NEW SOURCES OF GOLD.

BY WALDON FAWCETT.

At an experiment station established at Chapel Hill, N. C., the Division of Mines of the United States Geological Survey is now seeking to devise a means of rendering commercially available the low-grade gold deposits of the mid-Atlantic and Southern States. Should the present effort prove successful, a method will be developed for deriving not only gold but other valuable minerals from a sediment that has heretofore been regarded as worthless. The primary purpose of the government scientists in their present tests is to ascertain the types of machinery best adapted for extracting the mineral wealth from deposits which have heretofore been regarded as of too low a grade to be worked profitably. The work was first taken up on the Pacific coast more than a year ago, and the results which attended the operations at the experiment station, or "concentrating pavilion," as it was termed, conducted by the Geological Survey at the Portland Exposition, were so gratifying as to induce the officials to seek similar possibilities on the Atlantic coast.

The investigation in the West last year was inaugurated because the exigencies of the Russo-Japanese war demonstrated how desirable it is for the United States to have its own source of platinum supply, instead of being dependent solely upon foreign mines; but in the end it was found that not only platinum, but gold and other valuable substances could be derived from what is generally referred to as "black sand." For the benefit of the lay reader, it may be explained that the term black sand is applied to the heavy sediment which is likely to be found wherever water has had an opportunity to work on the soil. There are many acres of this sand on the sea beaches, but vast deposits of it are also found at inland points, and especially in localities where hydraulic mining has been carried on. In most instances the placer miners were fully aware that some mineral wealth remained in the material which they discarded, but they had not the equipment to render its recovery profitable. It is such an economic process that is now being sought by the Division of Mines. In the experiments thus far conducted, the discovery was frequently made that a given deposit did not contain a sufficient quantity of any one mineral to justify its manipulation for any single product, but that if all the valuable contents were saved, the aggregate returns would be highly profitable. On the other hand, the officials of the Geological Survey have discovered sand deposits, notably those in Humboldt County, California, which show a good assay value in gold and platinum.

Apparatus showing a wide range in design and function has been tested by the government officials in connection with the black sand investigation, but the most important class of mechanical helpers is made up of the concentrators or concentrating machines. The concentrator derives its name from the fact that by a peculiar, continuous movement it concentrates the mineral particles rescued from the sand, and brings them to a common point of discharge. The concentrators, however, form but one link in the chain of appliances that figure in the treatment of the samples of black sand furnished to the government officials for investigation. These samples, it may be added, are supplied in consignments that range in quantity all the way from a few hundred pounds to carloads. The first step in the testing process as conducted at the experiment station is the placing of the given consignment of sand in a "feeder," from which it is elevated by a belt conveyer and delivered to a screen. Next the material passes to a revolving mixing distributer, from which it is piped to the different concentrators. The plant includes four or five concentrating machines, which are in simultaneous operation. The utilization of the mixing distributer insures an even quality of pulp for all the concentrators.

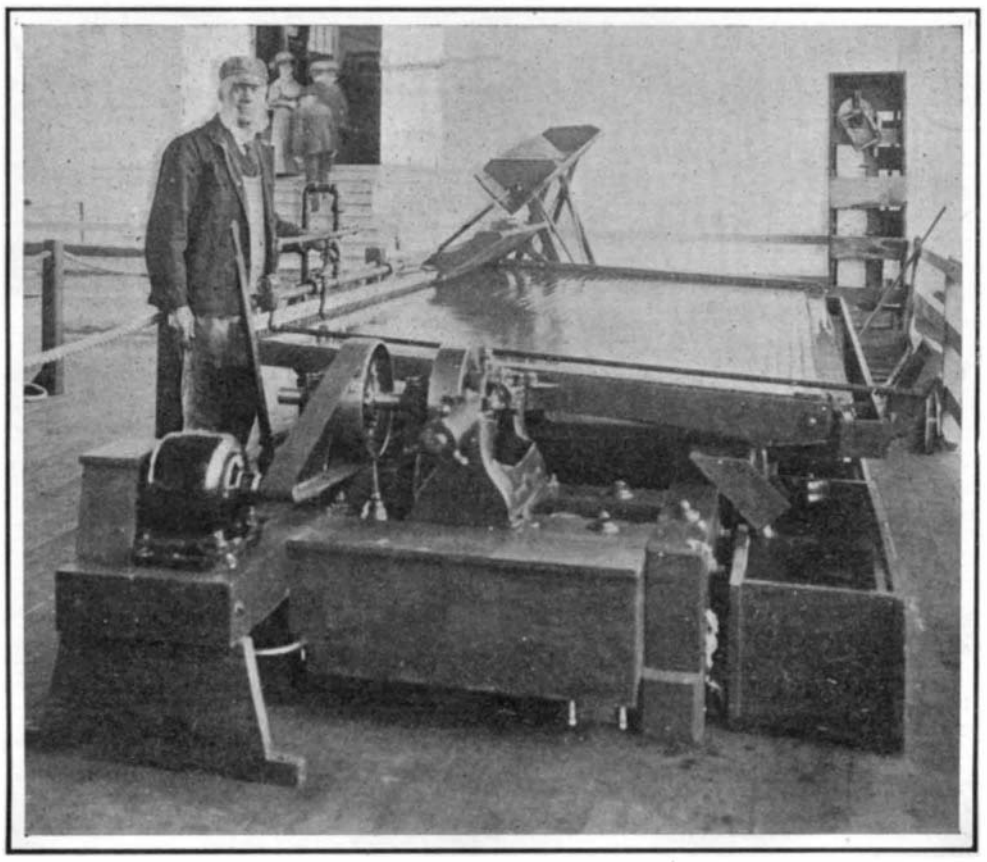
After the material has passed over one or another of the concentrating tables it is placed in a drying furnace, where all the moisture is expelled. After the pulp is thoroughly dried it is passed through a magnetic separator, where the magnetic elements are extracted. The magnetic machine effects the separation of magnetite, chromite, garnet, monozite, and quartz, all of which are found in the black sand, in addition to the mineral substances already mentioned. The experiments made by the Geological Survey in the West seem to indicate that there is enough magnetite in the black sands of the Pacific coast to supply all the iron and steel required on our western seaboard. Zircon, which is worth $200 per ton, shows in much of the sand, and much of the material that has been submitted for testing purposes has been found to run high in monazite, which is used in the manufacture of gaslight mantels and has practical value.

The concentrators, which, working rapidly and cheaply, are instrumental in deriving wealth from the heretofore worthless black sand, might as a class be popularly described as quivering tables over which pour perpetually streams of water. In the case of a representative concentrating machine, the shaking table is constructed of wood and steel, upon the surface of which a corrugated, vulcanized rubber sheet molded in one piece is firmly fastened. There are about eight corrugations or grooves to the inch, each about one-eighth of an inch in depth. Upon the surface of this grooved rubber, longitudinal riffles of solid rubber are molded, terminating at a point about three-quarters of the length from the feed end of the table. When the gold-bearing sand is placed upon one of these concentrating tables, the rush of water pouring over the surface carries off the mud, clay, and other worthless materials, whereas the particles of minerals being heavier sink to the bottom, and are stopped in the riffles. The constant trembling of the table constitutes the means of concentrating these mineral particles and bringing them to a common point of discharge.

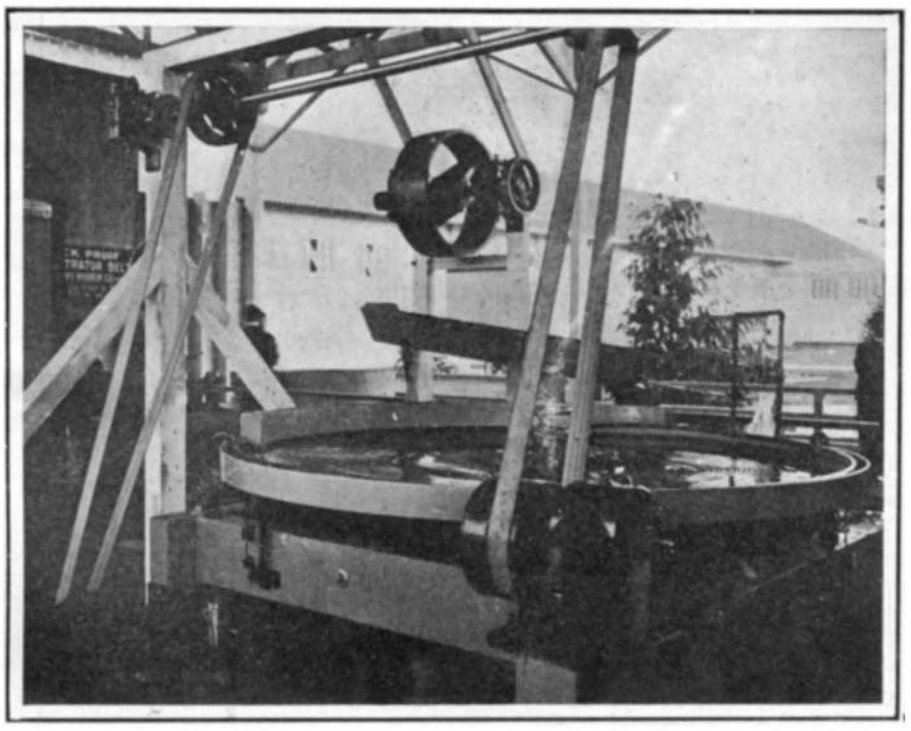
Further following the process of operation of this typical concentrator, it may be noted that the top or working surface of the concentrating table has an inclination downward and across the table transversely, or from side to side, and inasmuch as the material to be treated is introduced at the higher side near one end, a movement of this material is produced diagonally over the working surface, under the combined action and influence of the flow of water and the vibratory motion and inclination of the table. The "tailings" or discarded materials are discharged over the lower side of the table, while the concentrates or gleaned minerals are discharged at the head of the table.

One type of concentrator which is being tested by the government officials, and which differs from the familiar oblong pattern, has the table in the form of a circular pan with the bottom sloping toward the center. Its entire surface is covered with brown linoleum of a special make, and on this is placed a system composed of fifty-six tapering riffles, arranged spirally and radiating from the direction of the center outwardly. The riffles in the case of this machine are composition brass.

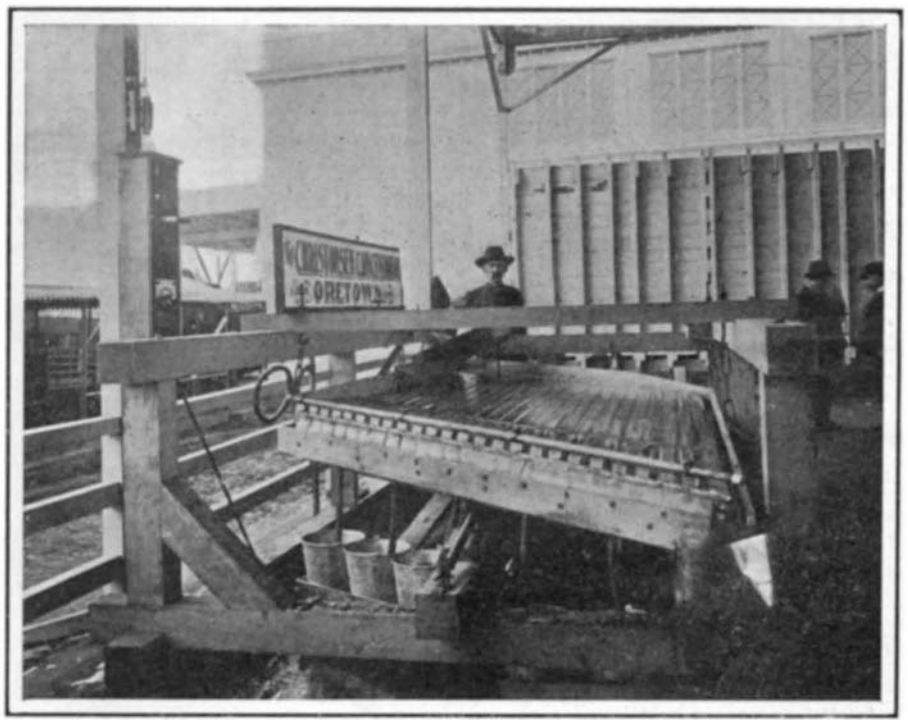
The capacities of the various concentrating tables vary considerably, being dependent in no slight degree upon the character of the material under treatment. In a general way, it may be said that the minimum capacity of the average machine is about ten tons per twenty-four hours, while the maximum capacity is



Motor-Driven Concentrating Machine for Handling Low-Grade Gold Deposits.



Circular Type of Concentrator for Refining Black Sand.



Concentrator in Use for Extracting Gold from Black Sand.

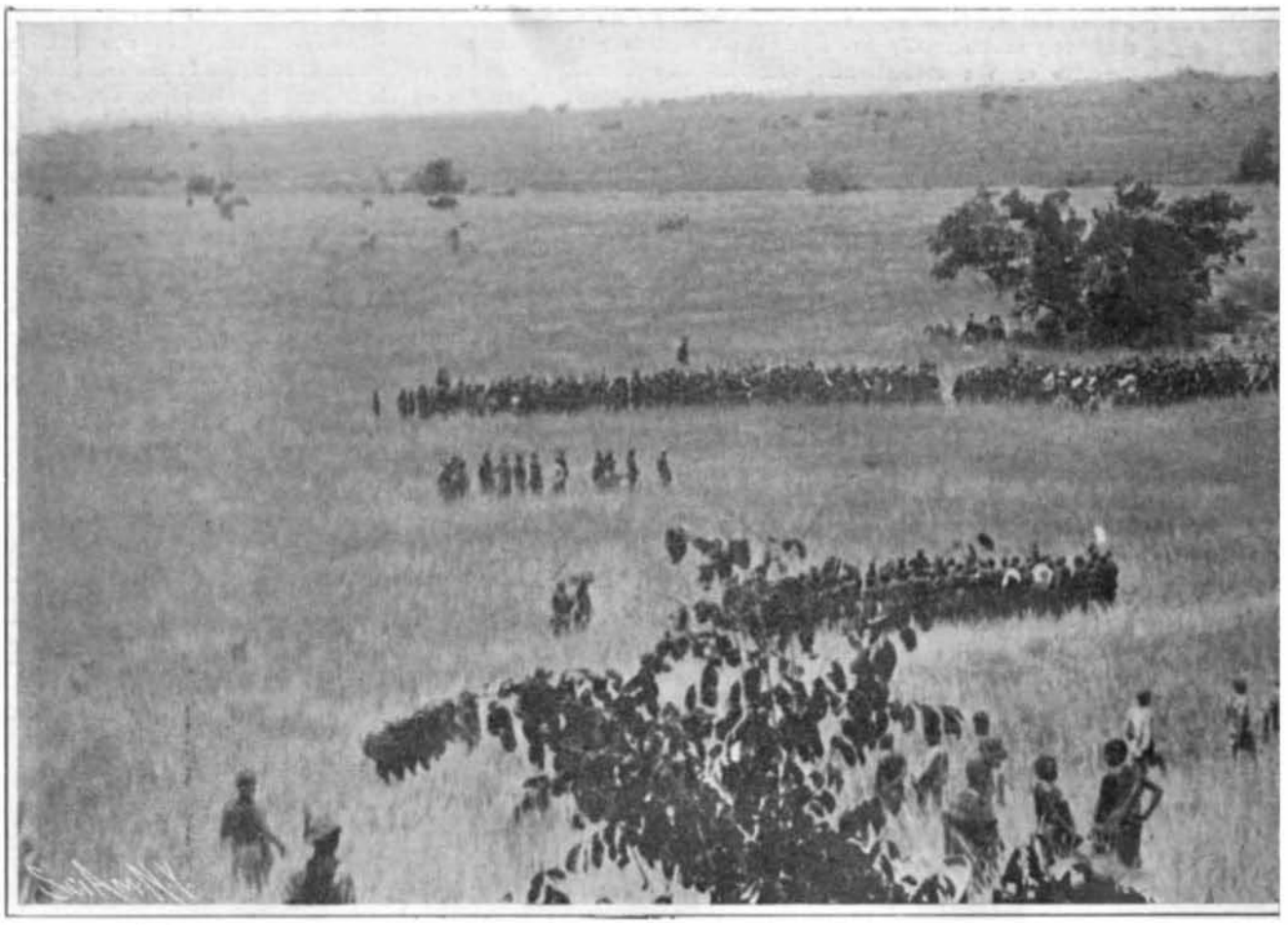
from thirty to forty tons, and there have been instances in which a concentrating table has satisfactorily handled as much as fifty tons in twenty-four hours. The amount of water required for the operation of a machine ranges from five to twenty gallons per minute. The concentrators utilized by the government in its present experiments are operated by individual electric motors of from one-half to two horse-power each.

THE FIGHTING TRIBES OF SOUTHERN AFRICA.

Scattered through her vast territories, Great Britain numbers among the subjugated races hundreds of peoples which even to-day are savage, turbulent, and restless, ever seeking opportunities to rise and throw off the yoke with which the white man has burdened them. Rare, indeed, is the time that some English force is not somewhere engaged in a repressive or punitive expedition, or in restoring order in rebellious territories. For a number of years past the blacks of South Africa have been comparatively quiescent; the white troopers and native rangers in the pay of the government have done their work thoroughly. Particularly is this true in the native states near the earlier white settlements, or of those tribes which disputed the right of way with the Boers. England's policy with regard to the natives, and not of South Africa alone, has often been one of the crassest ignorance and misgovernment, and one moreover which frequently resulted in those terrible uprisings and colonial wars which have blotted the history of many of her fairest dependencies. And while the white man has, of course, been victorious in the end, the cost has sometimes staggered humanity. The policy of the British government in South Africa to-day bids fair to arouse the still savage black population to united revolt, and reports from disaffected districts indicate that the disturbances are of greater extent than is generally realized.

The act which has been the ultimate cause of the present rebellion of the negroes is known as the "Glen Grey Act" of Cape Colony, and its real author was that master mind of South Africa, the late Cecil Rhodes. This law, which to-day exists also in Natal, Orange River Colony, and the Transvaal, provides that every native must pay a yearly head tax, and in default be imprisoned for a certain period, or work off the tax and attendant fine in the employ of some white man. The last clause explains the true significance of the law and the reason for its enactment—the labor problem. While the earlier differences between the natives and the settlers were due to territorial and governmental disputes, for the last twenty years these questions have fallen into the background before the problem of native labor. The year 1886 saw the beginning of the great mining industries with the discovery of gold on the Witwatersrand—industries which, of necessity, require the employment of many thousands of laborers. Because of the small number of the whites, and for climatic reasons, the laborers were to be found only in the ranks of the native blacks. Now, the native is constitutionally and ethnologically averse to protracted labor. He will work in fits and starts at that period of the year which is climatically unsuited to his tentative agricultural pursuits, or his care-free loafing—in other words, the winter. Even the head-tax scheme, however, failed substantially to improve the labor market, and as the subsequent importation of coolie workers into South Africa has not been very successful, the labor problem is still no nearer solution.

One thing is certain, the natives resist the imposition of the tax in every possible manner—by trickery, by evasion, and finally by force. The present uprising under the chief Bambata is directly due to the head tax; it followed the killing of two English collectors by Zulus, with the subsequent execution by the government of twelve natives implicated in the murders. Whether there is sufficient cohesion between the various tribes to make possible a general rebellion is prob-



Kafirs Assemb

A Zulu War Party Ready for the Trail.

Kafirs Traversing a Trail T

A Great Kafir War Dan