SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXV.—No. 4.] ESTABLISHED 1845. NEW YORK, JULY 25, 1891. [$3.00 A YEAR. WEEKLY.

EDISON DYNAMO AND MOTOR.

The SCIENTIFIC AMERICAN has repeatedly given detailed descriptions of small dynamos and electric motors copiously illustrated with first class engravings. These articles have enabled many mechanics and amateurs to construct machines which have proved more or less satisfactory, according as the work has been well or poorly done.

It is one thing to make a dynamo or motor from explicit instructions and quite another thing to design a machine adapted to generate or be operated by a particular current. The former is purely mechanical and within the range of most machinists and amateurs, while the latter is entirely within the province of the electrical engineer or electrician. When the work of machine building proceeds simultaneously with the study of fundamental principles, real progress is made. For the benefit of those who proceed in this way, and in answer to many inquirers, we give a detailed description of an Edison .25 kilowatt machine, designed for use as a dynamo for supplying a current for five Edison standard lamps, or for use on the Edison circuit as a quarter horse power motor.

Before beginning the description of the machine it is but fair to say that it is thoroughly well made in every particular. The insulation in every part is very perfect, and the whole is so well made that any single machine built by a mechanic or amateur could but suffer by comparison with it; and furthermore, we doubt if any maker of a single machine could even purchase the materials required for the price asked for the machine by the regular manufacturers. Therefore, if the machine is wanted, we advise a purchase. If experience is wanted, the making of the machine comes first in order, with a probable purchase to follow.

The engravings are one-third the actual size, linear measurement.

The base, which is of brass, is made hollow, as shown. It is 14 in. long, 7⅜ in. wide, 1¾ in. deep at the ends, with two 1⅛ in. elevations at the middle for receiving the cast iron pole pieces of the field magnet, which are each secured to the base by two small tap bolts extending upwardly through the base and into the pole pieces.

The upper surfaces of the pole pieces are truly faced for receiving the cylindrical field magnet cores, which are made of Swedish iron, 2⅝ in. in diameter and 4½ in. long. These magnet cores are each held in position by a threaded stud screwed into the pole piece and entering magnet core. Each core is provided with a vulcanized fiber collar at each end, which is ¼ in. thick and ⅞ in. wide. Upon each core, and between the fiber collars, is wound 5¼ lb. of No. 24 silk-covered copper wire, with a wrapping of thin varnished paper between the layers. The cores, before winding, are thoroughly insulated with the same material. The fiber collars are each held in place by three conical-headed screws entering the end of the core, with their heads projecting beyond the body of the core. To the inner and outer ends of the winding of each arm of the magnet are attached pieces of larger wire to avoid breakage, and the inner ends are led out through grooves in the fiber collars. The yoke, of Swedish iron, is 2⅝ in. wide, 2⅛ in. thick and 7½ in. long. It is held in position on the cores by two ½ in. bronze studs, each threaded at the upper and lower ends, and furnished with a collar which fits into the counterbored part of the hole in the yoke. The studs are squared at the upper end to receive a wrench, and a nut is placed on each stud above the yoke for clamping it securely after adjustment. The machine is regulated or adapted to any work requiring less than its full power by raising the yoke more or less. The yoke is provided with an eye, by means of which the machine may be lifted.

Front and rear boards of mahogany are arranged on opposite sides of the yoke, and held in place by brass plates at the ends.

The outside ends of the field magnet coils are connected with binding posts on the rear board.

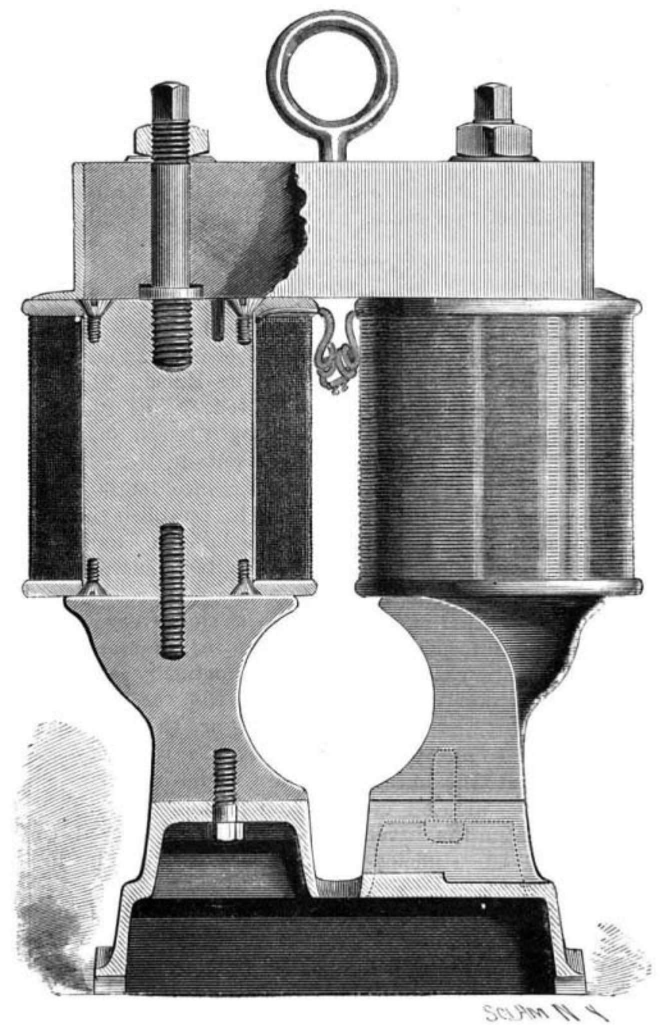
A variable resistance of ten or fifteen ohms is inserted between these posts when the machine is used as a dynamo. In the front board, at the right hand side, is secured a bronze casting known as the right hand motor head field magnet terminal. This is adapted to receive the line wire, also one of the leads, the upper end of which is screwed to the casting. The lower end of the lead is secured to a lead terminal attached to a block of wood secured to the right hand pole piece. At the right hand side of the machine a similar arrangement of the lead is found, but the upper lead terminal is made in two separate parts, one attached to the lead, the other being connected with the line; both being furnished with copper switch tongues. The switch arm turns on a stud projecting from the front board and carries a loose triangular switch plate of copper, having a knife edge which readily enters between the switch tongues. The switch has a T-handle of hard rubber, by means of which it is turned. A stop pin projecting from the front board limits the rearward movement of the switch arm.

The inside end of the right magnet coil is connected with the right hand lead, and the inside end of the left hand magnet coil is connected with the lower half of the left hand lead terminal.

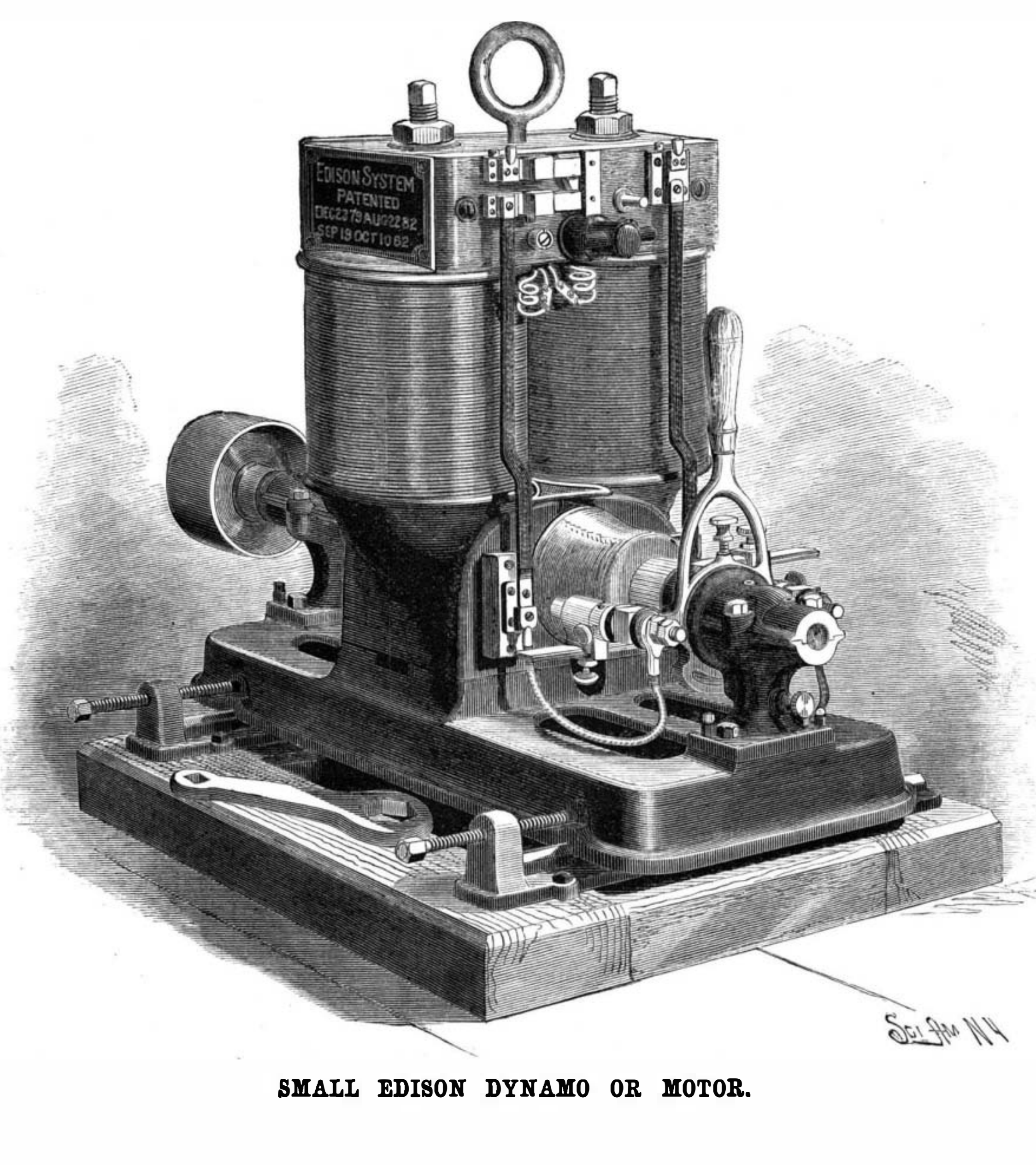
At opposite ends of the base there are plane surfaces to which are secured the self-oiling bearings of the armature shaft. Each bearing has a hollow standard furnished with a cap, which, together with a cross piece in the hollow standard, forms a support for the spherical central portion of the bronze sleeve forming the journal box proper.

This sleeve is shorter than the outer portion of the bearing, and is slotted across the top to allow two brass rings to ride upon the armature shaft. These rings dip in the oil in the hollow standard, and as they revolve carry oil to the shaft in quantities more than sufficient for the purpose of lubrication. The oil is distributed throughout the bearing by means of spiral grooves formed in the inner surface of the journal box. The surplus oil drops back into the hollow standard. A screw plug in the lower portion of the standard

(*Continued on page* 54.)



SIDE VIEW OF FIELD MAGNET, PARTLY IN SECTION.



SMALL EDISON DYNAMO OR MOTOR.

EDISON DYNAMO AND MOTOR.

(*Continued from first page.*)

allows of the renewal of the oil. The bearings at opposite ends of the machine are alike, except that the cast iron support of the bronze journal box, at the commutator end of the armature, is turned on its inner end to receive the brush yoke.

(*To be continued.*)

How to Protect Sun-Dried Brick Walls.

A missionary in Africa writes as follows in *Regions Beyond*:

"When we came to Lolongo, the first permanent building we attempted was of clay with a palm leaf roof, but before it was finished we found that far more time, trouble, and attention was needed for this kind of house than for one of brick. I am now firmly convinced, from experience, that to put up clay buildings is a great waste of strength and energy. Personally, I have resolved never again to attempt them.

"I am now writing this within comfortable brick walls, but before we could enjoy these we were obliged to exercise patience till a sufficient number of bricks were ready with which to start building. With bricks in readiness, a house like this could be easily erected and made fit for habitation in three months.

"Now these bricks are only sun-dried, and, where exposed, would suffer very considerably from the effects of tornadoes, were it not that we have discovered a means by which to protect them from wind and rain. The walls outside are plastered with a preparation of river sand and clay to the height of 4½ feet, but this would be little better than useless were it not painted with palm oil, which renders the surface impervious to water. Several months of experience have proved that the use of this simple discovery renders the plaster of which I speak almost as hard and as serviceable as English cement."

Stephen Grey, the Founder of Electrical Science.

A. D. 1720.—Grey, or Gray (Stephen), a pensioner of the Charter House and Fellow of the Royal Society, makes known through his first paper in the *Phil. Trans.* the details of the important line of investigation which finally led to the discovery of the principle of electric conduction and its insulation, as well as to the fact, not the principle, of induction (see Æpinus, A. D. 1759). *Thus, to Grey is due the credit of having laid the foundation of electricity as a science.*

He shows that electricity can be excited by the friction of feathers, hair, silk, paper, linen, etc., all of which attract light bodies even at a distance of eight or ten inches. He next discovers that electricity can be communicated from excited bodies to bodies incapable of excitation. When first suspending a hempen line with pack threads he could not transmit electricity, but when suspending the line with silken threads he transmitted the electrical influence at distances of several hundred feet. The latter he did at the suggestion of his friend Granville Wheeler—Wheler—(not Checler, as Aglave et Boulard have it in *Lumiere Electrique*, p. 20), thinking that "silk might do better than pack thread on account of its smallness, as less of the virtue would probably pass off by it than by the thickness of the hempen line which had been previously used." They afterward tried experiments with longer lines of pack thread, but failed, as they likewise did after substituting thin brass wire for the thread. This showed the insulating property of silk and led to the discovery of other insulating substances, like hair, resin, etc. During the months of June, 1729, and August, 1730, Grey and Wheeler succeeded in transmitting electricity through pack thread supported by silken cords a distance of 765 feet, and through wire at a distance of 800-886 feet.

Grey demonstrated also that electric attraction is not proportioned to the quantity of matter in bodies, but to the extent of their surface. He likewise discovered the conducting powers of fluids and of the human body. Of the cracklings and flashes of light he remarks: "And although these effects are at present but *in minimis*, it is probable, in time, there may be found out a way to collect a greater quantity of the electric fire, and consequently to increase the force of that power, which by several of those experiments, if we are permitted to compare great things with small, seems to be of the same nature with that of thunder and lightning." (*Phil. Trans.*, abridged, vol. viii., p. 401.)

Stephen Grey may be said to have continued his experiments while lying upon his death bed, for, unable to write, he dictated to the last, as best he could, the progress he had made in his studies to Dr. Mortimer, the secretary of the Royal Society. (*Phil. Trans.*, 1735-1736, vol. xxxix., page 400.)

Grey's own description of a new electric planetarium

SWITCH ON THE EDISON DYNAMO OR MOTOR.

deserves reproduction here: "I have lately made several new experiments upon the projectile and pendulous motions of small bodies by electricity; by which small bodies may be made to move about larger ones, either in circles or ellipses, and those either concentric or eccentric to the center of the large body about which they move, so as to make many revolutions about them. And this motion will constantly be the same way that the planets move around the sun, viz., from the right hand to the left, or from west to east. But these little planets, if I may so call them, move much faster in their apogeon than in the perigeon part of their orbits, which is directly contrary to the motion of the planets around the sun." To this should be added the following description of the manner in which these experiments can be made: "Place a small iron globe, of an inch or an inch and a half in diameter, on the middle of a circular cake of resin, seven or eight inches in diameter, greatly excited; and then a light body, suspended by a very fine thread, five or six inches long, held in the hand over the center of the cake, will, of itself, begin to move in a circle around the iron globe, and constantly from west to east. If the globe is placed at any distance from the center of the circular cake, it will describe an ellipse, which will have the same eccentricity as the distance of the globe from the center of the cake. If the cake of resin be of an elliptical form, and the iron globe be placed in the center of it, the light body will describe an elliptical orbit of the same eccentricity with the form of the cake. If the globe be placed in or near one of the foci of the elliptical cake, the light body will move much swifter in the apogee than in the perigee of its orbit. If the iron globe is fixed on a pedestal an inch from the table, and a glass hoop, or a portion of a hollow glass cylinder, excited, be placed around it, the light body will move as in the circumstance above mentioned, and with the same varieties."—*Electrical World.*

The Folly High Pressure Pipe Coupling.

A patent has recently been granted Mr. Cornelius A. Folly, of No. 699 East 138th Street, this city, for an improved high pressure screw coupling for pipes. It is especially applicable to ammonia ice machines, steam, gas and air joints, or to hydraulic systems, and all devices requiring tight joints under high pressures. The joint is similar to an ordinary screw coupling, except that a groove is cut around the inner periphery of the female screw, into which a ring or collar of lead is run. This is formed upon a mandrel of slightly smaller size than the coupling, so that the lead projects a very little beyond the thread of the joint. A small hole, with a thread cut upon it, is made through the exterior of the coupling into the lead-filled groove. A screw plug stops the hole. If now a pipe is screwed into the coupling, it will expand the leaden packing, causing it tightly to fill the screw threads. In case of any sweating or leakage when under pressure, the leak is at once stopped by turning the screw plug. We have seen a number of the Folly joints subjected to the enormous pressure of 5,000 lb. to the square inch without leaking. This was as far as the gauge used would allow. How much higher pressure the joint will stand has yet to be ascertained. On starting a leak purposely when under great pressure, a turn of the small compressing screw at once stopped the leak. The great value, convenience and utility of this simple appliance in the case of ice machine pipes or other high pressure pipes is obvious.

Executions by Electricity.

The new law of the State of New York, for the execution of criminals by the electrical current, instead of by hanging, was enforced for the second time on the 7th of July, upon the bodies of four murderers. The execution took place at the Sing Sing State prison. The death in each case was instantaneous and painless. There can be no question of the superiority of this mode of inflicting the death penalty over the rope system. The attending surgeons were two eminent doctors, namely, Dr. Carlos F. MacDonald and Dr. Samuel B. Ward. In their official report to the warden, they give the following particulars:

"First—All of the condemned walked into the execution room unrestrained, with firmness and without assistance, seated themselves in turn in the electric chair without the slightest protest or resistance, and quietly submitted to the adjustment of the retaining straps and the electrodes.

"Second—In each case unconsciousness was produced instantaneously by the closure of the circuit, was complete, and persisted without interruption until the heart's action had entirely ceased and death had certainly occurred. In each case death was manifestly painless.

"Third—In compliance with the statute, an autopsy was made in each case, as soon as practicable, by Dr. Ira T. Van Giesen, of New York, in our presence and under our supervision, with the result of revealing the same gross changes in the blood and tissues previously observed in cases of death by the action of strong electric current.

"In concluding, allow us to congratulate you on the completeness, in all their details, of all your preliminary arrangements, on the uniform good order and decorum which prevailed during the trying ordeal, and on the resulting demonstration of the rapidity and painlessness of this method of inflicting the death penalty. The experience of to-day has proved to our satisfaction that this method is superior to any other yet devised."

SIDE SECTIONAL ELEVATION OF DYNAMO.

THE earliest Connecticut patent found on record was granted in October, 1717, to Edward Hinman, of Stratford, for the exclusive right and liberty of making molasses from the stalks of Indian corn, in Fairfield County, for ten years, which grant ended with the words: "Always provided the said Hinman make as good molasses, and make it as cheap, as comes from the West Indies."