which would interfere with the operation of the settling tanks. Provision is made so that during times of flood the back pressure on the outfall sewer can be readily and quickly relieved, thus scouring out whatever deposits may have formed in the 36-inch reinforced concrete pipe.

Settling Tanks.—Concrete, either plain or reinforced, is practically the only structural material available for constructing sewage settling tanks of the dimensions required for a large municipality. So far as the writer knows, the circular tank has been used in this country only in constructing the smaller units; for the larger sizes it has been customary to use rectangular construction. The rectangular form under all conditions, and especially when a large portion of the tank is above the surface of the ground, is a more expensive form to build. The Springfield sewage tanks are neither square nor truly circular. Each unit is four-leaf-clover shaped, consisting as it does of four semi-cylindrical segments 26 feet in diameter. This type of construction is peculiarly

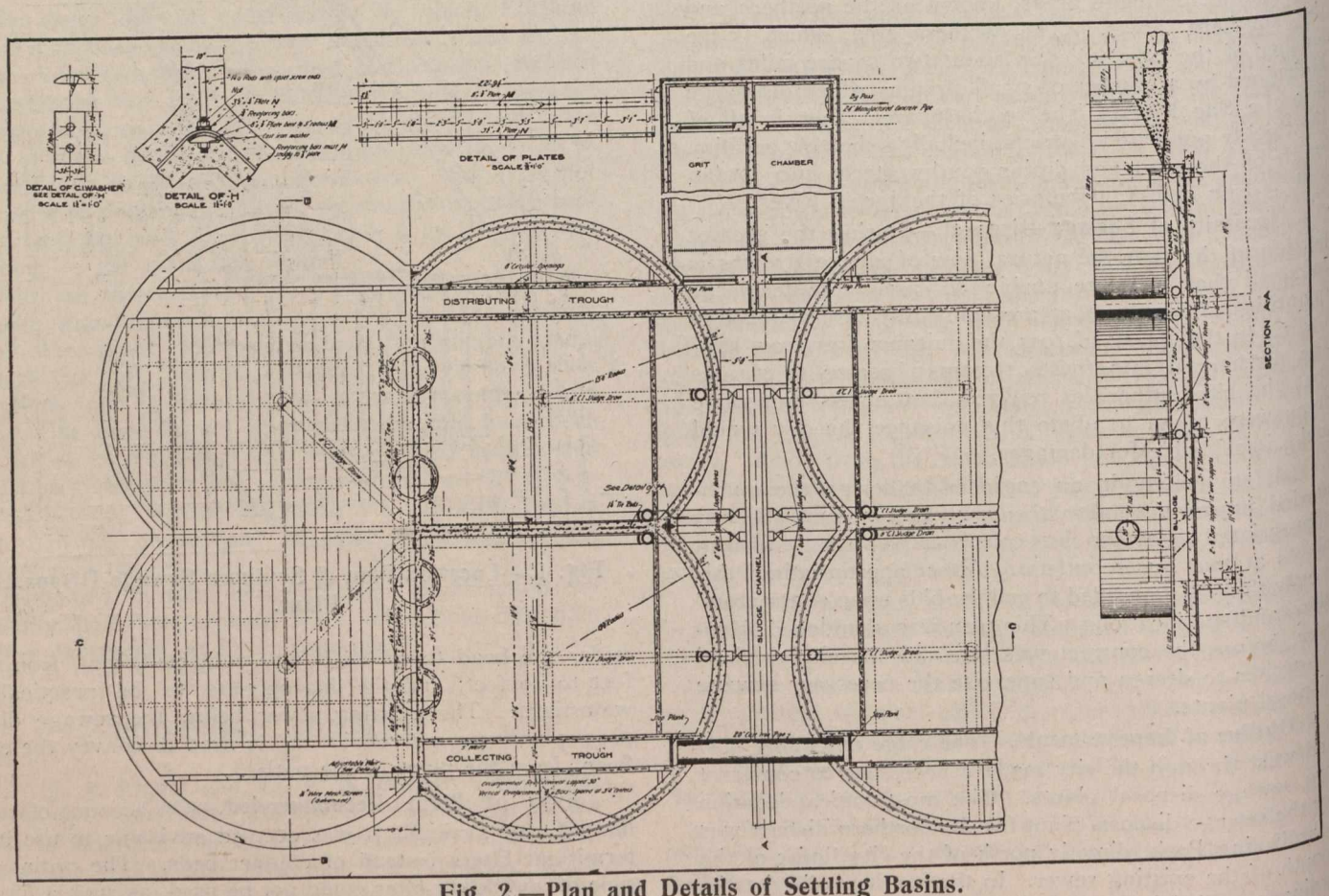

Fig. 2.—Plan and Details of Settling Basins.

well fitted not only to resist the water pressure from within, but also the earth pressure from without when the tank is below the ground and empty. The construction features of the tank are clearly shown in Figs. 2 and 3. The shell of the semi-circular segments is 12 inches thick, reinforced vertically with ¾-inch bars spaced 3 feet centres and circumferentially with ¾-inch square bars spaced so that the unit stress does not exceed 14,000 lbs. per square inch. The unbalanced tension at the point where the semi-circular segments intersect is taken up by 1¼-inch circular rods embedded in concrete struts, as show in detail H of Fig. 2.

The steel reinforcement in these ties is designed to to resist the tensile forces at the same unit stress as the circumferential reinforcement in the shell. If this is not done, and different stresses are used for the tie rods than are used for the shell, the shell, instead of being subjected to simple tension, will be subjected to bending. The tie rods are fastened to a steel plate 8 inches wide, ⅞-inch thick, bent to a 5-inch radius. By means of double nuts the reinforcement is kept in accurate alignment, which insures equal distribution of the tension among the larger number of tie rods.

The cylindrical segment must be free to expand in all directions. If the expansion is in any way prevented by interior construction, such as the troughs, false bottoms, beams, etc., the shell, instead of being under tension only as contemplated by the designer, will be subjected to heavy bending, often sufficient to cause the fracture of the structure. To permit of the free expansion of the shell when under internal pressure, all interior construction, except at the intersection of the ties and struts with the shell, is separated from the shell by expansion joints.

After passing through the grit chamber, the sewage enters the distributing trough, which is 2 feet wide, and holds, under normal conditions, about 2 feet of liquid. (See Fig. 3.) Eight 8-inch circular openings, placed in the sides of the trough near the bottom and on the side next the outer wall, admit the sewage to the settling compartment. At the end of the trough is an additional opening, placed so as to be but half submerged, so that whatever scum may tend to collect in the distributing troughs is carried over into the settling compartments. Each settling compartment has a capacity of 111,000 gallons, which gives an average period of retention of 1.[illegible] hours when the plant is operated at 4,000,000 gallons, its capacity. The flow in the settling compartment is parallel to the direction of the slot. To prevent eddies