

ENGINEERING.

Some great records for steam shovel work are being made on the Panama Canal. Recently, during a working day of eight hours a steam shovel, operating in the Empire Construction District, removed 3,941 cubic yards of rock and earth. The shovel was actually at work only six hours and fifty minutes of this time, one hour and ten minutes being consumed in waiting for the cars.

The extension of the railroad system of China is proceeding steadily, if rather slowly. At the present time the total amount of road in active operation is 2,170 miles. There are 806 miles of new road under construction; provision has been made for the construction of an additional 2,232 miles; and 3,286 miles of new line are projected.

A recent report of the power efficiency committee of the American Railway Association shows that during the first fortnight in March there was a decrease in the number of surplus cars of 8,507, the total number of idle cars on March 3rd being 299,925, and on March 17th, 291,418. This steady placing of cars in service is one of the sure indications of the slowly returning prosperity of the country.

Advices from England state that the new protected cruiser "Boadicea" during her full power trials exceeded the record for a vessel of her size. The maximum speed achieved is said to have been 27.9 knots. She was designed for a speed of 25 knots, which was also the designed speed of the cruiser battleships of the "Indomitable" class, whose speed records of 26 knots and over now appear to have been surpassed by the "Boadicea."

According to an eminent German economist the aim of a healthy transportation policy should be to diminish, as far as possible, the economically unproductive cost of transport. It is in agreement with this policy that Germany has built up and is continually extending her inland waterways, upon which, during the past twenty years, she has expended \$150,000,000. At the present time Germany possesses in navigable rivers, canalized rivers, and inland canals over 8,278 miles of navigable waterways.

Speaking of canals, we note that the creation of an important naval base on the Firth of Forth on the east coast of Scotland has brought the question of a ship canal between the Forth and the Clyde once more prominently into public notice. As a commercial undertaking such a canal would have comparatively limited value; but for strategical reasons, as affording means of quickly concentrating the warships of the North Sea and the Irish Channel, on either coast, the canal would be worth the heavy expenditure which its construction would involve.

In an effort to provide shippers of coke with an improved car which can be loaded and unloaded in the shortest possible time, the Pennsylvania lines west of Pittsburg have specified that of the recent order for 3,200 new cars, 1,000 should be all-steel cars of new design and of greater capacity than any coke cars hitherto built for regular service. The chief novelty will consist of four hoppers with eight openings in the bottom of the car, making the latter practically self-clearing. The total capacity of each car is 100,000 pounds.

In spite of the rapid increase in the number of automobiles and trolley cars, the horse continues to more than hold his own. According to figures published in the last report of the Department of Agriculture, the number of horses in the United States increased from 13,537,000 in 1900 to 19,992,000 in 1908, the total value of the same having risen from \$603,000,000 to \$1,867,000,000. The fluctuations in the average price of horses have been remarkable. In 1893 it was \$61; in 1897, \$37; \$44 in 1900, and \$93 in 1908.

The conviction seems to be widespread that the future will witness a great increase in the dimensions of warships. That the German government is of this opinion is shown by the enlargement of the Kaiser Wilhelm Canal, which is to be deepened at once to 36 feet, with provision for a later deepening, if necessary, to 46 feet. The width of the canal is to be doubled, and the new locks at each end of the canal are to be 1,082 feet long, 147 feet broad, and 46 feet deep. These dimensions, by the way, considerably exceed those of the canal locks at Panama.

The huge dredger built for keeping open the Mersey Channel is aptly named the "Leviathan." She is 465 feet 9 inches in length, and is capable of pumping up 10,000 tons of sand and discharging it into her bunkers from a maximum depth of 70 feet in 50 minutes time. The pumping plant consists of four independent centrifugal pumping engines, each of 800 horse-power. Her capacity is shown by the fact that in a five hours' test, 20,000 tons of material was lifted from the Channel into the hoppers, carried 10 miles, and dumped. In a favorable year of work the "Leviathan" will dredge and remove to a suitable dumping ground at least 20,000,000 tons of sand.

ELECTRICITY

A report of the telegraph and telephone situation in Germany in 1906 to 1907 has just been published. The total length of the telegraph and telephone lines is over 2,800,000 miles, 1,360,000 miles of which are underground. There is a telephone exchange for every 1,956 inhabitants.

Some successful experiments with wireless telephony have recently been made by Lieuts. Colin and Jeance, between Paris and Melun, a distance of thirty miles. The Paris station was located at the Eiffel Tower and was operated by Lieut. Colin, while Lieut. Jeance, with the Minister of Marine, operated the instruments at Melun.

An electric railway between South Bend, Ind., and Pullman, Ill., has just been completed. The line is 77½ miles long and the single-phase system is used. The motor cars are each equipped with four 125-horsepower motors. The main line is furnished with current at 6,600 volts pressure, but this is reduced to 700 volts in cities. Pantograph collectors are used for collecting current at the higher tension.

Plans are under way for providing an unusually attractive electrical illumination during the Hudson-Fulton celebration next fall. It has been proposed to light up Washington, Union, and Madison squares and Riverside Park by means of lamps placed in the foliage. Mercury vapor lamps could be used to advantage so as to produce a remarkable effect. The Hudson River will be illuminated with search lights, while prominent buildings on Broadway and Fifth Avenue will be outlined with small electric lamps. The city has appropriated \$300,000 for this celebration.

A device is being placed on the market for preventing a consumer from using more current on his lighting circuit than he has contracted for. When the current consumption reaches the contract limit the lights begin to flicker and continue to do so until normal current is restored. This result is produced by means of a magnet which attracts a spring metal armature. By adjusting the tension of the spring the device may be set to operate at various loads. The mechanism is made to operate on two and three-wire circuits.

According to a daily press report a safe lock has been invented which is provided with phonographic mechanism so that it can be opened only by the voice of the owner. A mouthpiece like that of a telephone takes the place of a knob on the door, and this is provided with the usual style or needle which travels in a groove in the sound record of the phonograph cylinder. Before the safe can be unlocked the password must be spoken into the cylinder by the one who made the original record. The report does not state what would occur if the owner should come down to his office with a bad cold.

In order to do away with the bother of attending to exhausted batteries of doorbell systems, a transformer has just been put on the market which enables one to obtain the current from the city mains. The transformer will operate on the ordinary lighting circuits, and can be installed by anyone with a slight knowledge of electricity. As it has no moving parts, once installed it will thereafter require no attention. It is adapted to operate on circuits running from 100 to 130 volts, and is provided with taps giving 6, 12, and 18 volts, so as to meet the requirements of various styles and sizes of bells and buzzers.

In many of the smaller European towns oil engines are coming into favor as prime movers in central power stations. The reason for preferring oil engines to other engines is that they require very little space and are always ready for work. An excellent example of this use of the oil engine is to be found in the town of Iglau, Austria. The plant is described in a recent number of the Electrical World. This plant is provided with two 200-horse-power engines, rated at 165 kilowatts, and a two-cylinder engine of 130 horse-power operating a 106-kilowatt generator. Tests have shown that 272 grammes of oil are consumed for each kilowatt hour on a full load.

A new type of army rifle is being manufactured at the Springfield armory which differs from the ordinary in having electrically lighted sights for use at night. A battery is fitted in the stock of the rifle and serves to light a pair of miniature electric bulbs, placed at each side of the gun barrel, at the extreme end. The button which controls the electric circuit is fitted on the trigger guard, and when the operator presses this button the miniature lamps serve to light the rifle sight. The lights themselves are shielded from view. In twilight hours it is often impossible to take any aim with the ordinary rifle, although the object fired at, owing to its size, may be readily seen. By illuminating the sight in the manner just indicated, the shooter may aim quite accurately. The invention should be valuable for close-range fighting at night.

SCIENCE.

From extended experiments that have recently been made at Macon, Ga., it has been found that a fine grade of paper can be made from pulp prepared from the okra stem, and a plant for making paper from this source is likely to be erected in that city at an early date. Okra is easily grown in the Southern States, and could be produced in large quantities as a paper-making plant. The plant is an herb belonging to the mallow family, genus *Hibiscus*. Its botanical name is *Hibiscus esculentus*.

The first operation in this country upon a human being in which the cavity of the thorax was opened while the lungs were inflated from a chamber containing air at a greater pressure than that of the atmosphere was performed recently at the German Hospital by Dr. Willy Meyer. Many operations in the thorax have been difficult to perform, and others impossible because as soon as the cavity of the thorax is opened the lungs collapse because of the atmospheric pressure.

Later information on the results of Lieut. Shackleton's expedition to the Antarctic revealed much that was not discussed in the preliminary dispatches. It is now brought out plainly that the south magnetic pole like the north magnetic pole shifts its position. The discovery is important, because it will enable us to revise our magnetic charts and render navigation safer. It was not known before Shackleton's expedition whether or not the south geographical pole is a vast archipelago or a continent. Shackleton seems to have established the second view on a fairly firm basis.

Commandant Souié, of the Paris police, has perfected, for the use of the men in his command, spectacles, with the aid of which they may not only see very plainly what is going on ahead of them, but at the same time command a view of what is going on behind them, an arrangement that is expected to contribute materially to their efficiency. At the outer edge or corners of these unique "specs," small, concave mirrors are attached. They are very "true" and so placed as not to interfere in the least with the forward view of the wearer of the spectacles. After brief preliminary use they are found to give excellent service.

It will be remembered that M. Yves Delage succeeded in obtaining two good specimens of sea urchin by parthenogenesis at the Biological Station of Roscoff, France. These specimens continued to grow very well, but not long since they died from some cause which is unknown. M. Delage points out that the death was not due to any imperfections in the specimens. Both the specimens resulted from experiments with hydrochloric acid and ammonia. Both of them had a regular growth up to the time of their death, that is, about sixteen months after the metamorphosis. Death was probably due to poisoning in some way.

Owing to the careful adjustment and regulation of temperature necessary in bacteriological incubators, a new incubator has recently been built which will be heated by electricity and which it is expected will thus overcome the difficulties with gas-heated incubators. Incandescent lamps are used in the new heater to maintain the required temperature of 37 2/5 deg. C. A new mercury regulator controls the lamps. The instrument was tested quite recently for a run of forty-five days and the variations in temperature during this time were practically nothing. The incubator is formed with a triple wall, providing a water jacket and an air space, and is covered with asbestos finished in white enamel.

In a recent investigation of the influence of sulphur in illuminating gas upon the air in rooms, Mr. Arthur D. Little, chemical expert and engineer, Boston, compared the effect of the burning of a sulphur match with that of an ordinary gas jet. Analysis of the match showed that it contained enough sulphur to momentarily raise the sulphur dioxide in the room to an amount greater than would ordinarily be maintained by sulphur coming from burning gas. It was shown that the lighting of such a match would actually liberate as much sulphur into the room as ordinarily would be liberated by a standard gas jet burning for over twenty minutes.

The Arctic and Explorers' Clubs of America will organize an expedition to go north in search of Dr. Frederick Albert Cook, the polar explorer, who has not been heard from in over a year. Dr. Cook has no means of coming back. It is possible that he wintered somewhere with the Eskimos, where he could get plenty of food, but there is an uncertainty about it. According to the prearranged plans Dr. Cook was to return to headquarters at Annotoak, Greenland; down Kennedy Channel, through Smith Sound, and in case no ship arrived he would move to Cape York and thence to Upernavik, expecting to return home not later than September, 1908.