloud of fine particles resulting from the explosion of the gunpowder. Now, a cumulus cloud is, as is well known, composed of aqueous particles condensed primarily upon dust nuclei. We have already (see MONTHLY WEATHER REVIEW, April, 1900, pp. 156-159) explained how the condensation of moisture within a rising cloud is hindered until a state of extreme supersaturation is attained because the condensing moisture has no nuclei on which to collect except the small drops of water already formed. Now, the Stiger vortex brings to the cloud a fresh accession of innumerable dust nuclei and, moreover, nuclei that are especially favorable to the condensation of moisture. This must, therefore, to a moderate degree, facilitate the formation of new drops of water and the prevention of that stage of supersaturation as the result of which large drops of water, or large hailstones, or large snowflakes, and balls of snow are formed.

Although this forcible addition of dust nuclei to a thunder cloud may thus possibly have some effect on the cloud and its hail, yet we are bound to confess that even this hypothesis seems to be inapplicable in view of the fact that in the course of the Dyrenforth experiments, made by himself

and others, both in Texas and in New York, both gunpowder and nitroglycerine were sent both by bombshells and small balloons up into the cloud region and exploded there without any appreciable effect, notwithstanding the immense number of particles of dust and powder thus violently thrown into the cloud. The experiments of Carl Barus, for the Weather Bureau, in 1893–94 (see Weather Bureau Bulletin No. 12), showed that the vapors of phosphorus and sulphur were peculiarly effective in producing cloudy condensation. We have, therefore, no good reason for believing that the Stiger vortices can influence even the molecular processes within the cloud.

THE WEATHER BUREAU IN DOMINICA, W. I.

The Chief of the Weather Bureau has received, under date of July 12, a letter from Dr. H. A. Alford Nicholls, C. M. G., M. D., Vice-President of the Dominica Agricultural Society, informing him that—

> The officer in charge of the Dominica branch of your department has been elected an honorary member of the Dominica Agricultural Society.

The pleasure that it gives the Chief to receive this appreciative recognition of the good work that the Weather Bureau is doing in the interests of the general public in the West Indies, is heightened by the receipt of the following letter from Charles E. Ashcraft, Jr., observer Weather Bureau and official in charge of the station at Roseau, Dominica. Mr. Ashcraft says:

> I have the honor to inform you that I am in receipt of a letter dated the 3d instant, from the Acting Secretary of the Dominica Agricultural Society, stating that the council of the society has elected me, as the official in charge of this station of the United States Weather Bureau, an honorary member of the Society, and requesting me to inform you of the same.
>
> This action is taken, presumably, as a token of the appreciation of the planters and other residents of Dominica, for the establishment and maintenance of one of our stations in the island. I have already extended, on behalf of the service, thanks for the compliment and assurance that it is an honor duly appreciated.

It is oftentimes difficult to distinguish between the honor due to an individual, on account of his own personal labors, and the honor due to him as representative of a government or institution. In the present case we doubt not that Mr. Ashcraft has taken the proper view of his appointment, and his admirable letter shows that he was eminently worthy of it.

THE NILE FLOODS AND THE INDIAN MONSOONS.

The official journal of the Manchester Cotton Association is entitled "Cotton," and is edited by Richard J. Allen; we copy the following from the number for Saturday, July 14, 1900:

> Whether there is any relation between the Nile floods and the monsoon rains in India has been investigated by Mr. John Eliot, the meteorological reporter to the government of India. His investigations suggest that the relation is found more exact and complete than had been supposed. He gathers from the statistics and conditions for the last twenty-five years that during six of these years when the rainfall in India was about normal the Nile was also in very high flood. Mr. Eliot says that the facts are sufficient to indicate that these two agricultural countries, which are almost solely dependent for their prosperity on the distribution and amount of rainfall, are similarly affected by general meteorological conditions and variations of conditions from one year to another. It is suggested that the coincidence is due to the fact that the rainfall of the period June to September or October in Abysinia, the south Arabian highlands, and northern India is derived from a common source. The whole of the regions mentioned become intensely heated in May, when practically no rain falls there. The solar action during that month, he argues, gives rise to meteorological changes which prepare for the advance of the monsoon currents, but do not primarily and directly induce the currents. If the currents are deflected by local conditions, or if the southeast trade winds are weaker than usual, droughts in India and small rainfall in the Abyssinian highlands result. Last year the currents in question were deflected to south Africa. After June the monsoon current practically collapsed in the Arabian Sea, and during July, August, and September the atmospheric movements were little different from those of May, and little aqueous vapor was brought up by them from the Indian Ocean. What are the influences which cause the deflection of the currents? Mr. Eliot has previously suggested that the problem may be solved by a closer study of the meteorology of Australia, the Indian Ocean, and possibly the Antarctic Ocean. It is suggested that the new cable from the Cape to Australia and a station well south of Mauritius may be useful in enabling observers in India to get more information from the Southern Hemisphere in good time.

We have not yet seen the original paper by Mr. Eliot, to which the above seems to refer, but recall the very important paper by Eliot, published some years since, in which he shows that the southwest monsoon of India can be traced backward across the equator north of Madagascar where it merges into the southeast trade wind of the south Indian Ocean, and that this southeast trade wind is turned northward as it crosses the torrid zone, partly by reason of the great indraught toward the center of Asia and partly also by the resistance of the southeast coast of Africa against which it impinges. That, in fact, the rain that falls among the mountains of the upper Nile region has been abstracted from this southeast trade wind, which then turns toward India where it again gives up its moisture as a southwest monsoon. It would, therefore, be natural to expect an intimate relation between the rains of these two regions. If the southeast trade is feeble or does not extend far enough westward, the Nile, especially the White Nile, will receive less water and, for the same reason, the southwest monsoon will be feeble and India will receive less rain.

In the absence of the article, from which the editor of Cotton has quoted, we have taken the liberty of reprinting, on page 246, an excellent article by Mr. E. Douglas Archibald which has just appeared in Symons' Monthly Meteorological Magazine, giving a summary of the present condition of our knowledge of this subject.

ANOTHER USE FOR THE KITE.

A few years since we had occasion to enumerate the various uses to which ingenious men have applied the kite. Among these was its application to the saving of life by carrying a line from a shipwrecked vessel over the breakers to the wreckers on the shore beyond. We now learn that two young men in Chicago have given an exhibition showing how those within a besieged town or other inaccessible place can use the kite line to carry a telephone, with its separate telephone wire, through the air, and let it drop from the kite upon a distant place while the kite still remains in the air. By using a very large box kite and attaching to the kite line a little way below the kite a pulley through which runs the telephone wire, the telephone may be dropped from the pulley while the insulated wire keeps up the connection with the man at the kite reel. Of course, at the present time, when kites have rarely been sent out with more than two miles of wire, which corresponds to a horizontal distance of much less than two miles, this method does not promise to put us into communication with persons at a great distance, but it may, of course, be very useful for short distances.

A NEW METEOROLOGICAL JOURNAL.

In accordance with the announcement of a year ago, the new meteorological journal, edited by A. J. Monnet and Chr. A. C. Nell, under the title of Nederlandsch Tijdschrift voor Meteorologie, began with the number for July 15, 1900, and