and connecting pins of the main bucket chain and the elevator should be made of manganese steel, or some other hard steel. The bucket should be provided with interchangeable steel lips. For working in stony ground, at least two buckets should be omitted, and steelshod grabs put in their place.

A large supply of water is required for thoroughly washing the spoil, and it is generally supplied by a centrifugal pump belt-driven from the main engine.

The power required on a dredge is determined by the depth and quality of the wash and the size of the buckets. A dredge having 7 cubic feet buckets capable of working 50 feet below water level and elevating the tailings to a height of 40 feet, would require a 25 nominal horse-power engine, and as supplementary engines are required for the winch and electric light dynamo, the boiler should be about 40 nominal horse-power.

The small pebbles and sand, which pass through the perforations of the revolving screen, fall direct on to the gold-saving tables: these are covered with cocoanut matting, expanded metal, and various forms of riffles. The matting is taken off at intervals, and washed in suitable tubs provided for the purpose. There is no doubt that a considerable percentage of gold is lost, and improvements are therefore required in the gold-saving part of the plant. These will probably take the form of a stuffing box, to deliver the spoil more evenly upon the tables and probably, also, where the gold is fine, a system of re-elevation and retreatment of the finer sands by gravitation or chemical methods, will be adopted.

Almost any ground may be dredged if a constant supply of water be assured, either by a small stream or by dams, and we may therefore divide dredges into two distinct classes, varying as to their design, material, etc., namely, river dredges and dry land dredges.

Considered financially, the land dredge can generally be made a safe investment, by judicious prospecting, as its operations are confined to accessible beaches and flats. The river machine is generally more speculative, as prospecting is often out of the question, owing to the large volume of water, the proximity of old workings or gold-bearing terraces alone giving a clue as to the probabilities of payable wash in the bed of the river.

Thorough prospecting is of vital importance, where a large outlay on machinery is contemplated. Several important points must be determined by methods which must be adapted to local conditions, namely: (a) The value per cubic yard; (b) the class of wash; (c) the average depth of ground; (d) the percentage of ordinary sand, surface silt and heavy mineral sand; and (e) the position of the water level with reference to the surface and to the bottom. The importance of (a) is obvious and (b), (c), (d) and (e) will determine the size of buckets, length of ladder and elevator, spread of tables and quantity of water, which will enable the ground to be worked to the best advantage.

Shafts should be sunk at various points, and a careful record should be kept of the points previously enumerated. If there is sufficient water taken from the shaft, the excavated material may be run straight through an ordinary sluice box with matting, riffles and expanded metal. With a proper arrangement of screens, the percentage of light sands can be estimated, and the washings from the mats will give an approximation for the heavy sands.

If dish prospecting shows that the gravels are rich in fine gold, they should be treated by gravitation methods. If the loss is found to be great, it should be determined by chemical analysis, and the advisability of providing—for the dredge—concentrators and a potassium-cyanide plant should be considered. If there is a large influx of water to the shaft, a pump will be necessary, in which case a centrifugal pump, 3 or 4 inches in diameter, with a telescopic length of piping and a foot-valve, will be found useful. If the sinking is through loose sand, telescopic cylinders, that can be withdrawn and moved about, will often be found cheaper than timber. If the bottom cannot be reached by a shaft, on account of water, nor the depth calculated from the dip of strata or other means, a bore-hole should be made, as it is very important that the full depth should be known. In fine gravels, a steel rod, or small pipe, can often be hammered or jumped down.

Having ascertained the average depth of the ground below water level the length of the bucket ladder will be the square d2 plus d2 where d is the average depth below water level plus the height of the top pin (generally about 15 feet) above water level. This length enables the majority of the work to be done at the best possible angle of inclination, namely, 45 degrees.

A field book should be kept in the form shown in Table I.

Shafts.			Remarks on Strata and Nature of Bottom	Material excavated	Gold Saved.	Remarks on Gold	Water level	Total Gold: average per cubic yard	Coarse Wash Arrested by Screen	Heavy Sands off matting	Light Sands	Percentage to be Passed over Tables
No.	Surface Dimensions	Depth										
	Ft. Ft.	Ft.		C F	Grs			Grs	C F *	C F *	C F †	
1	2 5 x 4	3	Clay............	30	0	—	3 feet from surf. and 20 ft from bottom	11·9	153	40	37	33
		4	Fine wash.....	40	8	Fine						
		6	Coarse wash & boulders, largest two feet in diameter	60	43	Coarse shotty						
		10	Fine wash..... Bottom, finely laminated schist, strike north 23 deg. and dip 45 deg. west	100	51	Floury						
		23		230	102							

*Measured. †Calculated.

‡ 102 mul. 27 div.230=11·9. § 230—(153 plus 40)=37. ‖ 230:40 plus 37=100:33

If dish prospects show a big loss of fine gold in the light sands, and in the heavy sands after amalgamation, bulk samples should be saved for laboratory treatment by potassium cyanide or other methods.

If a large-scale chart is prepared of the area to be