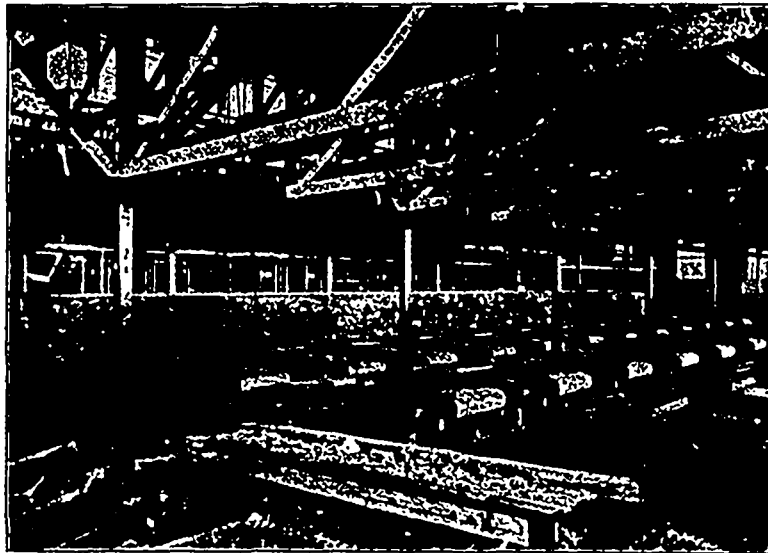


to the height necessary for the requirements of the cyanide plant, a rough concentration by means of spitzluten being, as a rule, the first step preliminary to the cyanide treatment. Where true vanners are employed, it is customary to use three for every five stamps, but, because of the heavy duty per stamp, they are often overloaded. The product from the vanners, being generally pyrites of high grade, is subjected to chlorination for the extraction of the gold. The mills are almost invariably placed near the mine rather than near the water supply. The building itself is framed with timber and covered with corrugated iron. Good foundations are put in, and the construction of the building is very strong. The timber is generally Oregon or pitch pine.

The ore bins are placed on strong masonry foundations, and are made of heavy timbers, well bolted together, the bottoms of the bins sloping towards the batteries at an angle of from 40° to 45° . In a few instances, as at the Simmer and Jack and the New Croesus, flat bottoms are used. Bottoms and sides are usually made of double thickness of 2-inch or 3-inch planks, with a lining of sheet iron. These bins hold from a day's run to four days' run. The feeders used are of the "Hendey Chal-

discharge in a battery is regulated by the use of chuck blocks as the dies wear down, or by having several sets of screens, which may be inserted from time to time. The width of the lower sides of these varies. The custom is to employ from two to three chuck blocks. There is a considerable variation in the height of the discharge. When amalgamation in the battery is considered an important feature, the discharge is raised; where rapid crushing is considered of more importance, a lower discharge is employed.

The first stamps employed on the Rand were considerably lighter than those favored at present. Stamps weighing from 750 to 850 pounds, the other parts being light in proportion, were used at first. In all the batteries now being erected, and in those that have been built within the last year and a half, the tendency is towards very heavy stamps, the weight varying between 1,100 and 1,250 pounds. The mills being erected under the supervision of the Rand Mines, Ltd., have stamps averaging about 1,150 pounds; those erected at the Simmer and Jack and at the Robinson Deep weigh nearly 1,200 pounds. Even with the old style of stamps, by adding extra tappets or putting in heavier heads, the weight has been increased, and, in conse-



ARRANGEMENT OF TRUE VANNERS IN GEORGE GOCH MILLS.

enge Ore Feeder" type, and are practically universal. There is no feeding by hand anywhere. The mortar boxes resemble the homestake pattern, the main differences being in the height of the feed opening and in the length and width of the boxes. Fraser and Chalmers and the Sandycroft foundry have supplied most of the batteries. As the stamp mills on the Rand are rather larger than the average, the mortar boxes, too, are larger and of greater thickness. At the issue the boxes vary between $11\frac{1}{2}$ inches and 18 inches. Most of the mortars have heavy cast iron or steel linings in the front, back, and sides of the boxes, to ensure a longer life. Below the dies false bottoms of cast-iron are put in. Several thicknesses are often employed, to ensure uniformity of depth of discharge as the dies wear down. The mortars are placed on piles 12 to 15 feet in length, which rest on $1\frac{1}{2}$ to 2 feet of concrete. The piles consist of heavy pine timber about $14\frac{1}{2}$ inches square, and are bolted together firmly, both lengthwise and crosswise. The pile pits are excavated to hard rock, where possible. The walls of the excavation are built of heavy masonry or concrete, and the space between them and the mortar blocks is filled either with sand, or with tailings well rammed, or with concrete. Between the mortar block and mortar is placed a thick sheet of rubber or, occasionally, felt. The boxes are held down by eight bolts about $1\frac{1}{2}$ inches in diameter, which at the lower ends are recessed into the wooden piles and are held by cotters. They are tightened by nuts on their upper ends. There is plenty of clear space about the batteries, and all bolts can be easily reached.

The screens are of well woven iron or steel wire. The meshes range in number between 500 and 900 to the square inch, 700 being very common. The area of the holes ranges from .004 to .007 of a square inch. The life of the screen is very short—between two and three days on the average. The height of

quence, the crushing capacity. According to the state mining engineer's report for 1896, the average weight of stamps was 973 pounds. In order to equalize the weight, it is the custom in some mills to use in one set of batteries heavy heads, and in another set lighter ones. New shoes are placed first in the second set, which, after being worn, are taken off and placed in the first. By this means the light heads always have the heavy shoes, and the heavy heads the partly worn shoes.

Shoes are made of various varieties of steel, such as Chrome, Hadfield's Manganese, Firth's cast steel and forged steel, etc. They range in weight from 180 to 240 pounds. They are $8\frac{1}{2}$ to 9 inches in diameter, and in height 9 to 12 inches. Heads and tappets are made of cast steel, the former weighing from 260 to 365 pounds and the latter from 106 to 130 pounds. Dies are $8\frac{1}{2}$ to 9 inches in diameter and 6 inches high from the top of the 1-inch hexagonal bottom. They are made of Firth's, Hadfield's Manganese, or forged steel. Stems are tapered at both ends, and are made of forged iron. They range in weight from 350 to 475 pounds, and in diameter from $3\frac{3}{4}$ to $3\frac{1}{4}$ inches.

It is customary the world over to have five stamps to a battery. On the Rand two batteries are usually placed together, with a clear space of five to six feet between them and the next pair, each battery having its own cam shaft and separate driving-wheel. In some cases one cam shaft and one driving-wheel serve for ten stamps. At the Simmer and Jack four batteries are placed consecutively, with two driving pulleys and two cam shafts. The plan of having one driving pulley for each five stamps is favored by the mill men, as the delays occasioned by necessary repairs affect a smaller number of stamps at a time. Cam shafts are made of forged iron, and range from 5 to $6\frac{1}{2}$ inches in diameter.

Cams are made of cast-steel, and vary somewhat in design