

ENGINEERING NOTES.

A train now runs between Paris and St. Petersburg in forty-eight hours, the only change of cars being on the Russian frontier.

A new line of railway is now being surveyed from Borgo-San Domingo to Cremona, Italy. It will cross the province of Plaisance, and will ultimately effect a junction with the Plaisance-Milan line.

The shipping trade of Montreal seems to be on the increase, and the harbor authorities have extended the wharfage and deepened the ship channel by the removal of shoals. When the works are completed the harbor will have a depth of 27 feet 6 inches. Last year 640 seagoing vessels, with an aggregate tonnage of 1,069,386, called at the port during the seven months in which navigation was open.

London has been aroused to the necessity of having a thirty foot channel open into the Thames at all stages of the tide, in order to be able to compete with Southampton and Liverpool. The Leigh middle shoal acts as a bar to the river; through the channel in this no vessel drawing twenty-eight feet can pass at low water. Vessels drawing twenty-seven feet can pass only thirteen days in the year, and those drawing twenty-five on 125 days.

Liquid fuel has been definitely adopted for the two German coast defense vessels, *Omin* and *Aegir*, after a series of experiments made on torpedo boats as well as on the *Siegfried*. The fuel consists of hydrocarbons of great heating power, its principal element being products distilled from Russian petroleum, mixed with other oils. The evaporation is eight or nine times as powerful as with coal. Besides which, the specific gravity of this fuel being much less than that of coal, a much larger quantity can be carried, and hence the radius of action of the vessel is greatly increased.—*Le Yacht*.

The *Deutsche Heeres Zeitung* reports successful experiments in crossing rivers with waterproof tent equipments. These are spread upon the ground and covered with a bed of straw, hay, leaves, or other like matter, upon which clothing and articles of equipment are placed, and the whole is then rolled up in the form of a bundle or bale. The packages thus formed float because of the quantity of air they confine. The rifles are fixed upon the top and the bundles are dragged across by swimmers employing tent ropes. For men who are unable to swim, bundles are filled entirely with straw, and these, being fixed together and made rigid by tent poles crossed on the top, form rafts which can either be hauled across or be navigated by means of spades used as paddles.

A very simple method of preventing hard deposits in steam boilers is mentioned by M. Schmidt, a French engineer. There are two boilers in use. Each boiler is allowed to go on working for about 500 hours before being cleaned, when it is stopped, with the water in it, and allowed to cool down for about a week; the masonry is allowed to become cold, and then the tap is opened, also the safety valve, so that the water runs naturally out of the boiler, the latter, when empty, being entered and simply swept. The deposit, being in the form of damp mud, is easily swept away, leaving the boiler as clean inside as if it were new. This method has been in use some five years, and seems to show that the ordinary hardening of deposits in boilers is due to the absence of water in them while the mud and the iron are being heated by the brickwork when the boiler has been emptied by the ordinary method under pressure. It is necessary, however, under this system, to be able to do without the particular boiler for some eight days.

Another steel hardening process is announced as having been introduced at the famous French steel and iron works of Creusot—a process based upon the fact, well known, that gas, under great heat, deposits carbon in solid form, upon this depending its light effects and also the formation of the so-called retort graphites, a thick covering of pure carbon on the walls of gaslight retorts, the gas that strikes the walls depositing part of its carbon upon them. Hardening iron and steel plates formerly consisted in covering the plates with layers of coal and heating them till they glowed; in the new process, two plates are put into a furnace, one on top of the other, with a hollow space between, this space made gastight by means of asbestos packing put on around the edges, and the plates heated red hot, while a stream of gas is poured into the hollow space indicated. The carbon thrown out by the gas is readily taken up by the glowing plates until they are quickly covered, and the depth of this carbon covering can be regulated by the amount of gas admitted. In order to secure regular and uniform action during the process and to prevent the pipes that carry the gas to the hollow space from absorbing any of the carbon, they are insulated in other pipes, through which water is constantly circulating.

M. Goubet, French inventor of submarine boats, recently constructed a boat of that kind for a South American republic, says the *Marine Review*. The vessel in question is 27 feet long by 5.8 feet in diameter. Its hull consists of three gun metal castings, viz., conical stem and stern pieces and a middle ring. The shell is 1 inch thick in the middle and $\frac{3}{8}$ inch at the ends. Access to the interior is gained through an oval manhole in the central belt. The torpedoes with which the boat is armed are carried outside the shell, and can be released at will, the same action starting their propellers into motion. The propeller of the boat is mounted on a shaft fitted with a universal joint, and steering is effected by suitably moving the propeller. Underneath the hull a weight of 1½ tons of lead is fitted, which can be released in case of emergency, thus increasing the buoyancy of the vessel very materially. The screw is operated by an electric motor of about two horse power, which will give, it is stated, a speed of seven or eight knots. Oars are also provided, so that when necessary the boat can be maneuvered by hand. These oars are of special construction, in order to fit them for use entirely under water. The crew consists of an officer and two men. An "optic tube" fitted with reflectors extends to the surface, thus enabling the boat to be guided in the desired course.

ELECTRICAL NOTES.

Storage electric traction is to be tried in Chicago on about twenty miles of new line in the southwestern part of the city. Chloride batteries are to be used.

Electric motorcycles are proposed for the park at Lake Harriet, Minneapolis. The idea is to run large carriages, capable of carrying twelve persons each. A floating race track for bicycles, lighted with electricity, is also proposed.

The telephone and the telegraph are rapidly making inroads into the arid portions of the Desert of Sahara. Engineer Bayolle is now on the way from Biskra to Tuggurth with a working force of 100 men, for the purpose of laying telegraph wires between the two places.

An electric ice cutting machine recently tried on a lake up in New Hampshire consisted essentially of a sled, propelled by an electric motor and wheels like a mowing machine, and carrying several circular saws that eat into the ice. Current was brought from shore through a flexible wire that drags along over the ice.

The researches of M. Moissan and others with the electric furnace have shown that under the influence of the electric arc zirconium forms a carbide of the formula ZrC_2 . It now appears that at lower temperatures another carbide of the formula ZrC is produced. This does not decompose water, but is attacked by acids and by oxidizers, in the latter case very vigorously.

The pumps at the city water works of Fresno City were run by electricity for the first time on April 14, 1896. The new company, which is bringing the power from the San Joaquin River, thirty-five miles distant, has turned on the current. A test was previously made with lights, and since that time additional machinery has been put in, and a seventy-five horse power pump was run with great smoothness.

Statistics of electric lighting in Japan to the end of 1895, not including any isolated plants, are as follows, says the *Electrical Engineer*: There are 31 electric lighting companies, eight of which use water power and the others steam; the total number of incandescent lamps is 90,150, or, reduced to their equivalent in 8 candle power lamps, 138,327; the number of arc lamps, nearly all of which are of 1,200 candle power, is 420.

After a long series of careful observations one of the principal electrical companies in the United States has decided to put Crookes tubes on the market, and tubes of approved sizes and types may now be purchased. "It is said," says the *Electrical Review*, "that very successful results have been obtained with the tubes already furnished. Experiments are being continued in order that the most improved forms may be within reach of the public continually."

In making tests of rods by the magnetometer method, it is usual to assume that as far as the self-demagnetizing forces are concerned, the cylinder is equivalent to a very long ellipsoid. That this assumption, the *Electrical Review* says, is not quite true is well known, and the question has been gone into by several observers. The latest research on the question is by Mr. C. R. Mann. He finds that up to a certain value of the intensity of magnetization, at about the point where the linear relation between I and H ceases in the reversal curve, the cylinder is very nearly represented by an ellipsoid, but after that the ellipsoid takes up a much greater magnetization for the same magnetizing force than does the cylinder. For a length ratio of 20 to 30, the deviation from the corresponding ellipsoid is a maximum.

A curious experiment with the phonograph was recently described in *Power*. The machinery of a large pumping works in California, erected by a New York firm, had got out of order, and to avoid the great expense of sending an expert to the Pacific coast to put the machinery into working order, the manager determined to utilize the phonograph. He brought the receiver to the machinery so that the peculiar sounds of the pulsations of the defective pump was recorded on the wax cylinder. The wax cylinder was sent to New York with a full description of the symptoms which had been observed by the manager. The experts were enabled to tell what was the matter with the pump from hearing the sounds made by the phonograph. The proper remedy was suggested and the pump was repaired, and is now running satisfactorily.

Retort carbon is proposed as a material for the manufacture of resistances on the principle covered by a patent in Austria of *Sirius Fabrik*. A meter length of carbon of one square millimeter cross section would give a resistance of about 75 ohms at 0° C., with a temperature coefficient of 0.00052, its specific resistance being nearly 80 times greater than that of manganese copper. An adjustable resistance for arc lamps consists essentially of a quantity of the best round lamp carbons of the customary length arranged between two slate plates in such a manner as to permit of expansion and with the necessary connections. The whole is covered with a perforated metal screen. The Electrical Engineer considers that there should be a place for apparatus of this class in alternating current work, since, owing to the short length required and the avoidance of the coil form, self-induction is obviated.

The *Centrale Zurichbergbahn* is a line about a mile and a half in length with severe gradients, and with curves of as little as 18 yards radius. It is worked on the overhead electric system, but the most noteworthy thing about it is that, instead of a steam plant, the power supply at the generating station is derived from Crossley engines and Dowson gas, says the *English Electrical Engineer*. The plant is in duplicate—that is, two sets of producers and engines. The latter are about 50 horse power, and are belted to the dynamos. These are four-pole compound-wound Oerlikon machines, and are worked in connection with an accumulator, a supplementary dynamo being provided for charging this. The voltage is 550. The plant has been working about nine months, but no figures are at present available to show whether a superior economy has actually been realized over what could have been obtained by the use of steam engines. It is, however, understood that the management consider the working and results to be satisfactory.

MISCELLANEOUS NOTES.

In Germany asparagus is peeled before being canned, by the aid of a special machine.

It is said that a certain Swedish copper mine has been worked without interruption for eight hundred years.

Two hundred and forty-five thousand dollars per annum has been offered and refused for the privilege of sorting the garbage of New York City.

One hundred and forty-two thousand three hundred and seven dollars and sixty cents' worth of coins were coined at the San Francisco mint in 1890; that is, 1,423,760 pieces.

It is said that in one office building in New York City there are 402 typewriting machines. The Czarina of Russia has recently ordered a typewriter with gold type bars and the frame inlaid with pearl.

As somewhat of a curiosity, I may mention the invention here of a lamp for burning currant spirit. On the score of cost, however, it would seem that this method of illumination is much dearer than the systems at present in vogue.—*Handels Museum*; Austro-Hungarian Consul at Piræus-Athens, January, 1896.

Balloon racing is the latest form of petty gambling in Paris. A number of toy balloons are set off at the same time, each bearing a postal card having on it the umpire's address and a request to the finder to note the time and place of the balloon's arrival. Bets are paid and the stakes awarded on the results of the replies received within a week. The balloon that goes furthest in the shortest time gets the prize.

A general abstract of the marriages, births and deaths registered in England in 1895 states that the number of persons married was 455,730, of births 921,860, and of deaths 568,758. The births comprised 468,753 males and 453,107 females and the deaths 290,714 males and 278,044 females. The persons married amounted to an average of 15 per 1,000 of the estimated population in the middle of the year; the births to 30.3 per 1,000; and the deaths to 18.7 per 1,000.

There is no part of the world which has such a black record for wrecks as the narrow Baltic seas, says the *Marine Review*. The number in some years has averaged more than one a day, the greatest number of wrecks recorded in one year being 425 and the smallest 154. About 50 per cent. of these vessels became total wrecks, all the crews being lost. In the four years 1877-81 no less than 700 lives were lost. It must be noted with regard to these wrecks, however, that many of the vessels navigating these seas are old and ill found, especially those engaged in the timber trade.

India rubber has been generally considered absolutely watertight, but experiments with a hermetically sealed rubber bottle of water show that it is not. The original weight of the bottle filled with water was 1 pound 1 ounce 4 drachms; in one year 1 pound 1 ounce and 2 drachms; in 9 years, 1 pound; in 18 years, 14 ounces 2 drachms; in 23 years, 13 ounces 4 drachms; in 25 years, 7 ounces 5 drachms; in 28 years, 3 ounces 14 drachms; in 30 years it was out open and found to be quite dry. The bottle then weighed 3 ounces and 12 drachms.

Neither Andorra nor San Marino can claim to be the smallest independent territory in Europe, says the *Westminster Gazette*. That position belongs to Tavorlo, an islet off the northwest coast of Sarдинia. Its size is three miles long and three-quarters of a mile broad, and its population numbers exactly fifty-five souls. From 1836 to 1882 the islet was governed by one Paoloto, who had all the authority of a king, but when he died, in the latter year, he advised the inhabitants to form a republic, which was done. All the adult islanders, women equally with men, have votes, and every six years a president is elected for that period.

A clerk in the redemption division of the Treasury Department says that the "cleanest" paper money in circulation is that which circulates in Washington, while the dirtiest is that which comes from Chicago for redemption, says the *Washington Star*. St. Louis is a close second to Chicago, and Cincinnati next. New York is next to Washington in the record for clean money, Philadelphia next, while Baltimore ranks next to Cincinnati for having dirty money. The money that comes in from Chicago, besides being dirty, is always much mutilated; so much so, he said, that there is twice as much time consumed in patching it up prior to cancellation as there is in counting it.

The *New York Engineering News* says: "A universal census is proposed for the year 1900, and the proposition was discussed at the meeting of the International Statistical Institute at Berne. A committee is to be appointed by the institute, which is to advise as to the most convenient date for the census and to determine and formulate important questions of general interest, leaving each country to supplement these as it deems fit. The terms to be used in the census papers should also be accurately defined, so as to avoid ambiguity and to obtain identical results; and, most important of all, the committee is to offer suggestions as to the best means of obtaining united action in several countries. This committee is to report at the next meeting of the institute in 1897."

M. W. De Fionvielle, the well known aeronaut, has been collecting reminiscences of the balloon voyagers who left Paris during the siege in 1870, says *Leisure Hour*. Gambetta was accompanied by M. Spuller, one of the survivors of the 169 persons who left Paris in that year by aerial transit. The number of balloons that made the voyage was 166, carrying 169 passengers, 3,000,000 letters, 363 carrier pigeons, and 5 dogs, which were expected to be sent back with messages and letters. Of the 166 balloons, 52 fell in France, 5 in Belgium, 4 in Holland, 2 in Germany, 1 in Norway, and 2 at sea. Five of the 52 which fell in France were captured by the Germans. It is a most interesting addition to the historical recollections of the famous siege. The scenes on the arrival of the pigeon-borne letters, when crowds assembled to see the news when magnified by lenses on the screens, are familiar to the readers of records of the siege.