THE WATER SUPPLY OF SINGLETON, N.S.W.

By H. H. Dare, M.E.; Assoc. M. Inst. C.E.

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Practically the whole of the work in connection with the design and construction of Water Supplies for the Country Towns of this State is carried out by the Public Works Department in accordance with the provisions of the Country Towns Water and Sewerage Act of 1880, and Extension and Amendment Acts of 1887, 1894, and 1905.

These Acts provide for the loan by the State of moneys to cover the cost of Water Supply Schemes and for the repayment by the Town supplied of the amount so advanced, within a period of from 50 to 100 years. The repayment period in recent schemes has been fixed at 50 years, and the annual repayment to cover interest and sinking fund, based upon an interest rate of 3½ per cent., amounts to 4.2634 per cent. per annum. Under the provisions of the Acts named, the debt is a first charge on the whole revenues of the Town, from whatever source derived.

In addition to the amount required for repayment of debt the Council is required to provide out of revenue a Renewal Fund, to cover the cost of replacing the perishable portions of the Works as they wear out. Included under this heading are such items as pumping machinery, timber work in engine-houses, and fencing, etc., for which a life of 25 years is usually allowed.

For purposes of revenue the Council may levy rates on all properties which are situated within 250 yards of any main, measured at right angles to same, even although such property is not actually supplied with water.

In the following Paper, which has been written principally for the benefit of the younger members of our Society, reference will be made in detail to various matters in connection with the design and construction of the Water Supply of Singleton, a town of about 3000 inhabitants, situated on the Hunter River, about 148 miles north of Sydney.

The scheme, which has been recently completed, includes the pumping of water from a well sunk into the drift near the river bank upstream of the town, and delivery, after softening,

into a service reservoir situated on a hill about a mile distant, whence the softened water gravitates through a service main to supply the town and the requirements of locomotives at the railway station.

ESTIMATED CONSUMPTION OF WATER.

In formulating the scheme the customary provision was made for a maximum consumption, in the Summer, of 50 gallons per head per day, and an average consumption, all the year round, of 30 gallons per head per day, based upon a present population of 3000, and an estimated future population of 5000 persons.

In addition to this it was estimated that a certain quantity of water would be sold by meter for the watering of gardens and industrial purposes, and also for the supply of locomotives, as Singleton is a railway depot. The total consumption in gallons per day was estimated as follows:—

ESTIMATED MAXIMUM CONSUMPTION PER DAY.

	For Present Population.	For Future Population.
At 50 gallons per head	150,000	250,000
For industrial purposes, locomotives, etc. ...	87,000	130,000
	237,000	380,000

ESTIMATED AVERAGE CONSUMPTION PER DAY.

At 30 gallons per head	90,000	150,000
For industrial purposes, locomotives, etc. ...	87,000	130,000
	177,000	280,000

Some slight reduction might have been made in the average allowance for gardens, but as this quantity is purely conjectural it was decided to be on the safe side and allow the full amount. The bulk of the supply by meter will be for locomotives, and this will not vary appreciably all the year round.

CAST IRON PIPES AND SPECIALS.

The whole of the cast iron pipes, specials, valves and hydrants were made by Messrs. G. and C. Hoskins, of Ultimo, Sydney, under the terms of their Contracts entered into with the State Government at the beginning of 1907, and which still have some years to run. The Cast Iron Pipe Contract includes the manufacture of various sizes of pipes from 3in. to 36in. diameter. The smaller sizes, 3in. and 4in. diameter, are each ⅜in. thick, and 9ft. long, cast "on the bank," under a head of about 15 inches.

The larger sizes, 6in. diameter and upwards, 12 feet long, are cast vertically, so as to obtain a sufficient head of metal to ensure solidity. The thickness of the 6in. pipes used at Singleton was 7/16in., and of the 8in. pipes, ½in. The whole of the pipes, with the exception of some specials, were spigot and socket pipes. After casting they were dressed clean from sand with iron brushes, and heated to a temperature of between 300 deg. F. and 400 deg. F., and were then completely submerged in a bath of coal tar for such period, not exceeding ten minutes, as was found necessary to give them a smooth and glossy coating. The whole of the pipes when cold, were then tested separately in a hydrostatic testing machine to the following pressures:—

3in. diameter	450lb. per sq. in.
4in. diameter	450lb. per sq. in.
6in. diameter	450lb. per sq. in.
8in. diameter	380lb. per sq. in.

After all the air was expelled from the pipes they were then sounded all over by the Inspector with a 1½lb. hammer, after which, if found satisfactory, they were weighed and branded, when they were ready for use in the work. These cast iron pipes are now cast so accurately that they seldom vary more than 3lb. each in the weight.

The stop-valves used are of the standard pattern made for the Public Works Department. Each valve has four gunmetal faces, two on the chest, and two on the door. The glands and nuts are of gunmetal, as are also the spindles, on which are cut left handed screws, so as to open the valve when turned from left to right.

The hydrants are also of standard pattern, with gunmetal valve, held up by a brass spring, and making a water-tight joint on a rubber insertion washer.

It may be noted that owing to the increased demand for rubber, some difficulty has been experienced of late in obtaining commercial insertion of satisfactory quality. The valves were tested under a hydrostatic pressure of 300lb., and the hydrants of 150lb. per square inch, during which they were sounded with a hammer as in the case of the pipes.

The pig iron used in the manufacture of the whole of the work at Messrs. G. and C. Hoskins' Foundry, was obtained from the Blast Furnace owned by the same firm at Lithgow, and was re-melted in a cupola with a suitable admixture of scrap, consisting principally of old railway chairs.

The specifications for the supply of pipes and valves provide that test bars 2in. x 1in. x 3ft. 6in. long are to be run, wherever required, and when tested on edge in cross-breaking on 36in. centres, are to withstand a weight of 24cwt. applied at

the centre, with a deflection of not less than 5/16in. before fracture. These tests are made in a machine at the Foundry. The actual callipered sizes of the unmachined test bars vary of course slightly from the specified dimensions, but it is an easy matter to obtain the equivalent test load by calculation.

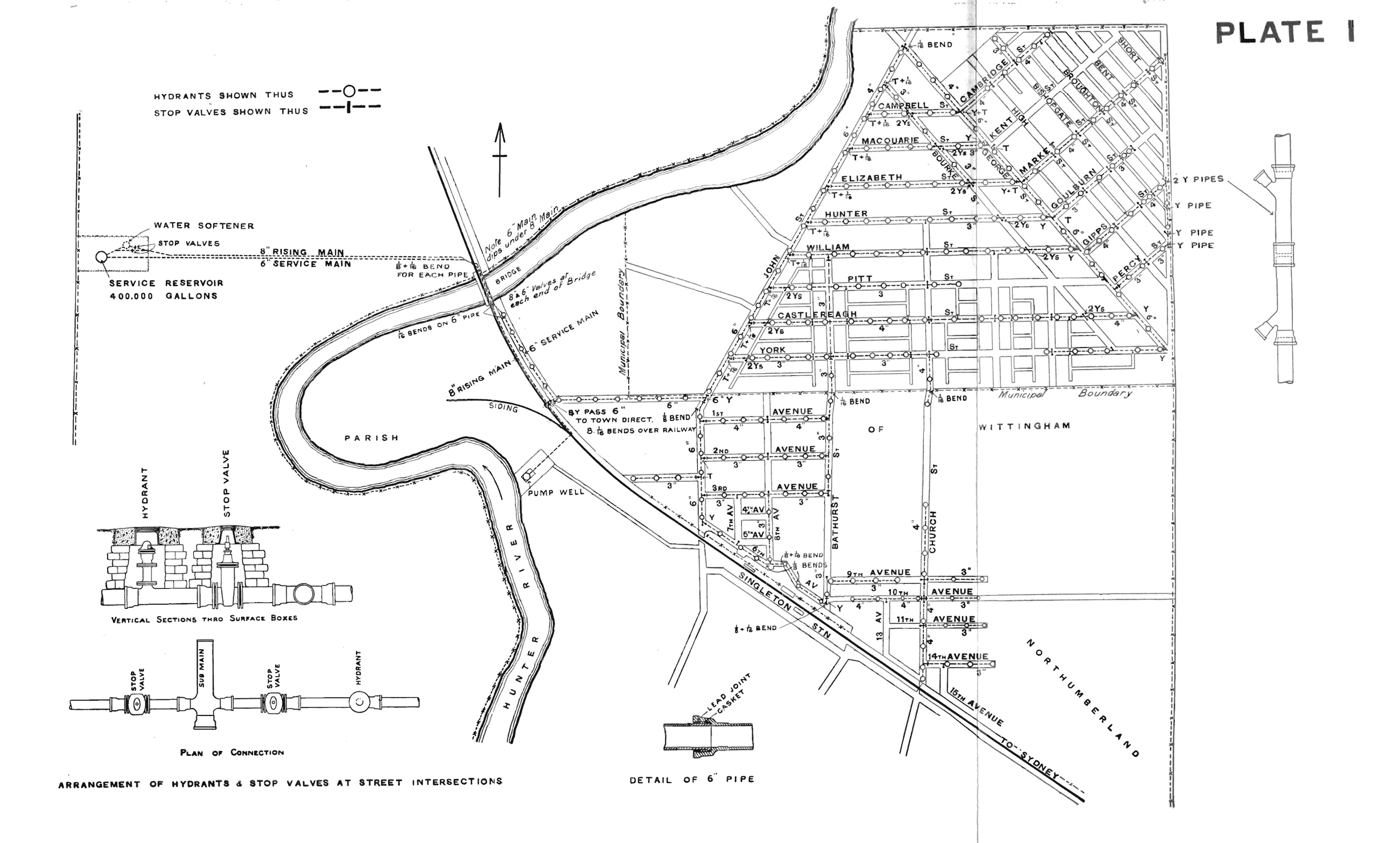
PUMP WELL.

The position of the Pump Well is shown on Plate No. 1. At this site the formation consists of 27ft. 9in. of alluvial overlying sand mixed with gravel drift, which varies from stones about one-half a cubic foot to those of the size of a pea. Under this was bed rock. The drift at this site was heavily charged with water of good quality and naturally filtered by percolation through the drift.

The following particulars with regard to the sinking of the pump well have been supplied by Mr. J. B. A. Reed, Assoc. M. Inst. C.E., who acted as Resident Engineer for the work. The excavation was carried down 26ft. 6in. from the surface through alluvial without lining. A section of the brick lining was then built, resting on a cast iron curb, and extending to somewhat above the surface of the ground. Four days were allowed to admit of the mortar hardening in the joints, and excavation was proceeded with, the lining following the excavation down. A second section of the lining was then built on top of the first, and the operation of sinking was repeated. There were three sections in the total depth of the lining. After striking water the excavation was taken out with scoops, operated by hand and diver. The well curb landed on rock at one side only, the rock dipping away round the rest of the circumference. See Plate 2.

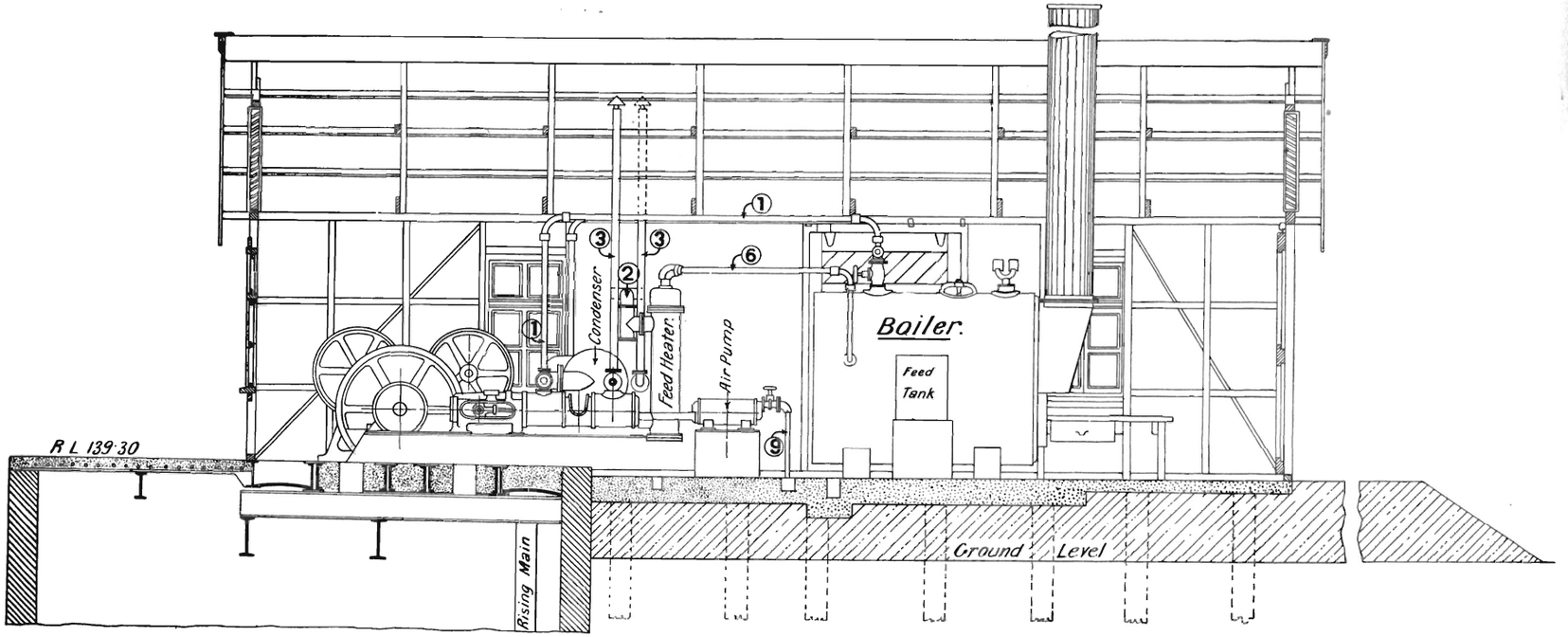
It is usual in sinking Pump Wells of this class to find that the skin friction of the material passed through is sufficient to sustain the weight of the lining; indeed, it is generally necessary to apply a load on the top in order to get the lining down. At Singleton, however, the contrary was the case, and as little, if any, support could be relied upon from skin friction, it was decided to underpin the lining at eight points off the rock. The fixing of these supports was a difficult matter, as there was a considerable depth of water in the well, which it was impossible to lower by pumping, and all work had to be done in a confined space by means of a diver. Timbering was inserted in order to check the inrush of sand under the curb, and to give space for fixing the supports. These consisted of four 5-ton screw jacks, and four 6in. cast iron pipes filled with concrete. After fixing the supports, a test load of about 50 tons was placed upon the top of the well, but after 24 hours no sinking could be detected. The space between the outside of the brickwork and

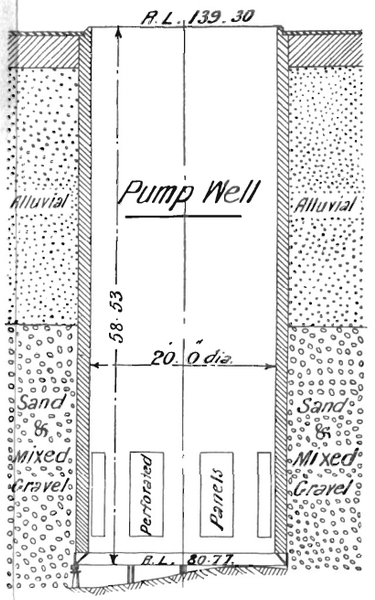
PLATE I



ARRANGEMENT OF HYDRANTS & STOP VALVES AT STREET INTERSECTIONS

PLATE Nº 2





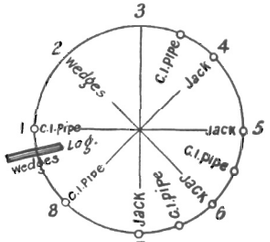
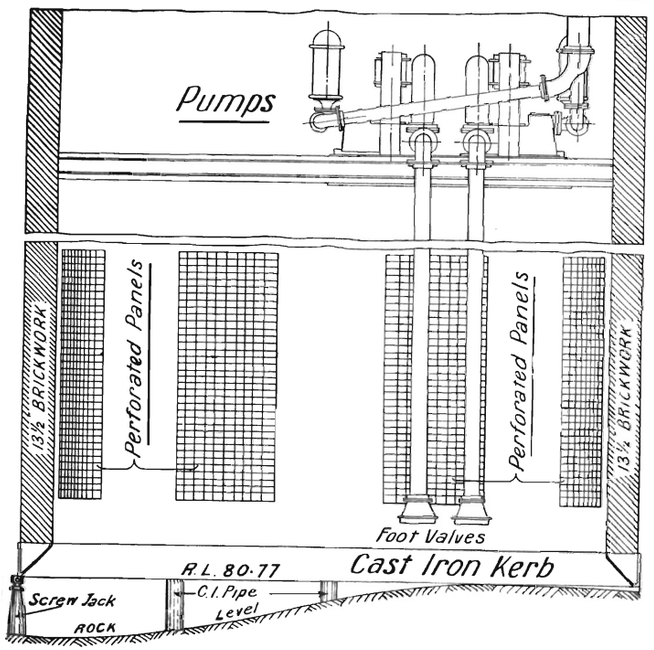
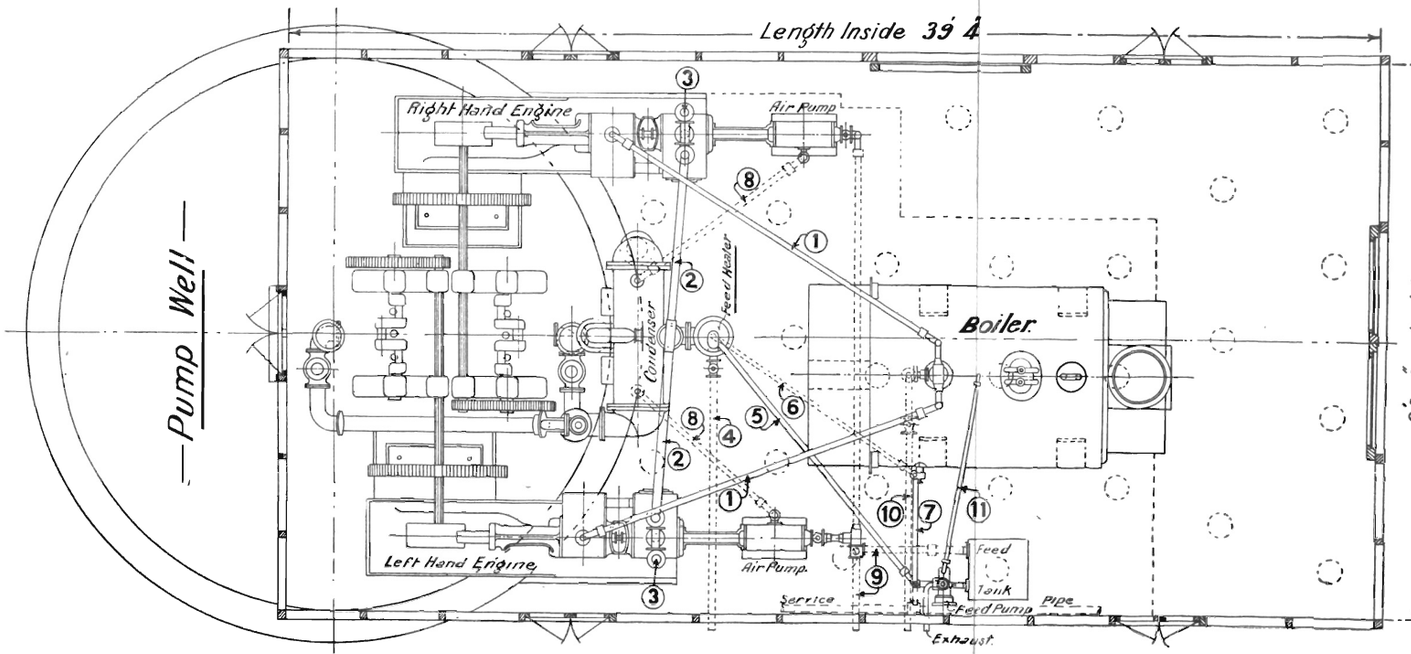
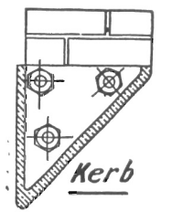


Diagram Showing Supports under Kerb.







—Pipe Index—

1. Main Steam
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3. Exhaust to Atmosphere
4. Heater Blow-down
5. Water Feed to Heater
6. Boiler " from Heater
7. Direct " " Pump
8. Air Pump Suction
9. Air " discharge
10. Boiler Feed Blow-down
11. Steam to Feed Pump