

REINFORCED CONCRETE SUPPORT OF THE WALLS OF THE MAIN ORE BIN AT No. 3 (SOUTH WEST) SHAFT, GOVERNMENT AREAS.

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As was the custom at the time, the No. 3 shaft ore bin at Government Areas was cut in the shale footwall of the reef.

Crushing was started on the mine towards the end of 1914, and from the beginning of 1915 to the end of 1934, exactly 20 years, 15,955,232 tons of rock were passed through this ore bin.

The result of the passage of hard reef and quartzite, of which the greater part of this tonnage was composed, on the soft shale walls of the ore bin was extensive abrasion and the gradual breaking away of portions of the walls with consequent enlargement of the bin to an extent which caused considerable anxiety.

Further, hoisting at this shaft during 1934 was being continually interrupted on account of large pieces of shale from the ore bin walls choking the loading chutes.

It was then decided to build reinforced concrete walls inside the bin to arrest the abrasion and secure the bin.

The South West Shaft is in the fortunate position of having two separate ore passes into the main vertical ore bin. The lower pass enters about 20 ft. above the "toe" of the concrete block. So, before starting the job, it was seen that if 30 ft. in height of the concrete wall could be completed, this lower ore pass would carry all the ore required, without interfering with the remainder of the concreting which could then be carried on up the other ore pass (the main ore pass). Therefore if interference with the pulling of ore was to be avoided this 30 ft. had to be completed during a week-end. The South West Shaft pulls over 100,000 tons of ore per month, in addition to handling men, material, etc.

Taking advantage of two "shaft repair" days, the "toes" were blasted for the concrete work; hundreds of holes were drilled and a good solid concrete "toe" 10 ft. high by 20 ft. long by 7 ft. wide was built and had set hard before the main job was tackled.

The average dimensions of the main concrete block A (Fig. 43) are approximately 60 ft. high, 30 ft. wide and 12 ft. thick, the maximum thickness being 16 ft. The western side wall B (Fig. 43) which serves the dual purpose of (1) supporting the main wall and (2) protecting that side of the ore pass, is approximately 10 ft. wide by 6 ft. thick by 40 ft. high. Finally a concrete bridge C (Fig. 43) was built on the eastern side to support that end of the main concrete wall while allowing the ore to pass underneath. This bridge is approximately 12 ft. thick, an

S. W. SHAFT
ORE PASS
SECTION.

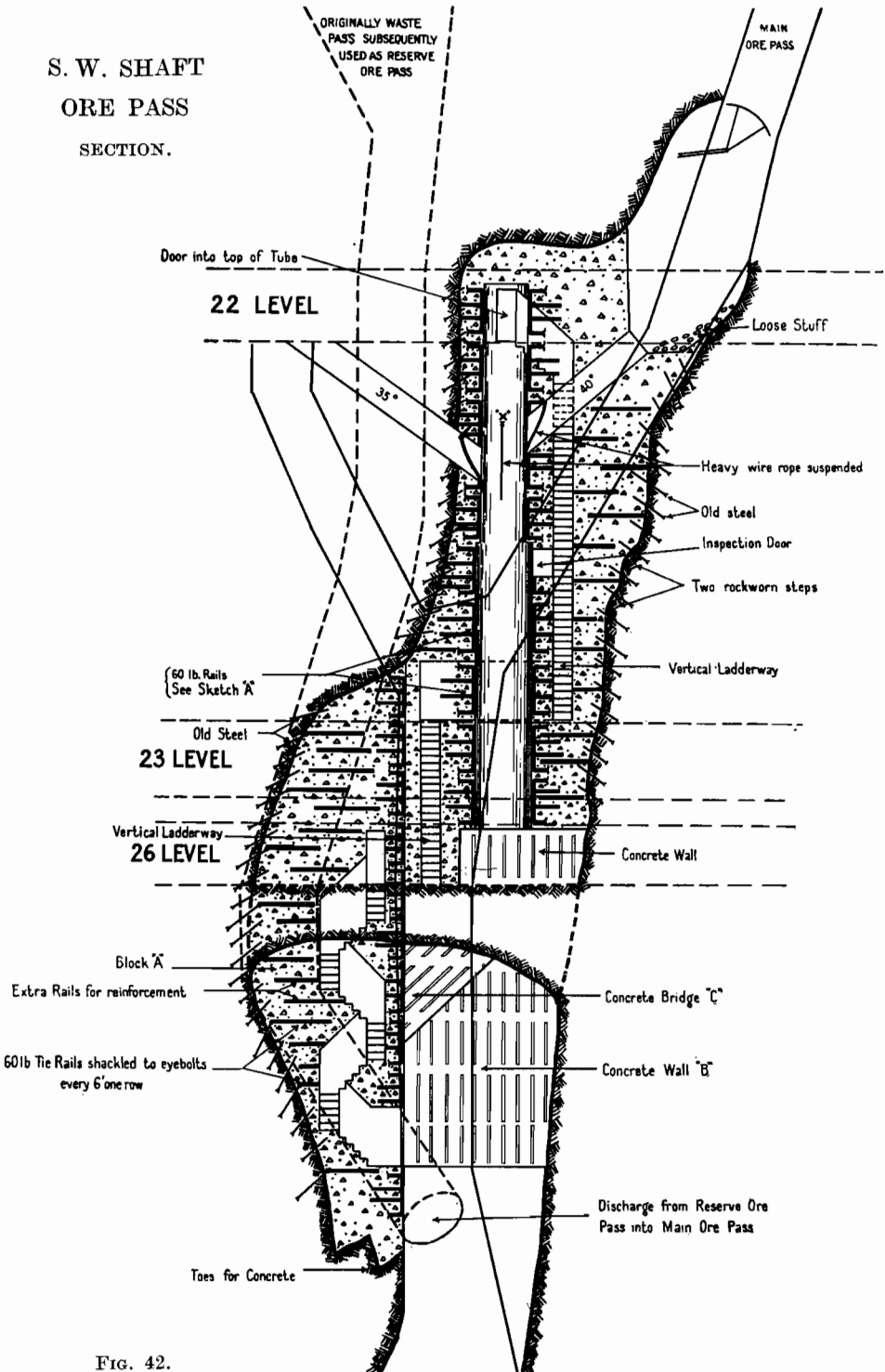


FIG. 42.

average of 8 ft. high and 15 ft. long. Not only does it act as a support to the main 60 ft. wall, but it also secures a large projection of rock which has resulted from continuous rock-wear in the neighbourhood and which might give trouble in future if not secured. After 18 months it is found that these expectations have been realized.

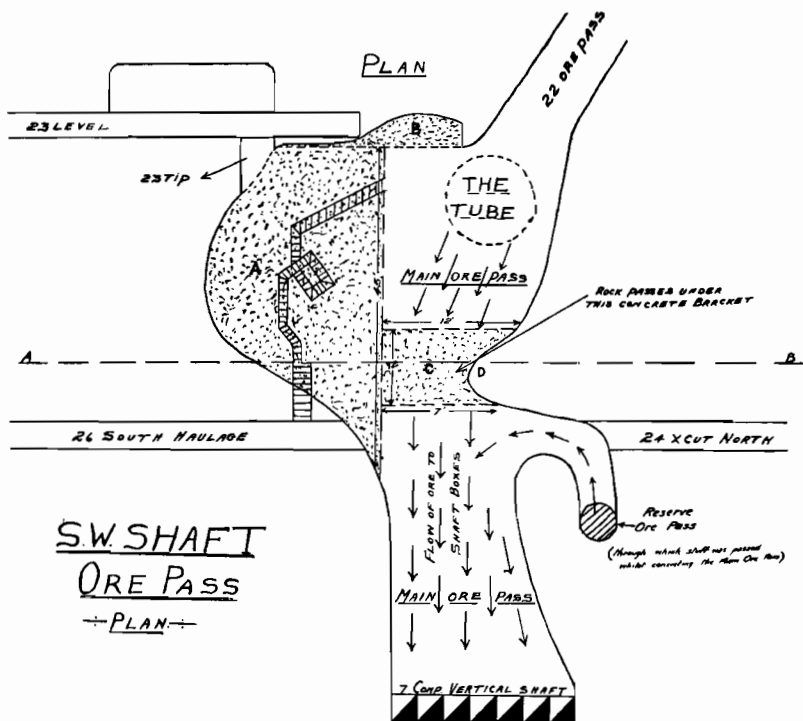


FIG. 43.

Owing to the excessive wear to which the bin is subjected it was a problem to know how to "face" the wall successfully. It was finally decided to use 60 lb. rails (see Fig. 44).

These rails were placed 6 in. apart, in rows, throughout the wall face. Each row stood on the row below. In addition, the wall face had 2,000 4 ft. rails end on to the face of the wall, the idea being to make the wearing face consist of as much steel as possible.

The walls were tied to the side rock by hundreds of short lengths of old 1½ in. steel drills, projecting from holes drilled for the purpose. At each 6 ft. rise rows of 60 lb. tie rails, 6 ft. long, 5 ft. apart, were fastened to the side wall in a horizontal position. The wall was also reinforced by heavy wire ropes and extra rails.

"Rapocrete" concrete was used: 4:2:1, and at the wider portions, well within the walls, numerous 6 in. plums were added. Over 1,000 tons of concrete were used in the construction of these walls, and the job was completed in two and a half weeks. The concrete was delivered down the ore pass by means of two lines of 14 in. ventilation tubes from two concrete mixers, and the material required was lowered by a small air winch.

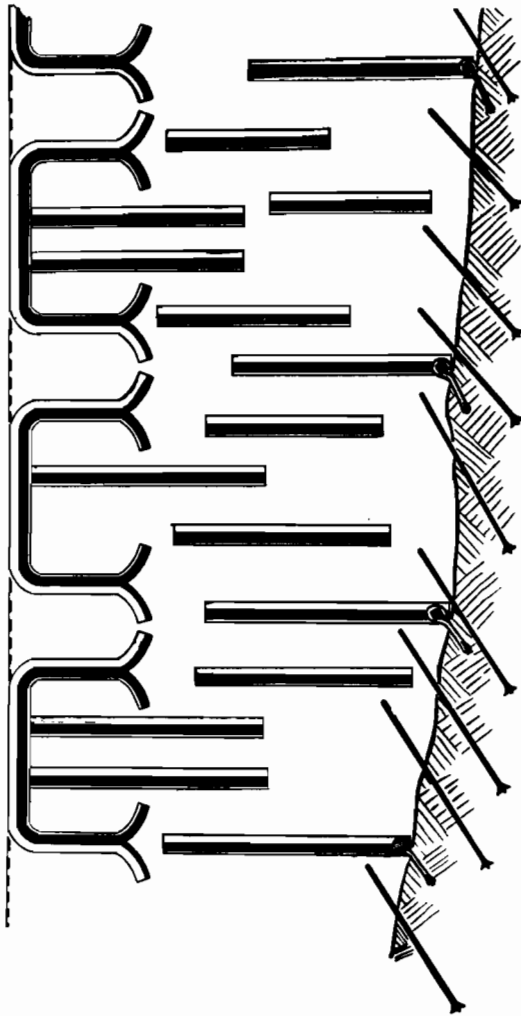


FIG. 44.

There is a narrow concrete staircase, 6 ft. high by 2 ft. wide, inside the concrete block, with an outlet at the foot of the block which gives easy access to the ore pass below, and down to the loading chutes in the vertical ore pass. This will enable any future work to be undertaken with ease.

On completion of the job it was found, after a fortnight's trial run, that there was an alarming wear at the top of the wall, so it was decided to carry a vertical concrete tube through the upper section of the ore pass in order to keep the falling ore away from the recently-built concrete walls. This tube was carried up to the next level, approximately 60 ft. above; the bottom half being of 6 ft. diameter and the top half of 5 ft. diameter. The tube was lined with 60 lb. rails similar to those used in the main concrete job (Fig. 44) excepting that, in this instance,

the rails were placed adjacent to each other, so the tube consists of reinforced concrete with a steel lining and a vertical ladderway within the concrete walls. This ladderway has two "inspection doors" entering into the tube, which permit of an efficient examination of its condition and wear.

It was found, when building the tube from the platform from which it was started (*i.e.*, at the top of the original concrete walls), that there were two rock-worn steps on the side of the ore pass, about 40 ft. up, which must have caused the majority of the ore pass wear by deflecting all large rocks continuously on to the same spot, thereby causing the extensive rock abrasion.

At the top of the tube there are two rail-lined concrete rectangular chutes running into the tube (one from a main haulage tip and the other from a controlled main ore pass from the top levels). Two thousand tons of ore are passed daily through the tube. Approximately 400 tons of concrete were used to construct this tube.

In order to prevent excessive wear in the tube there is a cross-rail about 15 in. back from the entrance to the tube (in the rectangular chute itself) from which nine doubled heavy wire ropes are suspended through the mouth of each chute and hang down the tube (see Fig. 45). These ropes are changed every two to three months.

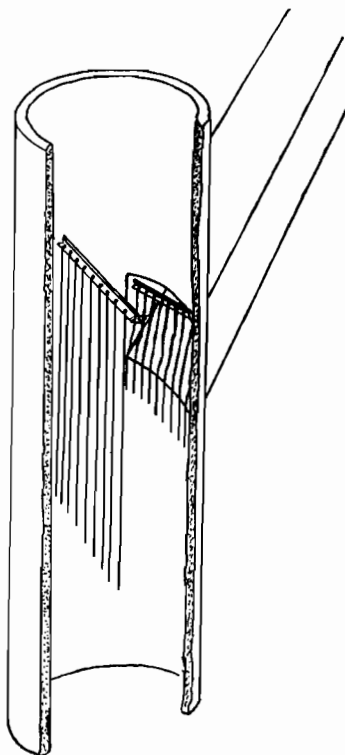


FIG. 45.

The ropes suspended from cross-rails at " X " (Fig. 42) in the tube are more or less a precautionary measure, as the rock only occasionally strikes this rope barrier, the ropes alone in the rectangular chutes being almost sufficient to prevent the tube being damaged, as the ore is merely pushed through the wire ropes into the tube by the pressure of the rock behind. Hanging rails were tried prior to the wire ropes to control the rock, but were not satisfactory.

The job was completed 18 months ago and as the visible wear is negligible, it is assumed that the undertaking has been successful.

23rd October, 1936.