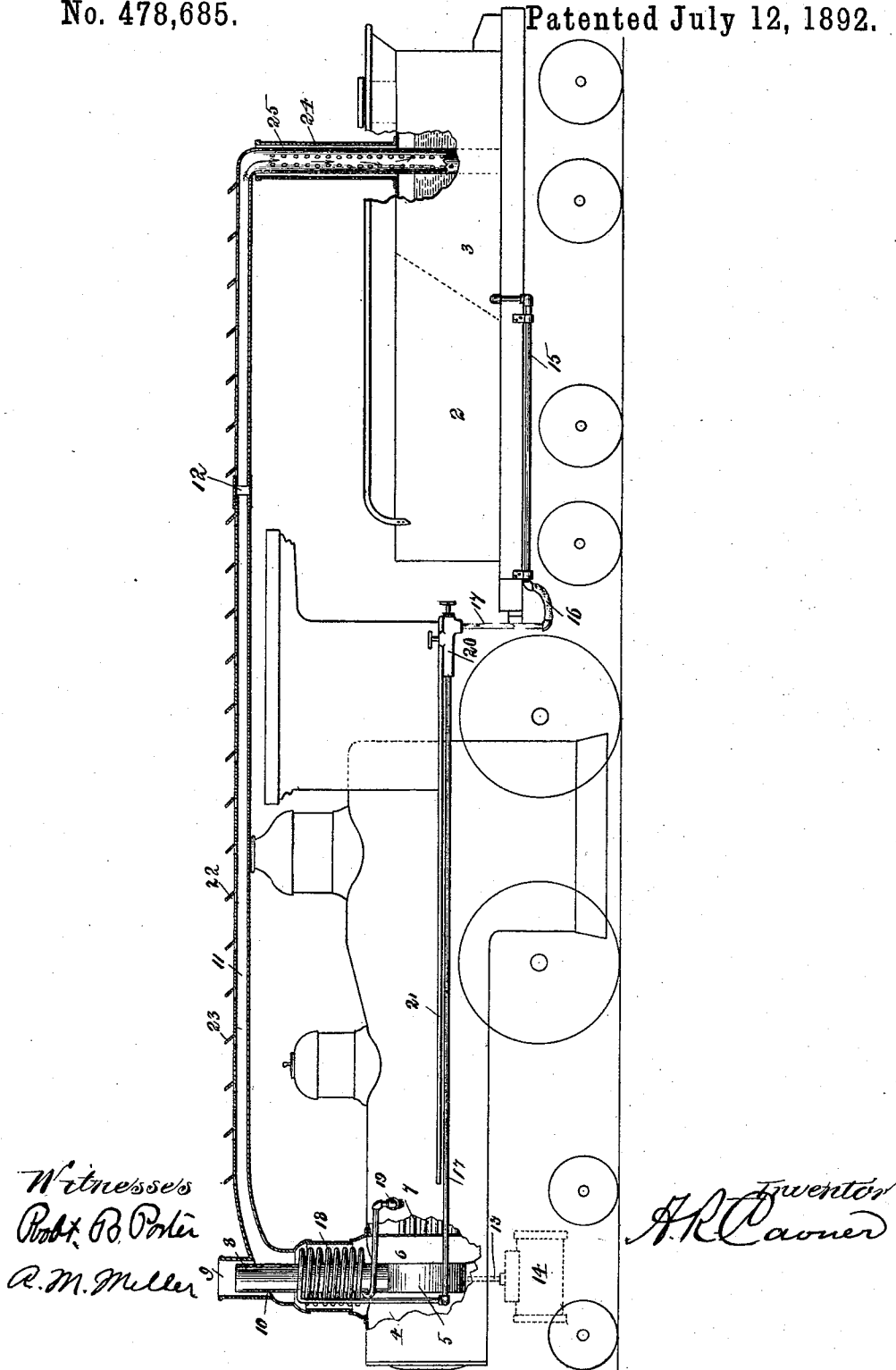


(No Model.)

A. R. CAVNER, Dec'd.
E. E. HOLMAN, Administrator.
LOCOMOTIVE ENGINE.

No. 478,685.

Patented July 12, 1892.



UNITED STATES PATENT OFFICE.

ALEXANDER R. CAVNER, OF CHICAGO, ILLINOIS; EDWARD E. HOLMAN, ADMINISTRATOR OF SAID ALEXANDER R. CAVNER, DECEASED, ASSIGNOR TO THE CAVNER LOCOMOTIVE IMPROVEMENT COMPANY, OF SAME PLACE.

LOCOMOTIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 478,685, dated July 12, 1892.

Application filed August 4, 1891. Serial No. 401,710. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER R. CAVNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Locomotive-Engines, of which the following is a specification, reference being had to the accompanying drawing, in which the figure is a side elevation of a locomotive, some parts being in section.

My invention relates to locomotives, and more particularly to locomotives having a boiler with a compartment at its forward end, in which is located apparatus for causing a draft through the flues of the boiler to fan the fire.

The object of my invention is to economize the consumption of fuel in locomotives and in other engines by condensing the exhaust-steam from the cylinders and reusing it to supply the boilers.

A further object of my invention is to utilize the hot gases which pass from the furnace for heating the water which is introduced into the boiler.

I accomplish these objects as hereinafter specified and as illustrated in the drawing.

That which I regard as new will be pointed out in the claims.

In the drawing, 1 indicates a locomotive, and 2 a tender. The tender is provided with the usual water-tank 3, in which is carried a reserve supply of water.

4 indicates a compartment, which is located in front of the boiler of the locomotive.

5 indicates an exhaust-fan, which is located in the compartment 4 and is connected by means of a hood 6 with the flues 7 of the boiler. The exhaust-fan 5 is adapted to be operated to cause a draft from the furnace through the flues of the boiler and to deliver it through a tube 8 into the upper end of the smoke-stack 9, substantially as described in one of my former applications. The upper part of the smoke-stack 9 is separated from the lower part by a partition or hood 10, which is fitted closely around the tube 8, as indicated in the drawing.

11 indicates a tube, which opens into the

lower portion of the smoke-stack 9 and extends backward, preferably over the cab of the engine, and empties into the tank 3, as shown. A suitable coupling 12 is provided in the pipe 11 between the locomotive and tender, whereby the locomotive and tender may be separated from each other when desired. The lower portion of the smoke-stack 9 opens into the forward compartment 4, thus affording communication between the forward compartment 4 and the tank 3 in the tender.

13 indicates a pipe, which extends from one of the cylinders 14 of the locomotive into the compartment 4 and is adapted to conduct exhaust-steam from said cylinder into the compartment 4. The other cylinder of the locomotive is connected in a similar manner to the compartment 4.

15 indicates a pipe, which is of usual form and is adapted to conduct water from the tank 3 to the forward portion of the tender 2. A hose 16 or other suitable connecting-pipe connects the pipe 15 with a pipe 17 at the rear end of the locomotive. The pipe 17 is adapted to conduct water from the pipe 15 to the forward compartment 4 of the locomotive, where it extends upward to a point near the upper portion of the tube 8 at the interior of the lower portion of the smoke-stack 9, and is thence wound around the tube 8 to form a coil 18 around said tube, as shown. The lower end of the pipe then passes into the boiler at any suitable point. A check-valve 19 is provided for regulating the supply of water furnished to the boiler.

20 indicates an injector or other suitable apparatus for forcing the water through the pipe 17 into the boiler, which is preferably located at the cab end of the locomotive. The pipe 17 preferably passes along the side of the locomotive underneath the running-board 21, but it may extend along the locomotive at any other desired point.

22 indicates apertures formed in the tube 11 at suitable points for the admission of air into said tube.

23 indicates deflectors, which extend forward and upward from the tube 11, one be-

ing placed back of each aperture 22, as shown. The apertures 22 and deflectors 23 are placed at the upper part of the tube 11.

24 indicates a tube, which is secured around the downwardly-extending portion of the tube 11 and is somewhat larger than said tube.

25 indicates holes or apertures in the downwardly-extending portion at the rear end of the tube 11, which may be of any desired number.

The operation of my improved devices is as follows: When the locomotive is in operation, the exhaust-steam from the cylinders will pass through the pipe 13 into the compartment 4, and will thence pass upward around the tube 8 and coil 18 into the pipe 11, through which it will be conducted back to the tank 3. By the motion of the locomotive air will be drawn into the tube 11 through the apertures 22 and will be carried backward by the motion of the locomotive and will be caused to become intermixed with the steam in said tube. This will cause a condensation of the steam, and it will be collected in the tank 3. The air which passes into the tube 11 when it reaches the downwardly-projecting portion of the pipe 11 will pass out of the tube 11 through the holes 25 into the tube 24, and will thence escape into the open air. The tube 24 tends to prevent any uncondensed steam which may pass out through the holes 25 from escaping. The hot gases from the furnace will at the same time pass through the exhaust-fan and be delivered through the tube 8 at the smoke-stack 9. The water in the tank 3 which is thus formed from the condensed steam will still remain at a high temperature, and in that condition will be drawn by means of the injector 20 from the tank 3 and will be forced through the tube 17 into the coil 18, where it will be subjected to the influence of the heat of the exhaust-steam passing upward from the compartment 4 to the tube 11 and to the heat from the hot gases from the furnace as they pass through the tube 8. The exhaust-steam and hot gases will thereby serve to still further heat the water before it enters the boiler. After passing from the coil 18 the water will enter the boiler through the check-valve 19, as shown. By this construction the heat of the exhaust-steam and also of the hot gases from the furnace is utilized to raise the water to a very high temperature before it is introduced into the boiler, and thereby a great saving of fuel is effected.

That which I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a locomotive, of a compartment in front of the boiler-flues, an exhaust-fan arranged in the compartment, connected with the boiler-flues, and having a delivery-tube communicating with the smoke-stack, and a feed-water pipe coiled round the tube of the exhaust-fan and connected with the boiler, substantially as described.

2. The combination, with a locomotive hav-

ing a compartment at its forward end, apparatus located in said forward compartment adapted to conduct the hot gases from the furnace to the upper part of the smoke-stack of the locomotive, and a pipe adapted to conduct exhaust-steam from the cylinder to said compartment, of a pipe adapted to supply water to the boiler of the locomotive, said pipe being so arranged as to expose the water to the heat of the exhaust-steam and the hot gases from the boiler, substantially as and for the purpose specified.

3. The combination, with a locomotive and a tender carrying a water-tank, of a tube arranged to conduct exhaust-steam from the locomotive-cylinder to the water-tank and means by which cool air is admitted into such tube for condensing the exhaust-steam as it passes through said tube in transit to the water-tank, substantially as described.

4. The combination, with a locomotive and a tender carrying a water-tank, of a tube for conveying exhaust-steam from the cylinders of the locomotive to said water-tank, said tube having apertures adapted to admit air into said tube, substantially as and for the purpose specified.

5. The combination, with a locomotive and a tender carrying a water-tank, of a tube for conveying exhaust-steam from the cylinders of the locomotive to the water-tank, apertures in said tube for the admission of air, and deflectors, substantially as and for the purpose specified.

6. The combination, with a locomotive having a compartment at its forward end, said compartment having no communication with the flues of the boiler, and a tender carrying a water-tank, of tubes for conducting exhaust-steam from the cylinders of the locomotive into said compartment and a tube opening into said compartment adapted to convey steam from said compartment to the water-tank, substantially as and for the purpose specified.

7. The combination, with a locomotive having a compartment at its forward end, said compartment having no communication with the flues of the boiler, a tender, and a water-tank carried thereby, of tubes adapted to convey exhaust-steam from the cylinders of the locomotive to said forward compartment and a tube opening into said compartment and adapted to convey said steam into the water-tank, said tube having apertures for the admission of air, substantially as and for the purpose specified.

8. The combination, with a locomotive having a compartment at its forward end, said compartment having no communication with the flues of the boiler, a tender, and a water-tank carried thereby, of tubes adapted to conduct exhaust-steam from the cylinders of the locomotive into said forward compartment and a tube 11, opening into said compartment and adapted to conduct the steam from said compartment to the water-tank, said tube

having apertures 22, deflectors 23, and apertures 25, substantially as and for the purpose specified.

5 9. The combination, with a locomotive having a compartment at its forward end, an exhaust-fan in said compartment connected with the flues of the boiler and adapted to draw the gases from the boiler, and a tube 8, adapted to conduct said gases and deliver
10 them into the upper end of the smoke-stack of the locomotive, of tubes adapted to con-

duct exhaust-steam from the cylinders of the locomotive into said forward compartment, a tube adapted to conduct said exhaust-steam to the water-tank, and pipes for conducting
15 the water from the water-tank around the tube 8 and to empty it into the boiler, substantially as described.

ALEXANDER R. CAVNER.

Witnesses:

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