sufficient to allow the cylinder to turn, which is effected as described in the pistol. After the finger is relieved from the lever (when the lock is set) a small spring draws it back to its former place to make room for the end *d* of the hammer, so that its force may not be impaired. By pulling the trigger from the catch of the hammer the mainspring (which is connected to the hammer by the stirrup *o*) forces its end *f* forward against the end *m* of the adopter, the end *l* of which is brought in contact with the percussion-cap placed upon the tube *n*, which discharges the load. To load, it is only requisite to draw the key *j*, which will liberate Section 4. Then by drawing the key that locks the cylinder (which may be effected by drawing back the hammer) the cylinder may be taken from the arbor.

Many Advantages

Among the many advantages in the use of these guns, independent of the number of charges they contain, are, first, the facility in loading them; secondly, the outward security against dampness; thirdly, security of the lock against the smoke of the powder; fourthly, the use of the partitions between the caps, which prevent fire communicating from the exploding cap to the adjoining ones; fifthly, by the hammer's striking the cap at the end of the cylinder no jar is occasioned, deviating from the line of sight; sixthly, the weight and location of the cylinder, which give steadiness to the hand; seventhly, the great rapidity in the succession of discharges, which is effected merely by drawing back the hammer and pulling the trigger.

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age developed, all of the other devices upon which physicists had been working diligently in a half dozen other laboratories.

So striking was the success of the 1,500,000-volt model that Research Corporation funds were obtained under the auspices of the Massachusetts Institute of Technology to build the ten-million-volt machine which is now about to go into the service of physics.

In principle the Van de Graaff generator is simple. From near the surface of the ground to the elevated hollow cylinders there run moving belts. Electricity is picked up upon these belts at the ground level and it is then conveyed, like water in a bucket pump, to the hollow spheres where it is dumped into them and travels to their surfaces. It is not even necessary to provide a source of low voltage electricity to spray upon the belts as the belts can create and pick up the necessary electricity without aid. One of the hollow cylinders thus has its surface charged positively and the other is charged with negative electricity. How much electricity the hollow cylinders will hold without spilling over, or sparking like artificial lightning, one from the other, depends upon their size and the atmosphere conditions.

A relatively large amount of electricity, a thousand kilowatts, will be generated by the ten million volt machine when it operates. This is as much as the power plant of a small town generates. Actually the current amounts to 100 milliamperes at a potential of ten million volts.

The generator would light 90,000 ordinary 10 watt, 110 volt incandescent electric lamps, if connected in series, and there would be ten per cent. current margin to spare. If these lamps were set as close together as possible, say eight to the foot, they would string out to about two miles.

The conductivity of the air prevents the generation of voltages much higher than ten million. The experimenters are therefore at work upon a Van de Graaff generator which will be immersed in a gigantic vacuum tank. With this electrical machine they expect to develop fifty million volts.

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ASTRONOMY

First Direct Photographs of Sun's Hydrogen Flames Made

SOLAR PROMINENCES, great flames of hydrogen that shoot out from the sun's surface, often to heights of hundreds of thousands of miles, have recently been photographed from the Meudon Observatory, near Paris, without waiting for an eclipse, or using a spectroscope, which has been required hitherto. At a recent meeting of the Academy of Sciences, M. B. Lyot, astronomer at the observatory, described the methods that he had used to accomplish this result, which is considered of great scientific importance.

At the time of a total eclipse of the sun, like that seen in New England last August, the prominences may be seen as brilliant spots of red around the moon's dark disc. Nearly forty years ago Dr. George Ellery Hale, famous American astronomer, and Dr. Henry Deslandres, a Frenchman, independently invented the spectroheliograph, which made it possible to photograph them solely by the hydrogen light which they emit. In this way the intensity of the surrounding glare, which is of all colors, was eliminated. Since the prominences are only about five millionths as bright as the sun itself, the glare that surrounds it usually hides them.

A few years ago M. Lyot made some experiments from the summit of the Pic du Midi to record the sun's corona without waiting for an eclipse. This was successful. Because of the extreme clarity of the atmosphere, the diffuse light around the sun was almost completely absent, and by screening the sun's disc from the plate, it was possible to photograph the prominences directly. It was also possible to see them. Even on poorer days, M. Lyot reported, they could be seen by looking through a red glass filter, which eliminated the diffuse light.

When the experiments were repeated at Meudon, the greater amount of atmospheric haze and dust prevented results being obtained so easily. However, M. Lyot constructed a special filter, consisting of an acid solution of the chemical neodymium nitrate, which was contained in a tube covered at one end with plain glass and at the other with a special red filter. The sun's light was passed through this combination filter, and practically all of the light was removed with the exception of a narrow band of waves in the red, which included all of the red hydrogen light. With this apparatus, revealed M. Lyot, the prominences were photographed successfully. Even on misty days, it was possible to photograph them in an exposure time of one second, with the sun's image 8 centimeters (about 3 1/8 inches) in diameter.

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