silica is an argument against its being the skeleton produced by the solution of masses of pyrites from an anhydrous quartzite."

The top of the mount consisted chiefly of siliceous hæmatite, with a stalactitic structure, containing gold in a very fine state; but the bulk of the ore mined is a siliceous cellular sinter, which is sometimes so light that it will float in water. Auriferous pyritous ore is found at lower levels. Mining has been carried on in open cut to a depth of about 160 feet, and numerous floors are stoped out below ground. The ore was at first treated by milling and amalgamating, but as only about half the gold was saved owing to its extreme fineness, recourse was had to chlorination. The Newberry-Vantin system was in use for some time, but, as it is unsuited for the treatment of ore on a large scale, it has given place to a process in which the ore is leached in open tanks instead of closed barrels. After being dried, in revolving cylinders, crushed and roasted, the ore is deposited in the tanks, in which are gravel and sand filters, and the chlorine solution is run in. The effluent, containing chloride of gold, is passed through charcoal filters, when the metallic gold deposits on the charcoal. The charcoal is then burned off and the gold smelted in a small furnace (not in crucibles) and run off into bricks.

Krom rolls and ball mills are used for pulverizing the ore, and revolving cylinder and reverberatory furnaces for roasting pyritous ores. The first section of a series of shaft furnaces has just been brought into use. These furnaces are built of brick, and consist of tiers of arches inside the shaft, over which the ore passes continuously from top to bottom while being roasted. Means are provided to check or accelerate the rate at which the ore is passing through.

From 1886 up to 31st May, 1895, 1,331,015 ozs. of gold were taken out of the mine, which gave an average yield per ton of ore of 2 ozs. 13 dwt. 5 grs., and $18,500,000.00 were paid in dividends.

During 1896 the yield amounted to 153,097 ozs., giving an average of 1 oz. 8 dwt. 18 grs. per ton: while, during 1897, although 173,274 ozs. were obtained the average per ton only amounts to 1 oz. 6 dwt., 16 grs. So that while the amount of ore treated is increasing the yield of gold per ton is falling.

REPORT ON TRIALS AT BAGOG, QUEBEC, TO TEST THE ECONOMY EFFECTED BY PRE-HEATING COMPRESSED AIR.

By Prof. J. T. Nicolson, D. Sc. (Edinburgh and McGill), M. Inst., C. E.

THESE trials were made during the month of April, 1899, at the Dominion Cotton Mill, Magog, Canada, where there is installed a 150 horse power hydraulic air compressing plant on the system devised by C. H. Taylor, of Montreal.

They were made at the instance of Mr. John A. Inslee, of St. Louis, and conducted under the auspices of Mr. Inslee, the Taylor Hydraulic Air Compressing Company, and the Dominion Cotton Mill Company, jointly.

The trials were conducted by the undersigned, assisted by Professor R. J. Burley, B. Sc., Etc., of McGill University, but a number of prominent engineers from the United States were invited to be present and took part in the experiments. Amongst others, I may mention Mr. A. Langstaff Johnson, of Richmond, Va., Mr. Wm. O. Webber, of Boston, Mass., and Mr. John Birkinbine, of Philadelphia, Pa.

Experiments were made on five different methods of using compressed air in an ordinary steam engine of the Corliss type.

1st. The air was supplied to the engine cold.

2nd. Steam was injected into the air in the main pipe before supplying it to the engine.

3rd. The air was injected amongst the water in a steam boiler and heated by mixing with the water and steam of the boiler before being supplied to the engine.

4th. The air was blown upon the surface of the water in a steam boiler and heated, by mixing with steam in the same before being made to drive the engine

5th. The air was passed through a tubular heating vessel and heated by a coke fire afterwards being used to work the engine.

For all the experiments the air was drawn at a pressure of 53 pounds from the five-inch air pipe of the Taylor air compressor, which supplies power to the mill and was piped to a 12" diameter by 30" stroke Corliss engine supplied for the purpose of the trials by the Laurie Engine Company, of Montreal.

A friction brake was fitted on the fly-wheel of this engine, and the engine in this way was worked up to its full power at about 75 revolutions per minute.

Connection was made to a Lancashire boiler 7 feet diameter by 30 feet long, when it was desired to mix steam with the air for purposes of pre-heating.

When dry heating was resorted to the air pipe was led through a heater of the construction shown in the annexed drawing, on its way to the engine, having been previously blanked off from the steam boiler. This heater was designed by the writer and built by Messrs. The Laurie Engine Company, for these experiments; but, as it was designed of such size as to heat the whole of the compressed air used in the mill, it was considerably larger than was required to heat the greatest quantity of air which could be used by the Corliss engine employed on the test. It was, therefore, a matter of some difficulty to prevent the heater and the small quantity of air passed through the same from becoming hotter than was desired.

1. For the experiments made without pre-heating the observations made were as follows:

The temperature of the air before entering the engine.

The same on leaving the engine.

The pressure of the entering air, indicator cards from each end of the cylinder, readings of the revolution counter and of the rope brake weights.

A trial was conducted with cold air on April 27th in the presence of Mr. Birkinbine, which gave the following results :

The air entered at 66.5 F. and was exhausted at -41 F., the revolutions being 74.6, and the cut-off about one-third of the stroke. The indicated horse power was 27 and the weight of air used per hour was 1,671 lbs. This gives about 841 cubic feet of free air at 60 F. per 1 H.P. hour.

On another trial made under same conditions 850 cubic feet of free air were used per 1 H.P. hour.

2. In the case of experiments made with the dry heating, the following observations were made:

The temperature of the air before entering the heater; after passing up the first row of tubes; upon leaving the heater; before entering the engine.