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THE ELECTRICAL CAUSES OF CHANGES IN THE WEATHER.

BY FREDERICK A. TALBOT.

Prof. Elmer Gates, of Chevy Chase, Md., has conducted a series of experiments which has led him to conclude that our varying conditions of weather are due to electricity. According to the professor, this subtle force produces rain and drought, the changes of air pressure, and the various meteorological disturbances, such as tornadoes and waterspouts, which visit us from time to time.

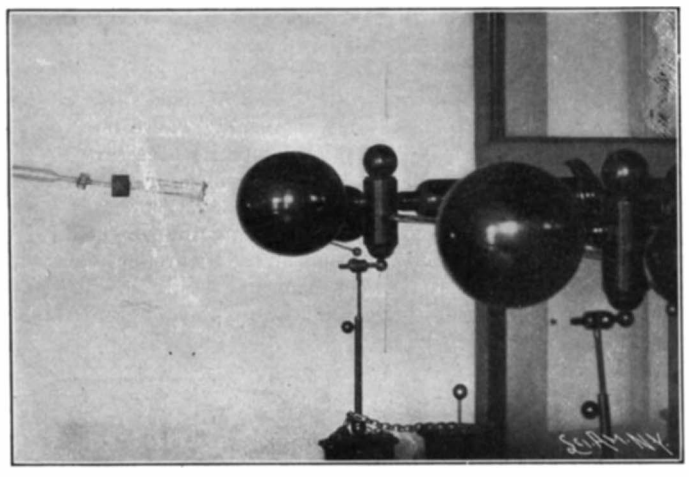
That electricity exerts a powerful influence upon the air pressure is proved by means of a simple experiment. A large fluffy ball of cotton suspended from the ceiling by means of a silken cord and charged with electricity immediately increases in size very appreciably. This expansion Prof. Gates explains as indicative of a low barometer, arguing that the expanding of the ball by charging it with electricity proves that the fibers of the cotton are repelling one another, so that the ball possesses less density. The same result attends the charging of the atmosphere with electricity. The density of the air is diminished, with the result that the pressure is decreased, and the barometer consequently falls.

The presence of electricity, however, in the atmosphere, produces not only low pressure, but high pressure as well. When two opposite masses of air charged with electricity—positive and negative respectively—approach one another, they become denser, with the result that the barometer rises. To prove this, Prof. Gates uses another ball of cotton, suspending it from the ceiling also by means of a silken cord about 2 feet distant from the first ball. In a few minutes the two balls approach each other, both decreasing in size. From this experiment Prof. Gates infers that when one mass of air becomes charged with electricity, a neighboring mass of air becomes electrified with an opposite charge by induction. Thereupon the masses of air gradually approach one another slowly, and decrease the density of the air.

One outcome of these investigations has been the construction of an appliance which Prof. Gates intends to use in forecasting the weather. It is impossible, with the present appliances employed, to predict the barometric pressure until a change has actually occurred; that is to say, until the barometer has either risen or fallen, meteorologists cannot tell us what weather to expect. If the variations of the barometer are the result of electrical influences, Prof. Gates suggests that the electric conditions of the atmosphere should be observed, and by this means foretell at what places and at what time the barometer will be either high or low. The primary object of his contrivance is to measure and to record the amount of electricity in different regions of the atmosphere. The device is to be attached to a small aerial apparatus which soars to the upper strata of air, makes automatic records at various heights, and then returns to the earth. By means of the appliance the professor hopes to glean information of those regions of air about which little at present is known.

That rain is produced by the mingling together of masses of air oppositely charged with electricity, Prof. Gates explains by another simple operation. Two windows on either side of his laboratory were opened. An electrical fan was placed in one window and set in motion for the purpose of withdrawing the air from the apartment. Thus the only air within the room was that which entered through the two windows. The weather outside was clear and bright, though the air was charged with a certain amount of humidity. The two currents of air entered the apartment by either window and mingled together in the usual way, without causing any untoward circumstance. A current of negative electricity was induced into the air entering through one window, and a similar current of positive electricity induced into the stream of air proceeding through the other window. A most remarkable phenomenon instantly occurred. The two oppositely electrified currents of air came into contact, formed a slight mist, and in a few seconds the floor of the laboratory was quite wet. Directly the electricity was switched off the air cleared, only to become misty again whenever the currents were switched on. This experiment was intended to prove that the electrified masses of moisture-laden air, generally termed clouds, when they meet, produce showers. When they are abnormally laden with electricity, lightning and thunderstorms result. If, for example, reverting, the two cotton balls are charged very highly with electricity they jump together with a spark and a snap, then spring apart and come together again with another spark and snap, separate once more, while the charge is maintained. This is practically an illustration of thunder and lightning upon a miniature scale. The spark represents the lightning and the snap the thunder.

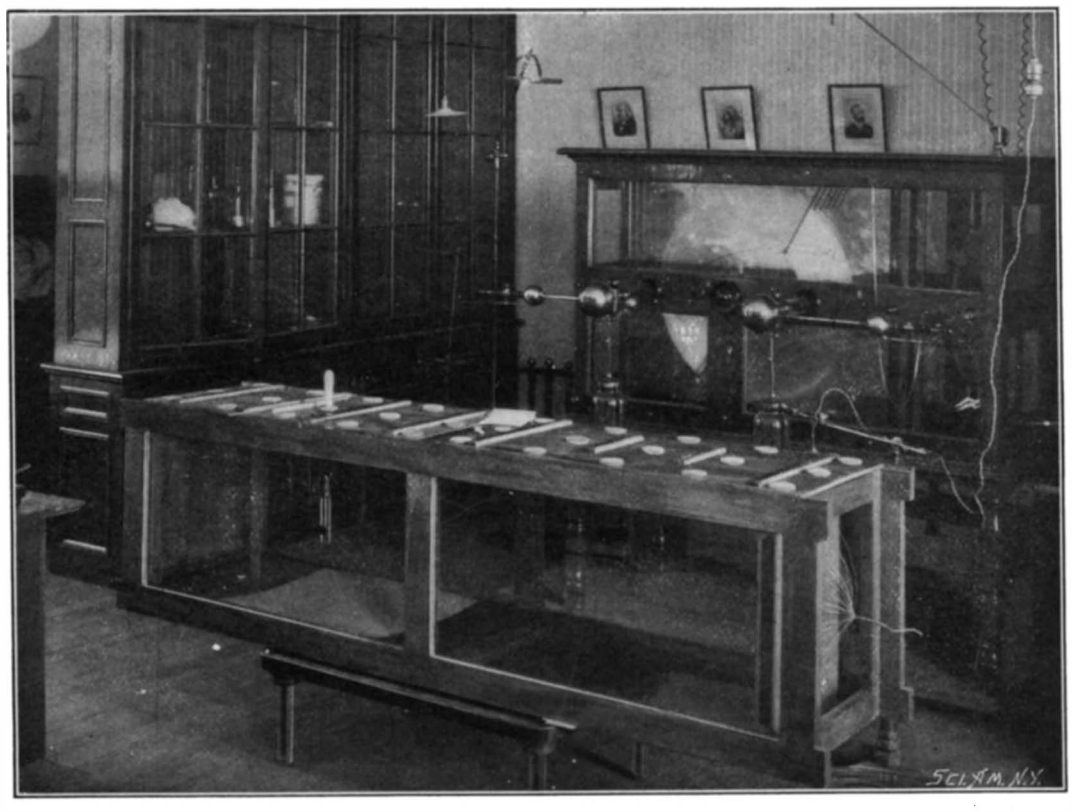
Prof. Gates, in the course of his experiments, also discovered another curious fact. This is the transportation of moisture from one point to another by means of electricity. During a shower of rain it has often been observed that a far greater quantity of



ELECTRICAL ATTRACTION SHOWING HOW CLOUDS MAY BE INFLUENCED BY ELECTRICITY.

rain has fallen in one place than could be possibly contained in the air covering that area. This peculiar fact is explained as follows: While it is raining in a certain spot, moisture from various directions is being conveyed to this special region by electrical energy. To illustrate this transportation possibility of electricity, Prof. Gates has constructed a large glass case about eight feet in length, divided into two compartments by means of a section of thin porous paper. One division is filled with very dry air and the other with air containing a heavy percentage of humidity. A wire leading from the negative pole of a static electrical machine is attached to the compartment containing the dry air, while another wire led from the positive pole is connected to the chamber containing the moist air. When the current is switched on, the moist air is transported from one end of the box to the other in a much shorter time than it would be conveyed by ordinary diffusion.

In addition to producing artificial miniature showers, mists, and thunderstorms, Prof. Gates contrives on a similar scale the more violent eruptions of nature, such as cyclones and waterspouts, with equal facility. To the bottom of an ordinary saucer filled with water a wire is attached, connected with the positive pole of the machine. A small rod connected with the other pole of the machine is held a short distance above the surface of the water. When the current is switched on, the water is agitated, the disturbance increasing in violence as the potential of the current is raised, until presently a cone is formed, rising higher and higher, until it ultimately touches the rod above.



ELECTRICAL APPARATUS BY WHICH EXPERIMENTS ON WEATHER CONDITIONS WERE MADE.

The British Antarctic Expedition.

The present year will be a red letter one in the annals of Antarctic exploration, inasmuch as determined efforts are to be made by the British Geographical Society and the German Government in concert, to unravel a little of the *terra incognita* of that remote region. Owing to its remote distance from the great centers of civilization, the South Pole has not received that attention from explorers which has been bestowed upon the North Pole, for whereas we are only 238 miles from the latter goal, we are yet about 770 miles distant from the South Pole. Yet it is imperative that our knowledge of these southern regions should be extended, in the interests of navigation, since owing to our meager information of the magnetic pole, ships sailing in these southern waters often stray miles out of their course and thus consequently protract their voyages unnecessarily.

The vessel in which the British expedition will set sail was recently launched at Dundee (Scotland), where she was constructed by the Dundee Shipbuilders Company, which makes a specialty of building whalers and other vessels for plying among the Arctic ice. As with the "Fram," in which Nansen set out for the North Pole, the "Discovery" has been specially built for the forthcoming task. In appearance she is a small, ungainly looking vessel, 178 feet in length, though she possesses fine lines. She is built of timber throughout and special attention has been devoted to the strengthening of her sides to enable her to resist the enormous ice pressure she will encounter. Her framing is constructed of Scottish oak, and where she will be subjected to the maximum pressure, heavy transverse bulkheads are supplied. There is a solid mass of wood 9 feet in thickness in her stem, while her sides amidships are 2½ feet thick. Her outside planking is of hard wood sheathed with greenheart and iron bark. Owing to the peculiarity of her form, when the ice exerts heavy pressure, instead of crushing the vessel, it will gradually lift her up.

She belongs to the auxiliary class of steam vessels, her engines developing only 450 horse power, and she will thus depend mainly upon her sails for progress. She is driven by three propellers fitted with new pattern withdrawing shafts and lifting screws, by which means, whenever an exigency arises, the screw shaft can be withdrawn inboard out of the way of the ice. Her boilers are the best return tube Scotch type. Her coal capacity is only 280 tons, but this is sufficient to carry her 8,000 knots at an average speed of 6½ to 7 knots per hour. She covered the 480 miles between Dundee and London with the consumption of only 14 tons of coal. She carries a steam dynamo and also a windmill dynamo to economize coal.

The internal arrangements of the vessel are as comfortable as possible. There is the usual range of laboratories and workshops incidental to such expeditions, and roomy quarters for the officers and crew. One prominent feature of the interior equipment is a kind of atmospheric lock by which means the raw Antarctic air is prevented from entering the interior of the vessel, when a person enters from the deck. It is a double-door arrangement, and when entering the person first closes the outer door before he opens the one leading into the apartment. To preserve the warmth in the rooms the walls are lined with asbestos. The stoves are provided with talc doors with funnel-like fittings over them, through which the air from the outside enters and is carried over glowing coals to be heated prior to its delivery into the rooms.

All the available space on the deck is occupied with winches, anchors, cables, sounding apparatus, spare propellers, masts, etc. For deep-sea soundings 10,000 fathoms of wire are being carried upon drums. The ship is lighted throughout with electric light. The magnetic instruments carried are of the most delicate description, and to prevent their being deranged no steel or iron