6-inch lens, of 104-inch focus, besides an immense 65-foot camera equipped with a cœlostat and triple lens. At the third station cameras and polar axes were likewise mounted, the instrumental equipment comprising a 40-foot camera, a polar axis on which a 15-foot camera was mounted, a concave grating spectrograph, a small concave grating, a low dispersion spectrograph, a chromospectrograph, four small prismatic polarigraphs for testing the polarity of the corona, and a 5-inch portable equatorial.

Eclipses come seldom, and last a few minutes at the most, for which reason the members of the expedition must be drilled until they are able to perform their duties with mechanical precision. Each man does his work in response to a signal. For weeks before the eclipse occurred, the battalion of men by whom the various instruments were to be handled, skilled though they were, were trained thoroughly. Day after day cameras, cœlostats, and spectroscopes were manipulated to obtain speed of operation and precision. Although the instruments were tested months before in the observatory grounds at Washington, the finer adjustments had to be made on the spot, and with the greatest care. The sun shifts his path each day, but lens and camera must be exactly in line for him at the all-important moment of eclipse, with clocks accurately rated to follow his declining while the moon's disk is passing his face. One instrument will compass the corona, another will catch the chromosphere; one waits but the instant after the sun's disappearance, another waits for that last second before his return; one follows the apparition throughout totality, another turns quite aside from the sun to his vicinity. No one of them, however, can wait till the eclipse has come and be aimed to it. It must be ready, with clocks so rated that there shall be no slips nor misconnections. Add to these difficulties the fact that the instruments themselves are made in one country and shipped to another for use, and we have some idea of the obstacles which an eclipse expedition must overcome.

Among the many by-ways of eclipse investigation only remotely related to things astronomical we may mention minute attention to variations in electric conditions of the air; fluctuations in the magnetic currents of the earth, caused by the immediate interposition of the moon between us and the sun; a close watch upon the barometer and thermometer, to see what changes the temporary withdrawal of the sun's heat may have, especially on changes in the wind.

Regarding the definite results of an expedition, it is as yet too early to speak with authority. An immense mass of detailed observations was collected, which will, in all probability, serve to confirm many already existing theories and hypotheses. The photographs obtained are the finest secured by the observatory in any of its eclipse expeditions, and the affair, regarded as a whole, deserves to be considered the most successful of its kind. Spectrographic results of undoubted value were secured, as well as color observations, which will, when published, be of exceeding interest to students of the sun. The photographs do not show the long equatorial streamers as well as some others have done because the sun, at the time of its eclipse, was at the sun-spot maximum, which seems to affect the streamers greatly, mixing them up and producing a tangle, which, while exceedingly interesting, is not so spectacular as the long equatorial streamers seen in photos of the sun when an eclipse has taken place near a sun-spot minimum. It will take a minimum of one year, and very likely two or three times as long, to reduce all the observations, study all the negatives and make public the results. Expeditions of that character are designed to get all the available data possible; totality lasts but a short time and there is all the time needed afterward to study the results. But an impatient public usually wants to be told something definite and remarkable a week afterward, and to that public these few words of explanation are addressed. Astronomers do not get up eclipse expeditions with the idea of making startling discoveries, nor do they expect them. There is always the chance of something being learned which will throw important light on that most important astronomical subject, the sun; but it is not looked for, as a definite object is sought. Rather are these expeditions made up to take advantage of the opportunities Nature offers us to investigate the sun with the hope that, by a persistent accumulation of data, some laws may be deduced which will assist us in fathoming other problems of astronomy, as well as the certainty that nothing but benefit has ever come to science from the painstaking and patient research into difficult and often obscure places of nature, of which the sun and stellar space are two.

The observations at the eclipse stations, taken in conjunction with those others which were made, would seem to indicate that the "eclipse cyclone," the name given to the atmospheric disturbance supposed to be caused by an eclipse, does not exist except in the imagination. The temperature dropped less than ten degrees during totality, a very small amount compared to the popular conception, and the barometer was not affected at all. There was a ten per cent rise in humidity during the eclipse, but no other disturbance of note. It should be understood that the temperature did not actually drop ten degrees in the time of totality but that amount of drop was caused by the eclipse, the drop lagging ten to fifteen minutes behind the shadow. The same is true of the humidity.

The study of the photographs of the eclipse will include measurements, the making of drawings, comparison with other photographs and drawings, made by other expeditions at this time and expeditions at previous eclipses, production of colored charts, etc. The entire force of the expedition is enthusiastic over the success of the observations and photographs and believes that much of value to science will mark the eclipse of 1905 as one of the best observed and most thoroughly studied and, consequently, one of the most interesting and instructive eclipses of modern times.

Eclipses only rarely bring discoveries of a sensational nature. In 1868 Janssen and Lockyer found, independently, that the blood-red protuberances heretofore seen only during the moments of totality could be followed by a properly adjusted spectroscope after the eclipse was over. Still, they exhibit marked differences when viewed at totality and in full sunlight, so that their study is still a part of complete eclipse pro-

USING THE HUMAN BODY FOR SENDING A WIRELESS MESSAGE BY THE DE FOREST SYSTEM WITH THE ASSISTANCE OF DR. OVINGTON'S MACHINE. IN THIS EXPERIMENT 200,000 VOLTS OF HIGH FREQUENCY CURRENT ARE PASSED THROUGH THE HUMAN BODY, WHICH SERVES AS A MAST.

grammes. Other marked results of these pregnant but fleeting moments have been Prof. Young's discovery in 1869 of a material termed coronium; of the same astronomer's discovery of the "reversing layer" in 1870; of enormously extended coronal streamers in 1878 by Prof. Langley, and Prof. Deslandre's discovery in 1893 that the corona rotates with the sun. All these were in a way spectacular discoveries, made possible by the happening of eclipses. But, generally, expeditions throw but a little more light on some large solar problem, the whole to be solved only after repeated attacks through many eagerly seized moments of eclipse.

With the fungi, exact studies may be made upon the influence of the different nutrients on the general form and upon the production of conidia, etc. It has been found, for instance, that, in the absence of potassium, *Sterigmatocytis niger* may produce no conidia or very curious modifications of the conidiophores. By far the most interesting problems with relation to the mineral nutrients are those which have to do with the rôles of these elements in metabolism. The effect of the lack of one or another element is made manifest by some general macroscopic change, and sooner or later, by disturbing pathological changes and subsequent death. It is reported, for example, that the absence of iron prevents the development of a healthy green color, and a scarcity of potassium is made evident, especially in reduced photosynthesis.

THE HUMAN BODY AS A WIRELESS TELEGRAPH TRANSMITTER AND RECEIVER.

Everyone knows that the human body is a conductor of electricity, but that it may be employed as a radiator and antenna instead of the usual aerial in wireless telegraphy may not be so well known.

During the recent electrical show at the Madison Square Garden, a series of experiments was performed by Prof. Ovington, of Boston, Mass., with high-potential and high-frequency currents. One of these consisted of substituting the body of the lecturer's assistant for the usual vertical conductor used in sending wireless messages.

A reference to the illustration shows how the connections were made, the current from the machine passing through the assistant's body, from whence the energy was radiated as wireless waves in the ether. The messages were sent from this novel radiating arrangement in the small demonstration hall at the extreme western end of the building, and were received by a De Forest receptor set up and furnished with the usual wire antenna located in about the middle of the main auditorium.

The potential and frequency of the oscillations were very much in excess of those utilized in the commercial transmission of wireless telegrams and hence the waves radiated were exceedingly short.

It was Prof. Tommasini, of Geneva, who first demonstrated that the human body could be successfully substituted for an aerial of the same length and capacity. The body is not, of course, as good a conductor as are the metals, but this is offset by the fact that a current of high frequency penetrates the skin only a very small fraction of a millimeter. M. Emile Guarini, of Brussels, actually sent messages through space by connecting one human body to the positive side of a spark-gap, and another similarly connected to one terminal of the coherer.

German Army Autos.

The German army, which already has three battalions of telegraph operators and one of aeronauts, is to be provided in the near future with a volunteer corps of chauffeurs. At first it was proposed to establish an automobile post or station, but the project was abandoned on account of the great cost it would involve. The volunteer automobile corps is to be recruited from among the members of the German Automobile Club, and it is limited to the Prussian provinces and the states whose military contingent is under the direction of the Berlin authorities. The persons who wish to enter as volunteers are asked to apply to the Automobile Club, with a declaration in which they engage first to serve an unlimited time in case of war, second, to undertake three periods of maneuvers of ten days each, in the space of four years, and third, to carry out all the orders which are given them by the officer in command. On November 1 of each year the club communicates to the Minister of War the list of volunteers available during the following years, with their addresses and the necessary data as to machines, etc. The volunteers are required to wear a gray uniform while in service. Prince Henry of Prussia has been placed at the head of the corps.

Crossing the English Channel by Balloon.

A balloon of the English Aero Club left London February 4 and descended in safety at Bermouville, France, twenty miles inland. The entire time consumed from London to the place of descent was 4 hours and 10 minutes.

The occupants of the balloon were Messrs. Pollock and Dale, who are members of the Aero Club of the United Kingdom. The name of the balloon is the "Vivienne III."

A strong northwest gale was blowing during the passage across the Channel, which was made in an hour and three-quarters. Once the balloon ascended to 10,000 feet, where a snowstorm was encountered and the entire airship was incrusted with frost.

Lucerne possesses one of the most recent hydraulic plants which has been set in operation in Switzerland. It is used for lighting and power in the city. The hydraulic plant uses a 1,000-foot fall to run the turbines. The dynamo plant consists at present of four alternating current dynamos of 1,600 horse-power each, but the plant is to receive eight dynamos when it is fully completed. These machines have been furnished by the Swiss Oerlikon Company. Three-phase current at 6,000 volts is employed here and the machines run at 300 revolutions per minute. Part of the current is sent over a cable line to the town of Engelberg, which lies three miles off, but the greater part of the current goes to Lucerne over a high-tension line at 27,000 volts, the distance being 17 miles. From Lucerne a number of branch lines go out to different localities. For use within the city of Lucerne, the high tension of the line is lowered to 2,600 volts and the current is distributed in part by cables and part is converted into direct current for operating the tramway lines.