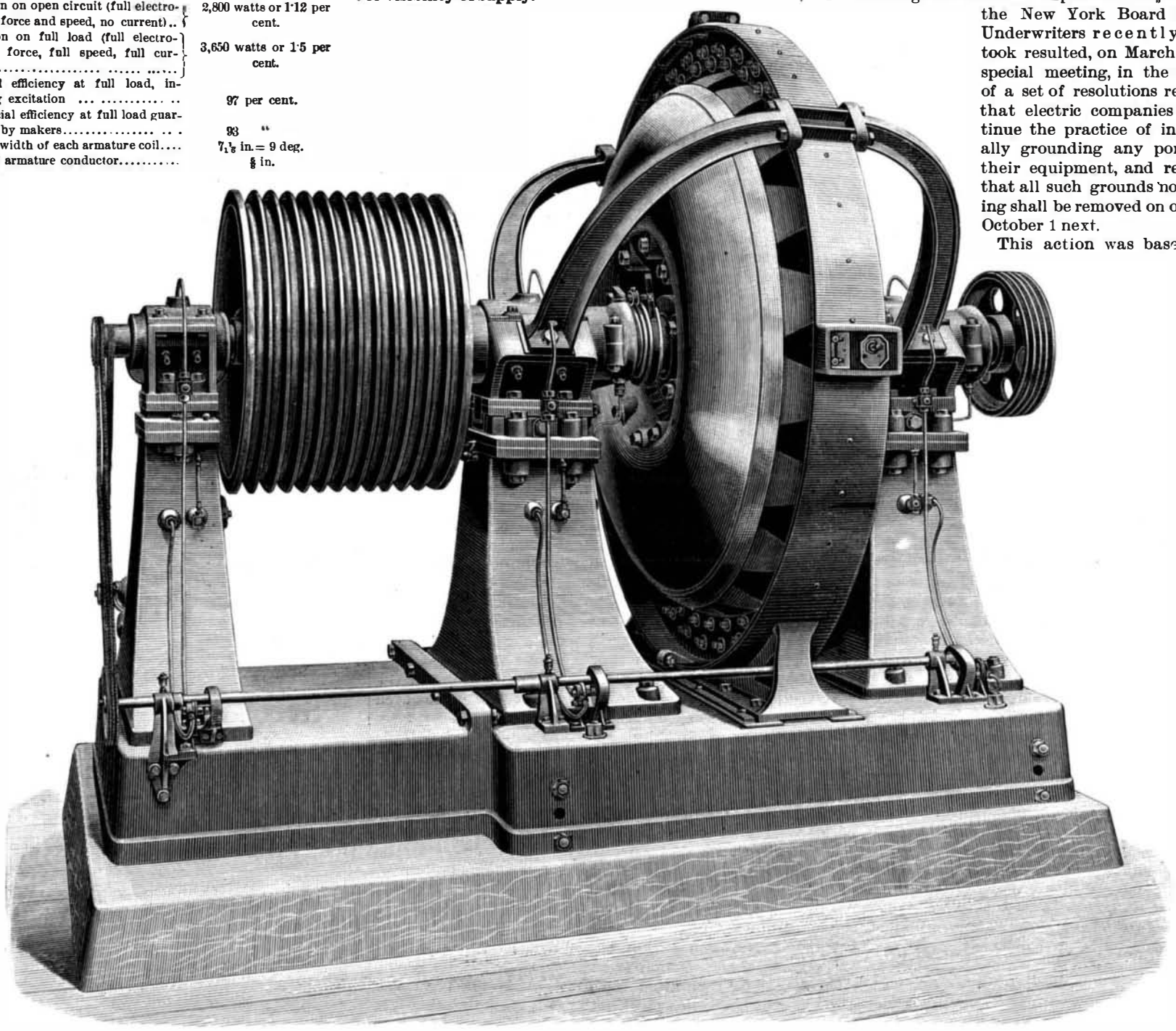
250-KILOWATT "MORDEY-VICTORIA" ALTERNATOR.

The Mordey-Victoria alternator was constructed by the Brush Electrical Engineering Company, Limited, of London and Loughborough, and is the size known as "A 20." This indicates that there are twenty polar projections on each side of the stationary armature of forty coils.

The following are the principal figures as to the size and performance of the machine:

Output	250 kilowatts = 335 E.H.P. at 2,000 volts.
Number of revolutions	300
Twenty polar projections, 40 armature coils	100 alternations per second.
Weight of revolving magnet and shaft complete	15 tons.
Weight of complete machine	20 "
Drop in volts between no load and full load	4½ per cent at constant excitation.
Rise in volts between full load and no load	5¼ per cent at constant excitation.
Increase of excitation (amperes) required to maintain constant electromotive force from 0 to full load	12 per cent.
Excitation on open circuit (full electromotive force and speed, no current)	2,800 watts or 1·12 per cent.
Excitation on full load (full electromotive force, full speed, full current)	3,650 watts or 1·5 per cent.
Electrical efficiency at full load, including excitation	97 per cent.
Commercial efficiency at full load guaranteed by makers	93 "
Greatest width of each armature coil	7,1⅛ in. = 9 deg.
Width of armature conductor	§ in.



THE MORDEY-VICTORIA ALTERNATOR.

The armature is fixed, the supporting ring being divided vertically. The whole ring, or either half, may thus be withdrawn very rapidly. Such withdrawal is, however, not necessary either for examination, cleaning, or repairs, as, owing to the peculiar construction of the field magnet, any and every armature coil is fully accessible without the removal of any portion of the machine. Even when the machine is at work, owing to the persistence of vision effect the whole of the armature is perfectly visible, as each coil is alternately covered and uncovered by the revolving magnet horns.

The existing current is supplied to the single coil of the magnet by a pair of collector rings (one ring on each end or side of the magnet), two brushes being arranged on each ring.

From the data given above it will be seen that the excitation is very small, and that the amount of variation of the excitation required to maintain constant electromotive force is also small, while even if the excitation is maintained constant (that is if no regulation is attempted), the electromotive force of the alternator varies only about five per cent, even if the full load is thrown on or off. These satisfactory features are common to all the alternators of this type, but we are informed that in none to quite so high a degree as in the machine under notice.

The lubricating arrangements deserve attention. There are three solid white metal bearings. Efficient and abundant lubrication is secured by means of force pumps. Each bearing pedestal forms a large oil reservoir in connection with which is a small force pump, the three pumps being driven by a light steel shaft running the length of the bedplate, and belted to the magnet shaft. Oil is thus delivered under pressure to the bottom of each bearing. There is a by-pass tube with cock, supplying oil also to the top. After circulating through the bearing, the oil finds its way from each end by a separate visible outlet, and then is conducted to a small gauze filter, so returning visibly to the reservoirs, which contain such a large quantity of oil that renewal is only necessary at long intervals. The amount of oil passing to each part of the bearing is readily observed, and by using a visible open return, instead of a visible feed, the advantage of a supply under pressure is secured, together with the advantage of visibility of supply.

Further, each bearing is provided with a water-jacket space with connections for the attachment of pipes if necessary.

It will be noticed that the machine is made for 100 complete alternations, this being the standard rate adopted in all the apparatus of the Mordey-Victoria system. Great convenience results from strict adherence to this rate, not only on account of the parallel working of the alternators, but in connection with the design and construction of transformers, arc lamps, impedance coils, and other accessories. We are indebted to *Engineering* for our illustration and the foregoing particulars.

The Baltimore Railway Tunnels.

When the new Belt Line tunnel is completed, Baltimore will have about five miles of railroad tunnels under its streets. The Pennsylvania tunnel connects its Philadelphia and Northern Central divisions with its southern line, and the Belt Line tunnel will join the Baltimore & Ohio's Philadelphia line with its Washington branch. The Pennsylvania tunnel has always been a great inconvenience to travelers, because of the stifling smoke and coal gas. Plans, however, have just been completed to ventilate it by electricity, the same method to be employed by the Belt Line. Powerful dynamos will furnish the currents. The ventilation will be accomplished by building a slanting subway, eight feet wide by sixteen feet high, from the side of the tunnel near its top to the foot of the ventilating stack. At the foot of the stack a huge fan, fashioned like the blades of a steam boat propeller, will be revolved, creating a strong draught toward the top of the stack. The vacuum created at the middle of the tunnel will cause the smoke and gas to be drawn from the ends of the tunnel to its middle and out at the top of the stack. The stack is to be 100 feet high and 18 feet square.

Does Grounding the Neutral Wire Increase Fire Hazards?

There exists a difference of opinion among electricians as to the advisability of grounding electric light wires. One party contends that such practice increases the fire hazard, while the other argues from the opposite standpoint.

The investigation into this important subject which the New York Board of Fire Underwriters recently undertook resulted, on March 10, at a special meeting, in the offering of a set of resolutions requiring that electric companies discontinue the practice of intentionally grounding any portion of their equipment, and requiring that all such grounds now existing shall be removed on or before October 1 next.

This action was based upon the report of Prof. Henry Morton, in answer to questions propounded by the Committee on Police and Origin of Fires, with reference to fire hazards from the grounding of electric wires, and particularly the middle or "neutral" wire in the Edison system.

Prof. Morton is emphatic in his utterances, and states that in his opinion grounding the middle wire decidedly increases the fire risk. On the other hand, the Edison Electric Illuminating Company, replying to Prof. Morton's report, states that "It is the general opinion of the Edison interest that while absolute insulation, if it can be had, is preferable [to the grounding of the neutral wire], the advantages of grounding the neutral wire under certain conditions, and particularly on large systems, are such as to make that practice in those cases the best working method, particularly as a precaution against fire risk."

According to the *Electrical Age*, the resolutions will be considered and acted upon at the next meeting of the board, and the result will be awaited with interest, as the interests involved are large and important.

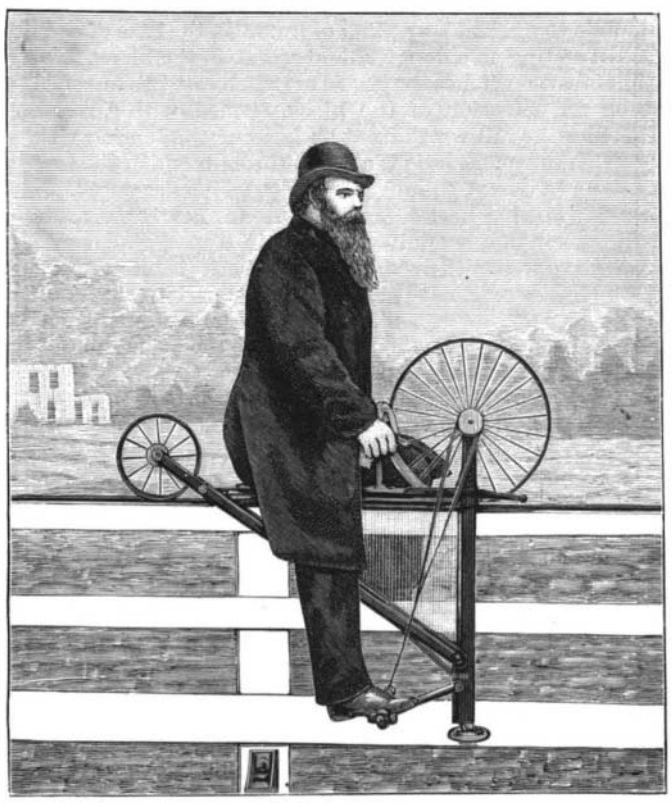
THERE is much truth in the remark of one who observed "The worst thing about the grip is that you are sick with it so long after you get well."

Epidemics—Influenza Due to Dust.

At a recent meeting of the Royal Meteorological Society, a paper on the untenability of an atmospheric hypothesis of epidemics was read by the Hon. Rollo Russell. The author is of opinion that no kind of epidemic or plague is conveyed by the general atmosphere, but that all epidemics are caused by human conditions and communications capable of control. In this paper he investigates the manner of the propagation of influenza, and gives the dates of the outbreaks in 1890 at a large number of islands and other places in various parts of the world. Mr. Russell says that there is no definite or known atmospheric quality or movement on which the hypothesis of atmospheric conveyance can rest, and when closely approached it is found to be no more available than a phantom. Neither upper nor lower currents have ever taken a year to cross Europe from east to west, or adjusted their progress to the varying rate of human intercourse. Like other maladies of high infective capacity, influenza has spread most easily, other things being equal, in cold calm weather, when ventilation in houses and railway cars is at a minimum, and when, perhaps, the breathing organs are most open to attack. But large and rapid communications seem to be of much more importance than mere climatic conditions. Across frozen and snow covered countries and tropical regions it is conveyed at a speed corresponding, not with the movements of the atmosphere, but with the movements of population and merchandise. Its indifference to soil and air, apart from human habits depending on these, seems to eliminate all considerations of outside natural surroundings, and to leave only personal infectiveness, with all which this implies of subtile transmission, to account for this propagation.—The origin of influenza epidemics was discussed by Mr. H. Harries. The author has made an investigation into the facts connected with the great eruption of Krakatoa in 1883, and the atmospheric phenomena which were the direct outcome of that catastrophe. He has come to the conclusion that the dust derived from the interior of the earth may be considered the principal factor concerned in the propagation of the recent influenza epidemics, and that, as this volcanic dust invaded the lower levels of the atmosphere, so a peculiar form of sickness assailed man and beast.

A RAIL FENCE BICYCLE RAILWAY.

A system of passenger travel is about to be put in operation between Mt. Holly and Smithville, N. J., by a company which has been organized to construct what is known as the Hotchkiss Bicycle Railway system. Each passenger furnishes his own motive power. The illustration will give, without any further detail, a good idea of the construction. The track rests upon a foundation of cross ties 3 × 6 in. by 3½ ft., which are placed at intervals of every 6 ft., and upon them rest wooden posts ordinarily 3½ ft. high. These are secured to the ties by bolts and angle irons. Narrow wooden stringers connect the posts, and the top stringer has a T-shaped rail fastened to it on which the bicycle runs. A special form of bicycle is required, although the ordinary saddle, handle bar and propelling mechanism are nothing new. The handle is not required for steering purposes, but is used simply as a means of convenience for the rider when in motion. The frame is double, extending down below the track rail on either side, a distance of 2½ ft., and has at the lower end a small guide wheel running horizontally, which serves to keep the machine in upright position, and absolutely prevents any possibility of jumping the track. The front wheel is the driving wheel, and is 20 in. in diameter, and like the other riding wheel is grooved to fit the rail. Two tracks will be constructed, so that the road may be operated in both directions at the same time. Side tracks will be placed at suitable intervals, at which the bicycles will be stored when not in use and at which point passengers can be supplied, leaving the machines at any station where they would wish to disembark.—*Street Railway Review.*



THE RAIL FENCE BICYCLE RAILWAY.

Overhead Rights.

Although any one may extend an overhead wire across or along a street, it does not seem generally known that no wire may pass over a house without the permission of the proprietor, even though the wire be in no way connected with the house. The owner may, if he pleases, take them all down, for his freehold extends from the center of the earth up to the sky. This is a principle that is not generally understood, but occasionally a householder is found who knows his rights and will not allow them to be infringed. Such a person was the landlord of a large boarding house on Beacon Hill, who made the electric light company provide bulbs for the lighting of his dining room in return for the privilege of stringing wires upon his roof. Few persons are so well posted in the law as to know what their rights are, and it is an object with large corporations to keep them in ignorance.—*Boston Courier.*

THE GREAT SUN SPOT OF FEBRUARY, 1892.

I have thought it would interest the readers of the SCIENTIFIC AMERICAN to have some photographic views of the great sun spot of February, 1892, good descriptions of which have already appeared. Quite a complete photographic record has been secured at this observatory of this great group of spots, from the time that it fairly rounded the sun's eastern limb, on February 5, to just before its disappearance, the last plates being taken on the morning of February 16. The photographs were made with an apparatus (constructed by the writer) attached to the 10 inch equatorial telescope. First, a view of the entire sun's disk is taken, four and one-half inches in diameter. These plates show the exact place of all spots upon the visible hemisphere. Then, usually, an enlarged view is taken, showing the more interesting spots in detail. The enlarged detail view is taken direct in the telescope, not copied from the smaller negative. It shows the group as it appeared on Feb. 16, as it was nearing the southwestern limb of the sun. The changes which have occurred in this interval will repay careful study. The rounded and darkened edge of the sun is well brought out. The lighter patches in the shading are immense fields of faculæ. The extreme length of this great group was about 150,000 miles and its width 85,000 miles.

THE GREAT SUN SPOT OF FEBRUARY, 1892.

WILLIAM R. BROOKS.

Smith Observatory, Geneva, N. Y., March, 1892.

ACCORDING to one of the French papers, electricity is in successful use at the gun factory at St. Etienne for tempering gun springs. The latter consist of steel wire which is wound spirally, and a current of 45 volts and 23 amperes is passed through it. Rapid heating results, and when the required temperature has been reached, the current is interrupted, and the spring is let fall into a trough of water. One workman can temper 2,400 springs per day by this method.

A Railroad from Cartagena to the Magdalena.

The construction of the Cartagena-Magdalena Railway deserves to rank among the most important rail road enterprises undertaken within the past decade in South America, by reason of the far-reaching results which will follow upon its completion. Its object is to connect the port of Cartagena with the Rio Magdalena by a line 52 miles in length, but to appreciate its importance the conditions affecting Colombian traffic must be reviewed.

The great centers of population in Colombia lie in the interior, with no outlet to the sea except by way of the Rio Magdalena. This remarkable river, flowing down from the mountains of Tolima, is navigable for vessels of 3½ feet draught, between 600 and 700 miles, into the very heart of the republic, and constitutes the artery of commerce between the outer world and the coffee and mining districts of Santander, Antioquia, Tolima, and Cundinamarca. Connection between the centers of production and the river ports is maintained by mule trains across the mountains, and yet in spite of these obstructions to free intercourse, the export and import traffic using the river amounts to 50,000 tons per annum. A further impediment to traffic is met at the mouth of the river, where the stream empties into the Caribbean Sea through a delta, whose several channels are obstructed by shifting sandbars, effectually precluding the entrance of ships.

Many years ago John C. Trautwine was employed by the Colombian government to attempt to control one of these channels, and other engineers have subsequently been engaged upon this problem, but all with negative results. In consequence of this the Bolivar Railroad was constructed from Barranquilla, on the Magdalena, to Salgar, an open roadstead on the Caribbean. More recently, a pier is being built at Puerto Colombia, about 2½ miles southwest of Salgar, and the railroad has been extended to that point. This, however, is also an open roadstead, and is a perilous point for ships during the prevalence of the "nor'westers" which frequently rage along this coast.

Cartagena, on the other hand, possesses a magnificent land-locked harbor, and in the colonial days was the port not only of Colombia, but of the entire western coast of South America as far as the northern confines of Chile. The products of the mines of Peru, of Ecuador, and of Colombia, came over the great mule road by way of Jaen, Cuenca, Quito, Popayan, and Quibdo, to Cartagena, whence they were shipped to Spain. By connecting a few creeks, lagoons, and bayous, the famous Canal del Dique was also constructed from Cartagena to the village of Calamar, on the Rio Magdalena, a shallow waterway which is still open for a few months of each year and diverts a small portion of the Magdalena traffic to this ancient port. It has long been foreseen that the advantages of the splendid harbor at Cartagena would inevitably restore this city to its former position as the port of Colombia, if it were connected with the Magdalena by a railroad. This is now to be done by a company of American capitalists who embarked in it at the instance of Mr. S. B. McConnico, formerly of the Illinois Central Railroad, who conceived the project, obtained concessions from the government, and had the preliminary surveys and estimates made which demonstrated its feasibility.

Two corporations have been formed to carry this work into effect, the Cartagena Terminal & Improvement Company, Limited, capitalized at $1,200,000, with J. Murray Forbes, president; S. B. McConnico, vice-president and general manager; Thomas R. Wheelock, secretary and treasurer; and W. D. Buckner, M. Am. Soc. C.E., chief engineer and superintendent; and the Cartagena-Magdalena Railway Company, capitalized at $1,800,000, and issuing six per cent mortgage bonds to an equal amount, with Thomas R. Wheelock, president; S. B. McConnico, vice-president and general manager; F. B. Beaumont, secretary and treasurer; and W. D. Buckner, chief engineer and superintendent. The full amount of capital needed to complete the road has been provided. Construction has already commenced, ten miles having been graded up to date.—*Railroad Gazette.*

Over Ninety-one Miles Per Hour.

Engine No. 385 of the Central Railroad of New Jersey broke all records of high speed on February 26, by running a mile in 39¼ seconds, or at the rate of 91·7 miles per hour. The engine is a Baldwin compound. In speeding this engine the first mile was made in 76 seconds, the second in 62, the third in 53½, the fourth in 45½, and the fifth in 39¼ seconds. The engineer reports that the engine was running fastest on the sixth mile, but it was not recorded on account of excitement which followed when the engine made this wonderful speed. Mr. Hoffecker, superintendent of motive power, informs the *National Car Builder* that he has every reason to believe the report correct, and that he has timed this engine himself while running a mile in 42 seconds. Four duplicates of this engine have been ordered.