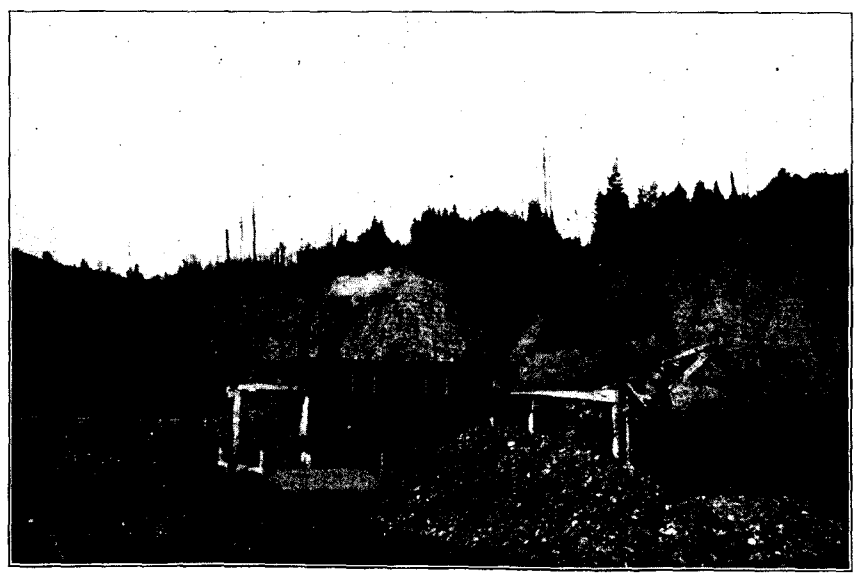
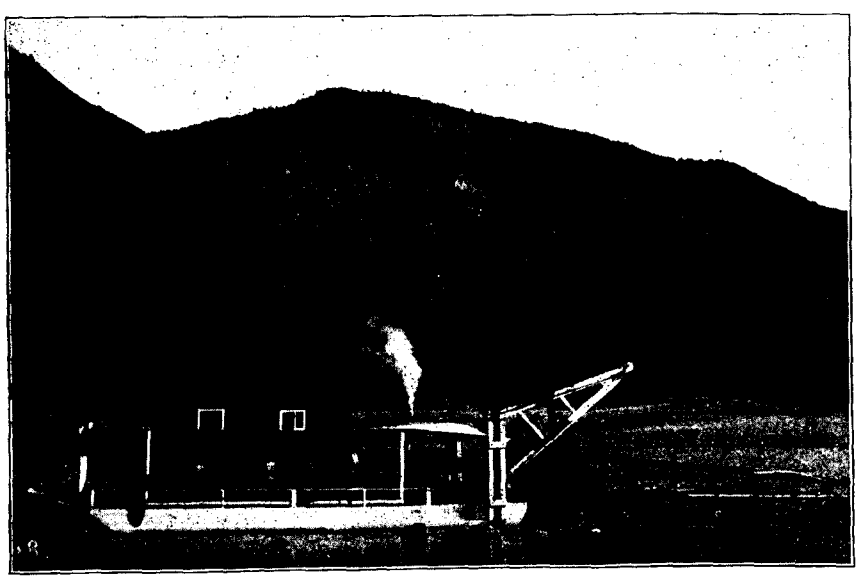
ton, thus it will be seen that ground containing 1 or 1½ grains to the ton can be made to return a profit. I might mention, in passing, that I know of a large dredge treating and handling ground at ¾d. per cubic yard. The object of the engineer is to design a plant that will give the largest possible output per week combined with the smallest possible expenditure, and it is absolutely necessary for him to study all the possibilities of the operations, in order to provide for all contingencies in the class and character of the machinery, so as to secure the best results. Although the main features are similar in almost every instance, at the same time many details will vary greatly according to local conditions, and it is on the careful consideration of these conditions that the successful working of the dredge will largely depend. The principal points to be considered are: The greatest depth of the ground to be worked below, and its height above the water level; the nature of the wash; whether fine or coarse, friable or otherwise; whether it contains many large boulders, sand, clay, or bands of cement; the character of the bottom, whether it be hard or soft; the probable difficulties to be overcome in the shape of rocky bars or snags; and the quantity of water available. Last, but by no means least, it is always essential that the wash to be treated should be thoroughly tested by, say, inexpensive boring operations or other methods so as to give some idea of the character of the gold to be saved and to ensure success in the undertaking. Care should be taken to obtain accurate results from every prospect, so that the engineer may be placed in a position to calculate the proper average value of the material, overburden, etc. If the preliminary investigations are only conducted in a proper and judicious manner, the investor need have no fear as to the ultimate result. It might be interesting to note, however, that over-sanguine views as to possible returns lead to disappointment, as was the case in the early days of New Zealand dredge mining. As regards the prospects of dredging in New South Wales, most of our rivers and flats appear to have been worked by fossickers and others in a crude and perfunctory way, consequently a large percentage of gold still remains to be recovered, particularly the fine gold. In proof of this statement and of the value of old and abandoned channels, I will, later on,



From Minister of Mines Report, 1899.
Dredge Cutting through Bar on Fraser River.



From Minister of Mines Report, 1899.
Same Dredge in Open Water.

show you slides of modern dredges working at a profit upon areas which in one case had been previously worked by an old-type dredge and in other cases where the ground has been repeatedly turned over by Europeans and Chinamen. In New Zealand, where the more easily worked and richer ground has been gone over by the smaller dredges, it was recognized that there were still immense tracts of lower grade country to be worked, and to do this profitably the lifting capacity of the buckets was gradually enlarged from about two to, in some cases, seven cubic feet. Here fears were entertained as to whether a dredge, fitted with the latter-sized buckets could successfully treat the enormous quantities of wash which it lifted. All doubts on this score were soon dispelled, and although on the large modern dredge the gold saving tables usually have an area of about 200 square feet, it has been found that practically the whole of the gold, including even the very finest, is saved on one-fourth of that area. It is on account of this gold-saving power of the bucket dredge that the modern machine, where it is possible to apply it, is rapidly superseding all other forms of alluvial mining. Of course, where both fine and coarse gold occur, special provision must be made