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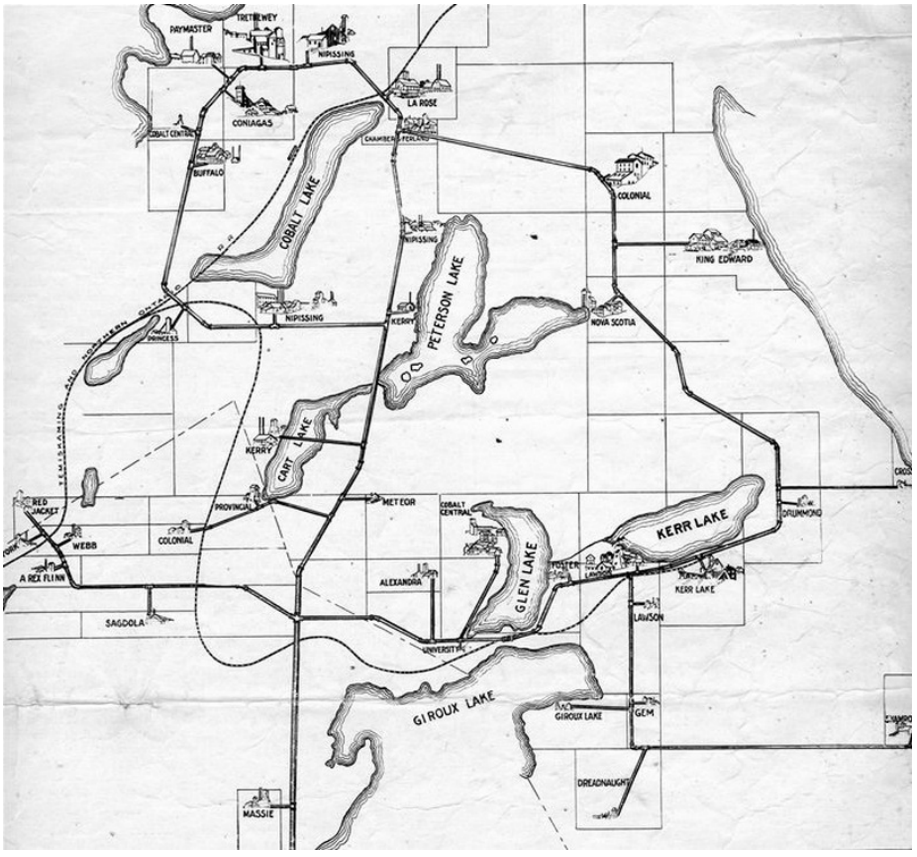
Ragged Chutes: A Modern Wonder Over 100 Years Old!!

At Ragged Chute, 16 km southeast of Cobalt on the Montreal River, was the world's only water-powered compressed air plant.



Built in 1910, at the peak of the Cobalt silver boom, the Ragged Chute Compressed Air Plant transmitted air-power to the local mining industry. Compressed air, rather than electricity, was the main power source used by heavy mining equipment such as drilling machines, grinders and hoists. Today, though, mines purchase electricity to run their own air compressors.

The late Charles H. Taylor invented the hydraulic air compressor while living in Montreal. One spring he observed the movement of the Ottawa River and, as water flowed over a dam and under the ice, noticed that peculiar domes rose from the surface of the ice. When they were pierced, compressed air escaped.

To Taylor's creative mind, the explanation was simple - when a mixture of air and water is compressed, the

air separates and rises. The air compresses, and not the water, because the molecules in a liquid are already very close together and, therefore, are almost impossible to compress.

Using this principle, Taylor determined that an efficient method to harness hydraulic air-compression would be to drop the air-water mixture through a shaft to an underground chamber. He designed the chamber in such a way as to allow the water to flow through, and at the same time cause the air to compress.

In the course of his experiments, Taylor discovered that the air pressure and horsepower created could be increased or decreased by altering the length and diameter of the intake shaft, and by changing the volume of water entering the works.

Since it was built in 1910, Ragged Chute practically ran itself. While under construction, in the early years of this century, a community of workers did live on the site.

In 1945, Ontario Hydro purchased the Ragged Chutes plant to supply local mines with the compressed air created there.

Only twice in its 70-year history was the plant closed for major repairs although, at one time, a dozen mines purchased thousands of cubic metres of compressed air each month.

Today, the plants and some of the pipes that carried the air-power to the mines have been removed. As a result, the famous geyser-like blow-off from the plant no longer exists. Nearly 90% of the pipes remain and can be seen along the roadway going to Hound chutes. At one time, this was nearly 40 kilometres of pipe.

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How it worked

Ragged Chute was specifically designed to produce air compressed to 862.5 kPa (gauge). Its intake shaft is 107 m deep and the tunnel-chamber had a blow-off valve to prevent increased pressure.

There were control gates to limit the amount of water entering the plant works. As well, the two intake heads, each made up of 72, 36 cm pipes, could be raised or lowered to maintain a constant depth over the bulkhead, usually about 46 cm of water.

From the heads, the water was fed into one pipe which widened just before the bottom. This was designed to decrease the pressure in the pipe and allow the air bubbles to collect and merge. At the base of the shaft were two steel-sheathed concrete cones which broke the initial impact of the air-water mixture, and directed the flow into the horizontal chamber.

The chamber collected the compressed air and channeled it to a receiver pipe, 61 cm in diameter. The receiver then carried the compressed air to a valve house where it was transmitted to Cobalt and area mines for distribution.

The 51 cm diameter steel transmission pipe had telescopic expansion joints every 0.8 km to allow for the effects of temperature change. The pipe was above ground and could expand about a metre each 1.6 km on a hot, sunny day.

Compressed air must be dry because through friction, humidity decreases the efficiency of both the pipeline and the motors using the air.

Water vapour also causes exhaust freezing in motors; the escaping air expands rapidly, which requires a great deal of heat energy. And, finally, the moisture washes away the lubricants within the motors.

The air transmitted from Ragged Chute was much drier than it was before compression because the water temperature was so cold it condensed the moisture in the air bubbles while still in the intake shaft. The condensation then remained with the water when the air-water mixture separated. The low humidity of Ragged Chutes air was one of the most remarkable features of the plant.

The blow-off valve was a 30 cm pipe beside the receiver leading to a point underwater on the river bed. It reached into the tunnel-chamber to the critical depth where it rested in water as long as the air was compressed to 862.5 kPa (gauge). But when the pressure increased, the water level within the chamber lowered slightly, allowing the excess pressure to escape. When it did blow, a stream of water often shot over 30 m into the air.

This spectacular, geyser-like blow-off was most commonly associated with the Ragged Chute Compressed Air Plant.