INTERESTING STATIC MOTORS.

BY HOWARD B. DAILEY.

The amateur worker in static electricity who possesses a good influence machine finds himself equipped with a source of much instructive entertainment for himself and scientifically inclined friends. To the experimenter any piece of accessory apparatus having novelty of design is always a welcome acquisition. The experiments possible with a six or eight plate Wimshurst machine, such as is described and illustrated in SCIENTIFIC AMERICAN SUPPLEMENT, No. 584, are of endless variety, and, when aided by suitable accessories and manipulative skill, luminous effects of great brilliancy and exceeding beauty may be produced. Such manifestations naturally appeal chiefly to the eye, but not less interesting to the student of physics is that class of experiments dealing with the conversion of mechanical energy into electrical and back again into mechanical energy in a manner readily perceived by the eye at a glance.

To demonstrate this principle, as well as to exhibit in a striking way the operation of electrical attraction and repulsion, the writer has devised two forms of static electrical motors. Fig. 1 is a small horizontal engine. At the ends of a vulcanite lever or walking beam are two wooden balls covered with gold leaf to give them a conducting surface. These play up and down between upper and lower sets of stationary brass balls.

The two upper balls, which are in metallic connection with each other, are supported above the walking beam upon four perpendicular glass pillars and are connected with one of the conductors of a static machine. The lower balls, which are not insulated, are given an earth connection through a binding post in the ebony bed frame of the engine. As the upper balls become charged through the action of the machine, their attraction causes the nearest of the two movable balls to rise within striking distance, when it receives a spark, thus becoming itself electrified, and is immediately repelled downward to one of the earth-connected balls, to which it yields up its charge. Being now in a neutral condition, it is again attracted upward. As the material separating the moving balls is an insulator, the action of each is independent of the other, one being repelled while the other is attracted. A reciprocating motion is thus given to the lever which is communicated to the flywheel shaft by means of a connecting rod and crank disk.

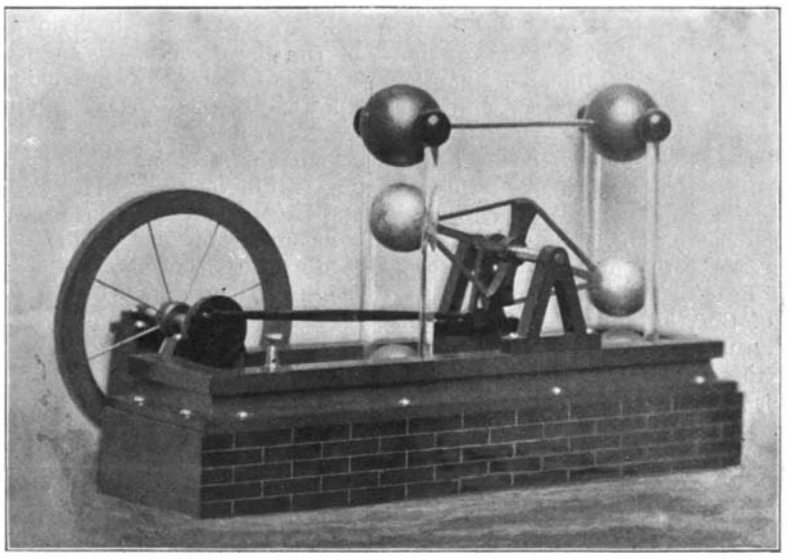


Fig. 1.—STATIC ELECTRICAL MOTOR—RECIPROCATING.

Since the attractive and repulsive force of static electricity is far from powerful, it is essential that machinery operated by it should be very light and freely running. To this end the moving balls, which are about 1½ inches in diameter, are made hollow and very thin, being turned in halves and glued together. The flywheel, which is of gilded wood, is very light and runs in pivoted bearings, as does the walking beam. This beautiful little machine, highly finished in all its parts, presents a very attractive appearance and runs at a rapid rate of speed; the click of the sparks as the swiftly flying balls charge and discharge themselves being strongly suggestive of the puffs of a steam engine. Watching the instrument in operation, an observer, unaware of the lightness of the moving parts, is impressed with the idea of considerable power, but is somewhat surprised to find that a sheet of note paper standing upon edge and leaning at a slight angle against the rim of the flywheel soon brings it to rest. Fig. 2 is a simple rotary motor. Into the hub of a horizontal spindle, whose indented ends receive pivot pointed screws passing through the tops of two upright brass standards, are inserted four slender vulcanite rods carrying at their outer ends gilded wooden balls. At the opposite sides of the instrument and very near to the revolving balls are placed two larger balls of polished brass, supported upon glass rods and connected respectively with the opposite poles of a static machine. The current being turned on, attraction and repulsion cause a rapid rotation of the spindle.

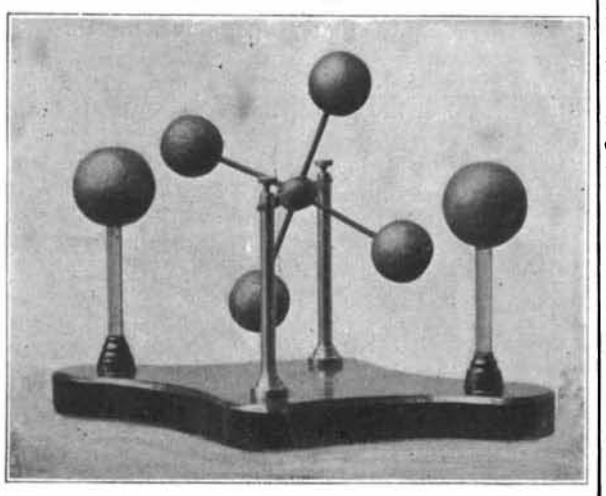


Fig. 2.—ROTARY ELECTRIC MOTOR.

This motor, from its continuous rotary action, is much the more powerful of the two, and has about it a sensitiveness and life that is wonderfully taking, while its appearance in the dark is highly interesting. Both these instruments run very satisfactorily either from a small influence machine or an ordinary frictional machine, furnishing an excellent illustration of the reappearance as mechanical energy of part of the power applied to the static generator after having been transformed largely into electrical energy.

IT is said, according to press reports, that in Stuttgart, Germany, all horse trucks and wagons are to be banished from the streets after a certain period of time. Stuttgart is the home of Herr Daimler.

MEASURING AND TESTING INSTRUMENTS USED IN THE MANUFACTURE OF NAVAL ORDNANCE.

(Continued from first page.)

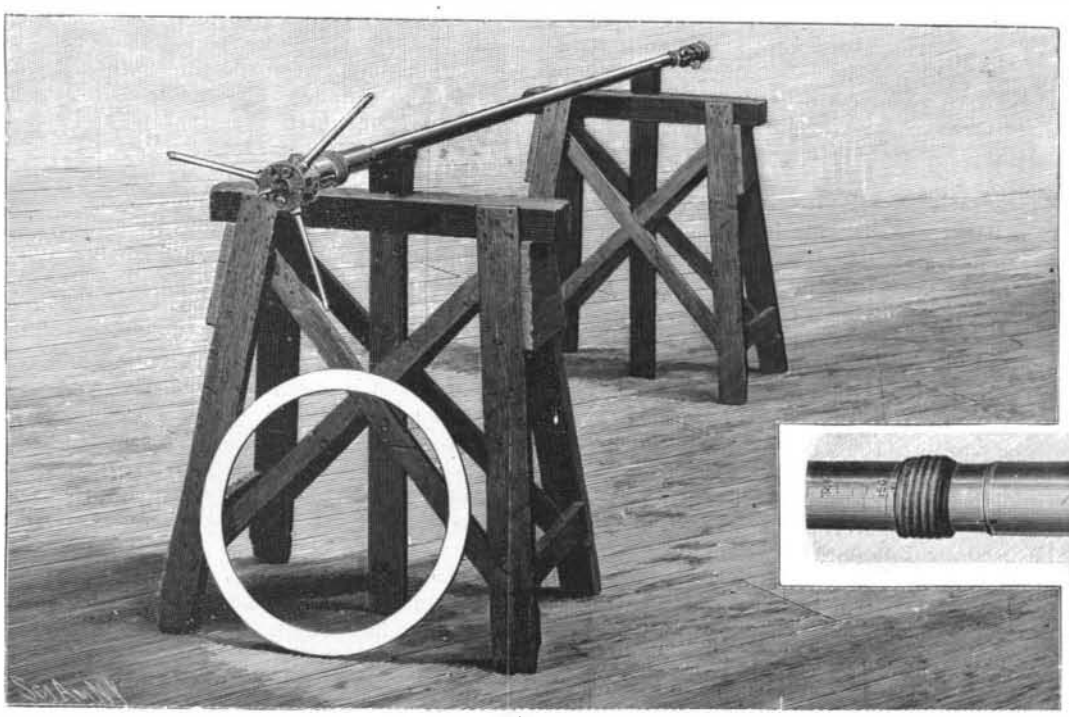
ciently different from that of other classes of machine shops to necessitate special appliances for performing and testing the various operations, and these appliances have been invented largely by the naval officers in charge of the work and have been constructed in the gun factory.

All measurements are given to the machinists in the form of steel rods, called "points," which are about ⅜ of an inch in diameter and of a length which corresponds to the desired measurement. The rod is rounded on the ends and is ground off on an oilstone to the exact length required, this length being determined in a measuring machine. The length of the rod is stamped on the rod in figures running to the third decimal place.

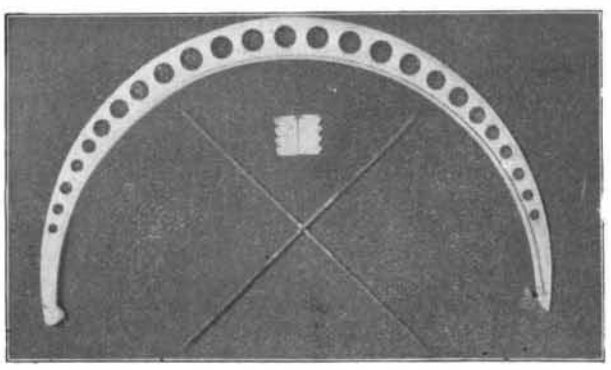
The measuring machine in which the length of the "points" is tested was invented and built in the Naval Gun Factory, except for the graduation of its scales. This machine has a bed 7 feet long, which is supported on a heavy wooden stand. The entire machine, including the bed, is machined all over. Two V-shaped guides are formed on the upper face of the bed. A fixed head is secured at one end of the bed between the guides, and an adjustable head is mounted on the guides. Each head has a hardened plate secured in the face which is opposite the other head, and it is between these plates that the measuring is done, and against them that the ends of the "points" rest. A scale plate, which is 67½ inches in length, and which was graduated by the Brown & Sharpe Company, is sunk in the beds between the two guides, and it is graduated with the utmost precision in hundredths of an inch.

The adjustable head consists of a rectangular box which is open at the top and bottom. It is held firmly down on the guides by two straps which fit over the upper edges of the sides of the head and which slide on guides formed on the sides of the bed. The under sides of these latter guides are at right angles to the side wall of the bed, while their upper faces are inclined downward toward the bed. Gibs carried by the straps, and held against the under sides of the strap-guides by setscrews on the straps, serve to prevent wobbling of the straps on their guides. Notches are formed in the strap-guides at intervals of half an inch, and bolts which are guided in vertical holes in the straps engage these notches and lock the straps. The upper ends of the bolts are pivoted to spring-pressed thumb-levers which are fulcrumed on the straps and serve to operate the bolts. Hand screws are carried by the straps, and they may be screwed against the strap-guides as an additional locking means for the former.

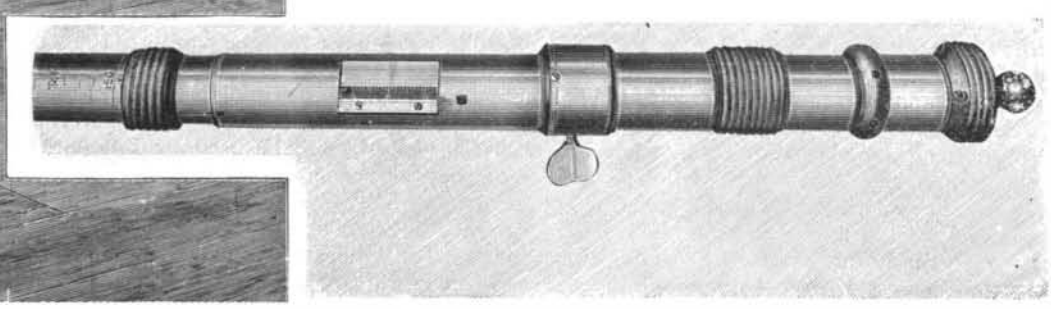
Screw shafts are journaled on the adjustable head, one on each side, so that they can have no longitudinal movement relatively to the head; and their threaded ends engage screw-boxes which are fastened to the straps. These boxes are split, and the cut is drawn together by a screw to compensate for wear. The threads on the screw shafts are very perfect and are cut forty threads to the inch. Each shaft, besides having a hand-wheel by which it may be turned, carries a bevel gear which meshes with a similar gear on a shaft that is journaled on the end of the adjustable head, so that the screw shafts are geared together.



Star Gage and Rind Gage.



Vernier Snap Gage, Templets and Crossed Points.



Handle of the Star Gage.

MEASURING INSTRUMENTS USED IN THE MANUFACTURE OF NAVAL ORDNANCE.