(No Model.)

H. S. SARONI.

COMBINED STEAM CONDENSER AND TENDER.

No. 267,463. Patented Nov. 14, 1882.

Fig. 1.

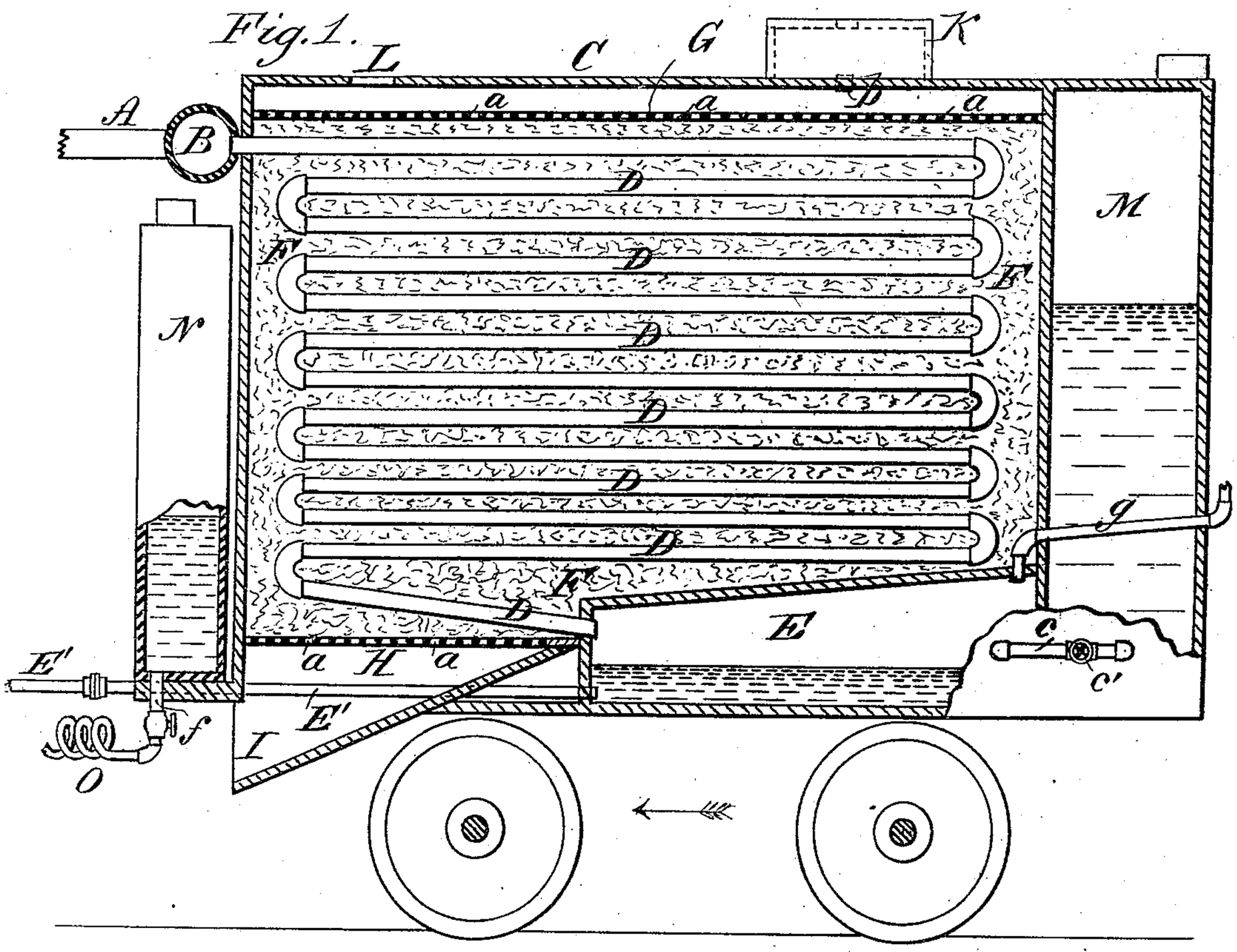


Fig. 2.

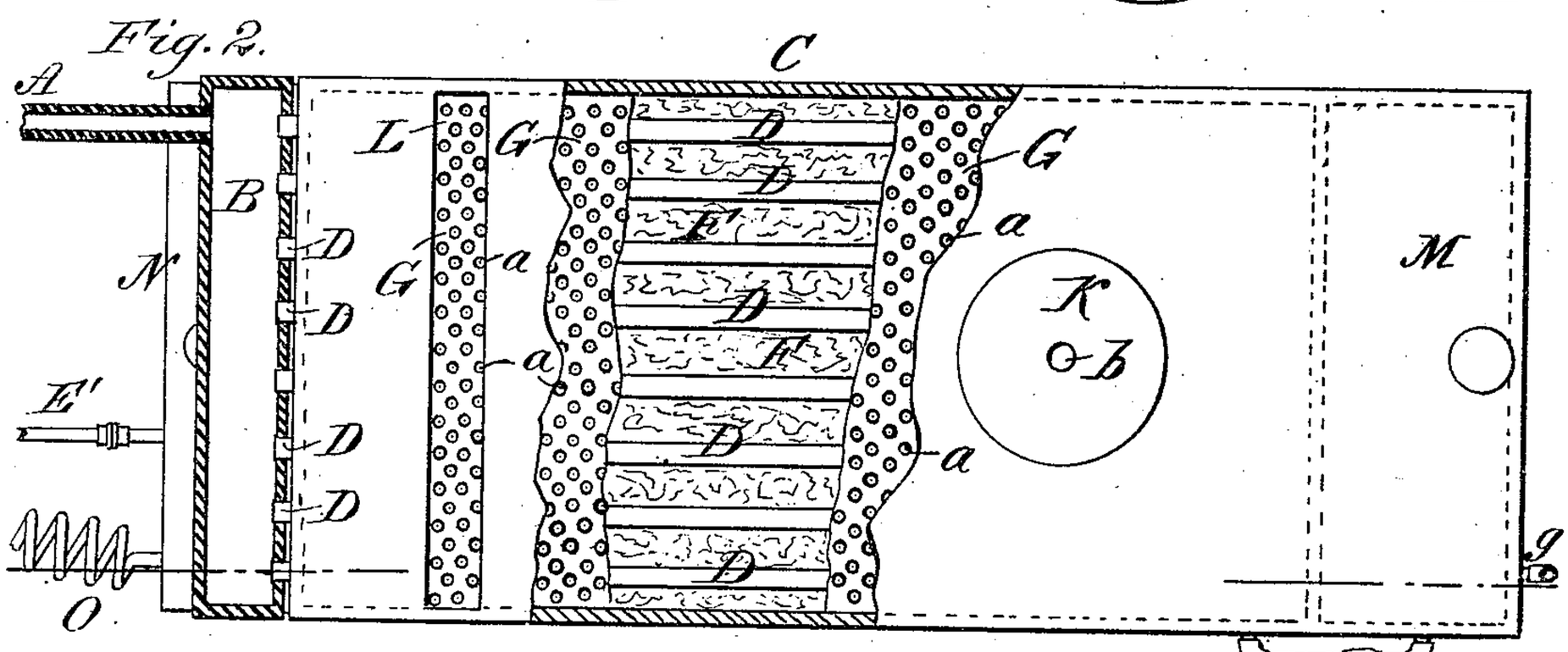
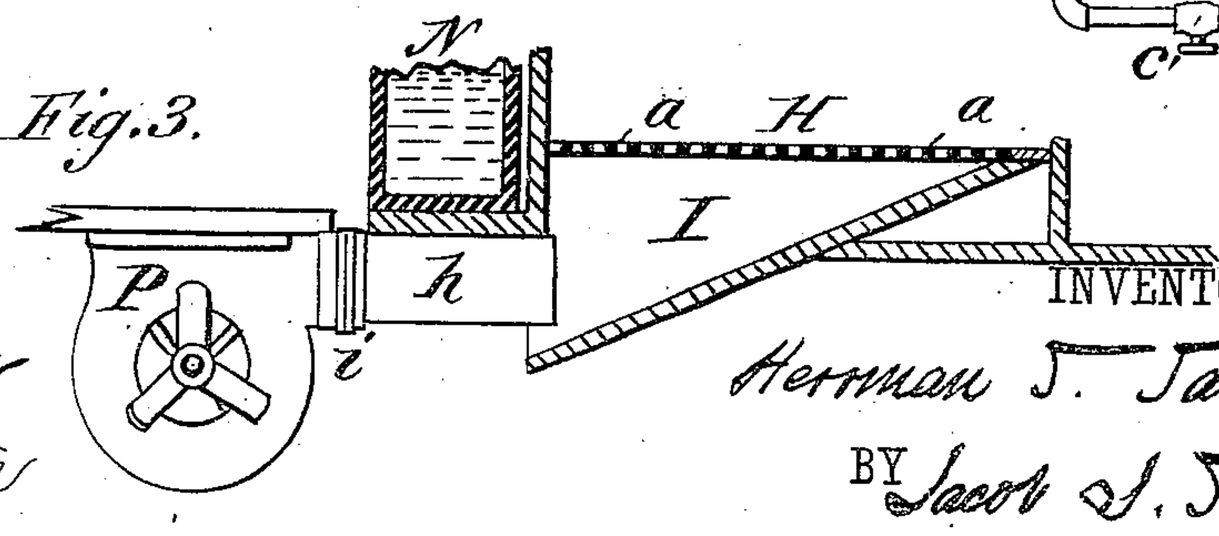


Fig. 3.



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HERRMAN S. SARONI, OF ST. PAUL, MINNESOTA.

COMBINED STEAM-CONDENSER AND TENDER.

SPECIFICATION forming part of Letters Patent No. 267,463, dated November 14, 1882.

Application filed January 20, 1882. (No model.)

To all whom it may concern:

Be it known that I, HERRMAN S. SARONI, of St. Paul, in the county of Ramsey and State of Minnesota, have invented a new and useful Improvement in Combined Steam-Condensers and Tenders for Engines, of which the following is a specification.

Great inconvenience and loss of time is often experienced in supplying operating traction and locomotive engines with water. In many instances water has to be brought from considerable distances for a proper boiler-supply when the traction-engine is operating, while locomotive engines have frequently to stop for the purpose of taking a supply of water aboard.

The object of this invention is to provide a device for condensing, for the purpose of renewed use in the boiler, the exhaust-steam of a locomotive or other engine, in order to obviate the frequent necessity of taking in fresh supplies of water, and also to adapt the tender for carrying and supplying liquid fuel for the engine.

The invention consists essentially of connected series or groups of pipes of successively-increasing capacity, designed to receive the exhaust-steam from the engine-cylinders, suitably arranged within the body of the tender and surrounded or enveloped with a packing of hair, wool, cork shavings, or other comparatively light or porous material through which water can readily percolate and air be forced; and, further, of devices for keeping the packing wet and for forcing or introducing air through it, and of a tank for receiving the condensed steam and an auxiliary water-tank.

Figure 1 is a longitudinal sectional elevation of the combined condenser and tender. Fig. 2 is a plan of the same with parts broken away to exhibit other parts. Fig. 3 is a side elevation of a portion of the tender with air-supplying fan in position.

Similar letters of reference indicate corresponding parts.

In the drawings, A represents the exhaust-steam pipe, extending from the engine-cylinder (not shown) and connecting with a horizontal drum, B, of much greater area and capacity, that is fixed at the front of the tender C, near the top thereof. Connected with this drum B are a number of parallel pipes, D, that extend horizontally rearward into the body of the tender C, and are then bent back and forth in many folds until their open extremities are connected with the condensed-steam tank E in the bottom of the tender. The combined areas of these manifold pipes D greatly exceed the capacity of the drum B.

From the above it will be seen that the steam passes through conductors of increasing capacity, the drum B having a greater capacity than the pipe A, and the pipes D having a greater capacity than the drum, thus allowing the steam to expand as it reaches the pipes D.

It is obvious that the exhaust-steam entering from the pipe A into the drum B will there expand very considerably, with consequent diminution of temperature and pressure and increased condensation, and, issuing from the drum B into the more capacious manifolds D, will have its temperature and pressure still further decreased, with consequent increased condensation. In fact, the devices of the drum and manifolds may easily be so multiplied that under ordinary circumstances the exhaust-steam from the engine will be completely condensed in its passage through them. All the spaces or interstices between or about the pipes D are filled with a packing, F, of mohair, wool, or other comparatively light and porous substance through which water and air can easily have passage, and which serves to interrupt, direct, and present water and air currents in constant contact with said pipes or manifolds D.

Fixed over the top of the packing F, and forming a complete cover therefor, is a horizontal diaphragm, G, perforated, as shown at *a*, for the distribution and passage of water and air, and a diaphragm, H, of like construction and function supports the forward portion of the packing F, and forms the top of the air-chamber I, that extends entirely across the front of the tender C.

On the top of the tender C is a water-tank, K, communicating by pipe *b* with the chamber containing the manifolds D, and designed for delivering water upon the diaphragm G for keeping the packing F moist.

Extending entirely across the top of the tender C is an opening, L, for the escape of the air that is received at I and passed up through the packing F and about the pipes D from the bottom of the tender.

At the rear of the manifold chamber is the

auxiliary water-tank M, which is designed to contain and deliver any water that may be required by the engine-boiler (not shown) in excess of that furnished by the condensed steam; and this tank M communicates with the condensed-steam tank E by means of a pipe, *c*, through which the flow of water into said tank E is regulated by a valve, *c'*, and from this tank E a pipe, E', extends forward to conduct the water therefrom, and this pipe E' is designed to be connected to a pump to supply water to the engine-boiler.

The air-chamber I is open at its front below the plane of the bottom of the tender C, and its bottom inclines downward and forward to facilitate the free admission of air.

At the front of the tender C is fixed a tank, N, for containing naphtha or other liquid fuel for the engine; and from the bottom of said tank N proceeds a discharge-pipe, *f*, that connects with a spirally-coiled metallic coupling-pipe, O, the opposite end of which is designed to be connected with the fuel-feeding device (not shown) of the engine. This pipe O, being coiled, as shown, possesses a sufficient degree of flexibility and elasticity to accommodate itself without rupture to the difference of lateral or vertical motion between the engine and tender, and, being of copper, brass, or other suitable metal, and seamless, is practically secure against corrosion from the liquid fuel passing through it. The tender is designed to run in the direction of the arrow, Fig. 1.

When the engine is in operation and moving forward, with the tender connected therewith, the exhaust-steam from the cylinders (not shown) escapes through the exhaust-pipe A into the drum B, where it expands, and whence it escapes into the manifold pipes D, where it is condensed by further expansion and the cooling effects of water that is made to drip from the tank K upon the diaphragm G, and thence upon the packing F, whereby the latter is always kept wet, the excess of water, if there be any, flowing through the packing escaping through the diaphragm H; and at the same time air enters the chamber I, and, passing up through the diaphragm H, packing F, and diaphragm G out through the opening L, serves further to cool the manifolds D and condense the steam therein, so that the said exhaust-steam is ordinarily completely condensed into water before completing the passage through the manifolds D. Any uncondensed steam, however, that may reach the tank E and be not condensed therein, will escape therefrom through a pipe, *g*, leading rearward.

From the above it will be seen that the water is intended to be just sufficient in quantity to keep the packing moist and slowly percolates downward through the same without forming a sufficient body to prevent its downward movement and the upward passage of air, although if the water should become in excess of the desired quantity the air under pressure would bubble up through it when the engine is in operation, and stationary air may be forced up through the diaphragm H by means of a fan-blower, P, that may be fixed upon the engine-platform, as indicated in Fig. 3, and be run by belt or other suitable connection with the engine-driving shaft, (not shown;) and said blower P may be provided with an exit-pipe, *h*, having a sliding joint, *i*, for convenience of adjustment.

In some instances the packing F and water-drip may be dispensed with, and the manifolds D may, by removal of portions of the sides or other parts of the tender, be more completely exposed to the action of air, which in extreme cold weather will effect, especially if the engine and tender be traveling, the condensation of the exhaust-steam.

It is obvious that this device can be applied with good effect to all engines whose exhaust-steam is not used for creating a draft through the fire-box.

The device herein described as a "fuel-reservoir" forms no part of this invention, and is designed to be made the subject-matter of a separate application.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The process herein described of condensing exhaust-steam for reuse, consisting in passing the same through conductors of successively-increasing capacity and subjecting the portion of said conductors having the greatest capacity to counter-currents of air and water, substantially as herein set forth.

2. In a combined steam-condenser and locomotive-tender, an exhaust-steam pipe, a receiving-drum of greater area and capacity than the exhaust-steam pipe, a series of manifold conducting-pipes of greater capacity than the drum, and a condensing-chamber connecting with the conducting-pipes, as and for the purpose set forth.

3. In a locomotive-tender, the condensing mechanism described, consisting of the exhaust-pipe A, the transverse drum B, the series of manifold conducting-pipes D, and the condensing-chamber E, of successively-increasing capacity, in the order named, combined with connections with an ordinary boiler-pump, as and for the purpose specified.

4. An exhaust-condenser consisting of the pipe A, drum B, and manifold conductors D, as described, combined with a confined fibrous or porous material in which the conductors are embedded, and which is kept moist by gravitating water, and with means for inciting a draft of air through said material, as and for the purposes specified.

5. In an exhaust-steam condenser, a series of manifold conducting-pipes embedded in a fibrous or porous material, and the said material and pipes subjected to currents of moisture and air for the purpose of reducing the temperature, as specified.

6. The combination, with the condensing-drum B, manifolds D, and porous packing F,

of the perforated diaphragms G H, water-tank K, condensed-steam tank E, and air-chamber I, substantially as herein shown and described.

7. In a combined steam-condenser and tender, the combination, with the manifold pipes D, condensed-steam tank E, porous packing F, diaphragms G H, and water-tank K, of the auxiliary water-tank M and pipe *c*, substantially as herein shown and described.

8. In a locomotive-tender having a condensing apparatus and a condensing-chamber, substantially as described, the reservoir M, having valved connections *c c'*, with said condensing-chamber, and connections E' with the boiler-pumps, all arranged and combined to serve as set forth.

9. The combination, with the steam-condensing manifold pipes D, condensed-steam tank E, and water-tank M, of the water-pipes *c* E' and escape-pipe *g*, substantially as set forth.

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Witnesses:
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