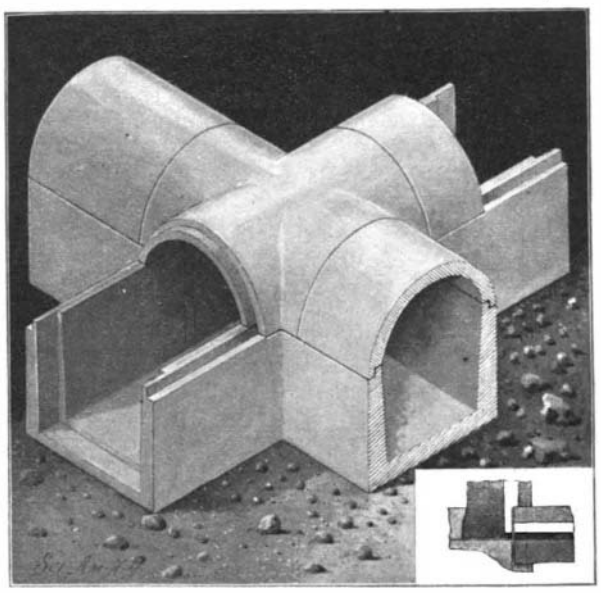
### AN UNDERGROUND CONDUIT-CROSSING FOR ELECTRICAL CONDUCTORS.

Our illustrations represent a new crossing for underground conduits for electrical conductors, which has been invented by Victor Koch, of Scranton, Penn., and which is arranged thoroughly to protect the conductors from moisture and to permit the making of repairs.

The crossing is provided with a base having its top rabbeted along the sides. Oppositely-arranged longitudinal trough-sections have projecting tongues continuous along the bottom and sides, the bottom portions engaging the corresponding rabbets in the base. The transverse trough-sections which complete the crossing are provided at one end with projecting tongues to engage the corresponding rabbets on the base. The sides of the transverse sections fit in the rabbets on the



PERSPECTIVE AND PARTIAL PLAN VIEWS OF THE CONDUIT-CROSSING.

sides of the longitudinal sections. Our small plan view of one corner of the crossing, with the cover removed, shows the arrangement of rabbets and tongues. Upon the longitudinal and transverse sections an arched, cross-shaped cover is fitted, and connected with the sections by tongues and grooves so that moisture cannot pass into the conduit in a longitudinal or a transverse section or at the crossing. In making the various parts of the conduit the inventor employs glass or other material impervious to water so that the wires placed in a conduit are protected from the influence of moisture. Interruptions in telegraphic, telephonic, or other electric lines are therefore not likely to occur.

### From Cable to Trolley on the Third Avenue Railroad, New York.

The work of changing the Third Avenue Railroad system in New York from cable to trolley has been actively prosecuted during the past year, and last week the first section of the road from Sixty-fifth Street to One Hundred and Twenty-ninth Street was put into electrical operation. The difficult work of making the necessary changes has been carried out without interrupting the heavy traffic which passes over this road. The improvement of the road has consisted in a general reconstruction, in the way of laying down heavier rails, in addition to the insertion of the appliances necessary for its operation on the underground trolley system. The old rails, which weighed 80 pounds to the yard, and were in 30-foot lengths, have been replaced by 100-pound, 60-foot rails. A further improvement, having for its object a smoother, running track, was the uniting of the rails by means of cast-welded joints. The improvement resulting from this change alone has been very marked; the running of the cars being exceptionally smooth and noiseless.

The change to electric power necessitated the laying of the ducts for the electric cables, the construction of handholes, 15 feet apart, at the side of the slot rails, and the putting in position of the insulators which carry the T-rail conductors. As this work had to be done without interfering with the cables of the cable system, the T-rails were not at first placed in the position they will finally occupy, but had to be placed fully 9 inches apart in order to make room for the passage of the plow on the present cable cars. This arrangement was made possible by providing oblong bolt holes in the insulator frames, with sufficient clearance to allow each rail to be moved back 1½ inches from its final permanent position.

The change from one system to the other on the stretch of track above mentioned was made immediately after midnight on Saturday, at which time a large force of men was stationed at the hand-holes and simultaneously moved the feeder rails to within half an inch of their proper position, leaving room for the cable plows to pass. At half-past two in the morning the cars were stopped, both feeder rails were moved to place, and all connections made. In removing the cables, they were cut and the sections were hauled into the power house by means of the main engines.

### AN IMPROVEMENT IN ROTARY DRUM-DRIERS.

A patent has been issued to John Bishop, of Bartow, and Andrew P. Jerguson, of Hull, Fla., for an improved drier designed primarily for the handling of phosphate rock and such material as may be allowed to come into direct contact with the products of combustion. The drier is of the rotary-drum type, and is provided with longitudinal partitions forming as many contracted longitudinal channels through which the material to be treated is passed, thus providing a large amount of radiating surface and consequently increasing the efficiency of the drier. The feed end of the drier is furnished with a number of diagonal angle-iron flanges, which, as the drum revolves, feed the material toward the partitions. The stock is further advanced by angle-iron flanges on the partitions, which, however, are used only when the drum is horizontally mounted.

The inventors state that by the use of the continuous partitions a large increase of effective heating surface is obtained and that the material is more equally distributed, since it is divided into a series of sections sliding over the heating-surfaces. The continuous partitions applied to an ordinary, direct-fired rotary drier differentiate this apparatus from others of the same class.

### WATERWORKS EXPANSION IN BOSTON.

BY J. A. STEWART.

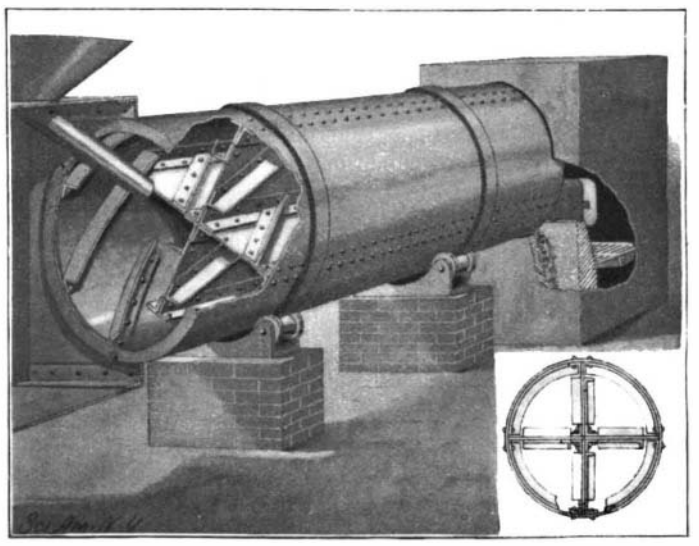
Few people realize, even in Boston, the importance and magnitude of the plans, which at present under way, to give that city a pure and adequate supply of water for all purposes. Not only Boston is to be benefited, but also the various municipalities which lie within a ten-mile radius.

It was in 1893 that public attention was called to the inadequacy of the water provision and the imminent danger of deficiency in time of drought, by a legislative act authorizing the State Board of Health to present a plan for a suitable water supply for the city of Boston and its suburbs.

At that time Boston was receiving some 57,000,000 gallons of fresh water daily from a watershed of about 120 square miles. About five-eighths of the supply came from Sudbury River and its tributaries (constituting the Sudbury system) and the remainder was drawn from Mystic Lake and Lake Cochituate. Though three distinct systems thus contributed to supply it, there was barely sufficient water to meet the needs of the people, which on a conservative estimate would in 1895 amount to 84,000,000 gallons daily.

It was consequently deemed of the utmost importance that there should be no delay in augmenting the sources of water supply. By the legislative act of 1895, the Metropolitan Water Board was created to act for the State.

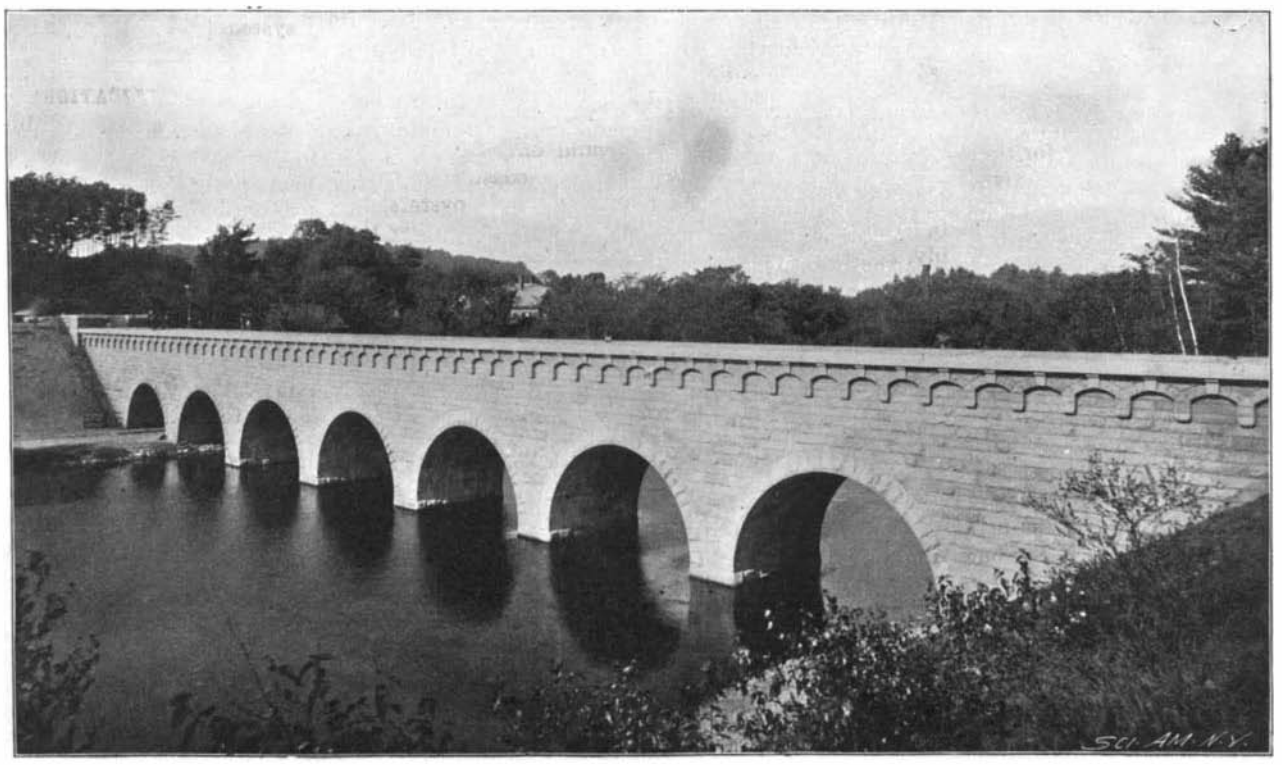
The act constituted a metropolitan district to include the cities of Boston, Chelsea, Everett, Malden, Medford, Newton, and Somerville, and the towns of Belmont, Hyde Park, Melrose, Revere, Watertown, and Winthrop. By a special provision other cities and towns may be supplied by the Board, of which provision Nahant, Swampscott, and Quincy have taken advantage. The issue of bonds to the amount of $27,000,000



AN IMPROVED ROTARY DRUM DRIER.

was authorized, the total cost of the extension being estimated at $20,000,000. By the construction of the proposed works, the water of the Nashua watershed, an area of about 118 square miles, capable of yielding, even in a series of very dry years, 105,000,000 gallons of water daily, will be stored in a great reservoir, 6½ square miles in area, on the south branch of the Nashua River. This water is conveyed by the new Wachusett aqueduct to the new Sudbury reservoir in Southborough and Marlborough; thence with the mingled waters of the present Sudbury and Cochituate systems of the city of Boston to the Chestnut Hill reservoir and to Spot Pond, whence it is distributed to the various cities and towns of the metropolitan district, insuring a daily supply of at least 173,000,000 gallons, double that of all other sources combined for the use of the district.

The carrying out of the plans requires the erection of a large dam and dikes at Clinton, Mass., and the construction of a vast storage basin. The building of new pumping stations and the laying of great main distributing pipes are among the minor operations involved. As the first duty of the Board, however, was to furnish increased water supply at the earliest period, its efforts were at once directed to the completion of the Sudbury reservoir (a work half finished by the city of Boston) and the building of the Wachusett aqueduct. The latter important work, begun early in 1896 and completed in 1898, embraces (1) a tunnel two miles long through rock so compact as not to require a lining for half its length, (2) a masonry aqueduct, seven miles long, with a bridge of seven spans and 360 feet in length across the Assabet River, and (3) an open channel, three miles long, following the course of a brook into Sudbury reservoir. The masonry aqueduct, which is 11 feet 4 inches wide and 10 feet 5 inches high, has a maximum capacity of 300,000,000 gallons daily. It terminates at a point on the Sudbury watershed in the town of Northborough. Its waters then run for three miles through the open channel, which is 20 feet wide at the bottom, to Sudbury reservoir, from which a second aqueduct issues, branching at Weston into two great pipe lines, one taking a northeasterly



ASSABET BRIDGE, ON LINE OF AQUEDUCT.

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