Concrete Dam and Concrete-Steel Subway for Walter Baker & Company, Limited.

As one step in the rehabilitation of the power equipment of the extensive plant of Walter Baker & Company, Limited, of Milton, Boston, Mass., manufacturers of well-known chocolate products, an old timber and stone crib dam is being replaced by a substantial new structure of mass concrete. This part of the undertaking is interesting principally as an excellent example of a small piece of work well designed and executed. The old dam was built across the Neponset River many years ago; it was about 12 feet high, and in length somewhat less than 80 feet. The river is underlaid with rock at a comparatively shallow depth at the site of the dam. Some soundings were taken just below the dam to determine approximately the elevation of the rock surface. In a general way it may be said that the rock has been found during the progress of construction about at the levels indicated, excepting in a pocket of very small area. The depth of this hole in the rock was so great and its area so small that the concrete was laid directly on top of the gravel with which the pocket was filled. Otherwise the dam rests on ledge everywhere.

To build the new dam the greater part of the old structure was removed and a cofferdam of sheeting filled with clay placed across the river a few feet upstream from the line of the back of the new dam. To aid in the construction of the cofferdam the millpond was partially drained so that the bottom frames could be readily sunk to position and the sheeting carefully placed against them. As the tide backs up in the river to the dam site, it was necessary to exclude the water from the downstream side of the pit, also, by a second cofferdam.

Besides the main dam, the contract includes new headworks for the flumes leading to the water wheels under one corner of the mill adjacent to one end of the dam. The masonry in this part of the structure also is wholly of Portland cement concrete. Accompanying drawings show the principal features of the design. The dam will have a height of about 13 or 14 feet, as shown by the cross-section.

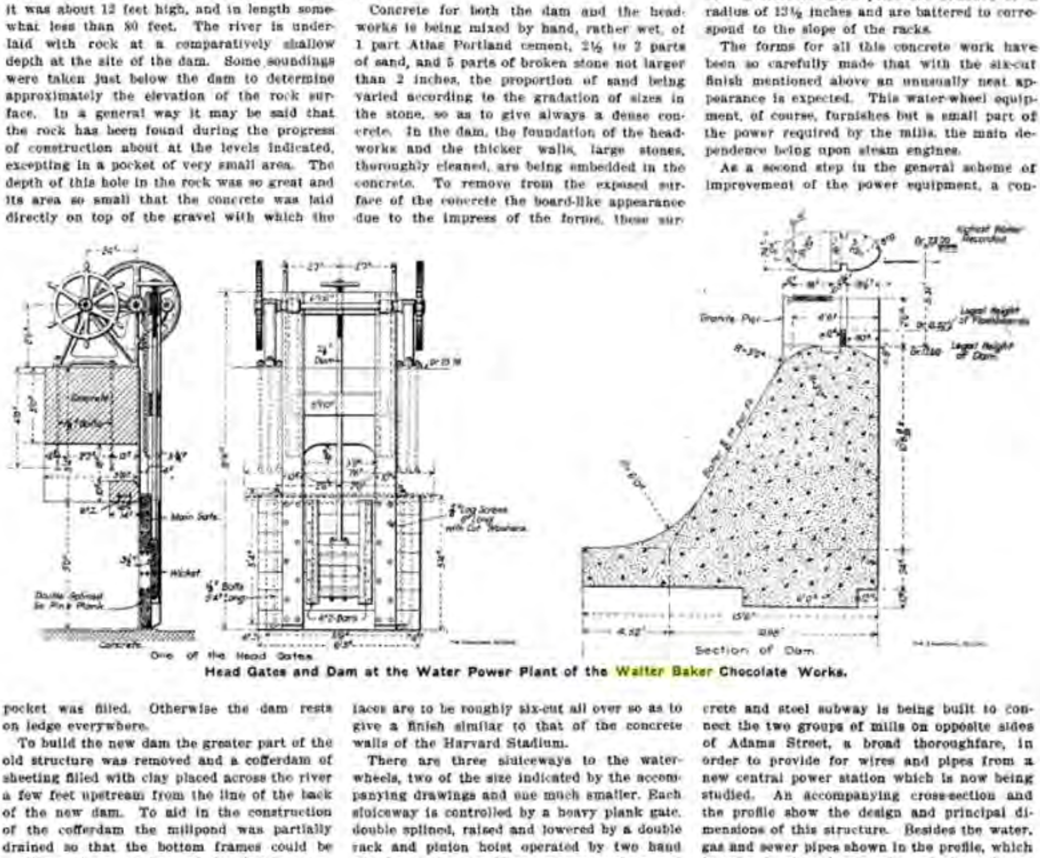
Flashboards 10 inches high are permitted on top of the dam; to support these and a narrow foot-bridge between the two mills at the opposite sides of the river, five monolithic granite piers, of the shape and dimensions shown, are to be set 12 feet apart on centers on the crest of the dam, and at each end there will be a half pier set against the retaining wall, with its center line 14 feet from the nearest pier. Each pier will be grooved vertically for the flashboards and notched on top so as to receive the foot planks nearly flush with the upper surface of the stone. A 2-inch wrought-iron pipe guard rail 3 feet high will protect the downstream edge of the foot-bridge. The bottoms of the flashboards, which are of chestnut 3 inches thick, will rest on carefully troweled strips in the surface of the concrete on the crest of the dam.

Concrete for both the dam and the headworks is being mixed by hand, rather wet, of 1 part Atlas Portland cement, 2½ to 3 parts of sand, and 5 parts of broken stone not larger than 2 inches, the proportion of sand being varied according to the gradation of sizes in the stone, so as to give always a dense concrete. In the dam, the foundation of the headworks and the thicker walls, large stones, thoroughly cleaned, are being embedded in the concrete. To remove from the exposed surface of the concrete the board-like appearance due to the impress of the forms, these surfaces are to be roughly six-cut all over so as to give a finish similar to that of the concrete walls of the Harvard Stadium.

There are three sluiceways to the water-wheels, two of the size indicated by the accompanying drawings and one much smaller. Each sluiceway is controlled by a heavy plank gate, double splined, raised and lowered by a double rack and pinion hoist operated by two hand wheels, as shown. These gates travel on and seat against the smooth troweled surfaces of the concrete, and their sills also are formed in the concrete. In each of the two larger gates there is an opening 18 inches square, and the wicket gate controlling it is worked by a screw stem and a small hand wheel attached to the stand of the main hoist. Above each of the three gates there is an opening 3 feet wide and 18 inches high through the head wall into the sluiceway. The bottoms of these openings are 10 inches above the level of the tops of the flashboards; they are intended as an additional means for discharging flood water, and, no provision being made for closing them, excepting as they are covered by the main gates when the latter are raised, the water will pass through them whenever it reaches a sufficient height.

The screen racks at the entrance to the sluiceways are composed of 2½x¼-inch steel bars spaced 1¼ inches apart in the clear on ⅝-inch bolt rods with ¾-inch pipe spacers, made up in sections 8 feet 4 inches high and about 19 inches wide over all. When in place the racks are set at a batter of 3 inches per foot, with their lower ends bearing against a horizontal rebated 12x16-inch yellow pine sill embedded in the concrete floor of the head-bay, and their upper ends resting on 8-inch I-beams supported by concrete piers, which are extensions of the sluiceway walls. The upstream ends of these piers are rounded to a radius of 13½ inches and are battered to correspond to the slope of the racks.

The forms for all this concrete work have been so carefully made that with the six-cut finish mentioned above an unusually neat appearance is expected. This water-wheel equipment, of course, furnishes but a small part of the power required by the mills, the main dependence being upon steam engines.



Head Gates and Dam at the Water Power Plant of the Walter Baker Chocolate Works.

As a second step in the general scheme of improvement of the power equipment, a concrete and steel subway is being built to connect the two groups of mills on opposite sides of Adams Street, a broad thoroughfare, in order to provide for wires and pipes from a new central power station which is now being studied. An accompanying cross-section and the profile show the design and principal dimensions of this structure. Besides the water, gas and sewer pipes shown in the profile, which interfered with the location of the subway, the single track of an electric street railway was crossed at a sharp skew, and a stone surface drain and a wire conduit of the New England Telephone & Telegraph Company had to be dealt with.

For over half its length the subway is only 10 to 15 feet from the Neponset River, which at this place is walled, while its lower part is several feet below the water level in the river above the dam and about on a level with the river below the dam. To exclude moisture from the interior of the subway the principal reliance is upon the watertightness of the concrete, which is of the same dense mixture as that in the dam, but made with stones not exceeding ¾ inch in size. In addition a waterproof tar coating is being applied on all sides, as indicated in the cross-section. On the foun-

dation layer of concrete, 8 inches below the finished floor surface, six thicknesses of tar paper were placed, the concrete being first mopped with tar and each layer of paper properly lapped and thoroughly mopped. To the outsides of the walls and top of the subway four coats of hot tar are being applied. The insides of the walls and the roof are being finished with ¼ to ⅜ inch of mortar composed of 1 part Portland cement and 2 parts sand well troweled, while the floor is being surfaced with 1 inch of granolith made of 1 part Portland cement, 1 part sand, and 1 part ¼-inch crushed granite or trap.

The side walls of the subway are reinforced with 8-inch 18-pound I-beams set vertically about 4 feet apart, and its roof with 8-inch 18-pound and 9-inch 25-pound I-beams, the heavier beams being placed under the street railway and the adjacent portion of the road subject to heavy loads. The roof beams are spaced the same distance apart as the wall beams, but half-way between them, and their bottom flanges are exposed.

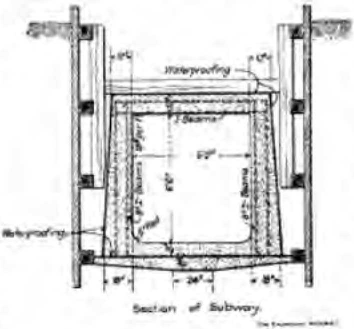
Messrs. Dean & Main, of Boston, are the engineers for the improvements being made in the plants of Walter Baker & Company, Limited. Mr. F. B. Gilbreth, of Boston, is the contractor for the dam and its appurtenances, and the subway is being built by Mr. William H. Ward, of Lowell, Mass.

The Power Plant of the Littleton Creamery, Denver.

By Howard S. Knowlton.

An interesting power plant will shortly be completed in Denver, Colo., by the Littleton Creamery Company. The expansion of the company's business rendered its old quarters inadequate and necessitated the building of an entirely new plant, which is a handsome brick low the engine room in order to obtain a high ceiling for the run of piping. The boiler room is 20 feet high from floor to ceiling. The coal supply is received through a scuttle direct from the cars and dumped into a bin close by the furnaces, a mixture of lignite and bituminous coal being used at present. Ashes are handled by a Chicago link belt ash hoist driven by belt from an artesian well pump, the ashes being raised through a shaft to the sidewalk level when desired. The boiler equipment is composed of two Bonus-Kewanee horizontal water tube boilers rated at 150-horse-power each, and built to operate at 225 pounds steam pressure. The steam pressure will probably not exceed 125 pounds at present. A breeching 4 feet square leads from the boiler flues to the stack, which is of brick, 120 feet high and 9 feet inside diameter. The stack rests on a rock foundation extending 6 feet below the boiler room floor.

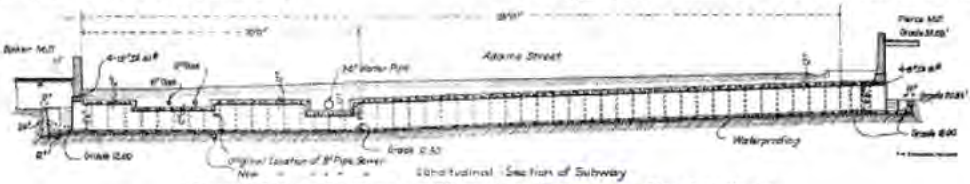
The main water supply of the building comes from an artesian well 587 feet deep, located just off the boiler room in a small chamber adjoining



Johns insulated covering is used on all steam piping. Exhaust steam passes through a 10-inch main under the engine room floor into a 600-horse power Stilwell open heater which takes care of the boiler feed. An eccentric flange reduces the diameter of the main steam line from 8 to 5 inches after it passes by two ice machines, giving an unobstructed steam flow. All steam connections are taken from the top of the main to avoid water troubles.

At one side of the engine room are located two pumps for brine circulation in the refrigerating system. One of these is a steam-driven duplex pump, and the other is a center hung Jackson impeller pump belt driven by a 10-horse-power Sprague motor making 1,250 revolutions per minute. The latter has a capacity of 650 gallons of brine per minute at a pressure of from 32 to 40 pounds per square inch; its suction and discharge pipes are each 9 inches in diameter, and it is controlled by a Cutler-Hammer rheostat, a circuit breaker and switch mounted on a panel close at hand. The foundations of both pumps are of brick. Between the boiler feed pumps is located a 5¼x4¾x5-inch steam driven pump for supplying all the hot water needed in the building, at a pressure of from 20 to 60 pounds per square inch, according to regulation by a Fisher governor. Two Ten-Winckle oil filters and extractors are used in the engine room.

The electrical generating plant consists of two direct-connected units aggregating 100 kilowatts in rated capacity. The larger of these is composed of a horizontal single-cylinder non-condensing 11x13-inch Chuse engine, and a direct current 60-kilowatt Sprague generator operating at 280 revolutions per minute, compound-wound with 6 poles, and giving 125 volts. The admission pipe of the engine is 4½ inches in diameter and the exhaust pipe 5 inches. The smaller unit is a 40-kilowatt 125-volt Sprague



Concrete Subway for Pipes and Wires at the Walter Baker Chocolate Works.