

ENGINEERING.

In a paper read before the Society of Naval Architects and Marine Engineers, Henry Penton states that the oldest iron ship in the world is the United States warship "Michigan," the material for whose construction was "dragged across the mountains from Pittsburgh to Lake Erie," where the ship was built, as long as sixty-six years ago.

A cave-in or slide of a portion of the preliminary work on the Gatun dam is causing considerable comment. The Chief Engineer of the Canal Commission, however, states that the mishap is of slight importance, and affords no cause for anxiety as to the stability of the dam itself when it shall be completed.

Our Consul-General to France writes of a rubber-asphalt pavement which is being used in that country. The material is a product resulting from the association of asphalt and rubber. It is said to be more plastic and more adhesive than pure asphalt, and to resist higher temperatures. Experimental work covering a period of six years in such cities as Paris and Lyons has given good results.

With the completion of the vast irrigation works now being carried on by the federal government in our western States, this country will possess three of the greatest dams in the world. The Shoshone dam, with a height of 326 feet, and the extremely short length of 175 feet, will store 456,000 acre-feet of water; the Pathfinder dam, 215 feet high and 226 feet long, will store 1,025,000 acre-feet; while the Roosevelt dam, 284 feet in height and 1,080 feet long, will store 1,284,000 acre-feet. The most notable structure comparable with these is the Assouan dam, which, after the work of increasing its height has been completed, will impound 1,860,000 acre-feet of water.

Work is being rushed on the new Ambrose channel, which is to form the entrance to New York harbor, in order to open the channel as early as possible to a depth of 40 feet for a clear width of 1,000 feet throughout the whole of its length. The finished channel will be 2,000 feet in width by 40 feet deep. In the last report the least depth over the 1,000-foot width is given as 37 feet; but, as a matter of fact, nearly the whole area has already been dredged to the 40-foot limit. Up to the present time, 54,000,000 cubic yards have been removed. Four seagoing dredges are continually at work, and they are expected to complete the channel in about two years from the present time.

The recent trial of the British battleship "Invincible," in which she attained, under reduced power, a speed of 25 knots, was followed by a full power trial in November, when she steamed at the unprecedented speed of 28 knots on a continuous run of eight hours' duration. This is certainly wonderful going for a ship protected with 7 inches of armor and carrying a battery of eight 12-inch guns. It is 9 knots faster than the speed of any battleship now in commission in our navy, and 2 knots faster than the one-mile trial speed of our swift cruisers of the "Salem" type. Moreover, it exceeds by 2 knots and $2\frac{1}{2}$ knots respectively the trial speed of the "Lusitania" and "Mauretania," which are to-day the fastest merchant vessels afloat.

We have before us a photograph of a steam rotary excavator built for digging irrigation canals, which forcibly illustrates the natural aptitude of the average American for mechanics. The machine, which was built by a farmer on his ranch 120 miles from a machine shop, is drawn by a 110-horse-power traction engine, from which it takes its steam for driving two auxiliary engines. It carries a drum, 30 inches in diameter by 30 inches in width, upon whose face is a series of 4-inch cutters, which are driven at a speed of 450 revolutions a minute. The excavated material is thrown forward upon a cross conveyor, which delivers at the desired height or distance from the canal. Although the machine is crude in construction, it has shown a capacity of 500 cubic yards an hour in hard soil, and of about 1,000 cubic yards in soft unpacked soil. The cost of operation works out at \$2 an hour.

The Boston elevated railroad had not been many months in service before it was discovered that the rails on the curves were wearing out at an astonishingly rapid rate. The tracks were first laid with Bessemer rail having the low percentage of 0.45 of carbon; and, after about three months of service, these rails, where they were laid on curves, were so greatly worn that they had to be replaced. In 1902 some experimental manganese rails were laid on a curve of 82 feet radius; and these rails remained in service until August of the present year. A comparison of these rails with the Bessemer rails shows that the latter wore down 0.065 of a foot in forty-four days, whereas the manganese steel rail wore down only 0.046 of a foot in 2,291 days. According to Mr. H. M. Steward, the company have tested other kinds of rail, made specially by the Bessemer or open-hearth process, including some of nickel steel; but none of these approaches the manganese rail in wearing qualities.

ELECTRICITY.

An electric charging launch has just been built as an auxiliary to the electric yacht "Cascapedia," so as to increase the radius of action of the yacht, and make it independent of shore charging stations. The launch, which is named the "Kilowatt," carries sufficient fuel to enable her to be operated 100 hours, and during this time she can recharge the yacht about a dozen times. This is the first electric auxiliary launch ever built.

Permission has been applied for by the New York, New Haven & Hartford Railway to electrify the Harlem River and Portchester Railroad. This line runs through Mott Haven to New Rochelle, where it joins the main line. The fact that this line is to be electrified indicates that it will be used for extensive passenger service, as it would be hardly worth while to change to electricity if freight is to be the principal traffic.

The Austrian government intends to electrify its mountain railways, and has been studying the question of hydro-electric plants in Scandinavia. According to a report recently made to the government, Norway has a total water power of 28,000,000 horse-power, Sweden 10,000,000 horse-power, and Finland of 4,000,000 horse-power. The plants of these countries now in operation or under construction have a total capacity of 500,000 horse-power.

Ten thousand electric flatirons are to be loaned to reliable customers of the Chicago Edison Company for a period of six months. The object of this is to popularize the use of electricity in the household, and lead to the introduction of other electric utensils. While these irons are loaned out for six months only, it is intimated that if the plan proves a success, they may be permitted to remain in the hands of the consumers for an indefinite length of time.

An interesting example of the displacing of steam by electricity is to be found in the up-to-date laundry. The electric motor is used to provide an individual drive for the various machines. The principal advantage of electricity over steam in this particular application lies in the fact that many of the machines are idle for a large part of the time, and the driving motor of such machines need only be consuming power when its services are required. In addition to this, greater variations of speed are possible with the electric motor, and the machine may be driven at exactly the speed desired. No overhead shafting or belts are used, thus doing away with the dust and dirt that accumulates in the steam laundry.

The street sweepers that operate at night on the more important boulevards of Chicago have found their work hampered and rendered dangerous by the carriages and automobiles that throng these avenues. In order to relieve this danger, each man is now provided with an electric lamp, which is attached to his helmet. A 2-volt 6-ampere tungsten lamp is provided, and this is fed from a storage battery in the sweeper's hip pocket. The entire outfit weighs less than a pound, and the lamps will burn for ten hours without recharging. The sweeper does not have to give the apparatus any care, as it is properly connected up and fitted to him when he starts out to work at night, and needs no attention until he returns from work in the morning.

The use of axle lighting systems in railway cars has reached a greater perfection in England than in this country. Of the 30,000 cars thus equipped in England by a single company, none is provided with any auxiliary system of lighting. This fact makes it imperative that every attention be paid to the electrical equipment to keep it in order. In this country we do not show sufficient confidence in electric lighting systems to depend upon them alone. Other forms of light are invariably used with the electric lights, and the former are apt to be better cared for, because their operation is better understood by the unskilled workman. In England the axle car lighting system is so standardized, that each road makes repairs in any of the cars of a foreign road that may happen to run over its lines.

Some time ago a magnetic phonograph was invented, which the inventor hoped to use in connection with the telephone to receive and record messages in the absence of the owner of the phone. The objection to this system was that a person calling up a number and receiving no response was not inclined to deliver his message to something so intangible as an unresponsive and apparently inanimate machine at the other end of the wire. The daily press reports a new improvement along this line, in which a phonograph is provided to answer calls of telephones when the person called is out. The person before leaving will deliver a message to the phonograph stating when he will return, where he is going, or where he may be called, and this the phonograph will automatically repeat twice to each call. This it will do, no matter how many calls there may be.

SCIENCE.

Dr. Charcot, the French explorer who is on his way to the South Polar regions, left Buenos Ayres on November 27.

Mme. Curie, who with her husband, the late Prof. Curie, discovered radium, has been appointed Chief Professor of Physics in the Faculty of Sciences, Paris University. Mme. Curie succeeded her husband in the professorship held by him in the Faculty of Sciences before his death.

Mr. Horace H. Poole has recently determined the heat evolved by pitchblende by means of a delicate thermocouple. With 560.7 grammes of pitchblende in an atmosphere of nitrogen, the temperature steadied at 0.0092 deg. C. above the surroundings. This corresponds to a heat leakage of 0.053 calorie per hour. Hence the amount per gramme per hour is 0.000094 calorie. The amount expected from the radium present is about half of this.

A German patent specification describes a process for preserving milk by removing all dissolved oxygen by means of the addition of a small quantity of ferrous carbonate. The process is based on the fact that freshly precipitated ferrous carbonate in the presence of oxygen immediately assimilates oxygen and evolves an equivalent quantity of carbon dioxide. One part of ferrous carbonate is sufficient for 50,000 parts of milk, and the properties of the milk are not altered in any way by the addition, which should be made before the milk is boiled.

Dr. Otto Rosaner recommends the employment, in soapmaking, of fatty acids distilled in copper vessels, and asserts that every large soap factory would find it profitable to install a distilling apparatus. The fatty acids subjected to distillation should be free from water and should not contain more than 5 per cent of neutral fat or more than 1/5 per cent of ash. These requirements may be satisfied by washing the crude fat with dilute sulphuric acid, in order to separate the fatty acids, and treating the latter, after their separation, with concentrated sulphuric acid. In most cases the distillation may be conducted at temperatures between 450 and 480 deg. F. Distillation in two stages is recommended in preference to continuous distillation, as it both increases the quantity and improves the quality of the product.

A Swiss patent has been granted to a Berlin firm for an explosive mixture composed of sulphur, sodium nitrate, small quantities of potassium nitrate and a chromate, and a carbonaceous material of fatty or resinous character which melts between 85 and 400 deg. F., becomes plastic and adhesive when heated, and is impervious to water. These ingredients are thoroughly mixed, without the addition of water, and are subjected to high pressure and temperature. The explosive is fired with a fuse, like gunpowder, to which it is claimed to be superior in the following respects: The products of combustion are less voluminous, less irritating to the lungs, and settle more rapidly; the explosive never becomes moist, cannot be ignited under 660 deg. F., burns more quietly, is less sensitive to blows and shocks, and possesses greater explosive power. The same firm has patented a safety explosive composed of ammonium nitrate mixed with one-fifth its weight of dinitro or trinitro compounds of the aromatic series, dissolved in a suitable medium. Potassium nitrate may be substituted for ammonium nitrate and metallic powders may be added to increase the explosive action.

Since Prof. Leduc, of Nantes, read his paper at the annual meeting of the British Medical Association, in 1907, on ionic medication, a great deal of work has been done on this subject in England. Prof. Leduc proved the efficacy of this method of local application of drugs by a striking experiment. He soaked a pad of lint in strychnine solution and strapped it to the ear of a rabbit. He then passed a current through the wet pad and the rabbit's ear, with the consequence that a rapidly fatal result occurred from strychnine poisoning. Ionic medication, or cataphoresis, has now been applied to the treatment of various conditions—skin affections, warts, ringworm, sciatica, and rheumatism. The treatment of rodent ulcer by zinc ions has been very successful. Among the cases already reported may be mentioned a case of rodent ulcer in the University College Hospital, which was treated by zinc ionization in the following manner: The ulcer, which was about the size of a threepenny piece and situated on the chin of an elderly man, was thoroughly treated with a solution of sulphate of zinc, then covered with lint soaked in a similar solution, and a positive zinc electrode applied to the lint. A moderate current was then passed through the lint and ulcer for some ten minutes, as a result of which the malignant ulcer rapidly healed. Copper ionization has been tried with success in the treatment of ringworm. Salicylate of sodium and iodine have been used in this way for sciatica.—New York Medical Journal.