

adjusted, much more so than in an experiment on a small scale. If the yellowish tinge has disappeared the proportion is then correct. The amount of clear lime-water at Canterbury required to soften the hard water is in the proportion of 1 to  $8\frac{3}{4}$ . The soap test described in Chapter II. may also occasionally be used to ascertain if the water has been softened down to the lowest point. After the testing has been satisfactorily performed the reservoir is allowed to remain undisturbed, when the carbonate of lime in the mass of water rapidly settles to the bottom, leaving the water above a bright limpid blue, so clear that any object at the bottom of the reservoir is perfectly distinct through the 15 feet 6 inches depth of water. The carbonate of lime or chalk deposited at each successive softening in one of these reservoirs full of water is about 4 cwt. The time required for settling after the pumping has ceased at Canterbury is from five to ten hours. In carrying out the softening process care must be taken that both the lime-water and spring water are perfectly clear; if these conditions are not fulfilled the time of settling will be unnecessarily prolonged.

The total certified cost of the whole works at Wincheap and St. Thomas's Hill, together with the mains and connections throughout the city and suburbs, but exclusive of land, engineering, and Parliamentary expenses, was £29,688. It is satisfactory to state that, in addition to the success of the works from an engineering point of view, they are also a financial success.

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PLATE 49.—HERBERT HOSPITAL.

DR. CLARKE'S SOFTENING PROCESS.

This plate illustrates Dr. Clarke's softening process as applied at the Herbert Hospital, Woolwich, by Mr. S. C. Homersham. The water for the hospital is supplied by the Kent Waterworks Company. Estimated by Dr. Clarke's soap-test its hardness amounts to 21°. It is, therefore, necessary to submit the water to a softening process, otherwise it would be unfit for hospital use. It is found that on an average the hardness of the water supplied to the hospital is reduced from 21° to 8°. The buildings connected with the water supply are situated about one-third of a mile from the hospital, on the western side of Shooter's Hill.

Fig. 1 is a block plan of the works; the main block contains the two service reservoirs and two depositing reservoirs. The former are below the surface of the ground. They are 35 feet 3 inches long, and 16 feet 6 inches wide, by 15 feet deep. The walls are of brick, and the whole building rests upon concrete foundations. Over the service reservoirs are placed the depositing reservoirs, the floors of which are brick in cement laid on concrete. These floors rest on iron girders, which are supported by cast-iron columns rising from the floors of the service reservoirs. The depositing reservoirs are 35 feet 3 inches long, 16 feet 6 inches wide, and 11 feet 3 inches deep. In the smaller block are placed the lime-water reservoir, lime-house, store-room, workshop, and boiler for hot water. The lime-water reservoir, which is constructed similarly to the service reservoirs, is partially below the surface of the ground, and also rests on a concrete foundation. It is on about the same level as the depositing reservoirs. It is 16 feet 9 inches long, 14 feet 6 inches wide, and 15 feet deep. The interior walls of all these reservoirs are rendered with Portland cement. The net capacity of the two depositing reservoirs is about 70,240 gallons, that of the service reservoirs 97,260 gallons. The lime-water reservoir will hold about 2,100 gallons. The process of softening the water is carried out at these works as follows:—1st. The lime is mixed with sufficient hot water to make it cream-of-lime, which operation takes place in a small iron tank in a room over the store-house. A pipe conveys this cream-of-lime to the lime-water reservoir, where a large body of water is added and thoroughly mixed with it by two revolving 'agitators,' fixed in the centre of the reservoir. The lime-water is then conducted by a pipe to one of the depositing reservoirs, where the necessary proportion of water is added to it. Here it remains a sufficient time to allow of the deposition of the earthy constituents of the water; the softened water is then drawn off from the upper part into the service reservoir, and is ready for supply to the hospital. A small quantity of water, containing the deposited sediment is allowed to remain at the bottom of the depositing reservoirs, to be passed away by a pipe into the whiting-pits outside the building. These works were erected at a cost of about £5,351.