S. A. GOODWIN.

Condenser for Steam-Engines.

No. 210,519. Patented Dec. 3, 1878.

Fig. 2.

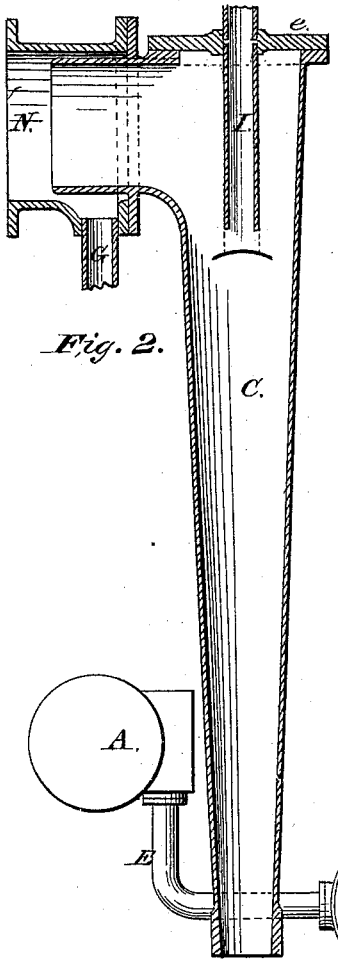
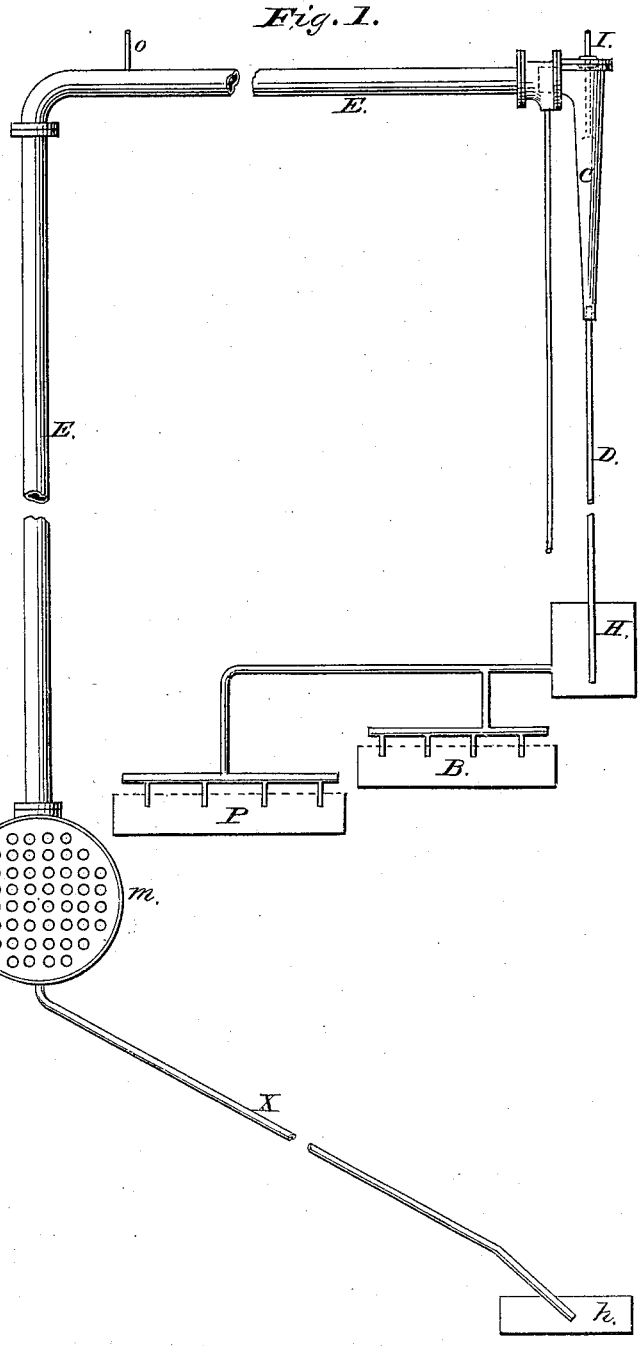


Fig. 1.



Witnesses:

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UNITED STATES PATENT OFFICE.

SIMEON A. GOODWIN, OF DAYTON, OHIO.

IMPROVEMENT IN CONDENSERS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **210,519**, dated December 3, 1878; application filed January 11, 1878.

To all whom it may concern:

Be it known that I, SIMEON A. GOODWIN, of Dayton, Montgomery county, Ohio, have invented a new and useful Improvement in Condensers for Steam-Engines, of which the following is a specification:

This invention relates to the class known as "water-fall" or "siphon" condensers.

Its objects are, first, to obtain a better vacuum by providing a more efficient means of clearing out the air that enters the condensing-chamber with the water; second, to adapt this class of condensers to convenient and economical use in quartz-mills for the reduction of silver ores; third, to heat the feed-water separate and apart from that used for condensation, and at a point in the exhaust-pipe so situated that it cannot run back to the cylinder of the engine to break it; fourth, to drain a tubular feed-heater located in the exhaust-pipe.

How these objects are accomplished, or in what the invention consists, will be more readily apprehended by the aid of the drawings.

Figure 1 is an elevation. Fig. 2 is an enlarged vertical section of the condensing chamber or pipe.

Similar letters indicate like parts in both figures.

A is the engine; E E E, the exhaust-pipe; C, the condenser; I, injection-pipe; D, drain-pipe; H, hot-well; B, location of quartz-mill stamps; P, location of quartz-mill amalgamating-pans, both connected by suitable pipes with the hot-well tank H; *o*, inlet for feed-water to exhaust-pipe; G, outlet for same to conduct the feed-water to the pump; *m*, tubular heater; X, drain-pipe to same, having the small tank *h* at its outer end to keep it covered with water, to keep out air.

The condenser C is a long, narrow, conical tube, its lower end connecting with the drain-pipe D. The injection-pipe I has a plate attached to its lower end to spread the water. N is a short section of pipe, of larger diameter, bolted to the elbow of C by flanges, and provided with a screwed orifice for the pipe G.

The feed-water passes through the tubes of the heater *m*, and the exhaust-steam around them.

The lower end of the injection-pipe should not be less than five feet above the height at which the water will stand in the drain-pipe D, by reason of the unbalanced atmospheric pressure with the usual vacuum. If the source of the injection-water is not high enough to insure that, the water will easily rise into the condenser. After the vacuum is started a pump may be used.

It is usual to locate the hot-well at or near the water-level; but in this case it is located sufficiently high for the water to flow from the stamps and pans, and the exhaust-pipe is extended vertically to suit this condition.

Operation: The spent steam of the engine passes by the exhaust-pipe to the condenser C, where it is condensed by the injection-water coming in through I, and it all falls into the foot of C and down D into the tank H. All water contains more or less atmospheric air, and when this comes into a partial vacuum it expands, and if not immediately discharged from the condenser it would destroy the vacuum. The steam coming with great velocity into the conical tube tends to drive the uncondensable gases into its smaller or lower end, and at the same time the water, as it falls, is, by the converging walls of the pipe, driven into a smaller compass, and the air is thus caught and forced down by the water, which is much heavier, into the mouth of the pipe D, and finally is discharged into the tank H. From the hot-well tank H the water passes by gravity to the stamps and pans, heated to the temperature of 100° to 130° Fahrenheit. This temperature is not detrimental to its use in the stamps, and it results in considerable economy in the pans, as they are generally heated to 150° to 200°. This plan thus enables us to use the same water for condensation, and afterward in the stamps and pans, and economizes all the heat in the water used in the pans, and that, too, without any additional machinery.

The feed-water enters the exhaust-pipe at *o*, and is heated to the temperature of the exhaust-steam, which is several degrees hotter than the hot-well. The high velocity of the steam tends to throw the water against and to carry it along the walls of the exhaust-pipe, and it will be caught around the elbow of the condenser and flow down the pipe C to the

pump. If the pump should stop, or should more feed-water be let into the exhaust-pipe than is required for the boilers, it will flow into the condenser, and not back to the cylinder of the engine. Another advantage of having the feed-heater located so high is, that it can be more readily pumped with so great a head, whereas it is quite impossible with an ordinary pump to draw water from a vacuum. It sometimes happens that impure water only is available for condensing, in which case, by this arrangement, the feed-water is heated separate and apart.

Pipe G is connected with the suction side of the feed-pump, which pump may deliver the water direct to the boiler or through the heater *m*, in which last case the pipe X is used to drain the heater of the water of condensation. This is only feasible, however, in hilly countries, or in mines where the descent is so great that a column of water in the pipe will overbalance the atmosphere. This condition is quite common in the mining districts of the western coast of the United States, where I have employed it with perfect success. I find that the tubular heater increases the temperature of the water considerably.

Sometimes it is necessary to work the engine non-condensing, and for this purpose I have provided the cover *e* to the top of the condensing-chamber C, that by its removal the steam may pass out that way without obstruction.

The various parts herein described as all working together in one combination may, it is evident, be each used separately. The heater drain-pipe X may run either in a vertical or gradually-descending direction, as circumstances require.

I claim as my invention—

1. The long, narrow, conical, condensing-chamber C, with its injection-pipe I, removable cover *e*, and pocket N, for catching the feed-water, substantially as described.

2. The combination of the condenser C, as described, with the hot-well H, stamps B, and pans P, arranged substantially as specified.

3. The combination of the condenser C and the tubular heater *m* with the drain-pipe X, arranged as shown, and for the purpose specified.

4. The combination of the pipe C with the pocket N, to conduct the feed-water to the feed-pump, substantially as and for the purpose specified.

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Witnesses:
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