dredges working the Buller River, upon the west coast of New Zealand."

All the rivers of New South Wales which drain auriferous country have now been taken up for dredging purposes. Many dredges are in course of construction, while at least a dozen have already started operations, and the result must cause a considerable increase in the production of gold in the near future. Mr. C. L. Garland's dredge was the first to start, in 1899, on the Macquarie River, near Stuart Town, and the proceeds are understood to be satisfactory. although considerable difficulty was met with owing to the occurrence in the bed of the river of an extremely hard cement, which caused great wear and tear on the buckets and machinery generally, necessitating frequent stoppages for repairs. The experience gained in this instance has been taken advantage of in the construction of later dredges, and the lips of the buckets are now being made much stronger.

The following are the particulars of the pioneer dredge of New South Wales, owned by Mr. C. L. Garland, and working on the Macquarie River: Length of pontoon, 100 ft.; beam, 31 ft.; depth, 6 ft. 6 in.; draught when loaded with 100 tons of machinery, 3 ft. 6 in.; total dead weight of dredge, 200 tons; steam power required, 75 h.p. (actual); capacity of dredge, 12 buckets per minute; capacity of buckets, 4½ cubic feet each.

The dredge is provided with 3 steam engines. The main engine is for actuating the buckets; the second is to work the winch, with 6 drums; the third engine is to work the electric light. The ladder is 68 ft. long, and is fitted with 38 buckets and 2 grab hooks, which will lift boulders up to one ton in weight. The weight of the ladder is 15 tons, and with the buckets attached it weighs 25 tons. When the ladder is inclined at an angle of 45° the machine will dredge to a depth of 40 ft. below the water line. The trommel is 20 ft. long, and has an inside diameter of 5 ft. The dredge is fitted with a 12-in. centrifugal pump, playing water on the gravel in the trommel from a perforated pipe. The capacity of the pump is 2,000 gallons per minute. The elevator will stack the coarse boulders 25 ft. above water level. There are 10 inclined tables, 5 on each side of the trommel, and arranged back to back. The length of the tables is 16 ft., and they are covered with cocoanut matting and expanded metal. The fine tailings escape by launders from the bottoms of the tables, and are conveyed to the stern of the dredge.

Bucket dredges of several other types are now at work in different parts of the colony; thus, in some a pair of revolving screens is used instead of one, while at Araluen 2 dredges are to be seen without either screens or elevators. In the latter case the gravel is discharged direct from the buckets into a sluice box, which delivers the tailings at the rear of the dredge, while the gold is caught in a variety of riffles. Some of these are formed of longitudinal bars, others of angle iron placed transversely, and others again consist of perforated iron plates resting upon coir matting. It is claimed that as much and as good work can be done by a dredge of this construction as by one fitted with a revolving screen, and that the initial cost is appreciably less. On the other hand there is considerable wear and tear of the riffles in the sluice box, owing to the big stones and boulders being carried over them; moreover, it seems probable that the saving of fine gold would be assisted by the action of the revolving screen in separating the large stones and allowing only the finer material to be treated on inclined tables.

However, experience with the different types of dredges will soon determine which are the most suitable for the different conditions met with in various localities. It is obvious that those dredges which have no elevators can only work in deposits of limited depth, since the tailings occupy more space than the original beds of gravel. If, therefore, the deposits be more than 15 or 20 ft. deep, the only way to find room for the tailings is to deposit them in high stacks, and hence the necessity for elevators.

Another method of dealing with auriferous gravels is by means of what are known as pump dredges, which have been introduced into this colony from Victoria. The term pump dredge is somewhat of a misnomer, since the machines do not work by dredging. The process consists of hydraulic sluicing, the necessary pressure being given to the water by means of a powerful centrifugal pump. The water and the gravel which it breaks down gravitate into a suction well or sump in the lowest part of the workings, and from this they are raised by another centrifugal pump and delivered into sluice boxes at a height of about 50 ft. from the floor of the excavation. The bottom of the sluice box is fitted with the usual riffles, which retain the gold, while the water, carrying with it the gravel, flows over the end of the box to the dump. The machinery is all fitted on a pontoon so that it can be floated to a fresh position when desired. When work is about to be commenced on a deposit, and excavation is made of sufficient size to accommodate the pontoon, the water is allowed to accumulate in this and the dredge is launched. The excavation is then drained by means of the centrifugal pump, so that the pontoon can rest on the bottom, and the bank of gravel is worked away by hydraulic sluicing. When the excavation has been so much enlarged that the shifting of the dredge is desirable, this is effected by letting in the water and floating the pontoon to the most convenient position for continuing the work.

The pump dredge has several advantages which make it more efficient than a bucket dredge under certain conditions. Thus, where the bed-rock or "bottom" consists of hard and uneven rock, it would be impossible to obtain the gold lodging in the crevices by means of buckets, whereas no special difficulties would be experienced in such cases with the so-called pump dredge. Again, where a deposit of gravel exceeds, say 50 ft. in depth, it is doubtful whether it would be practicable to work it with buckets, whereas there would be nothing to prevent its being successfully dealt with by the method of hydraulic sluicing and elevating.

When the question of cost, however, is considered, the comparison is all in favour of bucket dredges, which can be worked by two men per shift of eight hours, whereas the pump dredges require eight men per shift. Moreover, as much more powerful engines are necessary for the pump dredges, the consumption of fuel with these is much greater than with the bucket dredges.

Finally, it may be said that in the case of deposits of auriferous river gravels of moderate depth, resting upon fairly soft bed-rock, the bucket dredge is unquestionably the cheapest and most efficient appliance for recovering the gold; but where the deposits are of great depth, or the bed-rock is too hard and uneven to allow of the employment of bucket dredges, the process known as pump-dredging can be successfully employed, provided the gravels be sufficiently rich to cover the extra cost.

The Federal Centrifugal Gold Sluicing Company have recently completed a pump-dredging plant on their mine at Jembaicumbene, near Braidwood. The pontoon is 47 feet long, 39 feet wide and 5 feet deep; it rests on the bottom of the excavation when in operation, but can be floated when it is desired to move it. The engine is a horizontal compound one, of 300 h.p. indicated, with cylinders of 18 and 30 inch diameter, and with a 33 inch stroke. Steam is supplied by three boilers 7 feet 6 inches in diameter by 14 feet long. The flues are 50 feet high by 26 inches diameter. There are two centrifugal pumps of the Kershaw type, each with a 12 inch delivery pipe, the runners and casing being fitted with removable liners. Each pump is driven independently by rope gearing from the crank shaft of the engine. One of the pumps is used for working the hydraulic giant nozzles, while the other elevates the water and gravel to the sluice boxes, which are 45 feet long, and are fixed on a trestle work erected on the pontoon. The engine is sufficiently powerful to drive much larger pumps if desired.