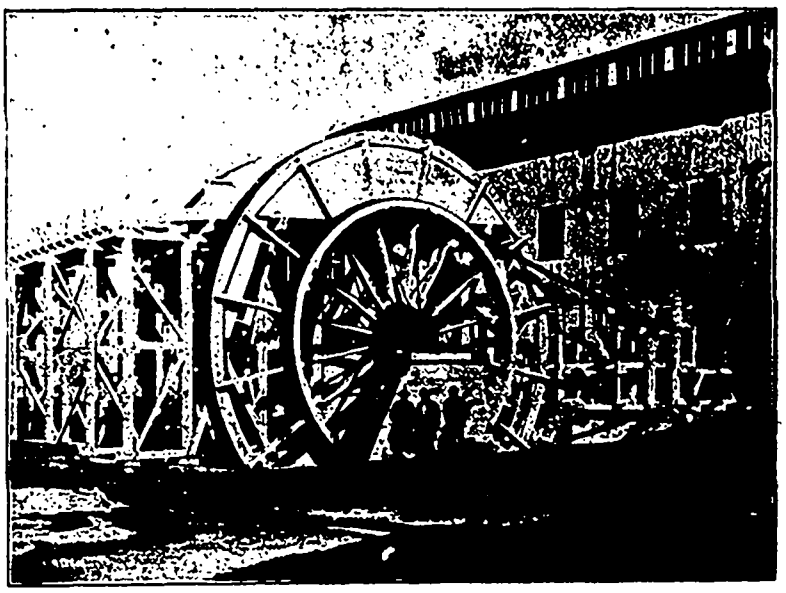
house, the frame being of wood covered with corrugated iron. The ore-bins are rectangular in cross section, the bottoms being flat, and have a capacity of 6,000 tons, or about four days' supply, with the full mill in operation.

The mortar blocks consist of eight karri wood piles bolted together, and the mortars are 4 feet 10 inches in length by 4 feet 8 inches in height, and are lined with steel. The sides are 1 inch in thickness, and the bottoms 9 inches. The feed opening is 3 feet 2 inches above the base, and has a width of 3½ inches for the full length of the box. The height of the discharge is 6¼ to 7¼ inches, and the screens, of 600-mesh steel wire, are 51¾ inches long by 10 inches wide, and have a life of three days, costing 54d. per ton of ore crushed. Amalgamation is done entirely on the outside plates or apron. This is a new departure at this property, as at the old mill inside amalgamation was also practised. The stamps are arranged in groups of twenty, ten being driven by each cam shaft, and weigh 1,200 pounds each. The drop is from 8 inches to 9 inches, and the order 1-5-3-2-4, the minimum of drops per minute being 95.

The cams are of cast steel, and have a sweep the outside diameter of which is 33½ inches. The cam shaft is of fagoted iron with a diameter of 6½ inches, and a length, over all, of 14 feet 3 inches. The cam pulley is of wood, having a diameter of 6 feet and a face of 17 inches. An overhead trolley is arranged under the cam platform for transporting shoes, dies, etc., to the mortar boxes. The mill has been running too short a time to enable an accurate estimate to be made of the consumption of iron and cost per ton of ore crushed. The battery tables have an effective surface 16 feet long by 4 feet 7½ inches wide, a fall of 1¾ inches per foot, and are covered with ⅛-inch sheet copper; they are constructed with one riffle 10 feet down from the mortar box end. A mercury trap is fixed at the end of each table. The pulp from the mortar boxes discharges on lip and splash plates before beginning the descent of the tables. There are two complete steel line shafts, one for each side of the mill, ranging from 10 inches in diameter at the engine end to 6 inches at the tail end. The pulleys for driving the cam shafts are 36 inches in diameter and 17 inches in face. The mill is driven by a compound tandem Corliss surface condensing engine, by Messrs. Yates and Thom, with cylinders 24 x 44 x 54, running at 70 revolutions, giving 900 i.h.p. The driving-pulley is 21 feet in diameter, having grooves for 20 1¼-inch manilla ropes, leading on to a pulley 15 feet 6 inches in diameter on the near line shaft, the two line shafts then being connected with rope pulleys 15 feet 6 inches in diameter for 10 1½-inch manilla ropes. Rope tightening gears are used on both drives. There are five 200 h.p. Heine boilers with two 200-tube economizers and one steel chimney 100 feet high and 6½ feet square. The launders in the mill have a 4 per cent. grade, and deliver the tailings to three 38-feet tailings wheels, to be elevated for delivery to the cyanide works. Such a gold mill varies but slightly from the general type in California and the west of America. Distinctly different from this in one feature at least, and peculiar to the mill construction of the Rand Mines Company, Ltd., is that of the single line shaft coupled directly to the crank shaft of the driving engine—a style of mill first introduced in the Black Hills of Dakota. Those of this type on the Rand are of 200 stamps, or constructed for 200 stamps as an ultimate; for instance, the Crown Deep, Rose Deep, Nourse Deep, Jumpers Deep, etc. The ore is delivered to the mill from a central sorting and crushing station, by rope-haulage up an incline, to bins of about 2,700 tons' capacity, and fed by challenge feeders to the stamps.

The mortar boxes are Fraser and Chalmers' No. 102, the height from the base being 4 feet 10½ inches, and length over all 4 feet 10½ inches. The average thickness of sides is 1½ inches; of bottom under the dies, 9 inches. The box is lined with steel. The height of the feed-opening is 4 feet 4½ inches above the base, and the width is 4½ inches. The height of the discharge is 8 inches, and the size of the screen 700-mesh with a life of 36 hours. Inside amalgamation is practised.

The cost of mill construction on the Witwatersrand may be placed at from £400 to £500 per stamp, depending on the size and design of the mill.



New Style Tailings Wheel Simmer & Jack Mill.

THE TALL BUILDING UNDER TEST OF FIRE.*

BY H. DE B. PARSONS.

The modern "sky-scraper" presents many problems, but none more generally interesting than the question of its security against fire. Many imagine that, because iron and steel are incombustible (in the common acceptation of the word), buildings constructed of such material, together with bricks, cement and glass, may be classified as fire-proof. The construction of a building out of materials in themselves non-combustible does not produce a fire-proof structure. The ruin of the Quinsigamond mill, Worcester, Mass., caused by fire April 5, 1896, shows this. The building was erected on the independent plan, a steel frame supporting the floors and roof. The columns were of built-up steel, carrying floor-beams of the same material. The window-boxes were of steel, and the walls were of brick built in between the frames so as to enclose the whole. Wood was used for the flooring on the "slow-burning" plan. The building was gutted, and the columns and beams twisted into a tangled mass. Witnesses of this fire state that the columns began to yield from fifteen to twenty-five minutes after the fire started, although the floors were not heavily loaded. Had this building been erected on the "slow-burning" principle, it would have resisted the fire much longer. In this type of construction heavy wooden columns and girders are used, which retain for a considerable time, when subjected to fire, sufficient strength to carry their

*A paper prepared for the Engineering Magazine, and published in the reports of the British Fire Prevention Committee.