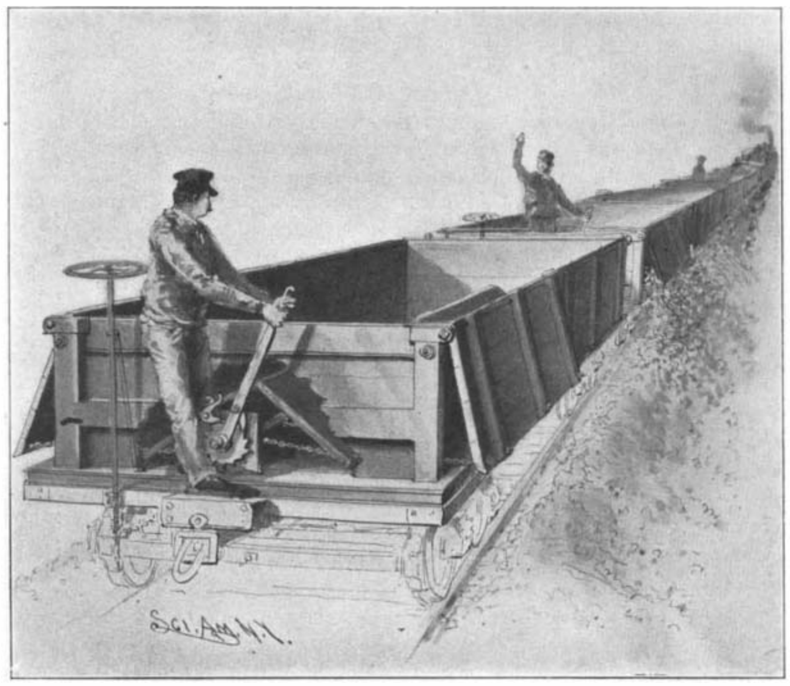
DUMPING-CAR WITH CONVENIENT LOCK AND RELEASE.

An improved device for railroad dumping cars is covered by a patent recently granted to Mr. A. J. Twiggs, of Augusta, Ga. The invention relates particularly to cars having peak-shaped bottoms and side doors which open outwardly to allow the contents of the cars to slide out to the sides of the track. The improvement may be placed on any flat car at moderate cost, and consists in a new locking means which may be readily operated to lock or open these side doors. A winding shaft passes longitudinally through the car below the peak bottom and to this shaft the side doors are connected by chains. The shaft is provided at each end with a ratchet wheel adapted to be engaged by a pawl fulcrumed upon an operating lever which is hung loosely on the winding shaft. The ratchet is locked against return movement by a dog pivoted on the car body. The dog is provided with an upwardly extending tripping arm which is adapted to be engaged by a latch. When operating the ratchet this latch is thrown out of engagement with the tripping arm. The tripping arm is so disposed relative to the ratchet pawl that, with the latch thrown up, when the lever is moved to the left this arm will be engaged by the fulcrum end of a pawl and the dog will be thus swung out of engagement with the ratchet wheel. Further movement of the lever causes the dog to lift the pawl also out of engagement with the ratchet teeth, thus unlocking the shaft. The chains are then free to unwind from the unlocked shaft and the pressure of the load against the side doors of the car causes the doors to swing open. When it is desired to close the doors the lever is swung forward, throwing the pawl into engagement with the ratchet wheel and permitting the dog to fall to its normal position. A short up-and-down motion is now given to the lever which intermittently turns the ratchet wheel, winding up the chains on the shaft and drawing the doors to their closed position. The latch is now thrown into engagement with the tripping arm and the doors are thus securely locked.



IMPROVED LOCKING DEVICE FOR DUMPING-CARS.

GERMAN TESTS OF THE PUPIN SYSTEM OF LONG-DISTANCE TELEPHONY.

In Supplement No. 1308 we gave a thorough explanation of the earlier experiments of Dr. M. I. Pupin, of Columbia University, in long-distance telephony.

A practical demonstration of his theory concerning the action of uniform and non-uniform conductors, together with the effects produced by the non-uniform conductors upon the amplitude of the waves, showing at the same time the limit to which such non-uniform conductors may be used, is also given. Dr. Pupin's investigations were directed mainly toward lessening the electrostatic capacity of cables, aerial, subterranean, or submarine. To do this within the circumscribed limits of a laboratory, it was necessary to construct a line with an ohmic resistance equal to that of a cable of a given length, and this he accomplished by the use of a line of tin foil carefully insulated and folded many times upon itself. When finished, the line possessed a resistance equal to that of 250 miles of cable. This cable, with the means employed to make of it a non-uniform conductor, we also illustrated in the same issue. The theory then, and so much of its application as was possible within the walls of the laboratory, we owe to Dr. Pupin; for a more extended application of the theory we must look to others. We all know that telephone lines over long distances, such as from New York to Philadelphia, Albany, Boston, or Buffalo, are simple, open, free copper wires suspended from ordinary telegraph poles. This method of construction is not followed from purely economical reasons. A line of this length, if formed into a cable of ordinary construction, would not deliver an audible word at the receiver.

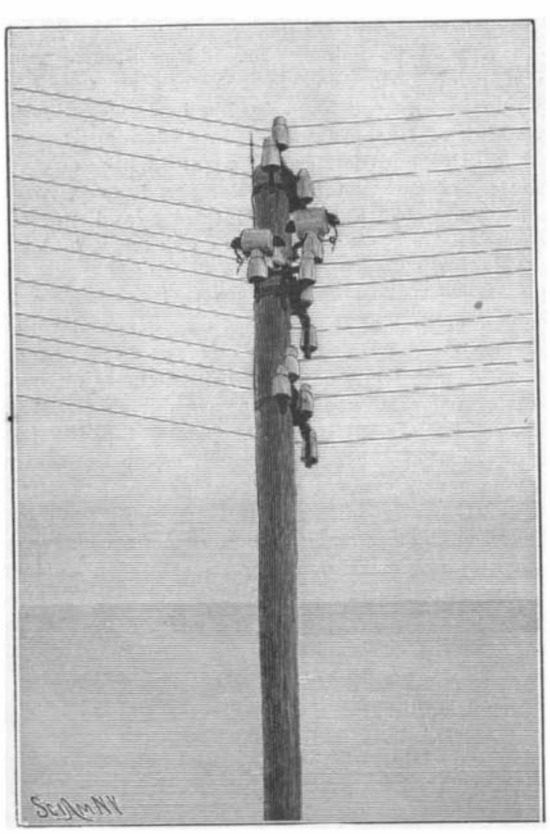


Fig. 3.—AN AERIAL LINE EQUIPPED WITH PUPIN COILS.

Peculiar effects are apparent the moment these wires are insulated and formed into a cable. The so-called electrostatic capacity of the cable operates to damp the telephone currents, and by attenuating the waves prevents them from reaching the terminus.

The greatest difficulty is experienced in sending a message through an ordinary cable 30 miles long. A cable 50 miles long presents insuperable difficulties. Many attempts have been made to reduce the capacity of the cables, such as placing layers of paper between the insulating materials of correlative wires, thereby to hold a film of air about them and thus lessen the effect of the various electric currents passing in such close proximity.

Such experiments have proven in a measure successful, but only for moderate distances; a few miles added to the length renders them ineffective.

By a practical application, however, of Dr. Pupin's discovery, cables five and six times as long as those now in use may be successfully operated.

The damping of the telephone currents depends upon three factors; the resistance of the conductor, the capacity of the cable, and its self-induction. An increase in the first two produces a like increase in the attenuation or damping, while any augmentation of the self-induction diminishes the damping.

Accordingly, we may reduce the attenuating effect of the cable, regardless of its capacity, to any desired point, provided we are able correspondingly to increase the self-induction. The phenomenon of self-induction was known to both Heaviside and Thompson, who even knew that the induction coils should be distributed along the cable; but it remained for Pupin to work out the law according to which the coils were to be placed, and fix their exact position upon the cables, thus furnishing the first practicable and trustworthy application of the system. Pupin discovered that, in order to accomplish the desired result, the coils must be inserted at distances corresponding to a fractional part of the wave length of the alternating current passing along the cable (conductor).

With these data before them, Siemens & Halske, of Berlin, made many experiments in their laboratory which gave most astonishing results. By the permission of the German Imperial Postal Department, this firm proceeded to equip the subterranean telephone cable with Pupin coils, the cables consisting of 28 double copper wires 1 mm. thick each, which connect Berlin with Potsdam over a distance of twenty miles. The insertions of the induction coils took place at the coupling boxes, one case of coils such as we show in Fig. 1, being laid at every other coupling box. In this manner, just half of the 28 double lines were provided with spools. Each case, or metallic box, contained 14 coils, the detailed construction of which is shown in Fig. 1, duly sealed and filled with insulating material such as paraffin. The ends emerging were then joined to the corresponding ends of the main wires inclosed in the sleeve joint, which was likewise poured full of insulating material. The distance between each successive case of coils was 4,265 feet. Measurements showed that, after the connecting in of the spools, the self-induction had increased two hundred fold, while the damping constant had been reduced to one-sixth. A great improvement in the talking efficiency of the line was to be expected, and the results confirmed the expectation.

When one of the loops provided with the Pupin coils was compared with one left without such assistance, the difference in the intensity of sound was astonishing. Standing at a distance of 15 inches from the receiver of an ordinary line, the words could scarcely be distinguished, while the receiver of the Pupin line projected the sound waves with such energy that the words were distinctly audible across the room, 33 feet distant. More startling was the effect of the Pupin system when several of the loops were connected. Three loops formed a continuous line of 60 miles in length. Over this length of unassisted wire the voice of the speaker could hardly be heard, and when five loops were connected, making a line 100 miles long, it gave out altogether, failing to deliver a word at the receiver; whereas the Pupin line delivered the voice with about the same intensity of tone as that received over the single 20-mile wire, thus showing a five-fold increase in the speaking property of the line due to the Pupin coils. Thirteen Pupin loops were now connected,

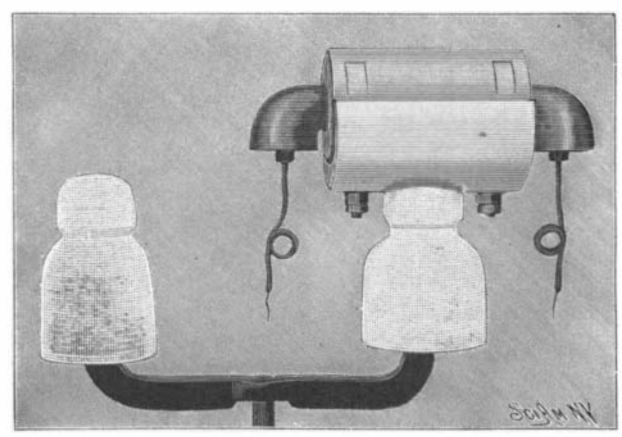


Fig. 2.—INDUCTION COIL FOR AERIAL CONDUCTORS.

making a line 262 miles long, and the speaker could still be heard, though his voice sounded very low. Compared with open wires, it was found that an assisted wire of 1 mm. (0.39 inch) diameter in a cable was equal to an open unassisted wire of the same length but of twice the diameter. Having obtained such favorable results with the cable, the most obstinate

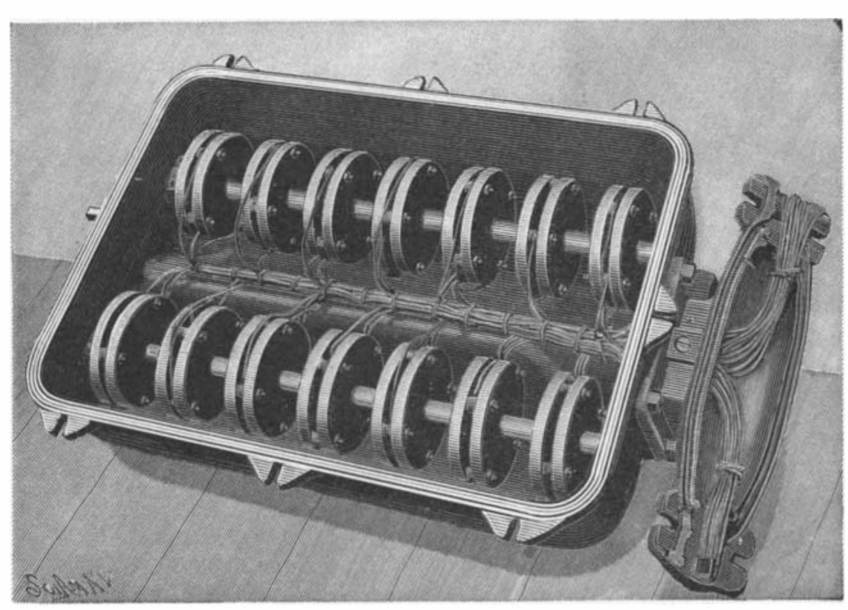


Fig. 1.—THE INDUCTION COIL BOX.

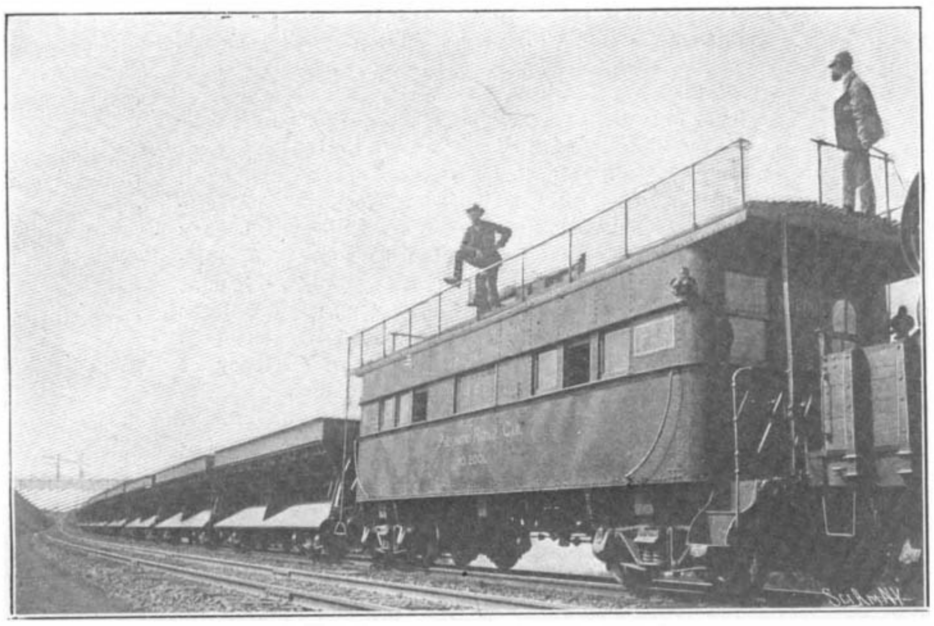
of all electric conductors, attention was turned to the open or uncovered wires. The line running from Berlin to Magdeburg, a distance of 93 miles, was selected. The comparison was made between a wire 2 mm. (.078 inch) in diameter and 93 miles long, and another of 3 mm. (.118 inch) in diameter and 111¾ miles long. Fig 2 shows the manner of equipping the former wire with the coils, as well as the double insulator. The coils were placed upon poles 2½ miles apart, and it was found that the assisted smaller wire far surpassed the work performed by the larger wire. In Fig. 3 we show a pole with a number of coils attached. These results prove that in the Pupin inventions, new means are provided for greatly increasing the speaking property of cables. The day may not be so very far in the future before New York and London, Paris, Berlin, Vienna, or St. Petersburg may be telephonically connected, and "Hello London," will be a common expression in Wall Street. The coils necessary to assist a wire are not too large to be placed in the sheathing of a transatlantic cable. Hence such a cable is by no means an impossibility. Such coils, if placed at proper intervals, may not exceed an inch in length with a diameter of half an inch. With the Marconi wireless telegraphic and the Pupin relay telephonic systems in working order, the era of quick and easy communication will have arrived.

A STEEL CABOOSE AND REPAIR CAR.

BY GEORGE J. JONES.

With steel cars now coming largely into use, entirely new problems of maintenance and repair are encountered. When a wooden car is wrecked in a collision or other accident, the problem generally presented is that of getting the debris out of the way as soon as possible and to subject the following trains to the least possible delay. But in the case of the steel car the damage sustained is of an entirely different character. With the proper facilities at hand, it is necessary only to replace a few parts, to straighten out a few others, and the car is ready to proceed to its destination.

The Goodwin Car Company has been the first to meet these changed conditions by the construction of a combined caboose and repair car, which is designed to accompany trains of the dumping cars built by that company. Such a car is shown in the accompanying cut, and was built for the Carnegie Steel Company as part of a train which that concern is now operating in the vicinity of Pittsburg. One of the features of superiority of this car over the caboose of wood is its great strength. It has but two sills, which are of steel and form the backbone of the car, being situated on the line of the draft and pulling strains. The rigidity thus obtained is especially desirable where it is found necessary to make use of pushing engines on mountain grades. One of the most common forms of accident is the result of the collapse of the caboose in these trying circumstances. The sudden application of the brakes at the head of the train on a slight grade has been known more than once to smash the caboose into splinters, killing or maiming the occupants. The steel caboose has already been put to a test of this character in actual practice, and no fault whatever could be found with its behavior. As a repair shop, this car is fitted with the pneumatic tools which are necessary to remedy any ordinary damage that will be encountered on the road, and which are operated from the train-line pressure of the air-brake system. The car parts are all interchangeable, and the repair car is fitted out with duplicate parts. Where it is necessary, it will be a comparatively easy matter to cut out a broken part and substitute a new one. A special tool is provided on the car for doing this work quickly. By means of this tool the rivets are cut out so that new parts can be substituted. With the usual cold chisel and sledge hammer, it would be impossible to accomplish much in difficult places under the car.



A STEEL CABOOSE AND REPAIR CAR.

The tool in question consists of an ordinary piece of hydraulic piping with a series of cutting teeth on one end, the other end being fitted to the drill ordinarily used with the pneumatic equipment. These teeth being allowed to operate on the head on the rivet, cut it away until it can be driven out with little difficulty.

In the construction of the steel cars, bolts are used instead of rivets on all parts which are most liable to damage while on the road by reason of accident. These parts can then be removed and replaced merely by the use of a monkey wrench, which feature further simplifies the matter of repairs on the road.

The steel caboose also can be used as an observation car, being supplied with a cupola and a railing around the top of the car. From this point the operation of the entire train can be observed. By opening an air-valve at one end of the car, any car or the whole train can be dumped either at the side of the track or in the center. This feature is of great advantage in trestle filling and storage purposes, mineral transportation and for filling work.

The dahlia is a plant prized solely for its bloom, yet were all the Irish potatoes to be destroyed, it is possible that this plant would to some extent replace them. Roasted, the dahlia bulb is wholesome and toothsome and makes a not bad substitute for the potato. When first introduced into Europe, it was not for its flower, but as a vegetable that it was valued. —G. E. M.

ELECTRIC HAULAGE ON CANALS.

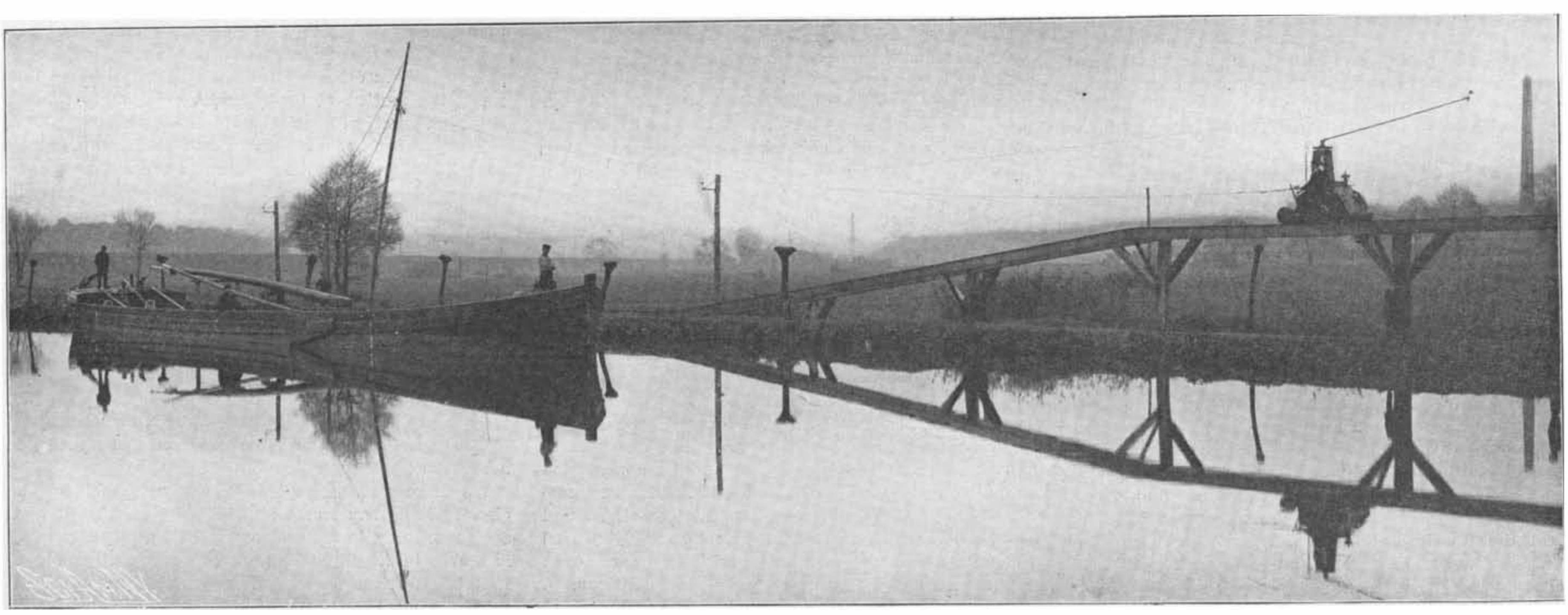
BY FRANK C. PERKINS.

Since the prize competition for an electric canal haulage system to be used on the Teltow Canal, considerable attention has been drawn to what has been done in the same field during the past decade. The Teltow Canal, nearly forty miles in length, it is said, would carry nearly five million tons per annum, connecting as it does the rivers Spree and Havel. The committee in charge of the competition offered prizes of about $3,000 for the best electric system of canal haulage. A score of applicants took part in the competition.

It may be of interest to consider some of the work done in electric canal haulage before going into the details of these tests. In Germany, France, America, and other countries experiments have been made with electric canal haulage systems with varying success during the past ten years or more. Recently it has been seriously questioned whether the railroads would be able to supersede the canals entirely or even compete successfully against them, when electrically equipped, for moderate speed transportation of freight. The general tendency is to enlarge canals to accommodate larger boats. The Erie Canal has been somewhat enlarged and will undoubtedly soon be reconstructed, and equipped for handling immense quantities of freight. The Oder-Spree Canal was enlarged for boats of 450 tons. The Dortmund-Ems Canal boats have a capacity of 750 tons. Large boats are also to be found on the great Mittelland Canal.

Lamb's aerial system was tested in America on the Erie Canal near Buffalo some years ago and on the Finow Canal near Eberswald, Germany. A strong steel cable is used in this system for supporting the motor carriage. The current is received from an overhead trolley wire and travels along the suspended cable. The steel cables are all supported on posts along the bank of the canal. The propelling mechanism consists of a revolving drum which winds itself on and along a second steel cable provided for the purpose. The length of the system installed for this test was somewhat less than half a mile.

The motor used was of about 1 ton weight, 500 volts pressure, and of 5 horse power capacity, while the speed attained was about 13,000 feet per hour, or 3.6 feet per second. On canals of many curves and turns the suspended system of haulage is open to the objection that many supporting posts are required. The weight of the heavy cable is said to be an objection; besides, many engineers contend that the cost of maintenance would be high. One of the advantages claimed for this system is that it leaves the bank free.



TOWING CANALBOATS BY ELECTRIC LOCOMOTIVES (KOETTGEN SYSTEM).

The Koettgen electric canal haulage system employs one rail in some cases and two rails in others where tests have been made as on the Finow Canal. The electrical equipment was supplied by Siemens & Halske of Berlin. The length of track used was about 3,300 feet and an electric locomotive is employed for hauling the canalboats. The single rail is placed farthest from the canal so as to impede other traffic on the canal as little as possible. Two of the locomotive wheels are grooved, are small in diameter, and carry more than three fourths of the weight. These small