

the capabilities of one unit only of the aforementioned current-pump at various velocities of the stream and at various heads or elevations above it. These results may be doubled or trebled by the installation of two or three current-wheels (units) on one pontoon, as may be required :—

Height pumped in Feet.				Velocity, 6 Miles per Hour. (B.h.p. developed, 40·97.)	Velocity, 7 Miles per Hour. (B.h.p. developed, 64·9.)	Velocity, 8 Miles per Hour. (B.h.p. developed, 97·00.)
	Water discharged, in Cubic Feet, per Second.					
50	..	..	..	..	3·60	5·71
100	..	..	..	..	1·80	2·85
150	..	..	..	..	1·20	1·90

In these calculations a pump giving 50 per cent. efficiency of the power of the current-wheel has been substituted for the inefficient centrifugal pump of the tests quoted, the brake horse-power produced being that registered by a rope dynamometer.

The patent current turbine pumping-machine of Messrs. H. Morgan and Milne is designed on entirely original lines, a turbine replacing the paddle-wheel of former types.

A working model of this machine has been installed by the inventors on the Clutha River, near Roxburgh. This turbine has six curved blades to divert the current at right angles to the flow, the blade being deflected at an angle of 22°. A conical boss on the up-stream side deflects that water on to the blades which would otherwise strike the axis of the turbine. The wheel revolves at a high speed, and is much more compact than the paddle-wheel type. A three-throw plunger, or ram, pump is installed on the pontoon, and is operated by the turbine, which is raised or lowered in the stream by a hand-winch on the pontoon.

Owing to the extremely variable velocity of the current rendering the gauging of the same in this case only approximate, and the fact that the pump was not connected with the river-banks by pipes, I am unable to furnish data regarding efficiency; but the machine, although only a model (the turbine being but 3 ft. in diameter), developed 2 brake horse-power with a current-velocity only slightly exceeding five miles per hour, which is extremely creditable for the first attempt at an entirely original type of current motor. The first cost of this class of current-pump would be less than that of the original paddle-wheel type, and the three-throw plunger pump should have higher efficiency than a centrifugal pump.

## V. MINERALS OTHER THAN GOLD.

### COPPER.

There exists a general stagnation and lack of energy in the prospecting and development of the copper-deposits throughout the Dominion, the total export of this metal during 1908 only amounting to £275. At Whangaroa the claims are still being prospected in a desultory manner; the old Mahara-hara Mine near Woodville has again been abandoned; the Maoriland Copper Company suspended operations at Aniseed Valley, Nelson, after the result of the trial smelting operations had proved unsatisfactory; at Mount Radiant, near Karamea, the copper leases still remain unworked. A report has been recently published that copper-lodes had been found near Kaipara Harbour; but the prospects of such a discovery in the Tertiary rocks which cover that district are extremely remote. A quarter of a century ago the occasional discovery of fragments of native copper on the beaches of that harbour was reported upon by Sir James Hector, F.R.S.; but such floating fragments do not constitute a copper-mine, although they probably approach as near thereto as anything that will ever be found in the Tertiary rocks of Kaipara.

### IRON.

Operations on the Parapara iron lease comprise the construction of roads and open cuttings. The Inspector of Mines for the district reports that no systematic development-work to determine the extent and value of the ironstone-deposits has yet been undertaken. During the past thirty years the potentialities of these deposits have been the theme of much reporting, and it is about time that some practical development was undertaken.

### SHEELITE.

A decline of £9,431 has occurred in the annual export of this mineral, notwithstanding the activity that appears to have been recently displayed in opening scheelite-mines. This decline is difficult to explain, considering the high price of £120 per ton prevailing for scheelite, and that it is one of the easiest minerals to mine and to save. Scheelite generally occurs associated with auriferous quartz and is remarkably heavy: about 6 cub. ft. weigh a ton, whereas about 13·5 cub. ft. of quartz is necessary to make the same weight. During the year 41 tons of scheelite concentrates were produced and exported by Messrs. Donaldson Bros. from Macrae's, and 30 tons, value £1,980, by Messrs. Reid, of Glenorchy.

### ANTIMONY.

Practically nothing has been done in connection with antimony-mining during the past year. The low price ruling no doubt accounted for the small amount of work done at the Alexandra antimony lease. On the West Coast this branch of mining has been moribund.