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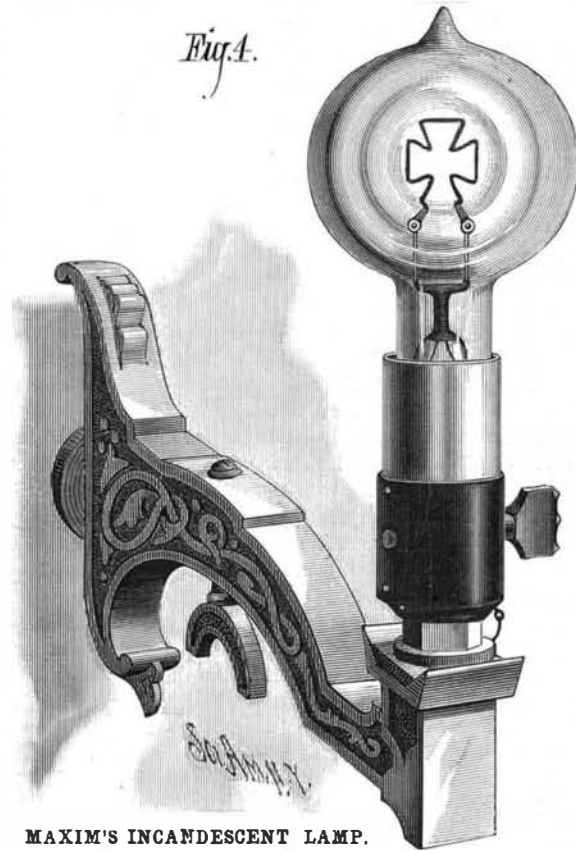
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RECENT DEVELOPMENTS IN ELECTRIC LIGHTING.

That the electric arc light has been gaining in public favor is evidenced by its permanent adoption in a large number of public halls, theaters, factories, warehouses and stores throughout the country; and its application to tunnels, mines, and engineering work by night, and to out-of-door illumination in streets, parks, and public places. It is also employed for lighting docks, and to a considerable extent by traveling shows. In its application to lighthouses and head-lights of steamers it certainly has no rival.

One of our prominent mechanical engineers, Mr. H. S. Maxim, of this city, has long been engaged in perfecting the electric light in its various forms, and has been one of the foremost in adapting it to special purposes. His dynamo-electric machines and electric light projectors for land and marine uses have been already illustrated in this journal, and not long since we published engravings of a new focusing lamp by the same inventor. We now give engravings of a new and remarkably efficient current regulator for electric light circuits, and illustrate a dynamo-electric machine, which is probably the largest ever built in this country. We also furnish views of Mr. Maxim's incandescent lamp which is now brought to public notice for the first time, although, as we are informed by the inventor, the lamp was made substantially in its present form some three or four years since. In fact, Mr. Maxim claims to be the pioneer in this direction.*

* The application for a patent on Mr. Maxim's incandescent lamp was filed October 4, 1878; the patent was granted August 10, 1880. The process of manufacturing carbon was patented July 20, 1880. The dynamo machine was patented June 8, 1880. The machine for regulating the current was patented June 8, 1880. A process for charging the lamps with vapors of gasoline was patented August 10, 1880.



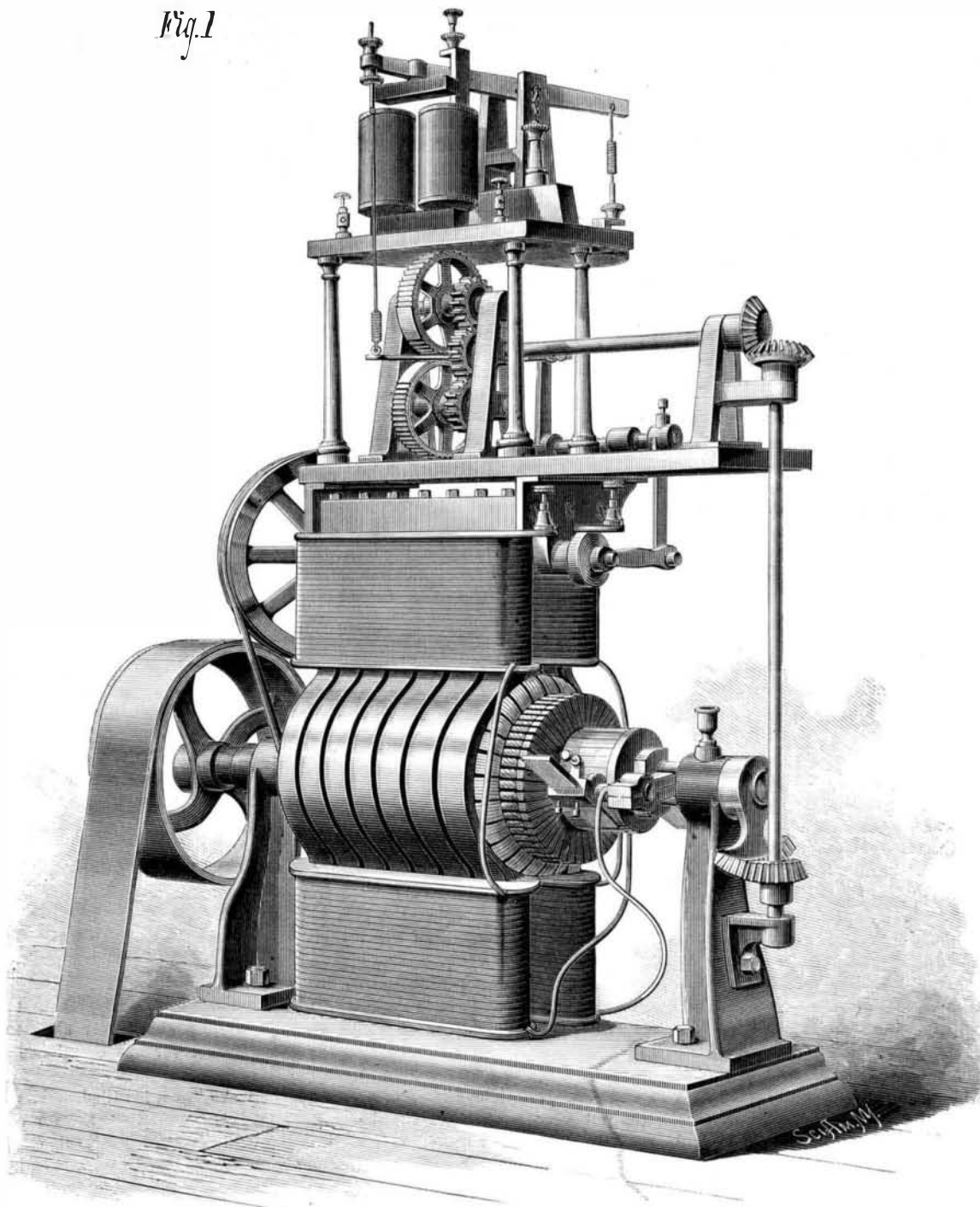
MAXIM'S INCANDESCENT LAMP.

The current regulator, which is shown in perspective in Fig. 1 and side view in Fig. 2, controls the current perfectly, and proportionates it so accurately to the work to be done that it makes no difference whether there are fifty lamps in the circuit or only one, the current in the single lamp when used alone being the same as it is when the lamp is associated with forty-nine others in the same circuit.

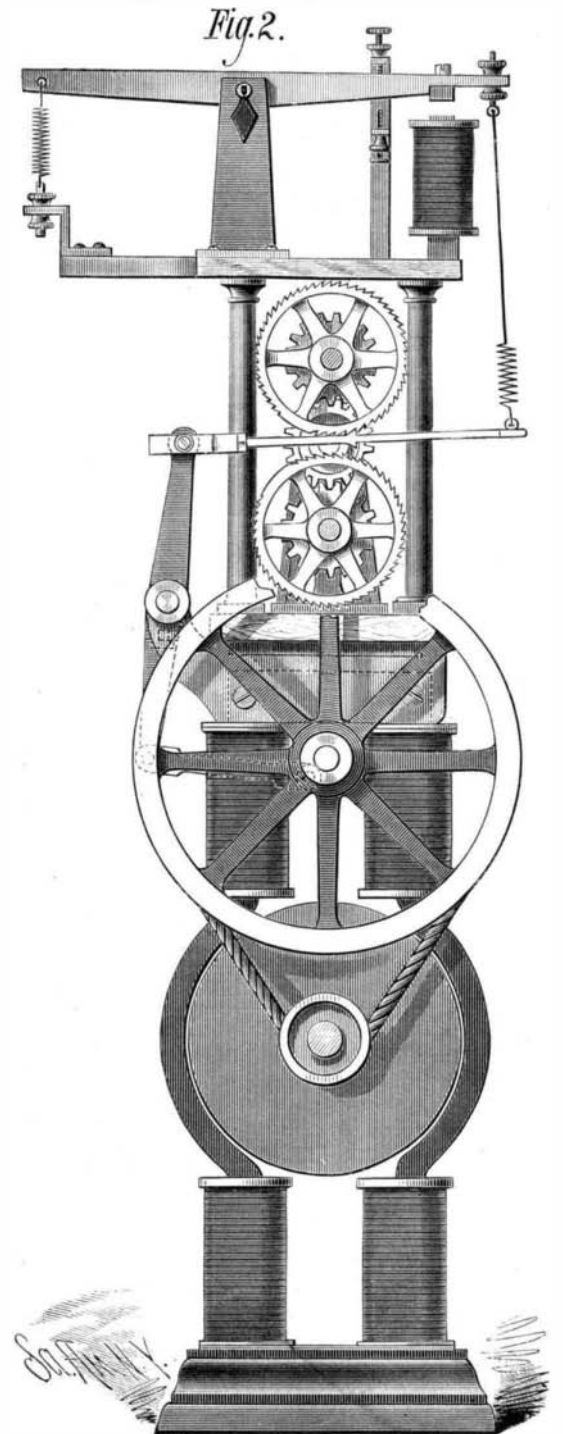
The manner in which this wonderful result is secured will be apparent on studying Figs. 1 and 2. In an electric lighting station, where a number of large machines like that shown in Fig. 3 are used, the field magnet of each machine will be excited by a small dynamo machine like that shown in connection with the current regulator in Figs. 1 and 2, and the strength of the current generated by the large machine depends on the degree of excitation of its magnets. If a strong current is desired the field magnets are strongly magnetized by their inclosing helices. If a very weak current is desired the magnets are but slightly excited, and the strength of the current may vary anywhere between these two extremes.

The commutator brushes of the exciting machine are arranged to swing on a bearing concentric with the commutator cylinder, so that by turning the brushes around to the neutral points the current is nil, and by turning it back nearly to the central position between the neutral points the current is the strongest that can be obtained from the machine. The current regulator is influenced by the current proceeding from the large machine and controls the mechanism which moves the commutator brush of the small machine, in this manner regulating the excitation of the mag-

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MAXIM'S CURRENT REGULATOR.



RECENT DEVELOPMENTS IN ELECTRIC LIGHTING.

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nets of the large machine, and consequently controlling the current in the external circuit.

On the top of the magnets of the exciting machine there is a platform supporting a train of gearing, consisting of two ratchet wheels mounted on shafts carrying spur wheels which mesh into an intermediate wheel connected with the pivotal support of the commutator brushes by bevel gearing and a vertical shaft. The ratchet wheels are a short distance apart, and between them there is a double faced pawl, which is capable of engaging one or both of the ratchet wheels, or of moving between them without touching either. This pawl is reciprocated by an oscillating shaft at the rear of the magnet, which takes its motion from a small crank on a shaft above the armature and between the helixes of the magnets. The crank shaft receives a comparatively slow rotary motion from the shaft of the armature.

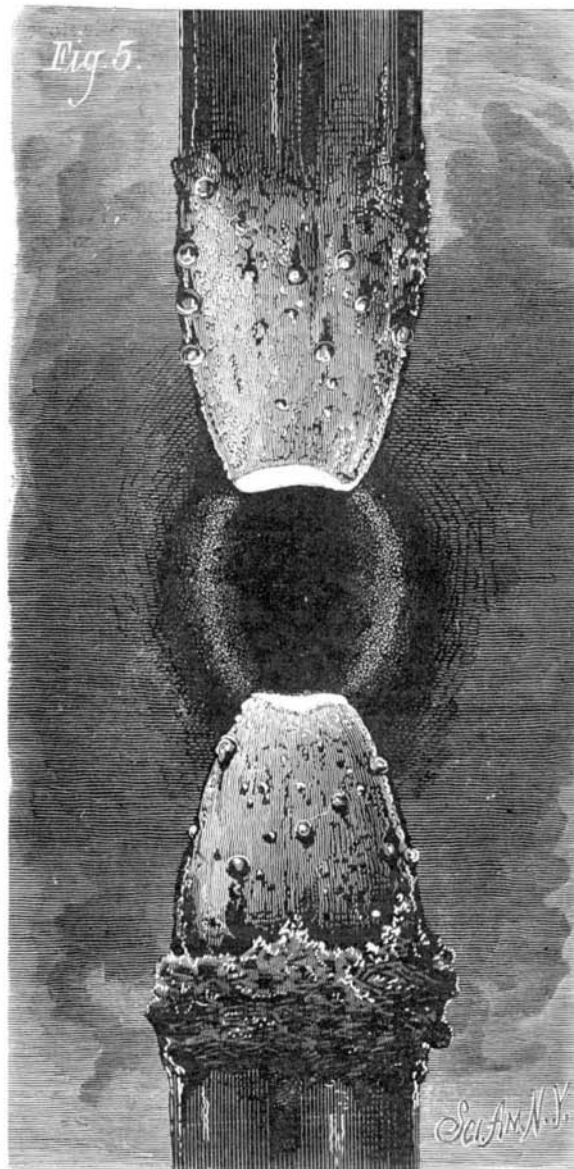
Above the ratchet gearing there is a table supported by pillars from the platform, and upon this table near one side there is an electro-magnet of high resistance, which is connected with the circuit wires, and is influenced by the current in the same manner as the incandescent lamps, which are connected in multiple arc. An armature is suspended above the electro-magnet by a nicely pivoted scale beam, and the downward movement of the armature is opposed by an adjustable spiral spring at the opposite end of the scale beam. The excursions of the scale beam are limited by stop screws in a vertical post near the electro-magnet. The end of the scale beam is prolonged beyond the armature to receive a rod, by which it is connected with the elongated end of the oscillating pawl playing between the ratchet wheels. The rod which connects the scale beam and the pawl is rendered elastic by the insertion of a short piece of spiral spring, to admit of the free action of the pawl in catching the teeth of the ratchet wheels. When the strength of the current is augmented by the removal of several lamps from the circuit, the armature of the regulator magnet is drawn down, permitting the pawl to engage with the lower ratchet wheel, which is turned one notch at a time until the commutator brushes are moved, so as to reduce the exciting current, and consequently diminish the current in the lamp circuit. Should the current diminish beyond the normal strength the armature is released, the spring moves the scale beam, bringing the pawl into engagement with the upper ratchet wheel, when the result will be opposite to that just described.

The incandescent lamps, in connection with which this regulator is more especially intended to be used, are connected in multiple arc; that is, they are connected across two parallel wires, so that the current is divided up between all of the lamps in the same circuit. Now, it is obvious that, when a number of the lamps are removed the current would, under ordinary circumstances, be much stronger in the lamps that are allowed to remain in the circuit, but when the regulator is applied there is no perceptible difference in the light given out by the lamps, whatever may be the number in circuit.

As many as sixty-four lamps have been brought up to over thirty candle power each in a single circuit by the machine shown in Fig. 3, and the lamps have been removed from the circuit until only one remained and then all replaced, the regulator meanwhile adapting the current perfectly to the widely varying conditions.

The incandescent lamp shown in Fig. 4 consists essentially of a glass globe containing an attenuated atmosphere of hydrocarbon vapor, in which is placed the carbon conductor, which is rendered incandescent by the electric current. The conducting wires, instead of being fused into the glass of the globe, are surrounded with a semi-elastic cement, which is capable of withstanding both heat and pressure. This cement insures a perfect and durable joint between the platinum elec-

trodes and the glass. It is estimated by Mr. Maxim that the large dynamo-machine will supply a current to 200 of these incandescent lamps. The machine certainly has great power, and generates what might be called



THE ARC ELECTRIC LIGHT.—CARBONS, NATURAL SIZE.

a giant current, which is capable of heating eighty feet of No. 9 iron wire to incandescence, and of maintaining a 10 inch arc between two 1 1/4 inch carbons, shown in Fig. 5. The light from these carbons when one inch apart is simply immense, and the heat is like that of a blast furnace.

Mr. Maxim's interests are identical with those of the United States Electric Light Company, of this city, whose offices are located at 120 Broadway. This company is doing a great deal toward the introduction of the electric light in all forms, and have recently established a central station in the vicinity of Madison square, from which several radiating wires extend to public buildings in that locality. We hope at an early day to be able to chronicle the introduction of the small electric lamp into offices, stores, hotels, and private dwellings.

MISCELLANEOUS INVENTIONS.

Mr. George E. Eastman, of Muskegon, Mich., has patented a vehicle seat, whose ends and back are joined together with angle irons that enter corresponding vertical corner slots; the seat frame is mitered and secured in place by metallic plates, that are blind slotted into the corners.

Mr. Charles R. Kinehan, of Springfield, Ill., has patented a simple device for more readily and accurately circling and leveling the hair springs of watches. It consists of a sliding and rotating rod holding the spring, and fixed adjustably in a vertically adjustable stud or pillar that is connected with the top plate of the watch.

Mr. Enos G. Boughton, of Pittsford, N. Y., has patented an improved drying apparatus for drying substances such as fruits, vegetables, hops, meats, etc. The moisture is evaporated from such materials with dry air at ordinary temperature without the application or use of artificial heat, so that the natural flavor of the fruit is preserved.

An improved attachment for the key boards of musical instruments has been patented by Mr. Christopher C. Reynolds, of Kelseyville, Cal. The invention consists in a series of levers pivoted adjacent to each other in such a manner that they can be acted upon by a moving sheet which has the notes cut out or raised, and passes between two feed rollers, which draw it under the lower ends of the above-mentioned levers, having a cord or wire attached to the upper ends, the said cords or wires passing over or through suitable bridges, and being attached to the upper ends of a series of fingers resting on the keys of the instrument. By means of a crank the feed rollers are rotated, thus moving the music sheet as is necessary, and at the same time a roller arranged adjacent to and parallel with the row of fingers is rotated in such a manner as to assist in depressing the fingers, thereby relieving the music sheet from undue strain.

Mr. Philip B. Bicknell, of Lincoln, England, has patented an improved dark lantern for the use of policemen, watchmen, and others. It is an improvement on that general form of lantern which is constructed with a rounded front side and a flat or slightly concave rear side adapted to lie against the wearer, and in which the front portion is hinged to a back plate attached to the waist belt, so that the front portion may fold outwardly with the lamp to give access to the latter.

A closet or safe, which may be concealed in a wall and provided with secret devices for giving entrance thereto, has been patented by Mr. Nicholas Huetter, of Kenosha, Wis. The invention consists in a box fitted with a hinged cover that is held closed by sliding catches, and thrown open by a spring when released, and having combined with it a rockshaft and crank lever for operating the catches.

Mr. Humphrey J. Williams, of New York Mills, N. Y., has patented a carpenter's bench hook that can be easily set in position, adjusted, and removed. The invention consists, essentially, of a tubular shell carrying a toothed plate on its top, set at right angles thereto, the shell being longitudinally divided into two sections that inclose an eccentric rod or screw, by means of which the sections are spread apart.

An improved vehicle spring brace has been patented by Mr. Charles A. E. Simpson, of Portsmouth, Ohio. The invention relates to means for preventing lateral

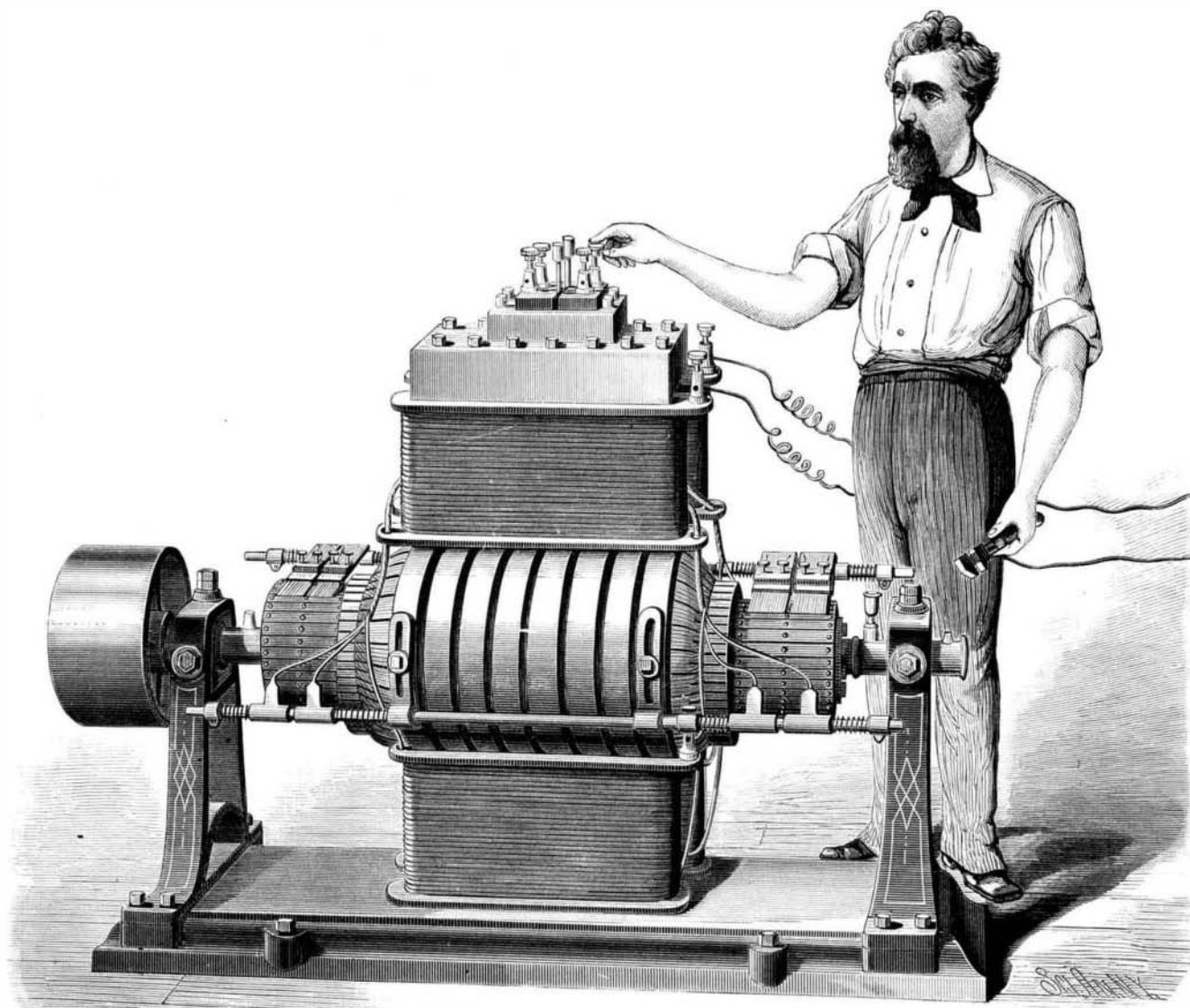


Fig. 3.—MAXIM'S DYNAMO-ELECTRIC MACHINE.