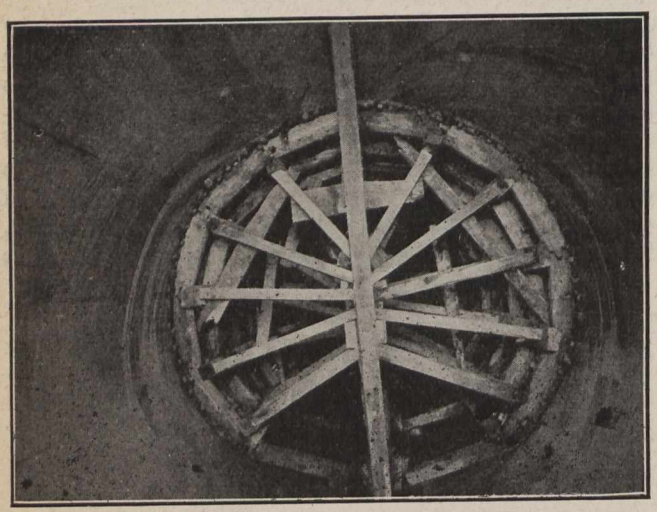
into two contracts, one of which is held by the T. A. Gillespie Company, of New York City.

Altogether, the fourteen siphons will require for the single central tube something over six miles of steel pipe.



Indian Brook Siphon, looking north, and showing forms in place or cement mortar lining of steel pipe. Lining is two inches thick. Invert is placed by hand on a preliminary operation,

The diameters are 9.50, 9.75 and 11.25 feet. The thicknesses of the steel plates vary from 0.438 to 0.750 inch. The variations in diameter and thickness of plate are made in order to permit a standard capacity to be maintained under varying conditions, and to enable varying bursting pressures to be withstood. The joints are riveted ones. Circular joints are lap-riveted. With the thinnest plates (0.438 inch), the longitudinal seams are also lap-riveted. For plates thicker than 0.500 inch the longitudinal seams are butt-riveted. For the 0.500-inch thickness both methods are employed on longitudinal joints. The butt-riveting is done by bringing the edges together—edge to edge—and then covering the joint, inside and out, with a steel strap. The inner strap is wider than the outer one. The rivets securing the outer strap to the tube are also the central rows of rivets for the wide inner strap. They thus hold together three thicknesses of plate. In addition, two single rows of rivets are arranged outside the narrower strap, holding the tube and the inner strap together. Altogether, six rows of rivets are employed. The two central rows—one row to each side of the joint—have their rivets arranged abreast of each other. The rivets of the rows just outside of these are arranged in staggered positions relative to the two central rows. The two rows outside of all which secure only two thicknesses of plate, have their rivets placed at double the interval used in the other rows.

In crossing the Peekskill Valley over a mile and a quarter of pipe is required. All of it is of the smallest diameter. A short length (139 feet), presumably at the lowest point, is of the thickest plate (0.750 inch); then there is a total of 1,000 feet or more of the 0.688 inch thickness. Apparently no other of the crossings required such thick plate as the 0.750 inch thickness. This will be understood when it is stated that the maximum head at Peekskill is 340 feet—45 per cent. greater than in any other case. It is the widest and the deepest of the steel siphon crossings.

The steel pipe is furnished in 15-foot lengths. A circular joint has, accordingly, to be made every 15 feet. This fact has to be taken into account in the preparations for the reception of the giant tubes. Concrete cradles are arranged at such intervals as to permit the shop and field joints to come between them. The concrete cradles are eight feet or more across, measured transversely the line of the aqueduct, and about three feet wide. The same style is not used everywhere. A typical cradle has, however, a curved depression above to fit the pipe. It is then continued horizontally for a short distance. Underneath, a vertical section across the line of the aqueduct discloses a flat curve. The manner of casting is quite simple. Two bulkheads of the required form are placed on the earthen surface, which has been given the required curvature. The bulkheads are held temporarily in position by a couple of wooden strips nailed across. The concrete is poured in and the upper surface formed by hand. However, a transverse and several longitudinal grooves are desired where cradle and pipe are to come into contact. These are provided by using short lengths of wooden strips. The object of these depressions will appear later.

When the cradles have been cast, the pipe suitably placed, and the field joints made, the entire siphon is filled with water, the pressure being brought to the conditions that are to exist when the aqueduct is in actual service. This is done not merely to test for possible leaks, but especially to give the pipe the exact form it will have when in actual use. While filled thus with water the concrete envelope is put on. This is a proceeding requiring time. During this period it is important that the pressure be maintained at the required point. It is necessary, therefore, not merely to pump the pipe full, but to maintain the pressure night and day. In this and other duties Cameron pumps have been used.

It is necessary, or at least advisable, to clean the surface of the pipe thoroughly preparatory to the application of the concrete envelope. It is possible that the concrete would absorb and take care of a thin coating of rust. But no chances are being taken on that. Removable ribs are employed to hold the lagging in place. At Bryn Mawr narrow wooden strips, making lap joint with each other, were in use upon the writer's visit. The concrete is dumped upon the crest of the pipe. The jacket of concrete completely envelops the tube, except where the cradles themselves are located.

Kensico Siphon—15 ft. Section of 9 ft. 9 in. x 7-16. in. Steel Pipe. Size shown by automobile.

Prior to placing the concrete of the envelope a grout is poured into the grooves arranged on the upper surface of the cradles. Access is gained from the side. This grout fills the system of grooves beneath the steel plate and effects a close joint.

The placing of the interior shell of cement mortar is one of the most interesting and important matters connected with the steel siphon work. This lining is required to have a minimum thickness of two inches and a smooth internal