THE UNDERGROUND TROLLEY STREET RAILWAY IN NEW YORK CITY.

The Metropolitan Traction Company, of this city, having organized and put in operation their highly developed cable traction system, has now gone a step farther and installed an underground trolley system on part of its line, with the double view of working the portion of the road now equipped therewith by electricity and of extending it in the near future to other portions of their line.

For some reason the idea of an underground trolley system has been considered almost impracticable. Up to the present time the Buda-Pesth road and a short line known as the Port Rush road, near the Giant's Causeway, in Ireland, are the only two roads which have actually employed an underground electric trolley successfully for any length of time. Great difficulty has been feared from the entrance of dirt, moisture, snow, etc, into the conduit, destroying insulation, bringing about the formation of arcs, and involving other troubles. So true is this that a number of ingenious systems for avoiding these troubles have been devised and have been operated with more or less success experimentally, although they, naturally, are more complicated than the simple open conduit. The Metropolitan Traction Company has adopted the system of the General Electric Company, which is distinguished by great simplicity, dependence being placed more upon perfection of construction than upon any especial design for its protection from interference with its general working qualities. The conduit proper is of the typical construction used for the cable roads. This construction has been followed with the object of supplying a conduit for a cable if the electric system should prove unsuccessful or undesirable. Through the conduit on each side the contact bars are carried by hangers. The contact bars are connected laterally with feeder wires placed just under the outer shoulder of the iron casting. In the more recent portions of the installation, the feeder bar is a wrought iron pipe 1½ inches interior diameter and 2 inches exterior diameter. The pipe is inserted in 30 foot lengths and bonded at the ends with copper wire connections, bolted into the hanger slots. These pipes can be seen in our view of the cross and longitudinal section of the conduit and also in Figs. 2 and 3.

The hangers, of one of which we give a section, Fig. 2, depend upon a porcelain cup for their insulation, which cup is corrugated inside and out, and sits into a correspondingly corrugated cast iron cup, receiving in its central aperture the iron hanger rod, all being secured together by cement. To the lower end of the hanger rod a socket is bolted, and to this the pipe, in its turn, is bolted, the end of the bolt in the pipe passing through a slot 1⅝ inches long in order to provide for expansion and contraction by heat and cold. The head of the bolt is so shaped that it can be introduced into the slot, when by a revolution of 90° the bolt is secured to the pipe as shown in our cut, Fig. 3. The hanger bar is 1½ inches thick and 9 inches long, and the lower semicircular socket is attached to it by a swivel joint. This is the construction practically settled upon definitely, subject of course to minor changes if anything better can be evolved.

The electrical contact apparatus, termed the "plow," is attached to the car body and is built up of sheet steel, with wood and fiber insulation, its form generally being a parallelogram. When it is remembered that the slot itself is only ¾ of an inch wide, it will be seen how accurately the plow has to be constructed to correspond thereto in size. Its shank is $\frac{7}{8}$ inch in thickness, giving a clearance of a little over ⅛ of an inch on each side. To construct the shank two sheets of steel ⅛ of an inch thick are bolted together, and in the center and at the ends a central shoulder and end pieces are inserted for keeping them ⅛ inch apart, thus providing two passages between them of this width and 3 inches long going all the way down. This shank is 9½ inches wide, and descends well into the conduit. On each side of the lower portion of the shank are carried the contact shoes, which are seen in various views in our cut, especially in Fig. 5. These are castings, each being 4¼ inches by 2¼ inches, and ¾ of an inch thick. A single shoe is used on each side, although as many as three on a side have been used experimentally. They are carried by sheet steel springs 2¾ inches wide, which press them outward from the plow frame, as shown in Fig. 5. Under the influence of these springs they are pressed against the conductors with a pressure of about 7 pounds. The upper ends of the springs are clamped in place by bolts, wooden blocks and fiber sheet being used to insulate them from the plow frame.

The exact disposition of these parts is seen in Fig. 5, The springs are held in place by compression and by the hooked upper end, which enters a mortise in the wooden block. The fiber sheet is shown directly back or to the right of the detached spring. The same cut shows a heavy sheet of fiber descending down from the plow shank and between the springs to prevent any possibility of a short circuit. We have spoken of the channels that extend through the shank of the plow; through these pass copper conductors insulated with mica and tape wrapping (Fig. 5), one conductor for each contact shoe. Between the ends of the conductors and the shoes the connection is made by safety fuses, so that if too much current is put on, the burning out occurs at this point.

At the present writing the system cannot be called experimental in the usual sense, as it has operated with uniform success for nearly an entire winter, as well as during the less trying summer weather and the line is in daily operation and gives the greatest satisfaction. The Columbus and Lenox Avenue line is operated from a power house at 146th Street near Lenox Avenue. Here there are installed two multipolar dynamos, class B, of the General Electric Company, which at one hundred revolutions give a pressure of 300 to 330 volts each with an output of 1,200 amperes, but in practice they have been speeded up to nearly 150 revolutions, raising the voltage to 525. For each dynamo there is installed a 1,000 horse power cross compound Allis engine with Corliss valve motion, exhausting into the open air. To supply the engines there are two Babcock & Wilcox boilers, each containing 100 four-inch tubes 18 feet long, with 42 inch drums ½ inch thick and 23 feet long and capable of working at 180 pounds. At present cars are run by electricity on this division from below One Hundred and Sixteenth Street on Columbus Avenue to Lenox Avenue and One Hundred and Forty-sixth Street, but ultimately it is proposed to extend the electric system to other roads in the city. The Eighth Avenue road is the next one of the old roads to be equipped. It has been found that the conduits do not accumulate dirt, that the loss of current is not worse than on an overhead trolley, and the conduit has proved to be practically self-cleaning, requiring to be swept out perhaps two or three times in a year, the natural flushing of the rain doing the greater portion of the cleaning. It is made, of course, self-draining.

Fig. 4 is a cross section of the conduit drawn to illustrate the relation of the cable and electric systems. It shows where the working and idle cable in the cable traction system are situated, and gives the position of the parts of the electric system very clearly.

Manholes are placed along the line, never less than 250 feet apart. At them are placed sewer connections for carrying off rain water. Over each insulator is a handhole beneath the street paving blocks easily reached by raising a few stones.

Each car is provided with two 25 horse power motors, with electric heaters and electric lamps, including headlight.

A very noticeable feature about the operation of the cars is their smoothness of operation. They start without the jerk which is so pronounced on the cable roads, and the extension of the system to other roads of the city will be a decided improvement on existing systems. The system is interesting also as not using a return grounded circuit, so that electrolysis of water and gas pipes will be avoided.

The Non-refillable Bottle.

Bonfort's Wine and Spirit Circular of January 10 contains an exhaustive article on the above vexed question from the pen of a writer who signs himself J. C. G. It opens with the remark that "for many years it has been the general belief that there has been systematically practiced a fraudulent custom of substituting an inferior grade of liquors in bottles originally containing a superior brand, resulting detrimentally to its reputation, aside from probable serious financial loss to those whose output is deservedly in good repute."

It is recognized by the trade that the only effective way to prevent this fraud is to provide some mechanical device within the bottle which shall make it practically impossible. A whole army of inventors have spent much time and money in the attempt to provide this much-needed device; but at the present time there appears to be no such bottle in the market as meets all the necessarily exacting conditions laid down by the trade.

"There have been so many devices submitted for approval, and invariably objected to for one reason or another, that the trade seems weary of being importuned, and it is gradually beginning to consider the idea impracticable and to regard inventors as 'cranks;' while the glass manufacturers, having been surfeited in the matter of making trial samples, are free to admit they prefer not to be troubled by such work, and if they can be prevailed upon to do the work at all, they do it at their own convenience, which may mean a delay of weeks or months."

It is necessary that the inventor, in seeking to provide a non-refillable bottle, should have a perfectly clear conception of every detail of the conditions which his invention is expected to meet. As the matter stands, it is difficult for him to tell just exactly what the requirements of the trade are. He is informed:

"First, that the present shape of bottles must not be materially changed.

"Another tells him that this is not a material objection, provided the result is accomplished.

"Second, if any liquid whatever may be introduced into the bottle it is fatal, as showing it may, in time, be refilled.

"Another says if it takes ten or twelve hours to refill it, it is practicable.

"Third, the cost must not exceed one cent.

"Another says five cents.

"Fourth, a perfect device in all respects is easily destroyed by boring the bottle, refilling it, and stopping up the hole, which may be readily concealed.

"Another says that is no objection, as it would be quite as readily discovered as though a different bottle were used. It would require an artist in the glass line to do it so cleverly as to avoid detection; and it is reasonable to suppose few, if any such, would be found in the business.

"Fifth, it must be impossible to extract the device from the bottle.

"Another says, provided the effort to extract it shall shatter the device so that its reinsertion, as a whole, is rendered impossible, such broken condition, or its utter absence, would be patent indication of the attempt or fact of refillment; especially after the public were aware that such a device had been adopted as part of the bottle."

It is pointed out that such contradiction is bewildering, and discourages invention at the very outset. The trade owes it to itself to "formulate certain qualifications," which may be easily recognized by inventors, and by which any new device shall be judged.

In regard to the change in the shape of the bottle, if it is the attractiveness of the particular bottle that sells the goods, the advantage gained does not warrant the change; but if it is the quality of the goods, it does.

If it will take not less than ten or twelve hours to refill a bottle, it is "practical as to that feature, because an appreciable percentage of substitution is occasioned by laziness," and the vast majority would give up the practice if it consumed so much time.

The cost of the non-refillable bottle should not be measured by that of the ordinary kind. If its cost be anything less than the cost of the present bottles, plus the present loss due to their refilling, it is practical in regard to this feature.

As against the statement that it would be an easy matter to bore a hole in the bottle, refill it, and seal it up again, it is urged that:

"The easiest way to convince one's self that this objection is an error is to take the necessary tools and bottles to any dealer, show him how to do it, and see how long it will be before he can do it so cleverly as to avoid ordinary observation. He would rather give up the practice of substitution. Now, whether such a hole were sealed with glass or by the paper label, it would be readily discoverable by agents; who, knowing that there was but one way to refill it, would always look carefully for such evidence; and, if found, it would be tangible evidence of the attempt at, or fact of, refillment."

The features which the trade demand as essential are summed up as follows:

First, the bottle must be made of a material that will in no way taint the liquid. This precludes metal, rubber, celluloid, leather, etc., and limits us practically to glass.

Second, its operative parts must be protected so that they may not be interfered with, or made inoperative by means of wire or other instruments.

Third, it must be impossible to refill the bottle by submersion, or by shaking it so as to disarrange its operative parts, or by forcing the liquid through the device by pressure within any reasonable time. Of course if it can be so constructed as to absolutely prevent the introduction of any liquid whatever by said means, it is most desirable; but if, on the other hand, it shall require such a length of time to successfully refill it as to preclude the probability of such attempts in the vast majority of cases, the device may be considered meritorious; but it remains for the trade to express itself on this point.

Fourth, the exit of the contents must be comparatively free and not seriously impeded.

A $2,350 Dog.

A record price for a dog was realized recently at the Birmingham Dog Show, at the customary sale by auction of dogs which had been claimed at catalogue price by two or more persons. Mr. R. S. Williamson's St. Bernard, Lord Hatherton, a young dog born in February last, which is said to be the best St. Bernard ever exhibited, was catalogued at $1,050, but, after a spirited bidding, the dog was disposed of for $2,350 to Mr. Joseph Royle, of Manchester.

THE suspension bridge at Niagara Falls is to be replaced with a steel arch bridge, wholly contained within itself, which will consist of a main arch span 840 feet long and two shore spans, that on the American side to be 190 feet long and the span on the Canadian side 210 feet in length. The arch span will consist of an open parabolic rib 26 feet in depth, with a rise of 105 feet at the center. The roadway will be 46 feet in the clear.

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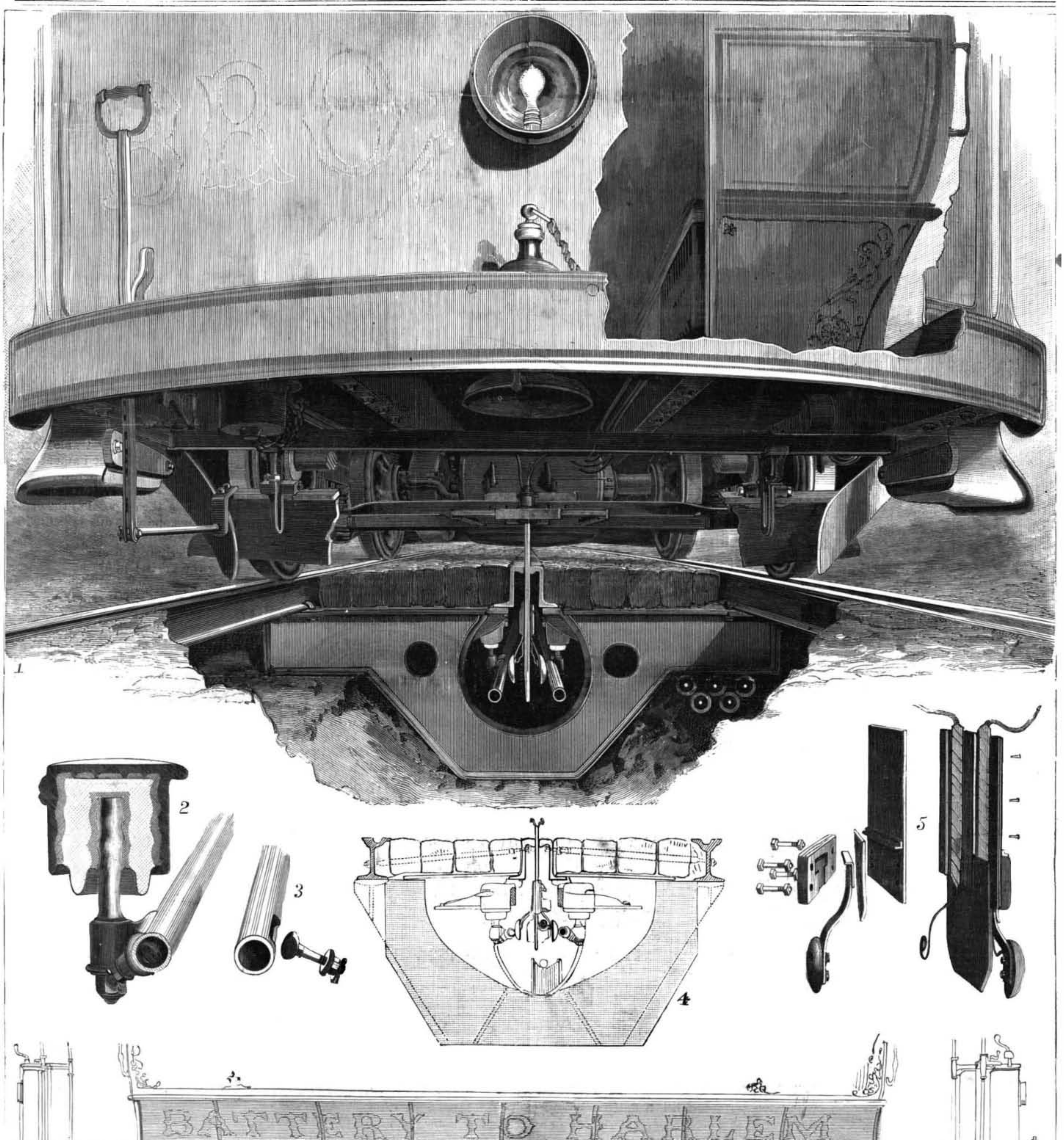

1. End view of conduit and car connections. 2. Insulating socket and hanger bar. 3. Contact bar and connection. 4. Comparison of electric and cable systems. 5. Details of plow. 6. Side view of car truck, motors, and conduit.

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