ELECTRIC LIFTING MAGNETS.

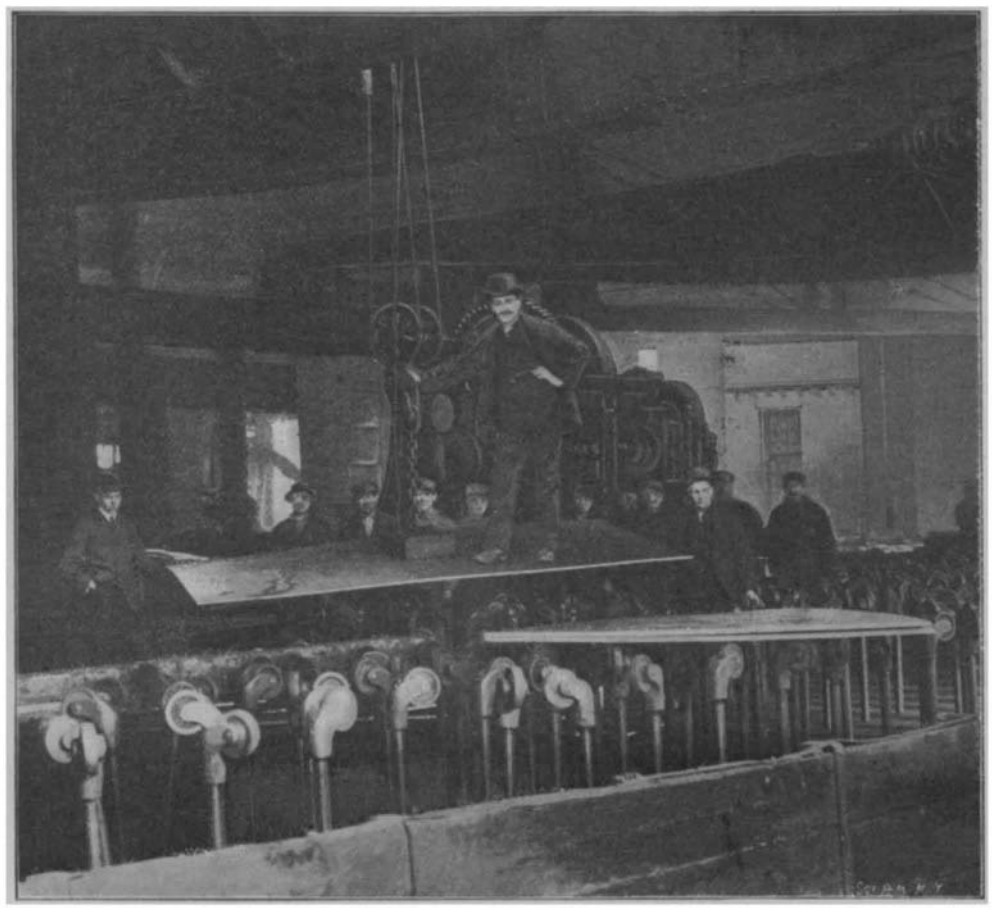
One of the newest and most ingenious devices for the speedy and economical handling of material in great manufacturing plants which has been introduced in the industrial world is the lifting magnet. There are several different types of the apparatus, but they differ only in detail. These magnets are, to a certain extent, a development of the idea embodied in the toys with which children pick up needles and other bits of steel, but each is directly connected with an electrical power transmission line which furnishes the current for holding the metallic material against the face of the magnet while the latter is being raised or lowered or moved from place to place. The magnets are now employed not only in the ordinary handling of steel and iron plates, bars, billets, etc., but also in stacking or placing them in racks and in loading them into or unloading them from railroad cars.

The operation of the magnets is simple in the extreme. The magnet is attached to the hook of a crane and connected to the main wires of a crane circuit, or if preferred it can be installed on an independent circuit, direct-connected with the dynamo. The magnet is lowered on to the material to be lifted, the current turned on and the hoist raised, whereupon the plate, billet, or other form of material is lifted by the magnet. When the load has been brought to the proper place it is lowered into position, the current cut off and the magnet raised, or if desired the load can be dropped without the magnet being lowered.

A very striking example of the possibilities of the new lifting devices is afforded at the yard of the New York Shipbuilding Company at Camden, N. J., where all the cranes designed for use in handling ship plates are equipped with electro-magnets, the magnet in each case being controlled by the engineer of the crane. Thus, instead of its being necessary, as has heretofore been the case in shipyards, to employ a gang of half a dozen laborers to lift with crowbars each plate to be moved while a chain is slipped underneath, and then go with the plate to its place of deposit and release the chain by a similar process, only one man is required in addition to the engineer. The latter brings the electro-magnet over the plate, turns on the current, and the plate, now the armature of the magnet, may be lifted and carried to any part of the shop. At the outset of the experiments with the lifting magnets it was found that there was a remote possibility of danger always present, from the fact that the current might at any time be cut off in the dynamo room without warning, but this is guarded against in most plants by the use of current from a storage battery.

In many cases a crane operator can load and unload material by means of the magnets without any assistance whatever from other operatives. The saving in time and labor in the handling, stacking, loading and unloading of steel or iron plates, bars, slabs, billets, ingots, etc., is variously estimated at from fifty to seventy-five per cent, although in the handling of plates a still greater saving is attainable. Otherwise expressed, the utilization of one of these labor-saving devices ordinarily means a saving of the services of from three to five men, and the work may be performed in less than half the time. In many minor ways, too, the new plan of handling material is an improvement. For instance, there is no necessity for the loss of time consequent to shifting the chain in order to get the load to balance, as commonly had to be done under the old system of handling plates, and moreover experiment has proved that magnets will actually lift and handle material where a chain would slip.

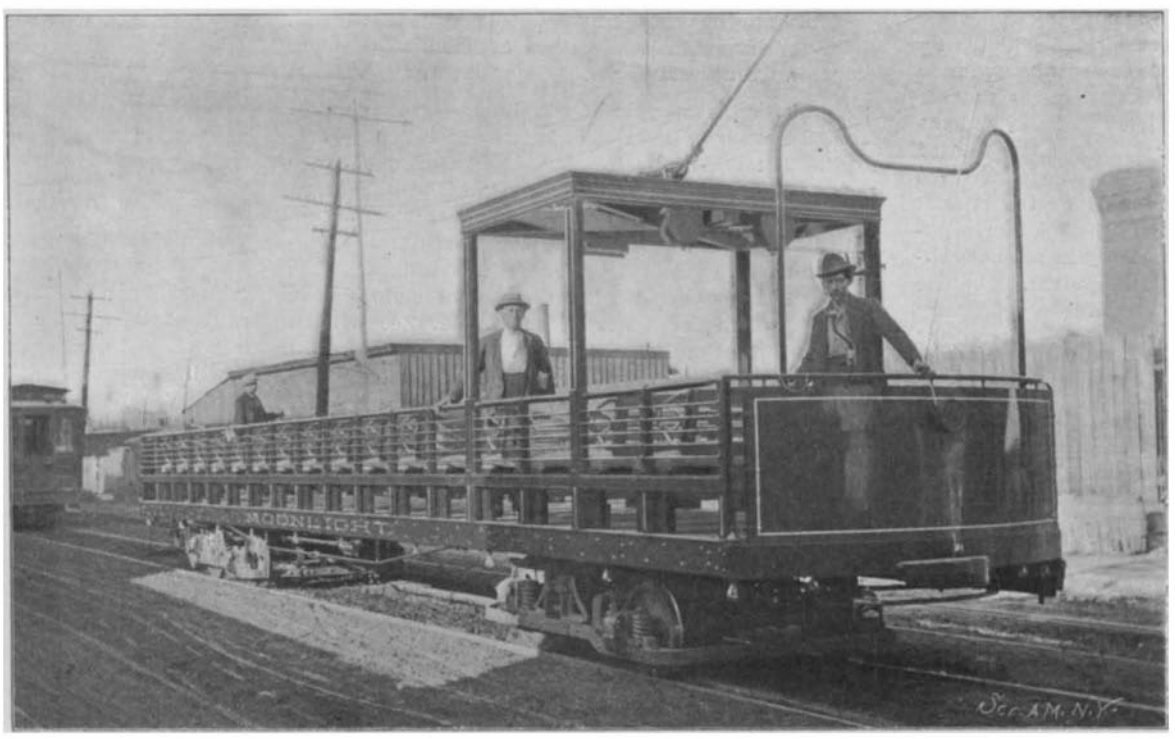
In handling billets or other material of similar shape, two, three, four or even more pieces, up to the full length of the magnet, can be picked up and handled at one time. In handling small thin plates, the current from the magnet will pass through a number of them, lifting several plates at a time. If, on the other hand, a magnet picks up more plates than required, the excess can be dropped off, one at a time. If desired, also, the magnet may be so designed as to only pick up one plate at a time.



HANDLING PLATES AT THE SHEARS BY LIFTING MAGNETS.

In plants where the electro-magnets have been introduced, a rather unique method has in some instances been followed in handling boiler heads and other thin plates. Piles of plates lying flat have been tilted to one side, so that the lifting-face of the magnet could come in contact with the edges of the material, and thus quite a number of pieces have been transferred from one place to another simultaneously. In handling long plates two or more magnets are used, in order to prevent bending or sagging. It has been discovered also that by the exercise of a little care magnets may be dropped on a plate in such a manner as to raise the plate from a flat to a vertical position and successfully handle it in this position or deposit it in a rack.

The ordinary magnets have a lifting capacity of five tons each. However, they are seldom if ever taxed to their full capacity. At a recent test a single magnet lifted five billets, each weighing 240 pounds, and later lifted a billet 15 inches by 15 inches by 5 feet in size and weighing 3,820 pounds. Then four billets, each weighing 145 pounds, were moved by the magnet, after which three billets, each weighing 730 pounds, were moved; and finally six billets, each weighing 730 pounds, were raised and transported. Owing to the size of the material, three magnets were utilized to lift a 3,000-pound steel plate over twenty-seven feet in length and nearly a yard wide, and the three magnets also raised a plate of this size from a flat position preparatory to placing it in a rack on edge.



ST. LOUIS NIGHT EXCURSION CAR "MOONLIGHT."

A NIGHT EXCURSION CAR.

There seems to be no end to specialties in the way of cars for street railways. The increase of mileage around our great cities has resulted in creating a great demand for excursions, and it is possible in many places to travel eight or ten miles for five or ten cents, and the trolley has even invaded Fairmount Park, passing through some of the most delightful sections of that great pleasure ground.

The St. Louis Transit Company has constructed a special roofless summer car, for hot weather service, running to Creve Cœur Lake each evening. The car is appropriately named "Moonlight" and is built much on the lines of the ordinary summer car, except that no part of it comes between the passengers and the sky. It was built under the supervision of the master mechanic of the St. Louis Transit Company in the shops of the company, and is 46 feet 5 inches long and 8 feet 2¼ inches wide. It is equipped with sixteen cross seats and can comfortably accommodate ninety-six passengers.

The tower which supports the trolley stand is not roofed over; this enables every passenger to have an unobstructed view. No lights are used above the seats, except a small cluster to illuminate the registers. The remaining lights are placed underneath the car body, parallel to the running board. The registers are operated by bell cords running parallel to the footboard and with cords extending up to the side posts. Electric bells are also provided on each post, and there is also an electric bell for the conductor to signal the motorman, and one for the motorman to signal the conductor. The car makes two trips every evening and the distance covered is 20 miles. We are indebted to Mr. J. Boyle Price, of the St. Louis Transit Company, for the foregoing particulars and for our photograph.

New Range Finder.

At the meeting of the British Association for the Advancement of Science in Glasgow, Prof. George Forbes described a new folding range-finder for infantry. This device is of the type known as a "one-man portable-base range-finder" and is eminently accurate up to 3,000 yards. Although founded upon the Aidi instrument it possesses none of the disadvantages which characterized the latter apparatus. The British Navy is provided with the Barr and Stroud finders, which are stated to supply the requisite accuracy. A one-man instrument convenient in weight, shape and portability, has long been deemed necessary. It should be so accurate that at a range of 3,000 yards the possibility of error in the hands of a capable man should not exceed 2 per cent, and should be so simple and easy to comprehend that only a short training would be necessary to enable the manipulator to understand and to handle it capably. The Forbes range-finder is a small folding aluminium base 6 feet in length and a field glass. A square tube constitutes the base, with a hinge in the center, and at each end of the base there is a doubly reflecting prism. In use the rays of light reflected from a distant object strike the outer prisms, are then transmitted along the tube, and strike the center prisms, and are reflected into the two telescopes of the binocu-

lar attached to the base, in directions parallel to the rays which strike the outer prisms. By measuring the angle between these rays the distance of the object being surveyed is determined. The measurement of the angle is accomplished by means of two vertical wires, one of which is placed in each telescope and which are seen by the two eyes. One wire is fixed, but the other is rendered movable by a small micrometer screw. This latter is operated until the second wire merges, as it were, into the first, and the two appear as one. This has been ascertained to prove accuracy to 2 per cent at 3,000 yards. Prof. Forbes contended, however, that single coincidence was not so accurate as stereoscopic vision, since by the latter the wire appears to stand out in bold relief against the picture, and the slightest movement of the micrometer screw immediately shows whether the wire is near or farther away than the object being observed. Prof. Forbes' instrument complete weighs 4 pounds, the base weighing 3 pounds, and the binoculars 3 pounds. The latter apparatus has a magnifying power of 12 diameters.

Automobile News.

The boilers of steam motor carriages in Chicago must be inspected by the regular boiler inspection department of the city.

A service of motor-cars has commenced to run between Piccadilly Circus and Putney. The fare is eight cents, and the journey occupies half an hour.

A doctor with a strong penchant for the motor-car has written to the London Times suggesting motor-car driving, "fully up to the legal limit," as a means of administering the open-air treatment to consumptive patients. He says he has been much struck by the beneficial effects produced by a 30 to 50 mile motor-car drive. Along with a feeling of marked exhilaration, an increased appetite, and improved sleep, there is a heightened healthy glow which after a few days' treatment tends to become permanent. The tendency to cough is much diminished.

The Austrian Minister of Railways has ordered from the Vienna Daimler Motor Company a motor car for service upon the railroads. In reality it is a motor railroad car. It is of the same dimensions as the ordinary third-class European railroad carriage, with thirty-two seats and corridor extending through the center. Under the floor and attached to the foundation frame is the four-cylinder motor of 30 horse power, together with the usual mechanism and supplies. The car is to attain a speed of thirty miles per hour. Only one man will be necessary to drive it. Such independently-propelled cars in Austria are faster than the fastest trains.

Pasteur Institute Figures for 1900.

According to the figures which have been published for the year 1900, 1,420 persons have undergone the treatment for rabies at the Pasteur Institute. Of these 11 have died of the rabies. In the case of 6 of these latter, the death has occurred within 15 days after the end of the treatment, and one person was taken with the rabies in the course of the treatment. These seven cases will not be counted in the following table, as after experiments made with dogs, it is supposed that the nervous centers of the persons who have died within the 15 days have been invaded by the virus before the cure could be fully efficacious. The figures show, thus, 1,413 persons treated, 4 dead, giving a percentage of 0.28. In the last ten years the number of persons treated ranges from 1,800 to 1,400, and the number of deaths from 7 to 3. The persons treated at the Pasteur establishment are divided into three classes, as follows. A. The madness of the animal which had bitten the patient was proven experimentally by the development of the malady in animals bitten by him or inoculated with his virus. B. The madness of the animal had been shown by a veterinary examination. C. The animal is only suspected of rabies. M. Viala gives in the following table the distribution of the cases in these three classes, for the year 1900:

	Bitten on the Head.			On the Hands.			On the Members.			Total.		
	Treated.	Died.	Per cent.	Treated.	Died.	Per cent.	Treated.	Died.	Per cent.	Treated.	Died.	Per cent.
Case A.....	20	0	0	109	3	2 75	50	1	2.00	179	4	2 23
Case B.....	78	0	0	555	0	0	233	0	0	866	0	0
Case C.....	28	0	0	188	0	0	159	0	0	375	0	0
Total.....	126	0	0	852	3	0 35	442	1	0 22	1,420	4	0.28

From the point of view of nationality, the 1,420 persons treated are divided as follows: England, 14; Germany, 4; Belgium, 5; Denmark, 2; Spain, 2; Greece, 2; British Indies, 56; Switzerland, 1; France, 1,334.

Mr. Peter Nissen has successfully passed through the Whirlpool Rapids in his "Fool Killer II.," which we illustrated in the Scientific American for October 12, 1901.

Engineering Notes.

Iron ore is being shipped to the United States from Spain, and a vessel which carried a cargo of iron ore returned with a cargo of steel rails.

Flywheel accidents can be provided for by insurance policies covering all damages to persons and property caused by the breaking of the flywheels. The wheels are inspected before the policy is issued and at regular intervals thereafter.

A company is being formed at Amsterdam for working a coal deposit on the islands of Java and Borneo, says The Engineer. The greater portion of the coal obtained will be held at the disposal of ocean steamers.

According to German reports, the Greek government has just granted a concession to the British Eastern Railway Company for building a new railway between the harbor of Piræus and the Greek-Turkish frontier. This will connect all the Greek railroads with the so-called International Orient Roads, making communication with Greece less complicated than at present.

The British Naval Department has authorized the construction of a sixth submarine boat. It differs from the preceding vessels, which are of the Holland pattern, and also from the French type in many respects. It is not quite such a fast traveler as the French boats, but it will be able to rise and to descend with greater facility and celerity. A torpedo tube is placed at the extreme forward end of the boat, while four 18-inch Whitehead torpedoes are to be carried. The gear is also being arranged so that the torpedoes may be discharged while the boat is either stationary, running at any speed submerged, or awash. The boat is to be fitted with a horizontal rudder in addition to the vertical pattern. Automatic means also determine the angle of diving or ascending, and also prevent the possibility of descending to excessive depths. The men who have been selected for manning these submarine vessels are to receive double pay. The first boat, which is nearly ready, is to be attached to the first-class battleship "Formidable," for service in the Mediterranean.

The Egyptian government, which is about to place extensive orders for locomotives for its railway, has been carrying out some exacting tests with English and American locomotives manufactured by Messrs. Nelson Reid & Co. of Glasgow and Baldwin & Co. respectively. The trials were carried out on the simplest and fairest lines. The American engines were similar to the English type in every respect, with the exception of the boiler pressure, which was 160 pounds per square inch as compared with 140 pounds per square inch on the English engine. The total weight of the train hauled by the American engine was 443 tons, while that drawn by the English locomotive was 555 tons. The coal in each case was carefully weighed for the respective engines, at the starting point, but 6 hundredweight 98 pounds was allowed each engine for raising steam preparatory to the run. The trial trip extended from Gabbari to Cairo, a distance of 130 miles. When the engines arrived at Cairo the remaining coal was recorded and the consumption of the English engine was found to be 26 hundredweight. According to the official report of this competitive trial, the English engine is advocated as being much more economical in working and more efficient.

A bill for the purpose of reclaiming the Zuider Zee from the sea is to be brought before the Dutch government. The scheme is to inclose and subsequently to reclaim the vast semi-lake or sea which lies behind the Hook of Holland. To carry out the project a dam will first be constructed across the mouth from Wieringen in North Holland to Piaam in Friesland. This dam will be provided with a series of sluice gates, through which the water of the Zuider Zee will be pumped into the North Sea by means of powerful steam pumps. Work will then proceed on the south-west corner, and the remaining portion will be left as a fresh-water lake owing to the overflow of the River Yssel. There will be two sections of reclaimed areas. One will be the Wieringen area, 83½ miles in extent, containing 72 miles of fertile land; and the other will be the Hoorn area, with 121¼ square miles, of which 107 miles will be fertile land. It is computed that the completion of the work will occupy approximately eighteen years. The dam shutting out the North Sea would be finished in nine years, and the Wieringen section of reclaimed land would be ready for cultivation at the termination of fourteen years, while in the eighteenth year the Hoorn section would be completed. The cost of the undertaking will be about $39,000,000. A large number of villages mostly occupied by fishermen, will have to be swept away, and the compensation paid to the owners for this part of the work alone will amount to a large sum. As a means of compensating the fishermen it is suggested that the government should supply the fishermen with new boats and tackle, as their existing craft are not capable of fishing in the North Sea.

Electrical Notes.

Tests have recently been carried out upon three 220-volt, 200-watt Nernst lamps in Germany. The lives were severally recorded as 124, 293, and 369 hours. All three lamps were destroyed because the glower feeding wire melted close to the incandescent body. The voltage was continually 220 volts. The candle power dropped from 146 candles at the start to 99 after 100 hours, 81 after 220 hours, 60 after 300 hours, and 48 after 350 hours, the watts consumed per candle being 1.33, 1.91, 2.19, 2.68, and 2.89 respectively.

According to the eighth edition of the list of cables just published by the International Telegraphic Bureau of Bern, the Gummi Zeitung says, there exist 1,380 government-owned cables of a combined length of 39,851 kilometers, and 370 cables owned by private companies of a total length of 318,286 kilometers. The principal company, which disposes of 93 cables, of a total length of 73,223 kilometers, is the Eastern Telegraph Company of London. The longest cable is the one connecting Deolen, near Brest, with Cape Cod, Mass., laid down in 1898 by the Compagnie Française of Paris; it measures 5,878 kilometers.

A recent number of the Bulletin de la Société Internationale des Electriciens, says Insurance Engineering, contains a paper read before that society by Janet, in which he gives the results of a number of laboratory experiments made to determine the insulation resistance of various types of gloves worn by electric workmen when handling live wires. The experiments were performed with the gloves first dry, then wet, the testing voltage being 105 in each case. In the dry test the gloves were filled with mercury and suspended in a bath of mercury; in the wet test fine sand, dampened with acidulated water, was substituted for the mercury. The resistance in megohms ran from zero to 52,000 dry and from zero to 420 wet. On test by high-tension alternating currents three samples broke down at very low voltage, while three others broke down at 1,000, 2,000 and 11,000 respectively. The sentiment expressed in the discussion which followed the reading of the paper was, that insulating gloves cannot be generally relied upon as an effective protection, and that wiremen with gloves should not touch bare conductors, but only such parts as are already insulated.

The contracts for the conversion of the tramways of London to electric traction are exciting keen interest in the electrical world. They will be among some of the largest known, since the work will represent a total expenditure of approximately $15,000,000. The ordinary track and slot rails, fastenings, tie bars, are to be of English manufacture, but there is no such stipulation in connection with the electrical plant and the cross-overs, since it is thought that the British manufacturers cannot supply these special lines on equal terms with the German or American manufacturers. The conduit system has been selected, and it is estimated that the cost will be from $75,000 to $100,000 per double mile. Several difficulties will be encountered in laying the conduits, which will considerably retard the progress of construction, owing to the labyrinth of pipes a few inches below the surface of the street. It is doubtful whether any other city in the world possesses such an intricate underground network of pipes and cables as does the city of London. It is confidently expected, however, that the electric tramways will be open for traffic in January, 1903.

An electric railway is projected between London and Brighton, a fashionable resort on the south seacoast of England. Many business men in the city have their homes there, and it is anticipated that the new line will carry them to and fro much more quickly than existing facilities. The distance by the present railroad is approximately 60 miles and the journey is covered by express trains in about an hour. The new line, however, will be practically straight, measuring 46¾ miles—only a quarter of a mile in excess as the crow flies. It is proposed to run a half-hourly service of trains from both termini. The London terminus will be at Westminster in the West End. The train will be composed of four coaches of the American type and two Pullmans, for first-class passengers. The fare for the round trip will be $1.25 first-class, and 75 cents second-class; single trips to be half the round trip rates. There will only be three curves, but each of these will have a wide radius, so that they will not be felt. Power is to be derived from two generating stations, one at each end of the railroad, each developing 10,000 I. H. P., and each carriage will be equipped with its own motor, gathering the current by means of an electric brush running on a copper ribbon laid between the rails. One feature of the railroad is that it does not touch a single public building or church throughout its entire length. The shield tunnel will be requisitioned for boring the tunnels through the hills. The effect of this railroad will be to develop Brighton, which is already a large town, as a residential quarter for city men.