as convenient to the district to be supplied. The actual construction of it depends on local conditions, both from a material and design standpoint. The author favors concrete construction with puddle clay backing and entirely covered in with arch construction, well ventilated and having at least 2 to 3 feet of earth filling above the roof to keep the water as cool as possible. The tank should be subdivided into at least two portions for cleansing purposes. The reservoir should be provided with ample arrangements for inspection and cleansing and the inlet, outlet and overflow pipes placed in the best position the local demands and requirements call for. After passing through the reservoir, the water should flow through a meter house constructed at the head of the main distribution pipes to the city and correct records kept by means of a meter recording automatically the daily consumption and delivery of water into the city at all hours of the day.

Wells.—A difficulty often arises in finding near a large town a suitable gathering ground. In such cases the engineer directs his attention to a source of supply from wells, if possible. In selecting the site and position of bore-holes, the engineer, if not conversant in practical geology, should engage the services of an expert geologist before finally selecting and commencing on a scheme. The preliminaries mentioned previously as regards rainfall calculations should be carefully and accurately taken and records kept. The construction for the bore-holes present very few engineering difficulties and is accomplished by the several drilling and deep-well boring outfits. The author has had experience in both the "free-falling tool" and the "slack rope" method, and can recommend both as worth consideration, the local conditions governing the final selection. Perhaps details the writer has at hand of the actual construction of a well and bore-hole for a large city in Great Britain will be of interest, as it gives an excellent idea of the usual procedure. The well was first constructed 8 feet inside diameter, 24 feet deep with 14 inches of best hard blue brick lining filled in behind with cement grout. The floor consisted of 18 inches of cement concrete. A circular cast iron stand-pipe, 29-in. bore 9 feet long with flanged end to which was fixed during boring operations two similar lengths bolted on with special short valve casting to facilitate the testing of the yield of the bore-hole at certain stages. The bore-hole for approximately 110 feet was 28 in. in diam. and lined with 25-in. bore steel tubes, the annular space being filled in with concrete and so lined to prevent the contamination by impure surface water. The boring was continued from the lining tubes with a 14-in. circular hole to the rock strata, a distance of approximately 600 feet, when the water-bearing strata was penetrated sufficiently for the following tests of the probable yield of water to be made. The previously mentioned valve at the top of the stand-pipe was closed and the brick well emptied of all water, carefully measured, and the water admitted by opening the valve on the standpipe. The time taken in filling the well was accurately measured as the water rose to the surface of the ground. This level was then taken as the rest level and surface pumping was continued to lower it. From these results the actual yield of water flowing into the well per hour was ascertained by hydraulic formula. The head on the valve being known, the yield in gallons per 24 hours could readily be calculated. In this particular case the above was considered sufficient to warrant the installation of the pumping and machinery plant. The actual yield from the bore-hole was almost 750,000 gal. per day.

Distribution.—It is always the aim of the engineer to install a gravitation system, not only from an initial outlay standpoint but also owing to maintenance cost. Providing the selected site for supply reservoir is situated at such an elevation as to give the minimum pressure for supply purposes, both for domestic and trade use, this can be adopted; but should it not be available, pumping machinery will have to be installed. It requires careful thought in designing a complete and suitable pumping plant of sufficient capacity to supply the maximum demand at all times and at the most economical cost, having in mind local conditions and requirements. The author has visited waterworks plant where considerable saving has been accomplished by means of syphons. A great deal of costly excavation can be saved by adopting syphons providing for practical working purposes the difference of elevation between the summit and level of water from which the supply is to be drawn does not exceed 25 feet (34 feet theoretically).

The syphon should be provided with an air pump attachment on the longer leg, and in all cases for proper and satisfactory results, sluice valves and cocks must be placed in proper positions.

Water is conveyed generally under pressure from the source of supply to the consumer and pipes are mostly used. They have been constructed in cast iron, wrought iron, steel, wood, and reinforced concrete. Whichever material is adopted the pipes should be properly calculated for diameter and thickness to give the delivery and strength required. The thickness of metal in pipes requires careful consideration and good judgment on the part of the engineer, as after calculations have been made, sufficient allowance must be made for imperfect workmanship, shocks in handling and laying, weight of earth and traffic, also the great strain to which pipes are subjected on the sudden closing and opening of valves. It is the author's practice in calculating the required thickness from formula to withstand the water pressure, to allow a high factor of safety to take care of the above-mentioned additional strains, and in no case using less than ⅝-in. in thickness whatever the calculations work out at.

A margin on the diameter should be allowed for possible corrosion. In specifying cast iron pipes, they should be cast vertically and dipped when hot into a hot bath of a solution consisting of asphalt, resin, pitch and linseed oil. A percentage of test bars 3 in. x 2 in. x 3 ft. 6 in. should be cast at the same time and tested for tensile strength and deflection. The following tests by Sir Frederick Bramwell, strikingly illustrate the increase in strength and density obtained by re-melting the metal before finally running:

Samples.	Tensile Strength per sq. in.
1st sample	7.5 tons
2nd sample, after 2 hours longer fusion	8.3 tons
3rd sample, after 1¾ hours longer fusion	10.8 tons
4th sample, re-melted with fresh pigs	11.0 tons
5th sample, after 4 hours longer fusion	18.5 tons
Maximum of 5th sample	19.6 tons

The strength at the spigot end is increased by casting an additional 6 in. or more beyond the finished length of the pipe, this having the effect of compressing the metal and permitting ash and air bubbles to rise into same, which extra length is finally cut off in the lathe and the pipe finished off to required dimensions. All pipes should be tested by oil or water (preferably the former) in a testing machine up to at least twice the pressure they will afterwards be subjected to before leaving the foundry.

Wrought iron and steel pipes have of late found favor amongst engineers, especially for large mains, because of their greater tensile strength and lightness over cast iron giving them many advantages in cases where weight and