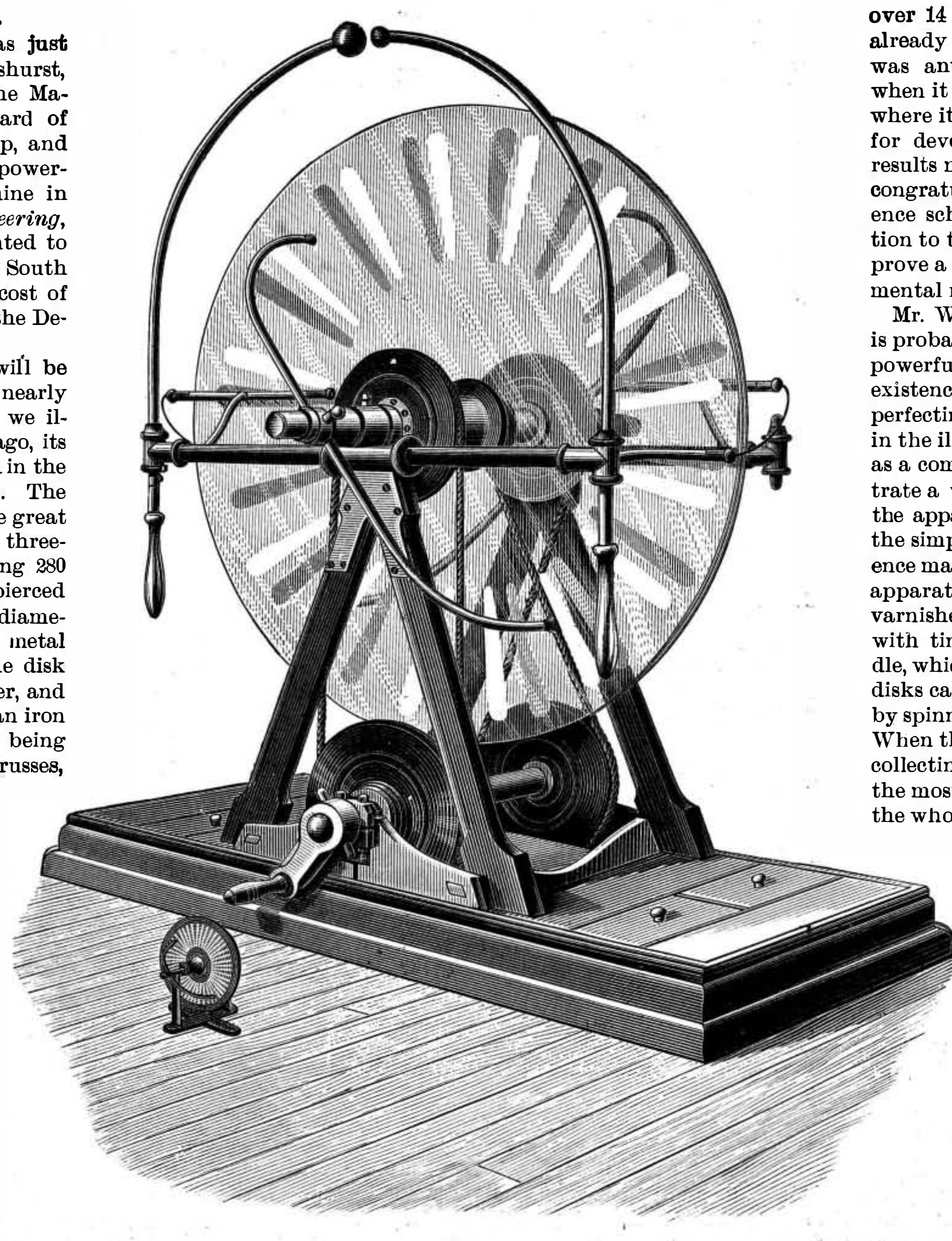
A GREAT ELECTRIC MACHINE.

We illustrate a machine which has just been completed by Mr. James Wimshurst, one of the consulting engineers to the Marine Department of the London Board of Trade, in his own private workshop, and which is, undoubtedly, the most powerful and efficient electrostatic machine in existence. This apparatus, says *Engineering*, has been constructed for and presented to the Science and Art Department at South Kensington by Mr. Wimshurst, the cost of the raw material being defrayed by the Department.

On reference to the illustration, it will be seen that the form of this machine is nearly identical with the smaller type which we illustrated and described two years ago, its points of difference lying in its size and in the construction of the supporting parts. The diameter of the circular plates of the great machine is 84 inches, of plate glass three-eighths inch in thickness, and weighing 280 pounds each. Each of these disks is pierced at its center with a hole, 6½ inches in diameter, and is firmly attached to a gun metal boss, 15 inches in length, carrying the disk at one end and a pulley at the other, and which is bored so as to run freely on an iron tube, 3 inches in diameter, this tube being supported at each end by strong oak trusses, rising from a firm base, also of oak, and which is fitted with lockers at each end, for holding spare parts and accessory apparatus. The heads of the two trusses, or A frames, consist of massive castings of gun metal, which are so shaped as to hold the hollow iron tube and the ebonite rod to which the collecting combs and discharging terminals are attached. The iron tube projects at each end beyond the trusses, and to the projecting ends are attached the brass "neutralizing" rods, which terminate in light wire brushes, shown in the illustration.



THE WIMSHURST SEVEN FOOT DUPLEX ELECTRIC MACHINE.

To the disks, which are well varnished with an alcoholic solution of shellac, are attached, at equal angular distances apart, radial sectors of tinfoil, sixteen on each disk. These sectors are 19 inches long, and have a mean width of 1·65 inches, thus having an area of 31·35 square inches. There is thus on each plate a metallically coated area of 500 square inches, or a thousand square inches on the two disks together.

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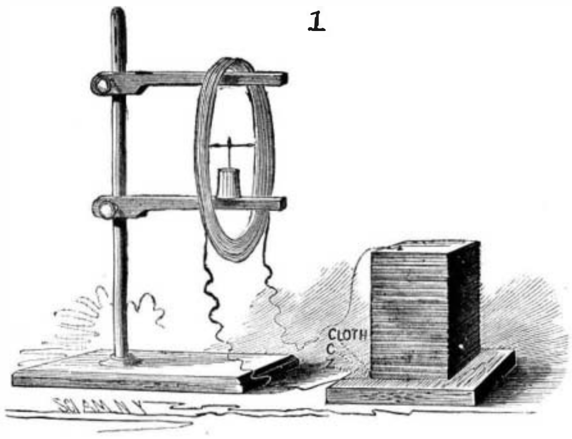

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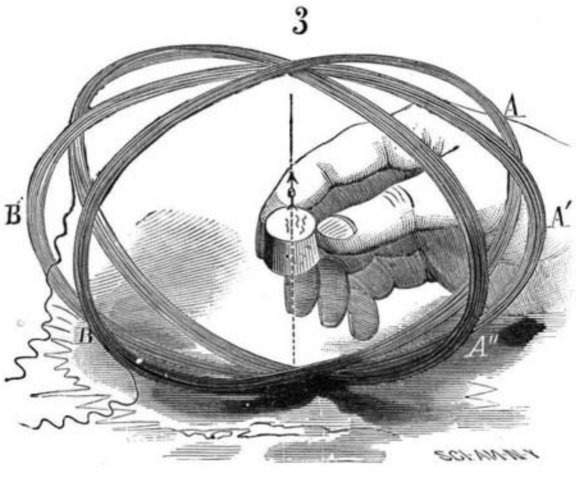

The apparatus may in principle be regarded as a sort of double-acting "Nicholson's revolving doubler," the sectors on the one disk acting as inductors on the other, and *vice versa*, and that the extraordinarily high efficiency of the machine is probably due to the fact that both plates contribute charges of electricity to the collecting combs, and that the sectors on the one disk act as inductors and as carriers respectively to those on the other when they approach the best positions for those respective actions to take place.

The collecting combs are attached to the discharging terminals, as shown in the engraving, by interchangeable brass rods, some being straight, while others are bent, so that their positions with respect to the horizontal diameters of the disks may be varied within a range of about 16 inches, that is to say, between about 8 inches above and 8 inches below the horizontal diameter. The discharging rods or terminals are constructed of brass tubes, 1¼ inches in diameter, and are fitted with terminal balls of different diameters, which are also interchangeable. The distance of these balls apart—and therefore the striking distance of the spark discharge—can be varied by the glass handles with which the discharging rods are fitted at their lower ends, and as these handles have their attachment in a hinge joint, they can be used as levers wherewith to turn the terminal rods around a vertical axis, and thus to vary the distance between their upper ends.

The two disks are rotated in opposite directions by the lower driving gear, shown in the figure; this consists of a horizontal spindle fitted with a winch handle at each end, and carrying a pair of oak pulleys which are connected respectively to the two pulleys attached to the disks by endless cords, one of which, being crossed, causes one disk to be rotated in the opposite direction to the other; and as the height of the bearings of the lower spindle is adjustable, the driving cords can always be maintained perfectly tight.

The principal characteristics of this form of electrostatic machine, and to which its exceptionally high value as a laboratory instrument is due, are (1) that it is readily self-exciting in almost every condition of the atmosphere; (2) that the polarity of the apparatus never changes, as it is so liable to do in other forms of induction machines; (3) that the charge is very large compared with the area of the glass employed in the disks; and (4) the small cost at which the machine may be constructed.

Although the great machine which we illustrate in this notice was working in a workshop in which there was a steam engine and boiler at work, and consequently with a considerable quantity of water in the atmosphere, and although it was closely surrounded with lathes and shafting and other metallic conducting bodies, not only did it pick up its charge even before a complete revolution was made, but kept up a constant stream of discharge sparks between its terminals of over 14 inches in length. The results have already proved far more satisfactory than was anticipated before it was tried, but when it is set to work at South Kensington, where it will be under far better conditions for developing its full powers, still higher results may be expected. We may, indeed, congratulate Professor Guthrie and the science schools generally on this new acquisition to the physical laboratory, which must prove a most valuable instrument for experimental research.

Mr. Wimshurst has in his laboratory what is probably the largest collection of the most powerful electrostatic induction machines in existence, having worked for several years in perfecting this class of apparatus. We have in the illustration introduced (partly to serve as a comparison of size and partly to illustrate a very interesting and typical form of the apparatus) a sketch of what is perhaps the simplest and the cheapest electric influence machine ever constructed. This little apparatus consists simply of two disks of varnished glass, 12 inches in diameter, fitted with tinfoil sectors, and mounted on a spindle, which can be held in the hands, and the disks can be rotated in opposite directions by spinning them with the finger and thumb. When this is done—although there are no collecting combs or discharge conductors—the most brilliant effects can be produced, the whole apparatus literally bristling with electric discharges immediately the rotation commences, and one of the most remarkable and not the least valuable features of this beautiful little instrument lies in the fact that it can be constructed in a good, salable, and workmanlike manner and sold at a very small charge.

INTERESTING ELECTRICAL EXPERIMENTS.

To the Editor of the Sci. Am.:

Judging from the interest exhibited by the young people in our public library, on the arrival of the SCIENTIFIC AMERICAN, that readers of that class might find the details of some simple experiments acceptable, I send a description of two such, which can be made without much outlay, with simple, easily attainable materials, and which may even possess some interest for older persons.

FIRST EXPERIMENT.

At any tin shop or coppersmith's can be procured, for a trifle, scraps of sheet copper, zinc, and iron, and at any tailor's a few remnants of cloth or flannel. The other materials needed are about twenty-five cents' worth of No. 22 insulated copper wire and a small magnetic needle, costing perhaps 50 cents; both of which investments may be considered permanent, as the needle and wire can be used for many other interesting experiments. The only additional requirements are a handful of common salt, or, if preferred, one or two cents' worth of commercial sulphuric acid, which, to prevent accident, may at once be mixed slowly with ten times as much water.

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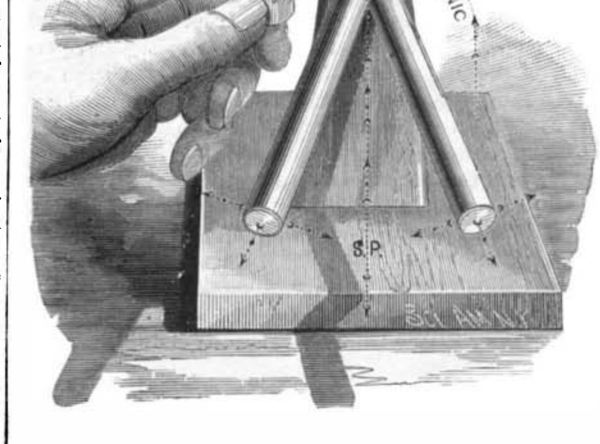

The young experimenter may now cut the zinc and