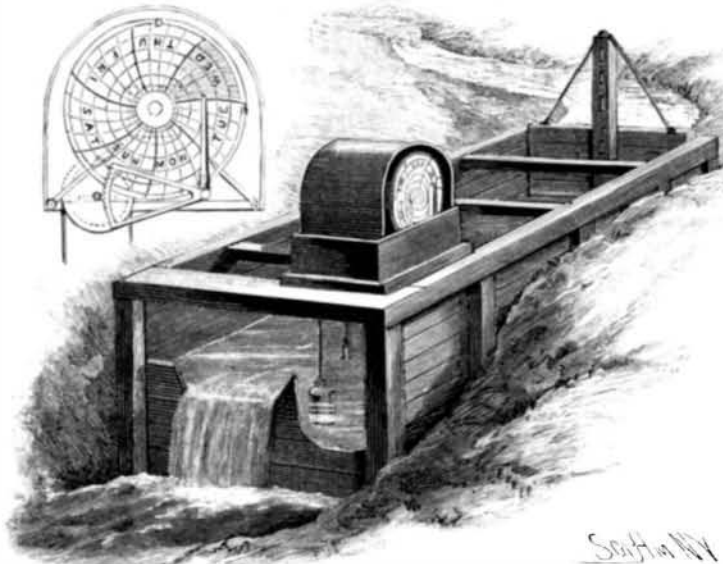


AN IMPROVED WATER REGISTER.

The accompanying illustration represents an apparatus for indicating and recording the rise and fall of a body of water, and is designed to be especially useful in localities where irrigation is resorted to, the machine being placed in a flume leading from the irrigating ditch, and keeping an accurate record of all varia-



CARPENTER'S WATER REGISTER.

tions of the depth of the water. This improvement has been patented by Mr. Don A. Carpenter, of Fort Collins, Col. The mechanism of the machine, as shown in the small sectional view, is preferably inclosed by a case. Upon a shaft carrying a grooved pulley is a cable, to one end of which is attached a float and to the other end a counterpoise, the counterpoise taking up all the slack of the cable, so that the shaft is moved with every rise and fall of the float. A pinion on the shaft meshes with a segmental rack on another shaft carrying an arm to which is secured a bar having at its upper end a stylus or pen. The point of this stylus presses against a dial, preferably of paper, secured to a metallic disk by clips, the disk having a hollow hub on its back secured to the spindle of a clock, an eight-day clock being preferably used, and the clockwork being so timed that the disk will make but one complete revolution a week. The dial is divided into seven equal segmental parts, to represent the days of the week, other subdivisions representing the hours, while the dial is also adapted to indicate the height of the water in feet. The dial for use in connection with the machine has also been copyrighted by the inventor, it being designed to furnish a standard size machine to be used with a standard size of weir, say three feet, when the dial slips will furnish the means of determining the discharge of water, in cubic feet, for any desired period.

MR. TESLA'S EXPERIMENTS ON ALTERNATING CURRENTS OF GREAT FREQUENCY.

Mr. Nikola Tesla, to whom the English and French scientific public has just accorded a very warm reception, is a pioneer in electric science, and one of those who will have influenced future progress through an almost radical transformation of the old processes and old methods.

Some day we shall have occasion to describe the two

alternating current motors devised by Mr. Tesla as long ago as 1888. At present, we shall content ourselves with recurring to his magnificent experiments on high potentials and alternating currents of great frequency, of which we have already given a complete idea in summarizing the communication made by the author on the 20th of May, 1891, before the American Institute of Electrical Engineers.

In the train of this communication, which made a very great sensation in the scientific world, Mr. Tesla, acceding to the pressing solicitations of his friends and admirers, came to Europe and performed at London on February 3d, and at Paris on the 19th of the same month, before the French Society of Physics and the International Society of Electricians, assembled in the hall of the Society of Encouragement, the remarkable experiments of which we were witness and of which we propose to give an idea, despite the dryness of the subject, its very special character, and our inability to make a clear exposition of it.

Mr. Tesla did not content himself with a simple repetition of the experiments made in America, but he extended them and rendered them complete, and the communications made in Europe may be considered as the second part of a long and remarkable

study of which the first part was presented in the New World last year.

In the first place, let us briefly recall the processes employed by Mr. Tesla for the production of alternating currents of great frequency. The simplest consists in the use of an alternator of special form, which is represented herewith in Fig. 2. This consists of a steel disk 30 inches in diameter, upon which are mounted 384 small bobbins, or, more accurately, 384 small zigzag windings. This disk revolves in the interior of a fixed ring carrying 384 inductor poles. The result is that the frequency of the alternating currents engendered by the revolution of the armature before the inductors produces 192 periods per revolution, and that at the normal maximum velocity of 3,000 revolutions per minute, or 30 per second, a frequency of 9,600 periods per second is obtained, instead of the hundred solely that ordinary alternators give. The alternating current thus engendered is collected through the aid of two rings against which two brushes rub, as in all alternators with movable armature. A separate excitation permits of varying at will the alternator's electromotive force, which, under full excitation, may reach 200 volts. In the second process employed by Mr. Tesla for obtaining much greater frequencies, which may reach and even exceed a million per second, he utilizes an ordinary alternator. In the experiments of February 19, he employed a Siemens alternator, whose frequency did not exceed fifty periods per second.

The alternating current thus produced is sent to an

induction coil by establishing in derivation, upon the primary circuit, a disruptive discharge apparatus formed of a condenser and two polished balls whose distance apart may be varied. This spacing regulates the frequency of the discharges, and, consequently, the frequency of the currents traversing the inductor of the bobbin. The sparks of the disruptive discharges burst forth in a powerful magnetic field which facilitates their rapid production, as well as the cooling of the space wherein they are produced with so great a rapidity. Whatever be the process employed for obtaining great frequencies, the potential is always inadequate, and it is increased by transforming the alternating current by the aid of a suitable bobbin. This latter consists of an internal inductor winding and an external armature winding, formed of relatively coarse wire, and of a number of quite small spirals; for it must not be lost sight of that, seeing the great frequency of the currents, the electromotive force developed for a given length of wire is incomparably higher than with ordinary bobbins. These bobbins have no iron core, and are completely submerged in boiled linseed oil; the object of which is to secure perfect insulation and to prevent the presence of air, which, in this particular case, would be very prejudicial through the considerable heating that it would produce under the action of the enormous and frequently reversed electrostatic tensions to which it would be submitted.

In order to obtain powerful effects, Mr. Tesla overcomes the prejudicial effects of self-induction by utilizing the properties of condensers properly interposed in the circuit of the alternator or in derivation upon the terminals of the disruptive discharge apparatus.

A certain number of the experiments made by Mr. Tesla on Feb. 19 were merely a reproduction of those that we have spoken of before. We shall therefore not

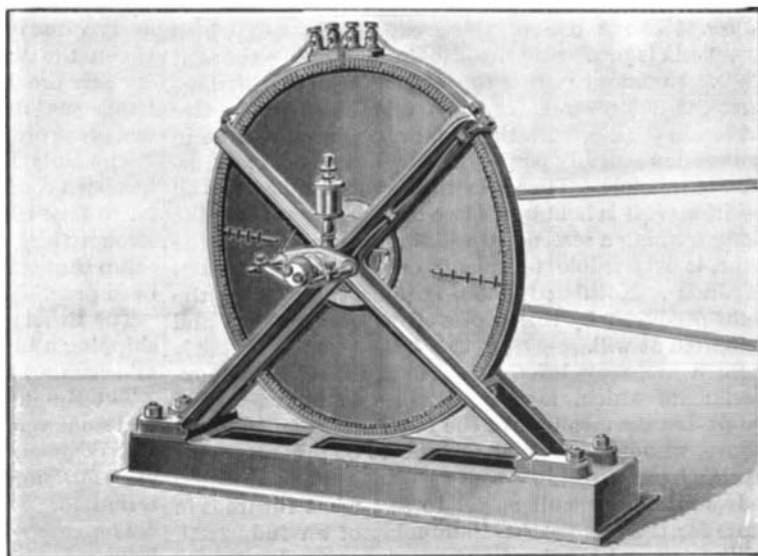


Fig. 2.—TESLA'S RAPID ALTERNATOR.

reproduce them, but shall dwell more especially upon those that present a character of novelty.

The first experiments were made with the disruptive discharge apparatus, that which gives the greatest frequencies at present obtainable by the means at our disposal. In these conditions, the electrostatic discharges traverse the air under the form of luminous discharges, as if the air were rarefied. On interposing an ebonite plate, the electrostatic capacity of the system formed by the two balls between which the discharge takes place and the ebonite plate is increased by the interposition of a dielectric whose specific inductive capacity is greater than that of the air, and the brightness of the discharges is thereby intensified. These discharges easily traverse long tubes containing rarefied gases, which they illuminate with a bright light, each rarefied gas giving to the light its own distinctive color. The discharges occur likewise between two cotton-covered wires insulated from each other and put in connection with the two terminals of the bobbin. These wires emit a violet light throughout their entire length, and even render luminous the space comprised between them.

All the other experiments were made with the alternator shown in Fig. 2, which gives from 9,000 to 10,000 periods per second. Mr. Tesla first showed the discharges in the form of a flame.

In order to prove that these discharges of high potential and great frequency are not dangerous, he was able, on taking in his hands two metallic balls designed to prevent his being burned by the spark, to receive the entire discharge from the bobbin, the discharge passing through his body interposed between the two balls. Mr. Tesla afterward showed that the return wire is absolutely useless for making the discharge current pass. The latter may be established by the air, and pass more easily if care be taken to connect one of the extremities of the wire of the bobbin with a conducting plate insulated in space. The molecular bombardment heats the part which presents but little sur-

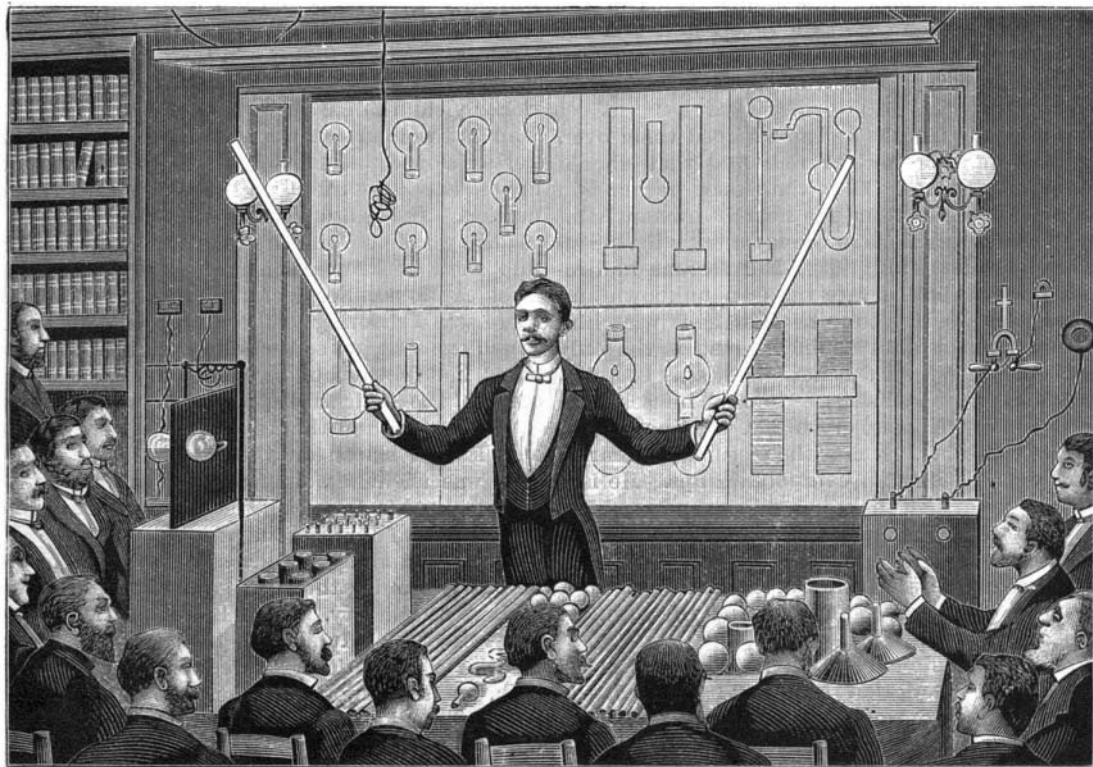


Fig. 1.—PARIS—MR. TESLA LECTURING BEFORE THE FRENCH PHYSICAL SOCIETY AND THE INTERNATIONAL SOCIETY OF ELECTRICIANS.