

(No Model.)

2 Sheets—Sheet 1.

E. J. MALLETT, Jr.

APPARATUS FOR CONDENSING EXHAUST STEAM AND HEATING AIR
AND WATER.

No. 262,073.

Patented Aug. 1, 1882.

Fig. 1.

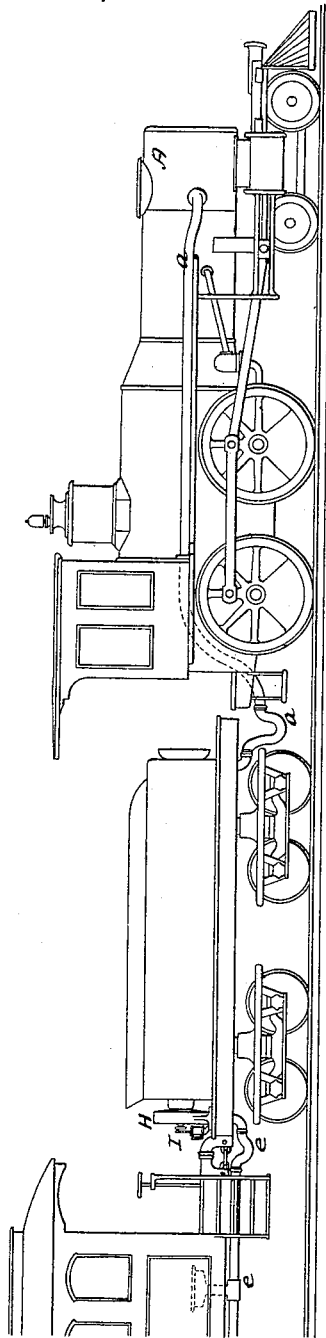


Fig. 5.

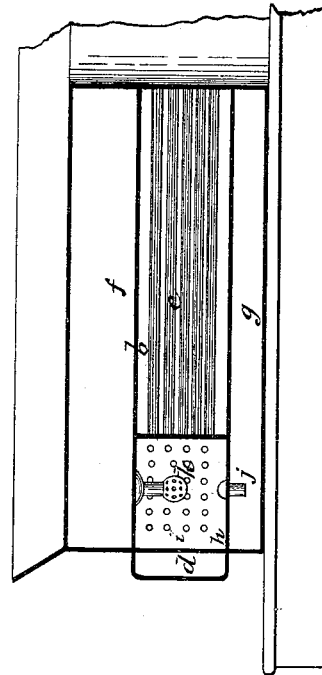
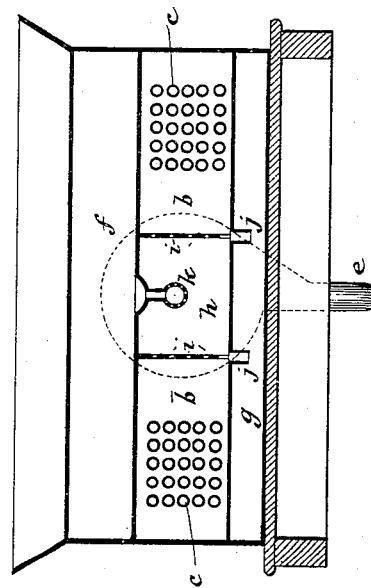


Fig. 4.



WITNESSES

Wm A. Sinks
Geo W. Brock

INVENTOR

Edward J. Mallett, Jr.
By his Attorney
Marshall D. Miles

(No Model.)

2 Sheets—Sheet 2.

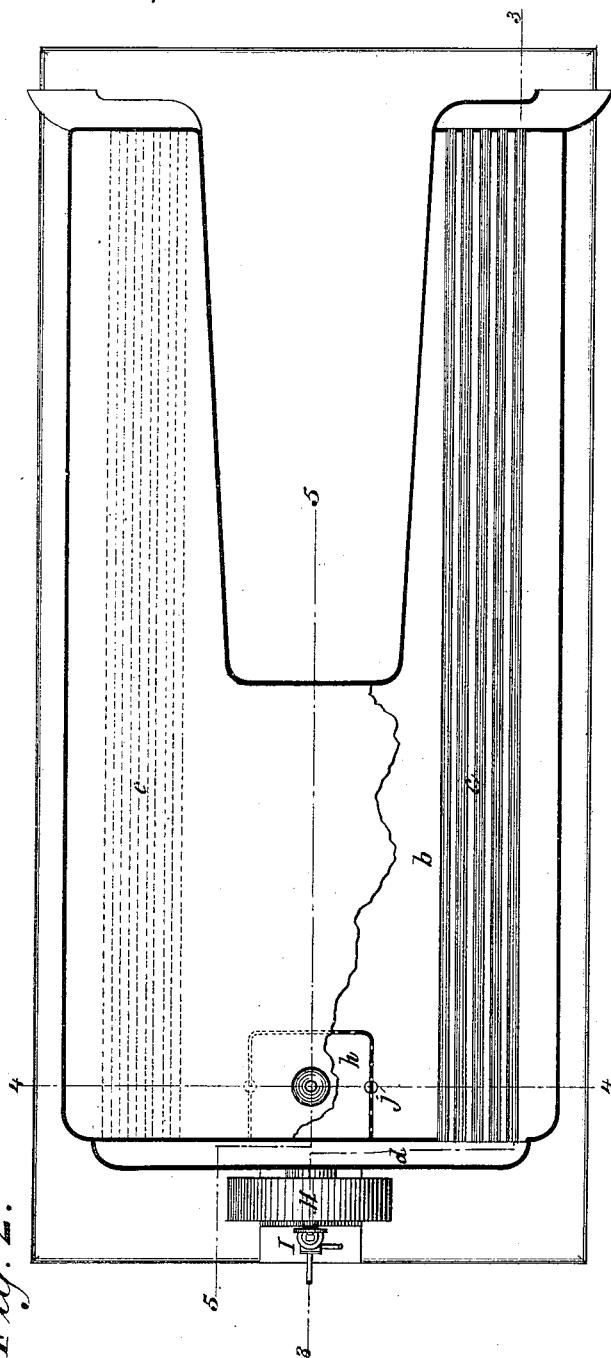
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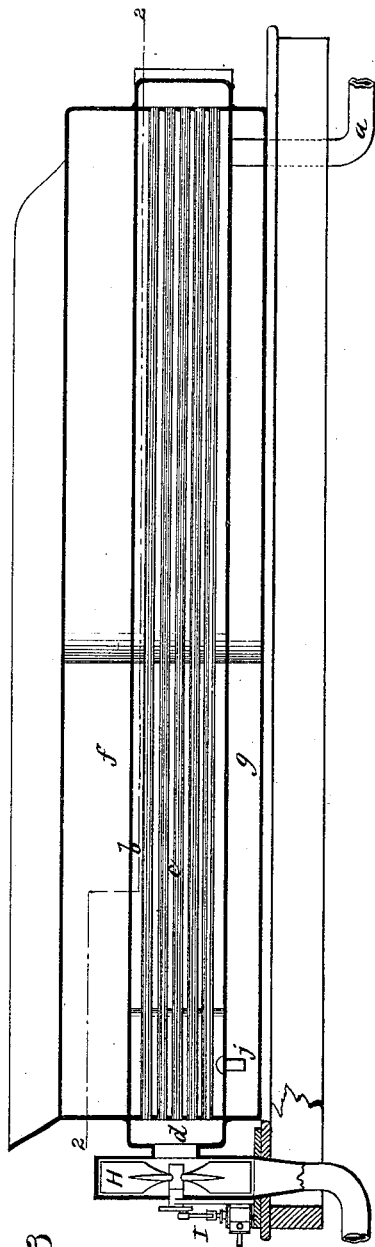
Fig. 2.



WITNESSES

Wm A. Skinkle
Geo H. Buck

Fig. 3.



INVENTOR

Edward J. Mallett, Jr.

By his Attorney

Manuel D. Bailey

UNITED STATES PATENT OFFICE.

EDWARD J. MALLETT, JR., OF NEW YORK, N. Y.

APPARATUS FOR CONDENSING EXHAUST-STEAM AND HEATING AIR AND WATER.

SPECIFICATION forming part of Letters Patent No. 262,073, dated August 1, 1892.

Application filed May 17, 1882. (No model.)

To all whom it may concern:

Be it known that I, EDWARD J. MALLETT, Jr., of the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Condensing Exhaust-Steam and Heating Water and Air, of which the following is a specification.

These improvements, while adapted to be used with some other kinds of boiler-furnaces and engines, have been designed by me with particular reference to their use with locomotives, and it is in this connection that I shall describe them. They are the outgrowth of the system of promoting combustion of fuel in boiler and other furnaces for which Letters Patent of the United States were issued to me on the 23d day of May, 1882. In an application for Letters Patent of even date herewith, I have shown and described a method of applying this system to locomotives in such manner as to enable me to dispense entirely with the use of exhaust-steam for producing draft, thus permitting the exhaust-steam to be utilized for other purposes.

In this specification I shall describe the way in which I utilize the exhaust-steam for heating purposes, and at the same time recondense it, so that it may return to the boiler as feed-water. I can best do this by reference to the accompanying drawings, in which I have represented my improvements as applied to a locomotive and its tender.

Figure 1 is a side elevation of the locomotive, its tender, and part of a railway-carriage coupled together. Fig. 2 is a sectional plan of the tender. Fig. 3 is a section on line 3 3, Fig. 2. Fig. 4 is a section on line 4 4, Fig. 2. Fig. 5 is a section on line 5 5, Fig. 2.

The locomotive represented in Fig. 1 is supposed to be one to which my system of promoting the combustion of fuel is applied. The casing or bonnet A, at the front of the boiler, contains the suction-fan for inducing draft in the furnace. Exhaust-steam from the engine-cylinder passes through a pipe, *a*, to the feed-water tank, which in this instance is in the locomotive-tender. The pipe *a* discharges into a chamber, *b*, in which are a number of tubes, *c*, extending from front to rear of the tender and open at each end. The rear ends of the tubes are covered by a hood, *d*, communicating with a suction-fan, H, on the rear of the

tender, driven by a small engine, I, or by any other suitable means, and acting to draw air through the tubes. The exhaust-steam heats the tubes *c* to a temperature proportionate to the steam-pressure, and the rush of air through the tubes has the effect of condensing in part the steam. The air of course becomes heated, usually to a high degree, and may, if desired, be conducted to the several railway-carriages composing the train through a pipe, *e*, leading from the fan H along beneath the floors of the carriages, the pipe-sections having flexible couplings at the points where the carriages join one another, and said pipe *e* discharges the air into the carriages through registers in the floors or walls of the same. I here remark that this system of heating and ventilating is also available in steam-ships, where the exhaust-steam of the engine is usually condensed by a salt-water condenser. In such a case I would substitute in part for the latter condenser a pneumatic condenser similar in principle to the one just described.

The condensing-chamber *b* is intermediate between a water-compartment, *f*, above and a water-compartment, *g*, below. The upper one, *f*, contains cold water. The lower one, *g*, contains water which has been heated by exhaust-steam, together with the water of condensation.

A convenient arrangement for bringing the exhaust-steam into contact with the feed-water is represented in the drawings, particularly in Figs. 4 and 5. At the rear of chamber *b* is a box, *h*, whose sides have perforations *i* for admission of the exhaust-steam. In the floor of chamber *b* are openings *j*, placed so as to open into both the box and the chamber, and leading into the chamber *g* below. From the upper chamber, *f*, leads a pipe terminating in a rose, *k*, from which water is sprayed or showered in determinate quantity into the box. The pipe can have a valve or cock for controlling the water-flow.

The operation is as follows: The uncondensed portion of exhaust-steam enters the box through the holes *i*, and is condensed by contact with the water-spray. The heated water resulting from this operation, together with the steam condensed in chamber *b* by contact with the pneumatic condensing-tubes *c*, passes down through pipes *j* into the lower chamber, *g*, and from this chamber the water is pumped

back to the locomotive-boiler in the usual way. I thus utilize the exhaust-steam for both the feed-water and air. I recondense it and return it as feed-water to the boiler; and I obtain a continuous current of pure heated air, which can be readily availed of for heating and ventilating purposes.

I have described what I believe to be the best way, on the whole, of carrying my improvements into effect. I do not, however, restrict myself to the special construction and arrangement of parts hereinbefore described, for these may be varied to a considerable extent without departure from my invention.

What I claim, and desire to secure by Letters Patent, is—

1. A pneumatic hydraulic steam-condensing appliance consisting of air-tubes around which steam circulates and in part condenses, and water-jets which further condense the steam by direct contact of the water therewith.

2. The combination, with the chamber or receptacle into which the exhaust-steam of a steam-engine is discharged, of air-tubes or pneumatic steam-condensing appliances, and a water-sprayer which discharges water into said receptacle or chamber, substantially as and for the purposes hereinbefore set forth.

3. The combination of a feed-water receptacle, an exhaust-steam chamber into which the exhaust-steam of the engine is discharged, air-tubes passing through said chamber, means for maintaining draft through said tubes, a

water-spraying appliance by which water is brought into direct contact with that portion of the exhaust-steam not condensed by the air-tubes, and pipes or ducts leading from said chamber to the feed-water receptacle, substantially as hereinbefore set forth.

4. The combination, with the feed-water tank of a locomotive-tender, of an exhaust-steam receptacle or chamber, means for spraying or discharging water from the tank into the chamber, and air-tubes passing through said chamber, substantially as hereinbefore set forth.

5. The combination of the upper or cold-water chamber, the lower or hot-water chamber, the intermediate exhaust-steam receptacle, pneumatic condensing-tubes passing through said receptacle, and a water-sprayer which delivers water from the upper chamber to the exhaust-steam receptacle, substantially as hereinbefore set forth.

6. The combination, with the water-tank, of the exhaust-steam-receiving chamber, air-tubes passing therethrough, the suction-fan, and means for condensing that portion of the exhaust-steam not condensed by the air-tubes, substantially as hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 16th day of May, 1882.

EDWARD J. MALLETT, JR.

Witnesses:

P. O'CONNOR,
JAS. H. COX.