Electrical Notes.

Referring to the low-frequency alternate current—25 per second—adopted at Niagara Falls, Mr. William Stanly, Jr., in a recent article in the *Electrical World*, shows that for the transmission of power the use of very low frequencies is not justified, and he intends to show why such a procedure is bad engineering from the transformer standpoint.

To sum up the virtues of high-frequency motors, we have, according to the author's calculations:

First.—A greater torque at all times for the material employed, and, consequently, a greater output.

Second.—A lower impedance armature and a lower inductance in the armature circuit, consequently for a given load a smaller armature current.

Third.—A smaller armature reaction and "blowing out" effect produced by armature reaction.

The experience at Pittsfield, where for fifteen months two-phased motors whose magnetizing currents are supplied from condensers have been in operation, is a sufficient proof of the practical operation of condensers. These motors are operating at 130 periods per second. They are connected to all classes of work, operating, as they do, a sawmill, a woolen factory, machine shops, a printing office, etc., and it has been found by actual observations of the voltmeter, in circuit on the consumers' premises, that the variation of potential due to changes of load and lag on the motors does not average 2 per cent of the voltage applied. The regulation of these circuits is as perfect as if they were simply operating lamps alone.

In order to carry off the heat generated in transformers working under a heavy load, Prof. Henry A. Rowland, of Johns Hopkins University, has invented a method employing a current of liquid led through the iron in tubes so placed as not to be cut by the lines of magnetic induction, the tubes and iron laminæ alternating with one another. Water or any other conducting liquid may thus be employed without interfering with the proper working of the transformer.

Another method employed by Prof. Rowland is to surround the transformer with a vessel containing a volatile liquid which, by boiling, carries away the heat. The vapor may be recondensed in the upper part of the vessel or carried off through a condensing coil and returned to the vessel in a liquid state. He also provides means for reducing the pressure in the vessel, in order that the liquid may boil at a low temperature.

To cool conductors carrying heavy currents, Prof. Rowland suggests making them hollow and passing a current of cooling liquid, such as water, through them from end to end, the liquid issuing in the form of spray to break the continuity of the stream, and thus insulate it from the vessel into which it flows.

Work has been begun on the Baltimore and Washington Electric Railway. The electric line will be only 32 miles long, while the Baltimore and Ohio's steam road is 40 and that of the Pennsylvania 42 miles in length between the two cites. Entrance has been secured both in Baltimore and Washington, and connection will probably be had in the former city with the Edmondson Avenue line of the Traction Company, which is to be converted into an electric railroad.

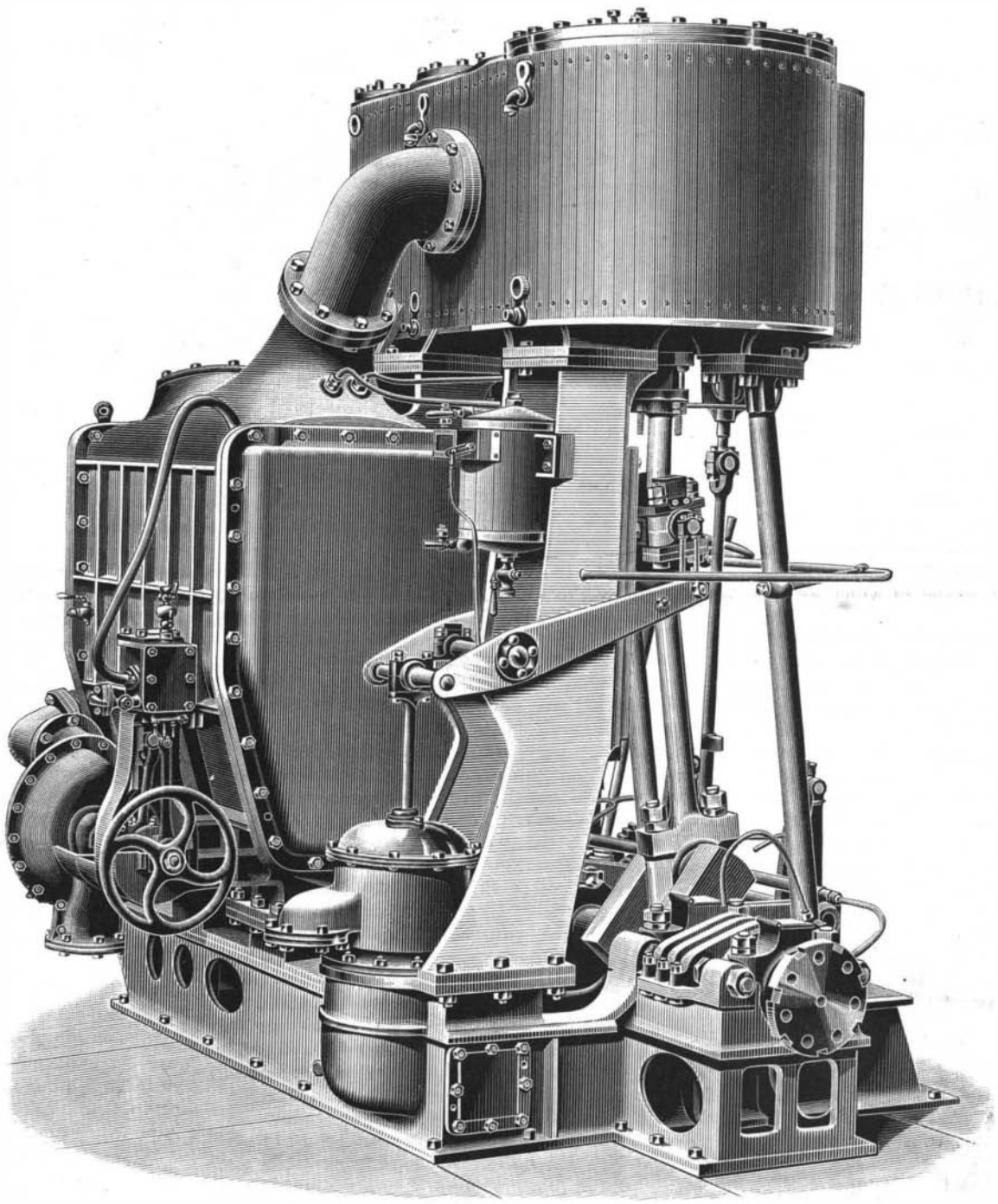
A trolley line connecting New York and Philadelphia will be built in the near future. Within the last few weeks arrangements have been made to extend the New Jersey Traction Company's lines from Newark to Elizabeth and thence to Plainfield by way of Westfield Avenue, the "county road," running parallel with and but a stone's throw from the New Jersey Central Railroad, and hence passing through all the smaller towns whose travel has been exclusively controlled by the latter road. From Plainfield the road will probably be extended through Bound Brook and from there to New Brunswick, and thence through Princeton and Lawrenceville to Trenton.

IMPROVED TRIPLE EXPANSION ENGINES.

The Condor, the engines of which we illustrate from *Engineering*, is a small composite schooner, built some time since at Havre, by the Forges et Chantiers de la Mediterranee, for the Chilean government. The following are her principal dimensions:

Length between perpendiculars	88 ft. 7 in.
Breadth	18 " 8 "
Depth	9 " 10 "
Mean draught of water	8 " 1 "
Displacement	145 tons.
Engines	250 horse power.
Speed on trials	10½ knots.
Approximate tonnage	115 tons.

This little vessel presents no special features of construction; the hull is composite, with copper sheathing over the wood and steel frames, it is divided into watertight compartments by four transverse bulkheads. The forward compartment contains the sail and cordage stores, in the next are the sleeping quarters of the men; the center compartment contains the engines,



IMPROVED TRIPLE EXPANSION ENGINES.

boilers, and coal bunkers; the fourth and fifth are devoted to the ammunition and general stores and officers' quarters.

The engine, of which we publish an illustration above, is triple expansion, with the three jacketed cylinders placed side by side, and an independent condenser with brass tubes, tinned inside and out; the circulating pump is driven by a separate motor. The boiler is cylindrical, with two corrugated furnaces and return flues; the shell is of Siemens-Martin steel, and the furnace plates are of iron. The following figures give some particulars of the engines and boiler:

Diameter of high pressure cylinder	12·20 in.
" intermediate "	17·72 "
" low pressure "	26·77 "
Length of stroke	17·72 "
Number of revolutions	130
Diameter of boiler	9 ft. 6 in.
Length	8 " 7 "
Internal diameter of furnace	2 " 7½ "
Area of grate	30·14 sq. ft.
Total heating surface	807 sq. ft.
Authorized working pressure	142 lb. per sq. in.

CORNELIUS VERMUYDEN, the Dutch engineer, was invited to England in 1621 to embank the Fens district.

The Cause of Trees being Struck by Lightning.

The frequent striking of trees by lightning is a traditional phenomenon that is well known, but the causes of it are not so precisely known, although it is, in a manner, a primordial electric manifestation. Mr. D. Jonesco has recently made a series of interesting experiments on this subject, the results of which have been communicated by him to the Agricultural Society of Brabant.

Mr. Jonesco has ascertained that certain trees attract lightning better than others. Starting from this, he has endeavored to find out how the various forest trees behave with respect to electric discharges, and has ascertained that the greater or less conductivity of trees should be taken so much the less into consideration in proportion as the electric tension is stronger. When the latter is sufficiently elevated, any tree may be struck by lightning; but differences exist from the moment that the tension is feeble. The richness of the wood in water, contrary to what is generally believed, has no influence upon the conductivity of the living wood for the electric spark. On the contrary, such conductivity depends much upon the richness of the wood in starch and oil. Mr. Jonesco, in accordance with Mr. A. Fischer on this subject, consequently distinguishes trees as oil trees and starch trees, and reaches the following conclusions:

The green wood of trees is in all cases a bad conductor of electricity, and so much the worse in proportion as the tree is richer in oil. On the contrary, the green wood of amylaceous trees, poor in oil, conducts electricity relatively well. Living wood is a much better conductor than dead. This existence of dead branches in trees of both categories, therefore, increases the danger of lightning. This is an observation of no small importance from the standpoint of the safety of houses situated in the vicinity of large trees. The cambium and bark are better conductors than the wood, but these parts are relatively to the bulk of the tree, too slightly developed to modify its electric conductivity. The latter, therefore, depends upon the wood only, since, according to Mr. Jonesco, the foliage is equally without influence upon the relative conductive power of trees for the electric spark.

The results of these researches are confirmed in the statistics given by Mr. Jonesco, and which consist in the observations made upon lightning strokes and trees since 1847 by the superintendency of forests of the principality of Lippe. It has been found, for example, that the oak is much oftener struck than the beech. Now, the first is a type of starch tree and the second a type of oil tree. On another hand, the observations made establish the fact that the frequency of lightning strokes is greater in the dry than in the other branches. Besides, the same statistics go to prove that the danger of lightning has no relation with the character of the soil. Although the highest figures are shown in hard and sandy ground, this is due to the fact that starch trees grow in such soil, but the nature of the latter is without influence.—*Le Genie Civil.*

Explosion of a War Ship's Boiler.

On the 16th of February an explosion of one of the new boilers of the German war ship Brandenburg took place in the harbor of Kiel. Forty men were killed and many wounded. The disaster took place during a test of the boiler. The Brandenburg is a steel belted cruiser, of 9,840 tons. Her dimensions are: Length, 354 feet 3 inches; beam, 64 feet. She draws 24 feet 7 inches of water. Her engines are of 9,500 indicated horse power, and she has a speed of 16 knots per hour. She was built at Wilhelmshaven in 1891.