MUNICIPAL DEPARTMENT

HYDRAULIC POWER SUPPLY FOR DRAINAGE.

Hydraulic power mains have recently been put down in the streets of Buenos Ayres for the purpose of drainage, and although the supply is not intended to be sold to the public, yet the conditions are such as to render interesting a general outline of the undertaking as an instance of a hydraulic power supply in towns. As engineer-in-chief of the works, the Hon. R. C. Parsons had a few years ago to face the problem of draining the two low-lying Boca and Barracas districts. In order to avoid the great cost and difficulty of laying deep sewers, he ultimately decided to lay out the works on the plan of numerous small automatic pumping stations, and finally adopted hydraulic power as the best means for working the pumps at the sumps. There is a central station, containing two compound surface-condensing horizontal engines, having cylinders 15½ in. and 27 in. diameter with 22 in. stroke; each engine works direct a double-acting pump of 5 in. diameter and 20 in. stroke, and is capable of delivering 175 gallons of water per minute at 58 revolutions. Space has been provided for a third engine, whenever the work to be done at the sumps renders it necessary. There are three Lancashire boilers, 6 ft. diameter by 22 ft. long, with a Green's economiser of 120 tubes. The roof of the engine-house is a tank, which is kept supplied from the water works mains. The water after use is run to waste into the sewers. The engines can be run with or without the condensers, as it is sometimes inconvenient to use the water in the tank for condensing purposes, owing to the high temperatures during the hot season. There are two accumulators of 18 in diameter and 20 ft stroke, which were loaded at the trials to 800 lb. per square inch; but the machinery is calculated to work at 750 lb. per square inch under ordinary conditions. The station is fitted out with the usual accessories. The mains carried through the Boca and Barracas districts are nearly 8½ miles in length. There is a duplicate supply to every sump. The largest mains are 5 in. bore, and the smallest 2 in. bore. There are in all 17 sumps. Each sump contains duplicate hydraulic sewage pumps on the author's system. The quantity of sewage to be dealt with varies considerably at the different sumps, but it was found practicable to reduce the whole of the pumps to two sizes, and as a matter of convenience the only substantial difference between them was made in the stroke. They are all single-acting, and have plungers 30 in. diameter; 22 of them are made with 3 ft. stroke, and 12 with 4 ft. stroke; the maximum speed of working is 10 double strokes per minute. The head of water and friction on the delivery sewers are also different at the different sumps, and the diameter of the hydraulic working rams was varied to suit. The pressure on the side rams, which perform the up stroke, is constant; the water from these rams is returned in the down stroke to the central hydraulic cylinder. The sewage runs into the sumps by gravity, and when they are nearly full a float starts one of the pumps, and when the level falls a certain amount the float stops the pumps. If the level of sewage continues to rise after the first pump is at work, another float starts the second pump. The pumps therefore always work so as to cause a flushing velocity in the rising main or sewers. The exhaust power water is discharged into the sewage-pump cylinders, thus serving to dilute the sewage and keep the plungers clean. The whole arrangement is automatic. At the time the machinery was completed, there were no houses connected to the sewers, so that the tests had to be made with water run into the sewers for the purpose; the results of the engine tests are given in Table IV. The delivery sewers discharge at different points into the main outfall sewer, which is everywhere above the level of the Boca and Barracas drainage area. The whole of the mains were tested to 1,500 lbs. on the square inch after being laid. In laying them during the hot weather it was found necessary to protect them from the heat of the sun, in order to preserve their correct length. The whole of the work, including all the mains, was prepared in such a way that it was unnecessary to obtain making-up pieces in Buenos Ayres, and all the machinery for each sump was erected in the workshops at Chester before being sent out.

TABLE IV.—Hydraulic Power Supply for Drainage in Buenos Ayres.—Trials of Two Compound Horizontal Condensing Pumping Engines at Central Station.

November 21 22, 1893.	Engine No. 1.	Engine No. 2.
Duration of trial, hours	10	10
Diameter of high-pressure cylinder.	15½in.	15½in.
Diameter of low pressure cylinder.	27in.	27in.
Stroke	22in	22in
Revolutions, total during trial	35,150	35,030
Revolutions, average per minute	58·58	58·38
Indicated horse-power, mean	119·131	120·757
Water pumped at 800 lbs pressure per sq. inch, total during trial, gallons	106,293	105,931
Water average per minute, gallons	177·15	176·55
South Wales coal feed into furnaces, total during trial, ash, etc., not deducted, pounds	2,354·51	2,192·47
Coal per indicated horse power per hour, pounds	1·97	1·81
Coal per pump horse-power per hour, pounds	2·37	2·22
Boiler pressure per sq. inch above atm., pounds	100	100

It will be seen from Table IV that the coal per indicated horse-power was 1·89 lbs. per hour, and per pump horse-power 2·29 lbs. per hour. Taking the average efficiency at the sewage pumps at 50 per cent.,* including all losses in the mains and valves at the highest speed contemplated, the expenditure of coal is 4·58 lbs. per pump horse-power at the sumps. This shows that 41 per cent. of the indicated horse-power of the engines is recovered in useful work at the sumps. The pumps have to work under most variable conditions, and are situated at 17 sumps distributed over an area of nearly two square miles, requiring over eight miles of mains to connect them with the central station. The economy to be attained under such circumstances cannot be great, and it is believed that no other method of distribution has shown such good results under similar conditions. The Hydraulic Engineering Company, Chester, were the contractors for the construction and erection of the whole of the plant; Mr. F. W. Thornton had charge of the erection of the machinery and laying of the mains for them. Hydraulic pumps of the same kind as those at Buenos Ayres have been for some years at work, pumping the water from the River Thames into the reservoir tanks at the London Hydraulic Supply stations. At Falcon Wharf, Blackfriars, the head is about 80 ft., including friction in the rising main; and the efficiency of the pumps is 75½ per cent.

*The actual efficiency of the pumps with the higher lifts of 20 ft. to 28 ft. was considerably more; but at the lower ends of 10ft. to 15ft. the efficiency was necessarily reduced.

CANVAS COFFERDAM.

AN interesting illustration of the usefulness of canvas in engineering operations is related in connection with the construction of Queen's bridge in Melbourne. It became necessary to build four piers, each consisting of eight cylinders, and these piers had to be founded on the bottom of a channel formed by blasting, and as the bottom was littered with large pieces of rock and was uneven and shattered, it was finally decided to resort to a square dam around each cylinder, and in order to make such dams available for more than a single cylinder, the whole of one side was fitted so as to open outward like a door—thus, after the cylinder was firmly settled in place, the door would be opened and the dam removed for use at another point.

Such a device had to be as light as possible so as to be readily moved, and it was accordingly made of a single thickness of sheathing covered with tarpaulin; the sheathing was vertical, and consisted of 12 x 4-inch rough-sawed planks, and was held against a series of horizontal frames by means of horizontal pieces on the outside of the planks, the tarpaulin commencing at the corner where the door closed and passing completely around the outside of the dam. Before beginning work all the sheathing was arranged with the bottom ends flush with the bottom horizontal frame; it was placed over the site of a cylinder and loaded until it sank as far as possible, after which the sheathing was driven by a pile driver to the rock through puddled clay, which had been thrown on the site, the vertical sheathing being next drawn up by jack-screws, one plank at a time, until the chisel marks came back to their original position, when the door was opened and the dam removed to another site.

A SUIT has been commenced by Jas. [illegible], of Port Stanley, against the lessees of the London and Port Stanley gravel road, to test their right to collect tolls. At the instance of the lessees the County of Elgin has been made a third party to the suit.