THE KNICKERBOCKER AVENUE EXTENSION SEWER, BROOKLYN, N. Y.

[SEE FIRST PAGE ILLUSTRATION.]

The city of Brooklyn is now building a sewer, having an area equal to that of a circle 12 feet in diameter, from the junction of Knickerbocker and Johnson Avenues, through Johnson Avenue and South 5th Street, to the East River. The necessity for the work is apparent from the fact that the present outlet sewer for this section of the city, which drains an area of about 2,800 acres, some of which is very low and flooded by every rain, is discharged upon the low lands at the head of Newtown Creek, making a nuisance greatly detrimental to public health and damaging to valuable property in the vicinity. Frequent complaints from people living near this outlet and by the Department of Health rendered the construction of a new outlet absolutely necessary.

Although there is nothing new either in the sewer itself or the duty it is designed to perform, the method of building one section of about three-quarters of a mile in length is certainly unique and interesting. Owing to the depth of the grade lines of the sewer below the street surface, in the greater portion of section one (next the river), and the danger to heavy buildings on both sides of South 5th Street, it was thought better to prosecute the work by means of tunneling rather than by open trench. Our frontispiece is composed of views showing the manner of prosecuting the work, both in the tunnel and in the open cuts.

The section of the sewer for almost its entire length is circular, 12 feet in diameter inside; and where it has been essential to alter this form, the sectional area has been made the same. The sewer is built of brick laid in cement, and the minimum thickness is 12 inches. At some points a foundation was made of transverse and longitudinal timbers, and the brick invert was reduced in thickness to 8 inches, between which and the timber was a bed of concrete. Where necessary, retaining walls, 3 feet thick at the bottom, 2 feet thick at the top, and extending a short distance above the center line of the sewer, were built. For the greater part of the tunnel section, the work passes through sand, and the sewer is a simple ring of brick. At each crossing street is a manhole, 3 feet in diameter, where it joins the arch, 2 feet in diameter at the surface, and in height varying with the depth of the sewer below the street. The outer end of the outfall is 18 feet in width and 6½ feet in height, measured from the center of the invert, the curve of which has a radius of ~~41 feet; the sides are vertical, and on~~ them rest iron I-beams, 12 inches deep, and varying in length from 20 feet at the outer end to 13 feet where the outfall sewer joins the circular one.

The general method of prosecuting the tunnel portion of the sewer has been to sink shafts at about every 700 or 800 feet, and then drive the headings each way. Fig. 1 represents the shaft on South 5th Street near 5th, which is 64 feet in depth to the bottom of the invert. The sides are held by sheet piling, and extending through the center are guides for the cage, the machinery for operating which is in the building shown at the right. A track is laid down each tunnel to the heading, as shown in Fig. 5. The cars filled with the excavated material are run to the bottom of the shaft, raised to the surface, and run to the dumping ground. Just east of 5th Street it was necessary to build a short section (Fig. 3) by open cut, and after this had been completed, the earth for filling in was obtained through the shaft shown. Fig. 2 shows the dumping car here used. The faces of the forward wheels are narrower than those of the rear ones, thereby permitting them to pass between the ends of the rails, which are inclined upward at a sharp angle, and rest in the curved parts of inner rails. The rear wheels mount the inclined rails, thus tilting the car and dumping the load.

Fig. 5 is a view looking into the heading, and Fig. 6 is a longitudinal sectional elevation of the same. The pilot tunnel here used is the invention of Mr. J. F. Anderson, and was first used upon the Hudson River tunnel; the duty it performs in its present location is precisely similar to that it performed under the river. The pilot is 5½ feet in diameter, and is made up of interchangeable flanged iron plates, bolted together. It is kept as near as possible in the center of the tunnel, and is extended some distance ahead of the finished masonry, the advance being made by removing the rear plates, carrying them forward, and bolting them to those already in place. The forward end of the pilot being in undisturbed ground, and the rear end being firmly held by radiating struts resting against the masonry, there is formed a rigid center or hub from which the work can be braced.

In the heading, the earth at the crown is removed and an iron plate inserted; this plate is bolted to the one already in, and is held by a strut against the pilot. These plates, unless the earth is very treacherous, are only carried about half way down each side. After the plates have been put in far enough, the section next the masonry is cleared, and a portion of the brickwork built.

This method of tunneling not only gives an exact idea of the nature of the material in advance of the main work, but also serves to firmly hold the sides of the excavation, preventing caving in; and where the route extends through a street lined upon each side with houses, and, as in this case, at an unusual depth below the surface, it has many advantages over the ordinary open cut. In addition, it occupies the street only at the shafts, so that travel is not much interfered with.

Fig. 4 shows an open cut portion of the work. Before beginning operations, the old sewer was removed and a new one built under each sidewalk, as a temporary measure during construction. A platform carrying the hoisting machinery extends across the trench, and is mounted upon wheels running upon tracks laid at the edge of the opening. The sides are held in the usual way by sheet piling braced by timbers extending across the opening, and which also carry the gas and water mains.

It is estimated that the total cost of the sewer—which will be finished in a short time—will be $575,000.

IMPROVED CORK ATTACHMENT.

The art of bottling liquids has attained quite large proportions as a distinct business. The machinery and appliances for driving and fastening the corks have been well studied, and brought to a considerable degree of perfection. But the reverse process, that of unbottling, has received less attention. It is usually left to the individual to struggle with the wires and a corkscrew as best he can. If the cork be of good quality, and not too tightly wedged, he succeeds fairly well; but it often happens that this is not the case, and numerous fragments of cork, perhaps the largest portion on the inside of the bottle, is pretty sure to be the result. We illustrate the cork attachments devised by Mr. John W. Hayward, of St. Johns, Newfoundland, which makes it as easy to get a cork out of a bottle as it is to drive it in. An ordinary cork, O, of the required size, has a piece of strong non-corrosive twine, 1, let into its sides. A button or shield, 5, also non-corrosive, is placed on the inner end of the cork to prevent the twine cutting through it. A hand metal tag, 2, is secured on the twine where it is knotted, or in case a capsule is placed on the end of a piece, 4, which hangs below the capsule.

HAYWARD'S IMPROVED CORK ATTACHMENT.

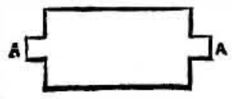
A rubber button, 3, placed on the outer end of the cork, has a hole or slit through which the twine passes. In 6 is shown the wire attached to the bottle neck, 6^1 representing the hook, and 6^2 the manner of locking it in place. 7 gives the appearance of a bottle when corked and the twine secured on the wire hooks. In 8, a capsule has been placed over the cork, and the tag is seen protruding beneath its edge. 9 shows the manner of securing the twine over the wire by stretching the elastic button, 3, and 9^1 the top view of the bottle when the operation is completed.

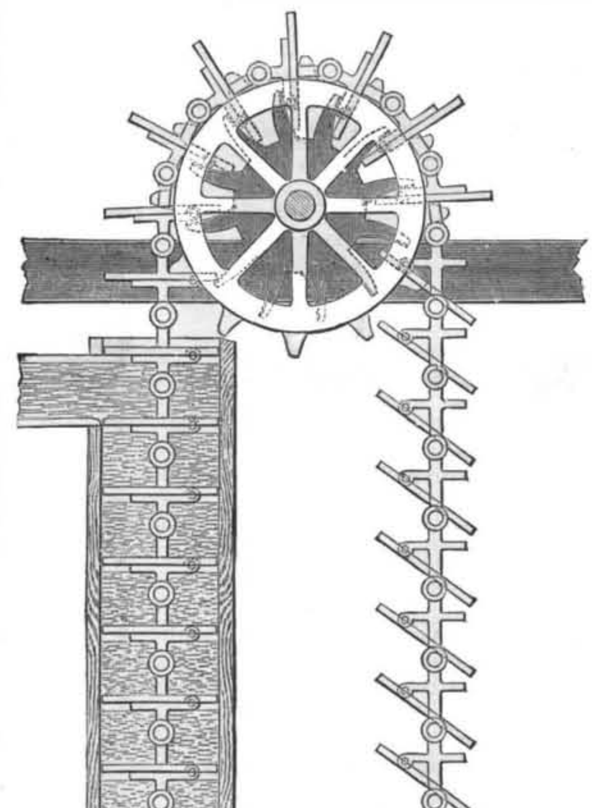
When the cork is being driven into the bottle, the rubber button is turned over on the twine and tag, as shown in 10, to protect them from injury. The button is then reversed, one loop of the twine passed under the wire hook on one side, and by stretching the rubber button the other loop secured on the opposite hook. The process of unbottling is shown in our last figure. The tag is grasped, and by an upward twist the capsule is torn open. The twine is disengaged from the wires, and, by passing the first and second fingers through the loop, the cork can be readily drawn. This system does away with the corkscrew entirely, each cork carrying its own means of release. It is applicable for any liquids, medicines, liquors, inks, etc., and as the corks are not injured they may be used a number of times. Mr. A. B Cohu, 197 Water Street, New York city, has the agency for this attachment.

BALANCED WATER MOTOR.

At the Inventions Exhibition, London, Sealey Allin, Queen Victoria Street, shows a patent balanced float water motor, with which he claims to obtain a working efficiency of over 90 per cent. Our illustration is from the *Engineer*. It consists of a series of feathering floats, hinged to a chain which works over a pair of drums, the floats on the descending side being inclosed in a casing, so as to form a series of moving chambers, which are successively filled with water as they enter the casing.

A cross section of the casing is shown in the annexed sketch. A A are planed grooves, in which slide projecting pieces forced on each link of the chain, the clearance being limited to one-sixty-fourth of an inch. The clearance of the floats themselves can, therefore, be made very small, and the inventor states that in this way he has been able to reduce the loss from leakage to a comparatively insignificant amount. The feathering of the floats is automatic, and is regulated by the level of the tail water; for so long as the pressure of water behind is greater than the resistance in front, the chain is pushed forward. As soon, however, as the resistance exceeds the pressure, the floats fall away from the chain, and rise nearly vertically out of the water. The power is taken off from the top drum, which is provided with specially formed teeth, which take each link of the chain as it passes over. The speed of the chain is about 180 feet per minute. Assuming that the difficulties of construction have been overcome, there seems no reason to doubt that the efficiency of such a motor as this will be much greater than that of even the best waterwheels, as a greater percentage of the fall can be utilized.





ALLIN'S WATER MOTOR.

It must not, however, be forgotten that hitherto, in the majority of cases where waterwheels have been applied, economy of water has been a secondary consideration, and there is, after all, something very fascinating in the simplicity of a waterwheel. What it may be in the future is, of course, a different matter. Probably, if any serious attempt is made to take advantage of the power to be derived from natural falls of water, or, as Mr. Allin proposes, of the rise and fall of the tide, more attention will be paid to efficiency; and if, as is stated, about 93 per cent of the actual energy can be given off in useful work, there may be a considerable field for Mr. Allin's invention.