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UTILIZING WASTE HEAT FROM STEAM ENGINES AND BOILERS.

Mr. J. H. Ellis, of Springfield, Vt., has recently made some interesting experiments in utilizing the heat that escapes in the exhaust steam from engines, and in the smoke from steam boiler furnaces. The apparatus used, and the results produced, are illustrated by the annexed engravings, of which Fig. 1 is a perspective view, and Fig. 2 a vertical section of the arch boilers and chimney flues. He used for the purpose the horizontal tubular steam boiler, A, Fig. 2, twelve inches in diameter and three feet long, with thirteen copper flues, B, one inch in diameter; the fire box, C, being under the boiler, and the smoke returning through the flues. He connected

to the inch. At this time the second or bisulphide engine was started, geared to a derrick, and commenced raising a weight of 500 pounds in the same manner that the steam engine was doing. The two engines were kept running simultaneously two hours, and during this time the steam engine made 38,000 revolutions, and raised 500 pounds 456 feet, while the bisulphide engine made 44,000 revolutions, and raised 500 pounds 528 feet. The pressure in the steam boiler ranged from 30 to 70 pounds to the inch, averaging about 45 pounds, and the pressure in the bisulphide boiler ranged from 30 to 60 pounds, averaging about the same as that of the steam boiler. The temperature of the smoke on leaving the flues of the steam boiler did not exceed 360 degrees during the trial.

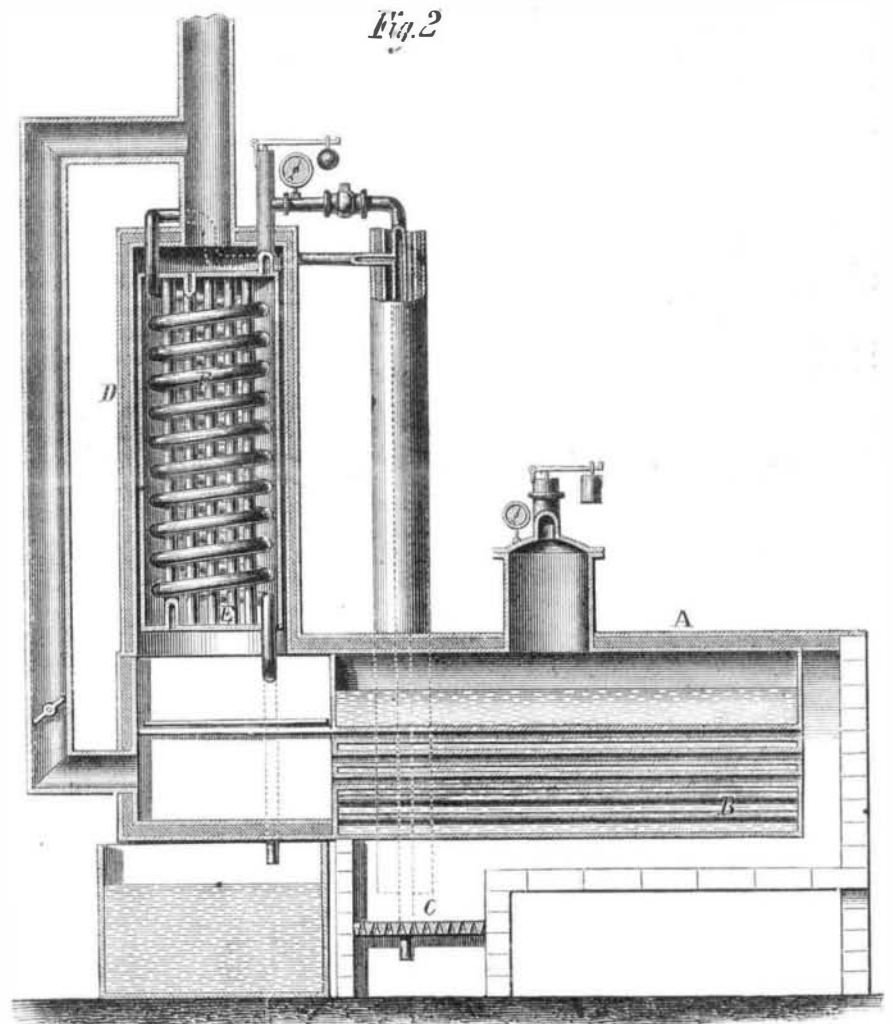
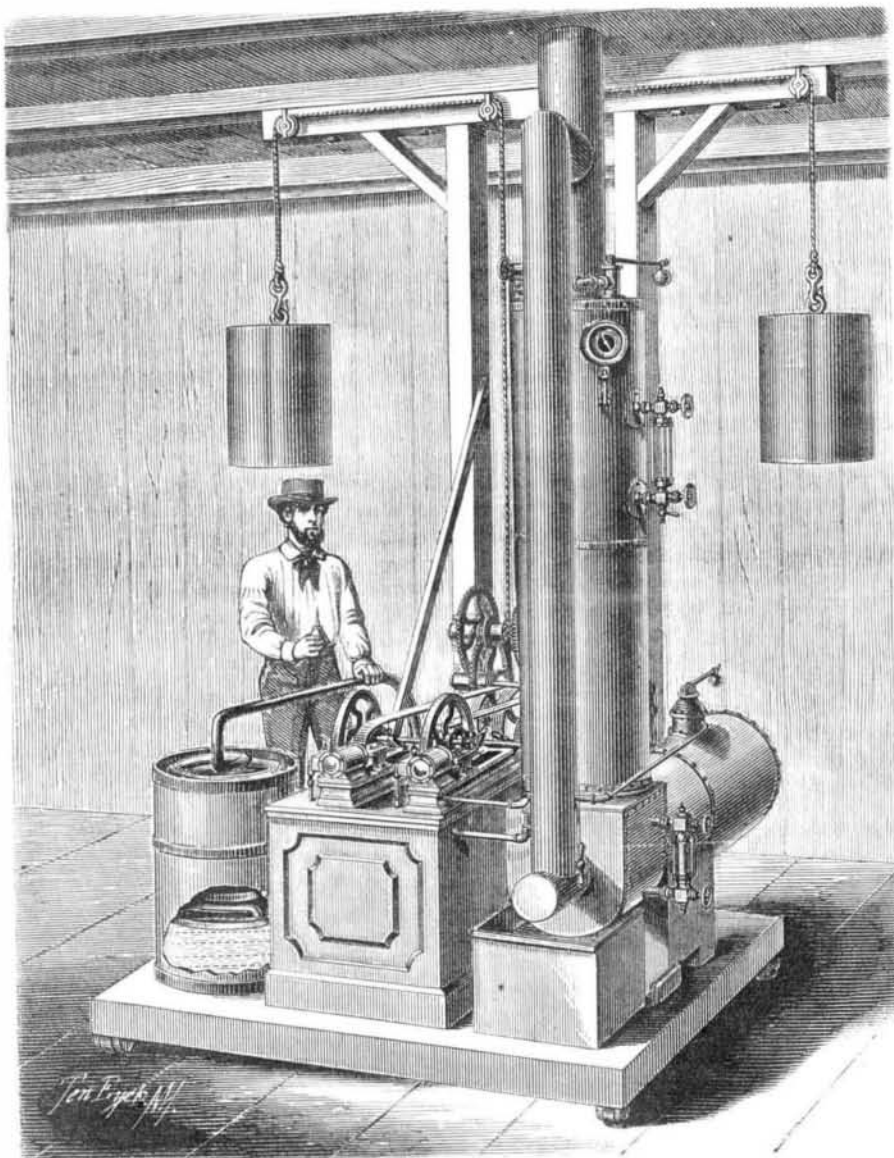
But as the bisulphide engine labored under precisely the same disadvantages that the steam engine did, the power gained by the use of the former was not affected thereby.

These engines can be seen running, or further particulars in regard to them obtained by applying to Joel A. H. Ellis, Springfield, Vt.

This invention has been secured through the Scientific American Patent Agency by four distinct letters patent. It has also been patented in foreign countries through the same medium.

Lumber Trade.

Some idea of the magnitude and importance of the lumber trade in the upper Mississippi and its tributaries may be



ELLIS' METHOD OF UTILIZING WASTE HEAT FROM STEAM ENGINES AND BOILERS.

with this boiler an engine, with cylinder $1\frac{1}{4}'' \times 2\frac{1}{2}''$, running 350 revolutions a minute. This engine was geared to a derrick, so that it raised a weight of five hundred pounds five feet in one minute.

For the purpose of using the escaping heat from this engine and boiler, he placed another upright tubular boiler, D, in the flue of the chimney, the base of the flue being enlarged sufficiently for the purpose. This boiler was four feet long and nine inches in diameter, and had seven copper flues, E, $1''$ in diameter. A spiral coil of copper pipe, F, was placed inside this boiler, of sufficient length to extend from one end to the other; one end of the coil passing out at the top, and the other end at the bottom of the boiler. The diameter of this coil was $8''$, and the diameter of the pipe of which it was made was $\frac{7}{8}''$. The upper end of this coil was connected with the exhaust pipe of the engine, so that the exhaust steam was compelled to pass through the coil to escape into the atmosphere.

The boiler, D, was filled with the bisulphide of carbon (which boils at about 110° Fah.) and it was connected with another engine, of the same size and style as the one used with the steam boiler, and geared to a derrick in the same manner.

Having raised the pressure in the steam boiler to 45 pounds, the steam engine was started, raising with the derrick a weight of 500 pounds, the exhaust steam passing through the coil of pipe in the bisulphide boiler in the manner described.

In five minutes after the steam engine commenced running, the pressure in the bisulphide boiler went from 0 to 30 pounds

The exhaust steam was perfectly condensed in the coil, and all its latent heat imparted to the fluid that surrounded it; and the temperature of the water discharged from the coil did not exceed 108 degrees, being reduced to that point by the cold bi-sulphide constantly pumped in at the bottom of the boiler around the lower end of the coil. The heat of the exhaust steam being applied at the top of the boiler, a pressure of 60 pounds to the inch was obtained, before the temperature at the bottom of the boiler was raised a single degree. The vapor of the bisulphide of carbon was condensed in a short coil of copper pipe, immersed in a tank of water, and pumped back into the boiler continuously during the trial, with no perceptible loss of the material.

The amount of fuel consumed in getting up steam from cold water and running the engine during the trial, was 5 pounds of wood and shavings, 6 pounds of charcoal, and 12 pounds of anthracite coal; and 60 pounds of water were condensed from the exhaust of the steam engine, in the coil of the bisulphide boiler.

It will be seen by the above statement of facts, made from data furnished us by Mr. Ellis, that the increase of power obtained from a given amount of fuel by the use of the bisulphide boiler was 115 per cent.

Mr. Ellis states that owing to the fact that the engines used had no cut-off valves, and had ports too much contracted to exhaust freely, and also because the amount of friction in the derrick gearing, which was new, was very great, the amount of power developed and useful work performed, was not as much as it would have been with more perfect engines.

formed from the following figures: The logs cut last winter measured in round numbers 100,000,000 feet, or 20 per cent less than the yield of the previous year. The stock on hand at the commencement of the season was 30,000,000 feet, about the usual quantity. The St. Anthony manufacture accounted for 110,000,000 feet, 15,000,000 were sent to market by river, and the balance not stacked was sold in Minnesota and Iowa. On the St. Croix and its tributaries, 73,700,000 feet were cut, and this large figure is 40 per cent below the production of 1868-69. With stock on hand 75,000,000 feet old logs, the total at the commencement of the manufacturing season was nearly 150,000,000 feet. Of this amount 40,000,000 was unattainable in the pineries; 75,000,000 was manufactured on the St. Croix, and at Hastings, Redwing, and Lake City, and the balance, 33,000,000, left for exportation. At Black River the logs scaled exceed those of the Upper Mississippi and its tributaries by more than 30,000,000 feet. The Black river is thus at the head of all the districts on the Mississippi river.

HAILSTONES.—A writer in *Nature* says: "Hailstones are frozen raindrops, and a raindrop falling through a vacuum would of necessity be spherical; but in falling through the air it must tend to assume the form of least resistance, whatever that may be. I was told many years ago of hailstones which had been picked up and found to be of the form of Minié bullets. I do not vouch for the truth of this, but I think it likely; the Minié bullet was, I believe, the nearest approach to the form of least resistance that the inventor was able to arrive at."