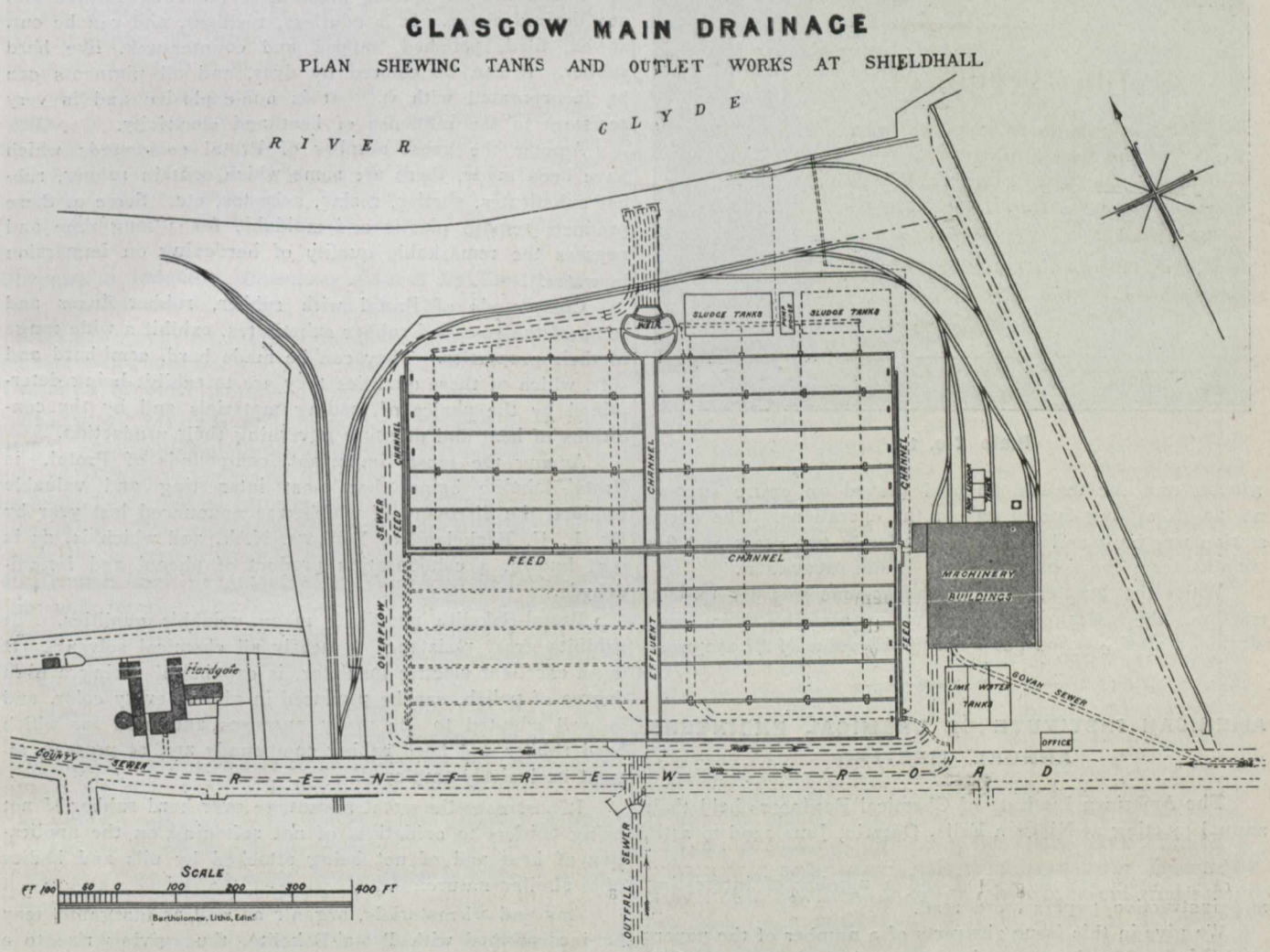
efficiency in removal of suspended matter, accompanied with a chemical purification (calculated on the albumenoid ammonia basis) of 50%. It was therefore decided to adopt this method of treating the entire sewage of the city. As the effluent is discharged into a tidal stream of fifty fold volume, the cost of further and more complete oxidization was considered unnecessary. Two entirely separate schemes were designed for the north and south sides of the river respectively. The sewage from the north side is intercepted and conveyed by gravitation to a point about seven miles below Glasgow by a large outfall and three intercepting sewers, two of these being pumped into the outfall and the



third pumped at the disposal works. On the southern section the features are very similar, but there is in addition a large overflow sewer running direct into the river which relieves the outfall during periods of storm. The sewers are designed on the combined system, but only a quarter-inch rainfall per day is allowed for, all junction chambers being so constructed that any quantity of storm water in excess of this is discharged by way of the existing sewers, direct into the river. The dry weather flow in each of these two sections is estimated at 48 million gallons per day, and the necessary collection and disposal of this 96 million gallons involved the construction of thirty miles of sewers varying from 2 ft. 6 in. to 10 ft. diameter at elevations of from 4 ft. above to 60 ft. below surface, also four separate pumping stations and two disposal areas.

A slight variation from the practice formerly employed in precipitation has been adopted. As a substitute for sulphate of alumina, the precipitating agent used is ferric sulphate, and it is giving very satisfactory results. An oxidizer plant has been installed for its production. The sludge gravitating into underground channels is pumped into storage tanks and conveyed to sea daily in specially designed sludge steamers.

Considerable engineering difficulties were met with, particularly on the construction of the southern district works, recently completed. The strata through which the low level interceptor passed consisted of fine running sand, the elevation of high water on the river practically coinciding with the crown of the sewer. This sewer was almost entirely driven in iron tunnel built in 18-inch lengths under air pressure, with the aid of hooded shields. The spaces between the iron segments and the unexcavated ground were grouted, as each ring was built, with lime at a pressure of 40 lbs. per sq. inch, and the tunnels were then lined with concrete and finished with an inch of granolithic. The photograph shows the tunnel previous to being lined.

The construction of the substructures of the pumping station which raised this sewer to the outfall necessitated the excavation of an area 100 feet long, varying from 50 to 100 feet in breadth, and 52 feet below street elevation. The strata was dry sand for 19 feet and fine running silt down to 63 feet from the surface, where the bores indicated the presence of boulder clay. The whole area was first sheet piled, 50 ft. piles being driven from the top of the silt (Fig. XI in the photograph) into the boulder clay, and then cross-