

## ENGINEERING.

But few people appreciate how extensive and valuable are the sources of natural fuel represented by the peat deposits of the United States. According to Prof. Charles A. Davis, who was in charge of the peat researches of the United States Geological Survey, the bogs and swamps of the United States contain nearly thirteen billion tons of peat, representing a value, exclusive of the by-products, of \$38,000,000,000.

By the opening of the new tunnel which the Delaware, Lackawanna & Western Railroad has been building through Bergen Hill, N. J., for the last three years, a notable improvement has been made possible in the traffic conditions of that road. As the new tunnel, like the old adjoining tunnel, contains two tracks, the road will now have four tracks available to cope with the heavy traffic of the morning and evening rush hours, and the fine new terminal station can be utilized to its full capacity.

Our naval forces in the Pacific are to be strengthened by the early dispatch to San Francisco of the battleships "New Hampshire," of the "Connecticut" class, the battleships "Mississippi" and "Idaho," which may be called a smaller edition of the "New Hampshire," and the armored cruiser "Montana." This squadron will be followed at an early date by other battleships that are at present on the Atlantic coast, where, before another year has elapsed, our two first "Dreadnoughts," the "South Carolina" and "Michigan," should be in commission.

Extensive tests are to be carried on at the Norfolk navy yard with a new system for cooling the magazines of our warships. After investigating various methods of magazine refrigeration, the navy has installed a system on the battleship "Iowa," and the forthcoming tests will be for the purpose of determining the best temperature at which to maintain the contents of the magazine, with a view to guarding them against such a disaster as occurred recently on the French battleship "Jena." If the results are satisfactory, the system will be installed on the sixteen battleships of the Atlantic fleet.

In our last issue mention was made of the new 14-inch gun being built for coast defense. The Navy Department is also building a 14-inch gun. The naval piece, however, will be of far greater weight and power than the army gun, the former being probably of not less than 2,800 foot-seconds velocity, as compared with the low velocity of 2,150 foot-seconds which has been adopted for the army gun, with a view to preventing erosion and increasing its useful life. High velocity, a flat trajectory, and large remaining energy at distant fighting ranges, are considered to be absolutely essential for an effective naval gun. If the 14-inch piece is successful, it will probably be mounted on our next "Dreadnoughts" of 26,000 tons displacement.

The company that built the Hudson River rapid-transit tunnels has asked permission to extend its two-track system from Thirty-third Street and Sixth Avenue to the Grand Central terminal on Forty-second Street. The opening of this short stretch of road will provide an important link in the movement of passenger traffic across New York city, between the New York Central and New Haven systems and the railroads which terminate in Jersey City. Passengers will proceed by a covered way from the Grand Central station to a new station below the present subway station at Forty-Second Street, where they will be able to take a train direct to the desired main-line terminal in New Jersey.

The recent visit of the "Mauretania" to the dockyard for cleaning and overhauling gave her builders the opportunity to stiffen her after-hull, and to ship a pair of four-bladed propellers in place of those which were lost on previous voyages. The improvement when the ship left drydock was at once noticeable in the absence of vibration and the greatly improved speed of the ship. On her last voyage to the eastward, concluded in very heavy weather, she broke the record by steaming over the long course in 4 days, 20 hours, and 27 minutes, at an hourly average of 25.2 knots, both of which performances are records. A third record was placed to her credit on the second day out from New York, when she logged 605 knots in the 23 hours from noon to noon, which is equivalent to an hourly average of 26.34 knots. On the return trip to the westward, during the first day out from Queenstown the ship covered 671 nautical miles, which is equivalent to an hourly average of 26.84 knots for the 25 hours from noon to noon. This all-day run of the turbine ship, made as it was in the winter season, renders her a very likely candidate for the honor of becoming during the summer months the first ship to cross the Atlantic at an average speed of 26 knots. On the second day out she covered 671 knots; on the third, 647 knots; and on the fourth, 668 knots. The total time for the whole trip was 4 days, 17 hours, and 6 minutes, and the average hourly speed for the whole trip works out as 25.55 knots.

## ELECTRICITY.

The practice of renewing broken or exhausted filaments in incandescent electric lamps has grown to such an extent that manufacturers have found it necessary to take out patents for its prevention, both in order to maintain their sales and to prevent damage to their reputation by the insertion of inferior filaments in lamps bearing their trade mark.

Oxybenzyl-methylenglycol-anhydride is the chemical name of a coal-tar product which is being used as an insulator. However, it goes by a trade name of bakelite after the inventor, Dr. L. H. Bakeland. It is stronger than hard rubber, withstands a higher degree of temperature, and is unaffected by most chemicals. It has been used for insulators and also to impregnate soft wood, causing the latter to become as hard as ebony. Generators and motors have been impregnated with the bakelite to protect the wiring.

Some recent information regarding the working of the Stassano electric steel and iron process in Italy is given in an account which the inventor presented at the sixth international congress of applied chemistry held at Rome. He shows that the electric process for steel may be more economical than the use of coal. For coal, the consumption of energy of four horse-power-hours corresponds to 1 kilogramme (2.204 pounds) of coal in the blast furnace. Using hydraulic power, when the price per horse-power-hour is 0.05 franc (1 cent), we have a more economical rate than where coal is at 20 francs (\$4) per ton. The newest Stassano furnace has three carbon electrodes which are cooled by water circulation, and the furnace is entirely protected against atmospheric influences, so that it contains only neutral gases. He can obtain with this furnace refined steel direct from the ore, and several analyses showed that this steel was of a good quality.

The supersession of illuminating gas by electric light, which was at one time threatened, was effectively and, it appeared, to the satisfaction of the gas industry, permanently prevented by the introduction of Welsbach or similar incandescent mantles. By their means brilliant lighting was effected at a cost per candle-power actually less than electricity, and in addition the light from groups of incandescent gas mantles was found to have a higher penetration of fog than that of single arc lamps of much higher candle-power. Now, however, it would seem that the so-called "flaming arc" lamp has the latter fog-penetrating quality in a marked degree, and in addition costs only one cent per 1,000 candle-power hours, as compared with 2.3 cents for Welsbach high-pressure gas lighting; so it would seem that gas lighting is again threatened at least with serious competition. The above figures are based on gas at 70 cents per 1,000 cubic feet and electricity at 3 cents per B. T. U.

An interesting type of lightning arrester in use in Italy is described in the current issue of the Electrical Journal. It consists of a series of metal plates, supported over a tank, the latter being provided with an arrangement for squirting jets of water against the plates. These jets provide high-resistance paths for the current to the ground. They are used only during a lightning storm and the flow of water may be adjusted so as to prevent too great a waste of current.

The Boston Elevated Railroad is trying a device invented by the chief engineer of motive power and rolling stock which is adapted to prevent motormen from turning on the current too quickly when starting the car. At each end of the car there is a buzzer connected in a battery circuit and this circuit is closed by means of a solenoid, connected with the main circuit of the motors, when an excessive amount of current is turned on. The motorman is thus warned by the ring of the buzzer when he is not properly operating the controller.

It will be remembered that the Illustration, one of the leading Paris weeklies, installed in its buildings a station for transmitting photographs over a wire, by Dr. Korn's system. Similar stations are established at London and Berlin. In a recent experiment between Berlin and Paris, instead of transmitting a photograph the instrument was adapted to be used for line drawings, and hence the picture was sent much more quickly and the details were clearer. The daily paper *Le Matin* published a drawing which was thus transmitted, showing the aeronaut Zippel mounted on his aeroplane. The picture published in the *Matin* is a photograph in which the principal lines have been drawn in ink, but the shades and tints are also visible. A halftone is used for the transmission, and it is rolled in cylinder form. The cylinder revolves and has a small contact wire passing over it so as to send the impulses of current. At the receiving end the usual apparatus is employed so as to give the impression on the cylinder covered with photographic film by means of a spot of light whose brightness depends upon the current. It took about ten minutes to send the above picture, while it would have taken eighteen hours for a photograph to be sent from Berlin by mail.

## SCIENCE.

Cornish miners of half a century ago sought for what are known as simple ores and threw aside the complex ones as refractory. In this way they found uranium ore and sent it to the smelters as "black copper" only to have it returned to them as rubbish, and so some 40,000 tons of ore containing perhaps 10 per cent of pitchblende estimated to be worth \$2,50 a pound has been found dumped at the head of the Wheal Trenwith mine near St. Ives.

While most of us were busy recalling the life and death of Abraham Lincoln, the New York Academy of Science gathered at the American Museum of Natural History to commemorate the services of Charles Darwin. A bronze bust of Darwin was unveiled and addresses were made by John James Stevenson, professor of geology in New York University; Nathaniel Lord Britton, the director of the New York Botanical Garden, and Hermon Carey Bumpus, the director of the American Museum of Natural History.

The Committee on Congestion of Population in New York has gathered all the necessary material for an exhibit on city planning. Material and data have been gathered to suggest methods for bettering the city's congested portions, and, more particularly, for safeguarding portions of the city at present only threatened with the bad conditions in the older districts. The committee believes that its work, particularly the preventive side of it, is really national in scope, as many cities of not over 50,000 inhabitants are now struggling with congested conditions of population, factories, and offices. Broadly speaking, the lessons in city planning will be readapted from European cities to make them applicable to New York. The general idea is that of having certain classes of buildings restricted to certain neighborhoods. According to the Vienna city plan, factories have certain allotted quarters, in which tenements are not erected. Land in factory districts is necessarily of higher value than in residence sections, so that tenements erected on factory land would have to be overcrowded to make them commercially profitable.

As a result of a lecture delivered by Sir Frederick Treves, the eminent British surgeon, in which he illustrated some practical curative results attained by the use of radium, a British Radium Institute has been founded for carrying out research operations in connection with the application of radium to surgery. In the course of his lecture Sir Frederick Treves recorded the specific cases in which an absolute cure had been effected. He stated that radium can cure every form of *nævus*; will eradicate the terrible port-wine stain, which is probably one of the greatest disfigurements with which one can be afflicted; and will rid the patient of the pigmented mole and hairy mole. A *nævus* the size of a gooseberry on the top of the head was completely removed. In another case a girl suffering from a large angioma on her eyelid was rid of the malady by this means when four surgical operations had failed. Possibly the most striking case was that of a young woman who had an angioma covering practically the whole of one side of the face. Repeated operations proved abortive, but under the radium treatment success was soon achieved. These were all affections of the skin. To show that it is equally successful in other cases, a boy who had a fibrous angioma as large as a hen's egg on one arm had it completely dispersed in the course of four weeks. The successful disappearance of a solid mass of such size the surgeon described as marvelous.

Monochromatic photographs of the sun have been made daily on Mount Wilson since October, 1905, with the Snow telescope and five-foot spectroheliograph. These record the phenomena of a region in the solar atmosphere higher than that previously explored, and reveal the existence of extensive vortices or cyclonic storms associated with sunspots. In general, the direction of rotation of the vortices is counter-clockwise in the northern hemisphere and clockwise in the southern, as in the case of terrestrial cyclones; but a few interesting exceptions, in which the direction of rotation was reversed, have been found. There can now be little doubt that what we see in the telescope as a sun-spot is the mass of vapor, cooled somewhat below the temperature of the photosphere, which lies at the center of an invisible vortex. The discovery of these vortices suggested that the rapid revolution of electrically charged particles, emitted from carbon and other vapors at the high temperature of the sun, should produce a magnetic field in sun-spots. Tests made with the 30-foot spectrograph of the tower telescope show all the characteristic phenomena of the Zeeman effect in the spot spectrum, and leave no doubt as to the existence of a magnetic field. Vortices rotating in opposite directions show opposite polarities, the changes in the spectrum and in the polarization phenomena being precisely similar to those of a luminous source in a magnetic field when the current through the magnet is reversed. The results indicate that the magnetic field is produced by the revolution of negative corpuscles in the vortices.