COMPRESSED AIR STORAGE IN ROCK.

In a recent issue of the Engineering and Mining Journal Mr. Frank Richards, of the Ingersoll-Rand Company, 111 Broadway, New York, gives some interesting data regarding compressed air storage in rock. We herewith reproduce the article and illustrations.

One of the most familiar annoyances or inconveniences in the use of compressed air is insufficiency of storage capacity. In most of the employments of compressed air, especially in mining operations, the air is used intermittently and the rate of air consumption varies over a wide range. At the same time the usual air receiver is so small as to have little effect in maintaining constant pressure.

It has often been proposed and also many times attempted to use old and abandoned workings of mines for air-storage purposes, but in many cases complete failure has resulted on account of the impossibility of making the rock air-tight. It is, therefore, a pleasure to call attention to at least one instance where this scheme has worked successfully. The storage capacity in this case is a hundred times that of the largest commercial air receiver usually furnished.

Fig. 1 shows the essential features of a crosscut and drift on the 700-ft. level of the Centre Star mine of the Consolidated Mining & Smelting Company, of Canada, Limited, Rossland, B.C., which has been fitted up to serve as an underground receiver. In this case the rock was so close

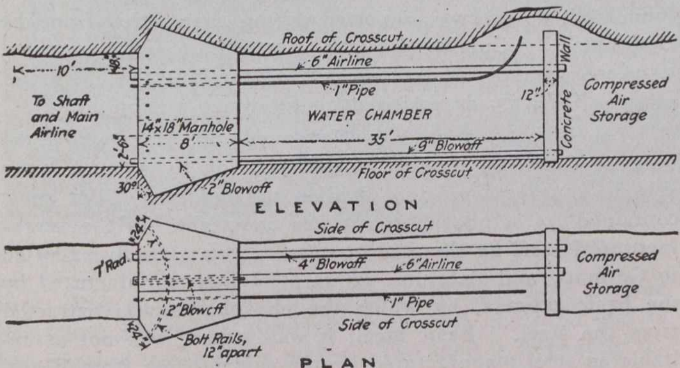

Fig. 1.

Compressed Air Storage in Abandoned Drift.

grained and free from fissures that the leakage was inappreciable. Fig. 2 is a plan of the workings appropriated for the receiver, the dam being placed as indicated. At this point the rock was notched out so as to give a bearing at least two feet wide all around to take the thrust caused by the air pressure, which aggregated about 450 tons. The dam was made of concrete eight feet thick, reinforced as seen in Fig. 1, by nine horizontal arched rows of 30-lb. rails. A manhole, 14 x 18 in., was run through the middle of the dam and secured by a cover on the inner face.

Inside the dam, with a space of 35 ft. between, was erected a concrete wall 12 in. thick to form a water chamber between it and the dam. It will be observed that this wall had to resist only the water pressure of four or five pounds at the most, the air pressure being effective equally on both sides, communication being free over the top of the wall.

The air communication between the main air line and the storage chamber was through the 6-in. pipe, this passing through the water chamber on the way. Any water which might accumulate in the bottom of the storage chamber could be drawn off through the 4-in. blow-off, while the 2-in. pipe would discharge the water from the water chamber when required. The function of the 1-in. pipe is not clear, but it could be used, like a try-cock on a steam boiler, to show whether or not the water was up to the turned-up head of the pipe.

How the water chamber was kept filled does not appear, but a pump must have been required for the purpose. It does not appear in fact how much the water scheme was used, Fig. 1 being from a blueprint made before the storage system was put into use. The air, so far as the storage function was concerned, was entirely independent of the water and we know that the storage is a permanent success. All necessary valves and gauges were, of course, provided outside to keep the engineers fully informed and in full control. For the information embodied in this article I am indebted to George A. Ohren, of the Canadian Ingersoll-Rand Company, Vancouver, British Columbia.

LAYING NEW INTAKE PIPE AT MONTREAL.

The new intake for the water supply of the city of Montreal consists of double lines of 72-in. lock-bar steel pipe, laid on the bottom of the river from shore to the intake piers built in the St. Lawrence River just above the head of the Lachine Rapids where the water has a very swift current and is 32 ft. deep at high water. The work was described in a recent issue of the Engineering Record. Trenches from 7 to 10 ft. deep were excavated in the very hard, compact sand by a 2½-yd. dipper dredge moored by spuds and anchored by two 1-in. steel cables and one 1¼-in. cable.

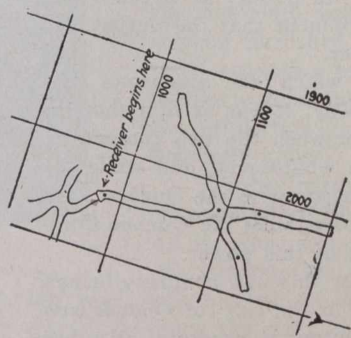

Fig. 2.

The pipe, 9/16 in. thick, was manufactured in 28-ft. lengths by the Stewart & Lloyd Company, Glasgow, Scotland, and at the site was riveted up on shore to 140-ft. lengths and butt-strap joints. The ends were closed with temporary wooden bulkheads and the pipes were rolled from the wharf, dropping about 5 ft. into the water and were towed to position. They were lifted clear of the water by two floating derricks, the bulkheads removed, and were then lowered into the trench, where they were connected by divers who united them with gasketed flange joints. The joints were made up with bolts inserted by the divers who fitted the nuts to them and set ratchet wrenches on them operated by lines from the boats above.

Each of the double lines of pipe were connected to a 22 x 62-ft. concrete intake pier 30 ft. high which was built after the pipes were laid. Open caissons, with 12 x 12-in. timber walls, were floated to position, filled to a depth of 4 ft. with concrete, and sunk in pits dredged to solid rock. The caissons were pumped out and the concrete piers built in them in the usual way in forms, 8 ft. in diameter, with holes left opposite the ends of the intake pipes.

Sections of 6-ft. steel pipe 12 ft. long were set in the pier openings, projecting into the interior walls, and the movable outer walls of the caissons were detached and floated away. Divers descended outside the intake piers and connected to the short pipes tackles which were operated by floating derricks to lift them and connect them up to the ends of the previously laid lock-bar pipes. The divers then sealed up the annular space around the pipes and both faces of the pier walls, after which the space around the pipe in the wall was grouted through holes left for that purpose in