ENGINEERING.

The figures of coke production in the United States in 1907 exceed all records in the history of coke making in this country, the total amount reaching 40,779,564 net tons. Over 35,000,000 tons of this total was produced in the beehive type of oven.

A dozen bids have been received at Albany by the State Barge Canal Board for the construction of a reservoir dam at Delta, at the head waters of the Mohawk River, the lowest tender being that of Arthur McMullin, of New York city, whose bid was $905,347. This is more than $107,000 under the engineer's estimate.

The total value of our pig-iron production in 1907, estimated at $20.59 per ton, was $529,958,000; but the journals devoted to the iron and steel trade estimate that because of the financial depression, the rate of production will prove to have been reduced nearly 50 per cent during the present year—unless, indeed, the present signs of recovery are fulfilled.

The Pennsylvania Railroad has awarded prizes to the amount of $5,400 to the supervisors and their assistants who maintained the best stretch of track during the last year. The tracks were inspected from a special train. One of the tests was to place glasses of water on the sills of the windows, and count the number of times they were spilled in running over a stretch of track.

The general public will learn with some surprise that of the total freight moved on all railroads during 1904, amounting to 641,680,547 tons, only 4,809,340 tons represented petroleum and all other oils; and that the total amount of petroleum shipped by the Standard Oil Company amounted to 2,887,500 tons, or less than one-half of one per cent of the total tonnage moved on all railroads during the year.

The report of the chairman of the Isthmian Canal Commission for August states that the reorganization of the forces was continued during the month. The summary of the construction work done by the three divisions shows that the material excavated in August amounted to 3,318,691 cubic yards, of which 1,375,991 yards were taken from the canal prism. The average number of laborers employed daily was 13,284. Health conditions continued satisfactory during the month.

Results obtained in several tests of the Maxim silent firearm before the United States Army Board are reported to have been decidedly encouraging, the report of the explosion being only faintly audible. The muffling of the discharge is necessarily obtained at some expense of velocity, though the reduction is said to be only about six per cent. If the loss of velocity and energy be no greater than this, the silencing of the report unquestionably increases the military value of the weapon.

In spite of the worldwide depression, Spain is experiencing a period of decided prosperity. The spirit of rejuvenation has extended to the navy, plans for the rebuilding of which are being actively prosecuted. Tenders have been submitted for three battleships, which will be about 425 feet in length and of 15,000 tons displacement, with a speed of 19½ knots. Also three destroyers of 360 tons and 28 knots and twenty-four 180-ton 26-knot torpedo boats are to be built, together with four gunboats of about 1,000 tons displacement. The battleships will be built at Ferrol, and the rest of the fleet at Carthagena.

At the last meeting of the Iron and Steel Institute in Great Britain, Henry E. Armstrong, professor of chemistry of the London Central Institute, said that he found it "difficult to keep calm" when he reflected on the ruthless way in which the world's stores of timber, iron, coal, and oil were being used up. The public, satisfied that science would discover a substitute for coal, was seemingly indifferent to the inevitable consequence of the present lavish waste. Science, however, is in no position, at present, to confidently state that any substitute for these fuels will be available in that near future when our present supplies will be exhausted.

That the Japanese are not always the mere imitators which some people would have us believe, is shown by the decidedly original method they have adopted for carrying two submarines from England to Japan. The "Transporter," a ship specially designed for this purpose, has been built by Messrs. Vickers, Sons & Maxim for carrying submarines intact. The engines are located aft, and forward of them the main deck for two-thirds its length has been removed. To place the submarines on board, they are floated into the drydock alongside the "Transporter." The latter is sunk to the bottom of the dock, and the submarines are then floated into position above a pair of cradles built into the hull of the ship. The water is then pumped from the dock, and, as it subsides, the submarines settle into their respective positions in the hold of the steamer. The main deck is then replaced, and the ship is pumped out until she is afloat.

ELECTRICITY.

Electric flatirons are becoming very popular in central Vermont, owing to the enterprising advertising of the Consolidated Lighting Company, which serves the district of Montpelier and Barré. There are 28,000 inhabitants in this district, and one out of every twenty-seven uses an electric flatiron.

In an address delivered before the Electrical Club of Chicago on the subject of the electrification of steam railroads, F. A. Sager stated that the railroads will have to spend approximately $5,000,000,000 within a few years to keep up with the increase of traffic. By electrifying their lines at a cost of $4,000,000,000, they would increase their capacity to such an extent that no new trackage would be needed.

A successful test of wireless telephony was recently conducted between the British cruiser "Furious" and the schoolship "Vernon." Both vessels were steaming at full speed, separated by a distance of 50 nautical miles. The De Forest system was used. The inventor operated the transmitter on the "Furious," while Mrs. De Forest received the messages on the "Vernon." The test consisted largely in repeating stock quotations and it is stated that out of 154 figures, there were only two mistakes.

In a recent article by Dr. Louis Bell in the Electrical World, attention is called to the lighting systems of Europe as compared with American street lighting. According to Dr. Bell, European streets are far better lighted than our own, but not because electricity is cheaper abroad than here; for London pays over $100 per arc per year, Paris $166, and Berlin nearly $120. The difference seems to be that in this country we attempt to light all of the streets fairly well, while abroad particular attention is paid to the more prominent streets.

The highest telephone line in Europe, which runs to the Regina Margherita Meteorological Observatory on Mont Rosa, at an altitude of 14,958 feet, is nearing completion. It was found impossible to run this line on poles, owing to the high winds and bad storms which prevail at these altitudes. It was also thought to be impracticable to lay an insulated cable, as it would gradually sink into the ice and would make repairs impossible. The final solution of the problem was to lay a bare wire across the glaciers, and depend upon the insulating qualities of the snow and ice.

Writing in the Electrical Review, Mr. G. W. Pickard describes some interesting experiments made to determine the character of wireless wave fronts. A closed circuit is used for the receiving system; that is, the antenna instead of being a vertical wire, is in the form of a hoop. The receiving apparatus is mounted on a tripod, so that it can readily be moved from place to place, and rotated to turn the hoop to any desired angle. When the plane of the hoop lies at right angles to the direction of the wave, the maximum number of electro-magnetic lines of force pass through it. In this way the wave front can be plotted out, and the disturbing effect of various obstacles can be determined.

The Forestry Bureau of the United States has recently been investigating the preservation of cross arms for telegraph and telephone wires. The trouble heretofore has been that the wood subjected to the creosote process has not been of uniform porosity, some of the arms absorbing more of the preservative than was necessary, while others did not receive sufficient treatment. The Forestry Bureau divides the wood into three grades according to grain and air-dries them thoroughly in piles protected from rain and snow. The different grades are separately treated, receiving from 6 pounds to 10 pounds per cubic foot. It is advised that the wood be not subjected to the customary steam bath before being treated with creosote.

Several years ago Prof. A. Heydweiller observed the remarkable phenomenon of self-electrification of the human body. The needle of a quadrant electrometer having been charged to a potential of some hundreds of volts, one of the pairs of quadrants was connected to the earth, and the other to an insulated metal plate. The subject then raised one of his hands to about 4 inches from the plate, and holding it in this position stepped on an insulating stool, when the electrometer showed a deflection indicative of a negative charge of the hand. The magnitude of this deflection and the interval of time occupied by its slow disappearance would vary according to the personal disposition of the subject and meteorological conditions. The same problem has been taken up recently by two Russian physicists, Drs. Tereshine and A. Georgievski. Whereas the qualitative results of the first series are mainly identical with those of Prof. Heydweiller, the electric tensions (of 10 to 15 volts) found by the Russian experimenters are much inferior, and experiments made on naked subjects gave very different results. And hence they draw the conclusion that the self-electrification of the human body is due, not to the contraction of the muscles, but to the friction of the feet on the insulating stool and to that of the clothes on the body and on one another.

SCIENCE.

On October 5 the first international congress on refrigeration was opened in Paris, thirty governments in all being represented. The United States, which leads the world in the production of cold-preserved foodstuffs, together with the republics of South America, took an important part in the proceedings. Some idea of the extent of the refrigerating business of the world is furnished by the committee of arrangements, which points out that a fleet of more than three hundred ships fitted with cold storage plants is now engaged in the transport of refrigerated products to Great Britain alone. The British cold storage imports have risen from $17,000,000 in 1885 to $180,000,000 in 1907. The United States, however, exceeds that figure, her cold storage commerce being valued at about $240,000,000.

In an oil refinery at Langelsheim, Germany, linseed oil is bleached by a process in which uviol lamps are employed, and which has been patented by Dr. A. Centhe. The uviol lamp, which has been described in these columns, is a mercury vapor lamp which produces ultraviolet rays in abundance, and is made by a special glass which transmits waves as short as 253 millionths of a millimeter. Twenty uviol lamps are immersed in a tank containing one ton of crude linseed oil, heated to 176 deg. F., into which air is simultaneously introduced in fine bubbles. Under the influence of the ultraviolet rays the oil absorbs 1/20 of its weight of oxygen and becomes colorless, brilliant and limpid. The expenditure of energy is 60 kilowatt hours per ton of oil. The air is forced through the oil by a pressure equivalent to 10 feet of water.

Dr. Leonard Hill's experiments in reviving exhausted athletes with oxygen may soon be made the subject of investigation by international athletic associations. Thanks to the administration of oxygen, Jabez Wolffe nearly succeeded in equaling Capt. Webb's famous feat of swimming the English Channel from Dover to Calais in 21 hours and 45 minutes. One of Wolffe's rivals denounced the practice, arguing that it was unsportsmanlike. To this Dr. Hill gives the retort scientific: "Oxygen is not a stimulant. To the perfectly trained runner or race horse oxygen will do nothing if given before a sprint. The trained man or horse has got enough in him for a sprint, and an excess has no effect. It is to the tired or untrained man or to the man fatigued by prolonged effort that oxygen does so much. Oxygen will not make a man do something that is beyond the power of the normally working heart and muscles. It will do neither more nor less than the food taken in long-distance swims. Beef juice is food, and oxygen is food. One is liquid and must be drunk; the other is gas and must be breathed. It is foolishness to give one and not the other. Almost the whole of modern sport is conducted with artificial aids. The record feats of to-day are too often not sport, but deadly, earnest business." Dr. Hill sensibly suggests that either sport should be limited to reasonable feats of endurance or else oxygen should be added to the other artificial aids now employed in breaking records, and so diminish the harm done the athlete's body.

The place occupied by the Milky Way in the theory of the universe is continually increasing in importance. This vast belt of stars is now regarded, not as a cluster comparable with thousands of other clusters, but rather as the frame or skeleton of the entire stellar universe. Additional support for this view is derived from H. H. Turner's comparative study of variable stars of long period. Our sun is, to some extent, a variable star. The variations in its luminosity complete their cycle in a period of about eleven years, during which the number of sun spots gradually increases from zero to a maximum and then decreases until the solar disk is again entirely spotless. The solar activity is manifested periodically by the spots and also by the intensely luminous faculæ which appear near the poles of the sun, move toward the equator, and there vanish. It is evident that the curve which represents the apparent variable luminosity of the sun will vary according to the position of the observer with respect to the solar axis, owing to the effects of perspective and absorption by the solar atmosphere upon the apparent brightness of the equatorial faculæ. Several astronomers have expressed the opinion that the fluctuations of variable stars (with the exception of stars of the Algol type, in which the variations are due to eclipses by a dark satellite) are similar in character to those of the sun, though very different in degree. Turner, working on this hypothesis, has examined the curves of variation of a number of variable stars. He finds that some of these stars appear to present their poles, others their equators, to the earth, but that no stars of the former class are situated near the poles of the Milky Way. The natural inference is that the axes of rotation of all these variable stars lie nearly in the plane of the Milky Way.