SCIENCE

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A SLOW-SPEED ELECTRIC MOTOR.

A NEW automatic low-speed electric motor, designe l by Frank A. Perret, electrician of the Elektron Manufacturing Company of Brooklyn, is shown in the accompanying illustrations, Fig. 1 being an end view, and Fig. 2 a section showing the magnetic circuit. It is of the multipolar type, and is designed to run at from 500 to 600 revolutions per minute. For special work the armature may be wound for a speed of 350 revolutions. While the speed is comparatively low, the machine is not heavy, as is the case of many motors designed for slow speed for special work.

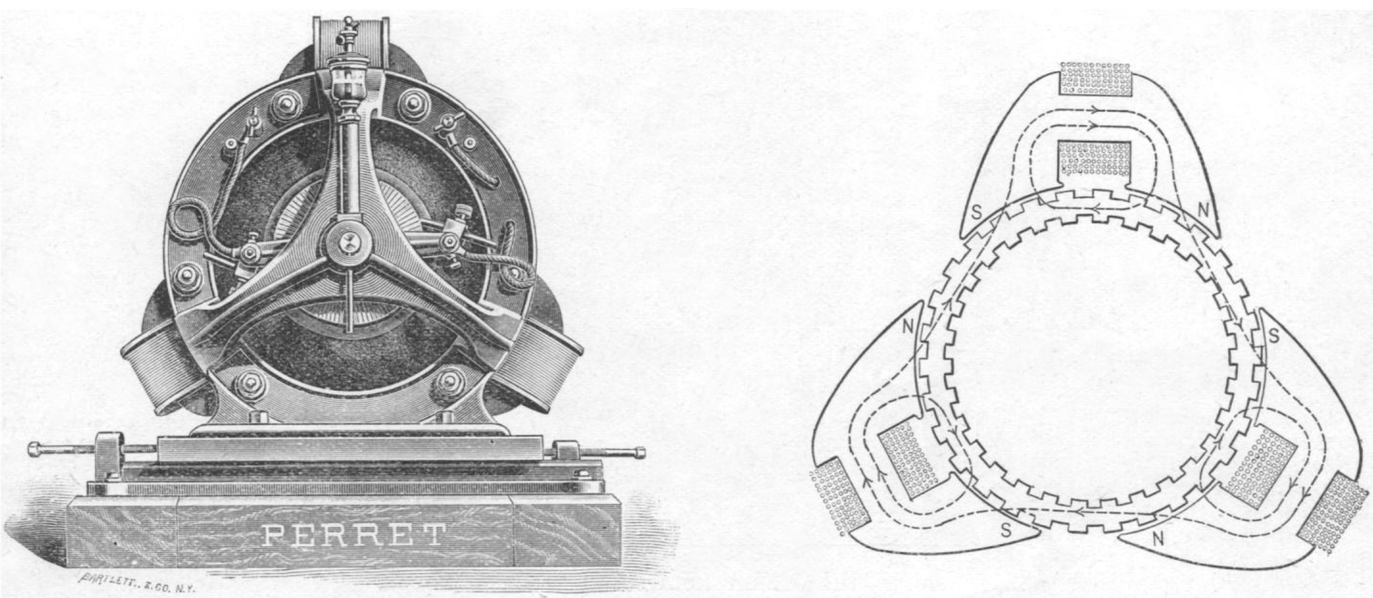
The practical advantages of low-speed motors are many. In ordinary machine-shops, wood-working shops, and printing-offices, for example, the shafting is commonly run at from 200 to 300 revolutions per minute; and it is a simple matter to belt directly to it from a motor running at 500 or 600 revolutions, thus dispensing with extra shafting and belting. These motors have recently been applied by direct gearing to pumps and to coal-cutting machines in mines, and also to the operation of coal-cutting machines by means of rope transmission from the motor to the cutter. Their slow speed also makes them well fitted for the direct driving of large exhaust fans and blowers, and for operating hoists and travelling cranes. In addition to the advantages of low speed in the special cases mentioned, there is, of course, a general advantage in the avoidance of the rapid wear and deterioration often connected with high speed.

These motors are built with a 6-pole field, and with armatures of large diameter. A powerful torque and great momentum of armature are secured, which are decided advantages when a heavy load is thrown suddenly on, as is often the case in elevator-work and hoisting.

These larger motors retain the distinctive feature of laminated field-magnets which were characteristic of the smaller Perret machines, as, it is claimed, the results secured would be practically impossible with any other construction. The armature is a ring of comparatively large diameter, with longitudinal channels on its periphery, in which the conductors are wound. They are thus embedded in the iron, which is in such close proximity to the iron pole-pieces that there is practically no gap in the magnetic circuit.

The field consists of three separate magnets, arranged at equal distances around the armature, each magnet having two pole-pieces, the winding being such as to produce alternate north and south poles. The magnets are built up of plates of soft charcoal iron, which are shaped as shown in the diagram, the magnet thus produced being readily wound in a lathe. A non-magnetic bolt passes through a hole in each pole-piece, and the plates are clamped together between washers and nuts. The bolts also serve to attach the magnets to the two iron end frames, which are of ring-shape, and are bolted to the bed-plates of the machine. The magnetic circuit is of unusually low resistance, by reason of its shape, its shortness, which is shown by the diagram, and the superior quality of iron used.

There is, it is claimed, no loss of magnetism in the frame or in the shaft of the machine, as the magnets are supported at some distance from the former by means of the non-magnetic bolts, and the armature is mounted on the shaft by spiders of non-magnetic metal. The whole machine is enclosed by a shield or case of sheet



FIGS. 1 AND 2.—PERRET MULTIPOLAR ELECTRIC MOTOR.

metal, as shown in Fig. 3, which is a perspective view of a motor, with sliding base and starting-box complete.

These machines are calculated to be equally efficient as dynamos, and are coming into use in many small isolated incandescent-light plants. For this purpose they are compound wound; and the regulation, it is claimed, is so perfect, that all but one lamp may be suddenly turned off without moving rheostat or brushes, and without noticeable change in the brilliancy of the remaining lamp.

THE LOUISVILLE TORNADO.

ONCE in a great while the whole world is startled by such an appalling catastrophe as the Chicago fire of 1871 or the Boston conflagration of 1872. Such disasters are entirely outside of the usual experience, and thus make a most profound impression. Of such a character are to be regarded the Grinnell (Iowa) tornado of April 17, 1882, and the more recent one at Louisville on March 27, 1890, in which 76 people were killed and $2,250,000 of property were destroyed. It might be thought that every tornado has exactly the same power, but does not show it because it does not happen to strike where it can do the most damage. To a certain extent we might argue in precisely the same way about a fire. Every fire, under such environments as mentioned above, would reproduce the terrible effects, but we find that the ordinary result of a fire is far different; and this is exactly the truth in regard to tornadoes. No two tornadoes are alike in their diameter or force. We may argue, however, that if two thousand tornadoes have produced one such as that at Grinnell, then we need not expect such a one again in about the same number, excepting as an increase in the size and frequency of towns in the tornado regions gives a more frequent opportunity for such accidents. This may also be said as true regarding the most serious fires.

Just preceding this tornado the atmospheric disturbance to the west and north-west of its development was unusually marked; so much so, that all the region in which the violent storms occurred were warned of their probable occurrence nearly twelve hours in advance by the Signal Office at Washington. The centre of the general storm at 7 A.M. (Central time), or twelve hours before the tornado, was in eastern Kansas, at which point the air-pressure was below 29.1 inches. At 7 P.M. this storm had moved rapidly to central Illinois, and just fifty-seven minutes later Louisville was struck and partly destroyed. This fact, that we have a chart of the meteorological conditions within an hour of this outburst, is very important. We find that the winds throughout the tornado region were from the south and south-east; and this current existed even up to the clouds, as we have determined in so many cases before. In fact, the whole circulation of the atmosphere was no whit different from that noted again and again in such general storms. The tornadoes were suddenly thrown into this atmospheric circulation almost without warning. The velocity of the general storm, moving nearly due east, was 38 miles per hour from 7 to 11 A.M. of March 27, 39 miles per hour in the next four hours, and 37 miles per hour in the four hours just

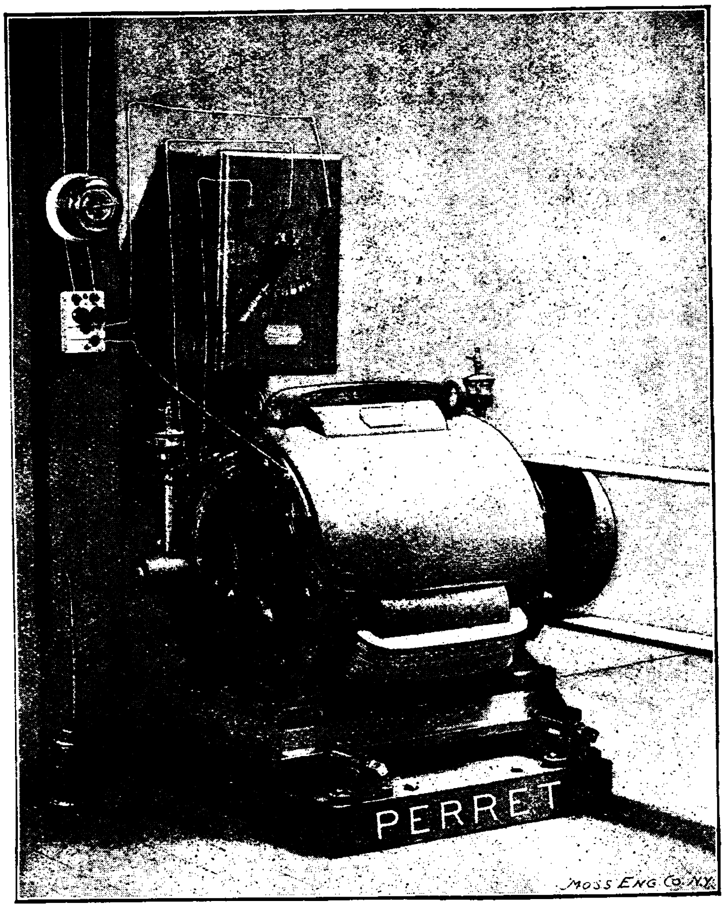


FIG. 3.—THE PERRET MULTIPOLAR ELECTRIC MOTOR.