"The total length of iron and steel piping at present in use at Kumara is 48,395 lineal feet, or 9 miles 13¼ chains, made up as follows:—

| | | |
|---|---|---|
| "6,157 | lin. ft. ... ... ... ... | 30in. in diameter. |
| 1,989 | " ... ... ... ... | 26in. " |
| 792 | " ... ... ... ... | 24in. " |
| 2,935 | " ... ... ... ... | 22in. " |
| 4,848 | " ... ... ... ... | 18in. " |
| 5,772 | " ... ... ... ... | 15in. " |
| 18,128 | " ... ... ... ... | 13in. " |
| 7,774 | " ... ... ... ... | 11in. " |
| 48,395 | lineal feet. | |

"This does not include a large number of 11in. and 13in. pipes not now in use, having been discarded by the miners as too small for economically conveying the large quantities of water now used in hydraulic sluicing.

"The pipes hitherto in use at Kumara for conveying water for hydraulic sluicing have been altogether too small, and miners have recognised the necessity and economy of conserving the head, and consequently the power of the water, by the use of pipes of greater carrying-capacity. The loss of head from the use of small pipes may be ascertained by an inspection of the table on page 195 of Gordon's "Miners' Guide," which is quite correct for this purpose, as well as for ascertaining the quantity of water discharged by pipes of various diameters *running free* on different hydraulic inclinations.

"A length of 1,000ft. of 11in. pipe will discharge 9·85 sluice-heads of water, with a loss of head of 1 in 10, or a total loss of head of 100ft.; while the same length of 28in. pipe will discharge 10·33 sluice-heads, with a loss of head of 1 in 880, or a total loss of head of only 1·13ft. The result may be tabulated thus:—

| Length of Pipe. | Diameter of Pipe. | Discharge in Sluice-heads. | Hydraulic Gradient. | Total Loss of Head. |
|---|---|---|---|---|
| 1,000ft. | 11in. | 9·85 | 1 in 10 | 100ft. |
| 1,000ft. | 13in. | 10·26 | 1 in 20 | 50ft. |
| 1,000ft. | 15in. | 9·90 | 1 in 60 | 16·66ft. |
| 1,000ft. | 16½in. | 9·91 | 1 in 90 | 11·11ft. |
| 1,000ft. | 18in. | 10·30 | 1 in 125 | 8ft. |
| 1,000ft. | 20in. | 10·18 | 1 in 200 | 5ft. |
| 1,000ft. | 22in. | 10·12 | 1 in 300 | 3·33ft. |
| 1,000ft. | 24in. | 10·34 | 1 in 440 | 2·27ft. |
| 1,000ft. | 26in. | 10·06 | 1 in 660 | 1·51ft. |
| 1,000ft. | 28in. | 10·33 | 1 in 880 | 1·13ft. |

"The total loss of head from any other length and diameter of pipe, and quantity of water conveyed, may be ascertained by a similar inspection of the table referred to, or by the rules immediately preceding it. The intake end of every line of pipes should have a bell mouth, or taper pipe of considerable length, so as to gradually increase the speed of the water until the required speed is attained, as the sudden increase of the speed from a state of comparative rest to a high velocity causes a great loss of head.

"Regarding the size of pipes that will produce the best result, with due regard to economy, where the head and power of the water has a value, the area of the pipe should be such that it will convey the required quantity of water at a rate of speed of from 3ft. to 6ft. per second, the lower rate of speed or less when the power is very valuable and the greater rate of speed or more when the power is of small value.

"From measurements made, it has been ascertained that, with tail-races having a fall of from 12in. to 14in. to the box (12ft.), some parties sluice away 150 cubic yards of wash per hour with ten sluice-heads of water, or at the rate of 15 cubic yards per hour for every sluice-head. The ground at Kumara is poor, and it is only by putting through large quantities of wash that it is made to pay. Without any fresh discoveries there is still a large area of ground to work, and some of the present claims will last for from fifteen to twenty years. There is also a fair probability of a good lead of gold-bearing wash-drift being traced both towards the ranges and also towards the sea, as gold is found in many places far below the level of the false bottom of the present workings, so that a payable run of gold-bearing wash may be fairly looked for at deeper levels than hitherto."

Recently a new description of air-valve has been adopted on the pipes on this field, which consists of a hole of about 2in. in diameter being cut in the pipe, a leather or vulcanized india-rubber clack being fixed inside the pipe, and held in its place by small screw-bolts. It is to all intents like the clack of a pump-bucket. When the pipes are full of water the clack is held firmly against the pipe, but when the water commences to run out of the pipe the clack drops, and admits a supply of air. This little valve answers much better than the more expensive air-valves which formerly were used, only costing about 2s. 6d. each.

The following table will show the number of hydraulic-sluicing claims on the field, with the quantity of water used, and the fall or gradient of the tail-races or sluices; also showing the different claims that are worked by means of the different water-races, sludge-channels, and private tail-races, with the number of men employed in such claims.