

(No Model.)

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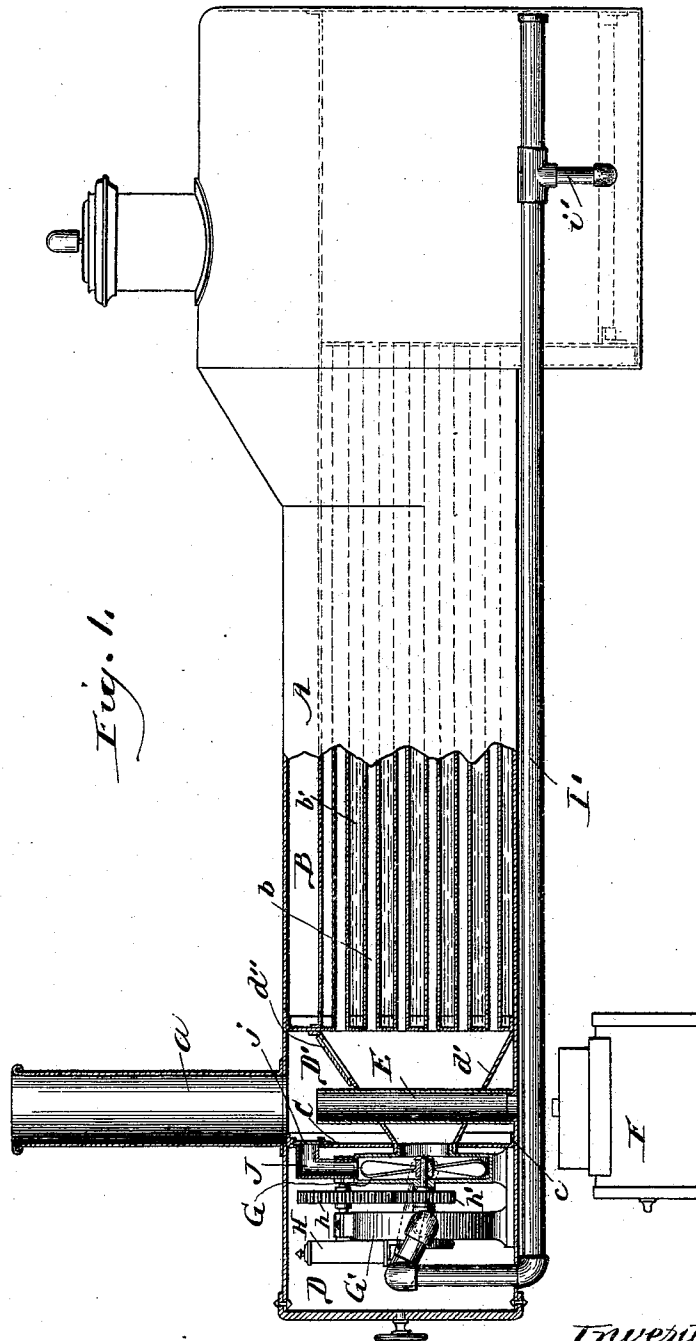
A. R. CAVNER, Dec'd.

E. E. HOLMAN, Administrator.

LOCOMOTIVE ENGINE.

No. 469,844.

Patented Mar. 1, 1892.



Witnesses
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2 Sheets—Sheet 2.

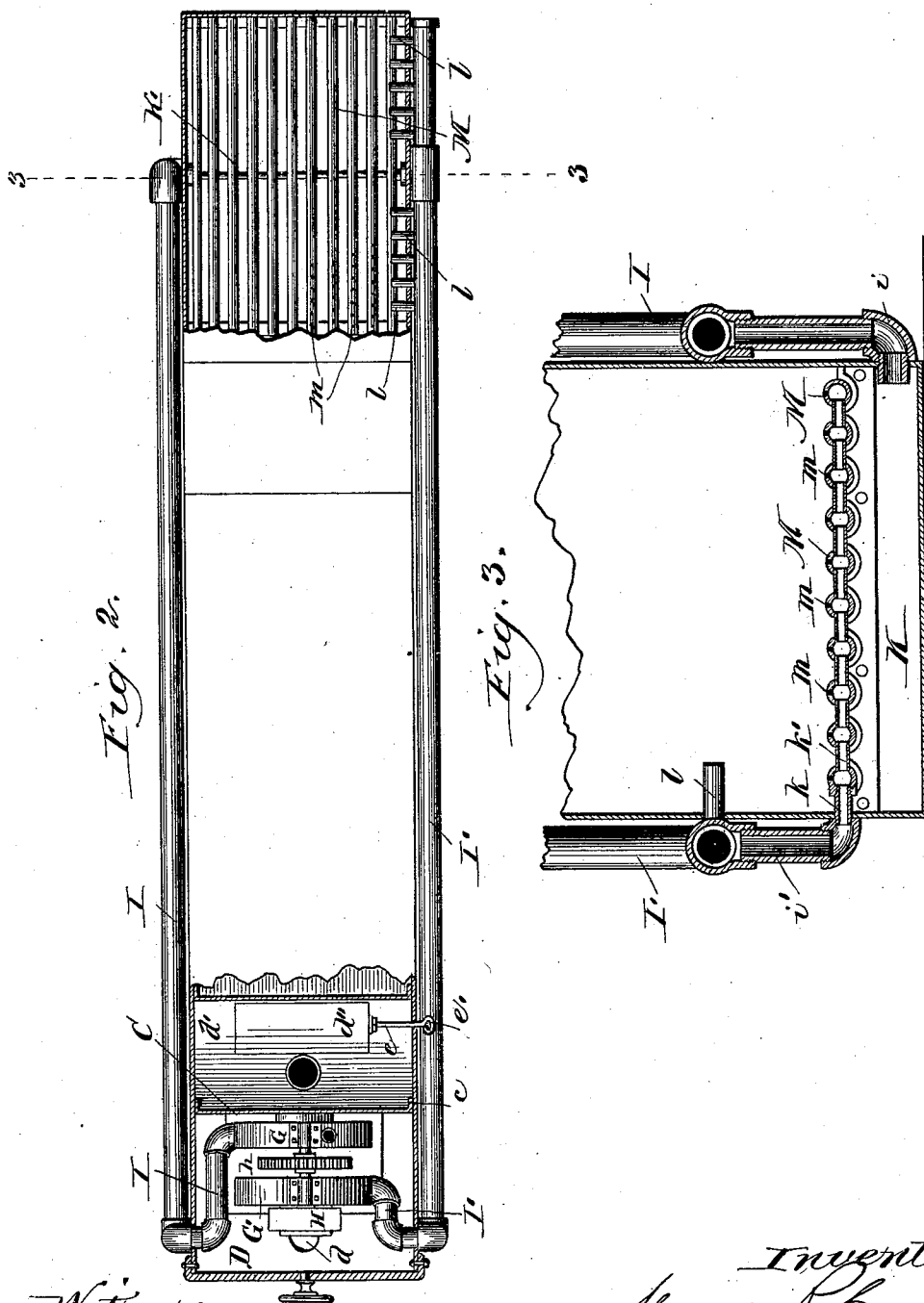
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UNITED STATES PATENT OFFICE.

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ADMINISTRATOR OF SAID ALEXANDER R. CAVNER, DECEASED.

LOCOMOTIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 469,844, dated March 1, 1892.

Application filed April 25, 1891. Serial No. 390,386. (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 drawings, in which—

Figure 1 is a side elevation of a portion of a locomotive, some parts being in section. Fig. 2 is a top or plan view showing some parts in section, and Fig. 3 is a vertical cross-section on line 3 3 of Fig. 2.

My invention relates to locomotive-engines, and is especially designed to be used upon locomotives having an extended forward compartment; but it may also be used upon any engine by a slight modification of its construction.

The principal objects of my invention are, first, to provide devices for relieving the exhaust from the cylinders from any back-pressure, so that the full power of the steam-pressure may be obtained, and, second, to provide devices for creating a more perfect draft through the flues of the boiler, and to provide means whereby the greatest amount of power may be derived from the fuel consumed.

Other objects of my invention are to insure perfect combustion of the fuel, to prevent cinders, and also to prevent the vibration of the tubes in the boiler, and thus avoid a great factor in the destruction of boilers.

I accomplish these objects as illustrated in the drawings, and as hereinafter set forth. That which I regard as new will be pointed out in the claims.

In the drawings, A indicates a locomotive, of which B is the boiler, which boiler B is of usual form and consists of flues *b* for the passage of flame and smoke through the boiler, and tubes *b'* to contain the water to be heated. In the ordinary locomotive the boiler extends to the forward part of the locomotive and terminates at a point a short distance back of the smoke-stack, leaving a compartment in the forward end. In the use of my present invention the boiler B is of the ordinary form with a compartment at the forward end, which compartment is divided by an air-tight par-

tion C into two compartments D and D'. The partition C is placed at or near the forward edge of the smoke-stack *a* and is preferably perpendicular. It may be secured in position in any suitable manner, as by flanges *c* around its periphery, secured by rivets to the shell of the compartment.

Extending upward through the chamber D' and terminating at a point slightly below the entrance to the smoke-stack *a* is an exhaust-pipe E, which is cylindrical in shape and is connected to the cylinders F of the engine. The exhaust-steam from the cylinders F passes through suitable connections into the pipe E and thence upward into the smoke-stack *a*. The exhaust-pipe E is made of uniform diameter, so that the exhaust-steam will not be compressed in its passage upward.

d' indicates a funnel-shaped partition or hood, which is tightly secured to the front end of the boiler B in such manner as to cover the flues *b*, and at its forward end is tightly secured in the partition C, forming a passage from the flues *b* into the forward compartment D. The partition *d'* is provided with holes for the passage of the exhaust-pipe E, which it fits tightly in order to prevent gases from passing from the interior of the chamber formed by the partition *d'* into the compartment D'. The partition or hood *d'* is provided, preferably at its upper part, with an opening leading into the compartment D', which opening is closed by a gate *d''*. The gate *d''* is adapted to be moved upon the partition *d'* to open the passage by means of a rod *e*, which extends to the exterior of the chamber D' and is provided with a handle *e'* or other suitable device, whereby it may be operated from the exterior of the engine.

G G' indicate exhaust-fans, which are mounted in the compartment D of the engine. The exhaust-fans G G' are in all respects similar, and one of them, as G, is connected to the opening leading from the compartment inclosed by the partition *d'*, as best shown in Fig. 1. The other fan G' is adapted to exhaust the air from the interior of the compartment D. The two fans G G' are driven by means of a suitable engine H, which is located in any suitable position in the compartment D. I prefer to use a small steam-en-

gine mounted, as shown at H in Fig. 1, at the upper part of the exhaust-fans and operating them by means of gear-wheels *h h'*, mounted between the two fans, as best shown in Fig. 1.

I indicates a tube, which is connected with the outlet of the exhaust-fan G and passes through a hole in the side of the compartment D of the engine and thence downward, preferably to a point below the foot-board of the engine, and back to the fire-box. I' indicates a similar tube, which is connected with the outlet of the exhaust-fan G' and passes through a corresponding hole in the opposite side of the compartment D of the engine, and also extends downward and backward under the foot-board to the fire-box. In the arrangement of the pipes I preferably make use of the holes found at the sides of the forward compartment of engines as commonly constructed, as the necessity of altering the engines is thereby avoided. In order to make use of these holes, the tubes I I' are arranged as shown in the drawings; but, if desired, the tubes I I' may pass through the sides of the compartment D at any other suitable point and thence backward, as I do not wish to confine my construction to the exact form shown.

d indicates a hole, which is preferably placed at the bottom of the compartment D and is used to admit air into the compartment D, for purposes hereinafter set forth.

J indicates a tube, which connects the exhaust-fan G with the compartment D', preferably at a point near the top of said compartment. The tube J is closed by means of a gate *j*, which is adapted to slide over the opening in the tube J and is provided with a rod similar to the rod *e*, which extends to the outside of the engine, so that the passage in the tube J may be opened when desired.

The tube I, as above described, extends backward to the fire-box, as best shown in Fig. 2, and thence downward to a point slightly below the grate-bars M of the furnace and terminates by a suitable connection *i* at the interior of the ash-pit K, as best shown in Fig. 3. The tube I', as above described, also passes backward to the fire-box and is provided with a number of jets *l*, which extend into the fire-box a short distance above the grate-bars M. The tube I' is provided with a downward extension *l'*, which is connected with the pipe I' in any suitable manner and extends downward, terminating in a tube *k*, which passes into the fire-box on a level with the grate-bars of the furnace.

The grate-bars M are made of cylindrical tubes, provided, preferably, at their upper surfaces with orifices *m*. The grate-bars M are secured in place in any suitable manner and communicate with each other through small connecting-pipes *k'*, which are preferably arranged in such manner as to form extensions of the pipe *k*, leading from the tube I'.

In locomotives as heretofore constructed,

when it is desired to increase the draft through the flues, the exhaust-steam from the cylinders passes upward through an exhaust-pipe, which is made smaller at its upper end, and, passing out of the smoke-stack, causes a partial vacuum in the chamber at the front of the engine and thereby creates a forced draft through the flues of the boiler. It is evident that the alternating character of the exhaust, and consequently of the draft thus formed, will cause a vibration of the boiler-tubes and thereby cause the boiler to wear out much sooner than it otherwise would. The back-pressure from the exhaust-steam, which is compressed by the peculiar construction of the exhaust-pipe, also detracts from the power of the engine. By the use of the improvements hereinbefore described these objectionable features are avoided, as will be seen from the following description of the operation of my improved devices.

When it is desired to start the fire in the locomotive, the gate *d''* in the partition or hood *d'* is opened, and a draft thereby may be created through the flues of the boiler, compartment D', and smoke-stack *a*. As soon as sufficient steam has been generated to operate the engine H, (the gate *d''* having first been closed,) the engine H is started, causing the exhaust-fans G G' to operate. The fan G will then exhaust the air or gases in the flues of the boiler and in the compartment formed by the partition or hood *d'*, causing a strong draft through the flues. At the same time the exhaust-fan G' will draw a current of fresh air from the compartment D and will deliver it through the pipes I' and *i'* into the jets *l* and the grate-bars M of the fire-box. This will greatly increase the heat of the fire and will insure an almost perfect combustion of the combustible gases and other fuel in the furnace. The gases drawn through the flues of the boiler by the fan G are also returned into the ash-pit K through the pipes I and *i*, whence they pass up through the grate-bars M into the fire-box, where they are again subjected to an intense heat and are greatly purified. When the supply of air and gases is more than it is desired to return to the fire-box, the gate *j* in the pipe J may be opened, allowing the extra supply to pass into the chamber D' and out at the smoke stack *a*. The exhaust-steam from the cylinders is allowed to pass upward through the pipe E and out at the smoke-stack without in any way affecting the other operations of the locomotive. By the construction herein shown the great advantage is gained of being able to maintain a constant draft through the flues of the boiler and also to feed the furnace with a supply both of hot combustible gases and of pure fresh air, so that almost perfect combustion is secured.

In the drawings I have shown two exhaust-fans G G' to create the two currents described; but it is evident that a single fan having separate connecting-tubes might be

used, if so desired. I do not wish to limit myself to the exact arrangement of pipes herein shown, as such arrangement is not an essential feature of my invention.

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

1. The combination, with a furnace and a steam-boiler having front and rear compartments D D' at its forward end divided from
10 each other by a partition C, of the two exhaust-fans G G', both located in the front compartment, one communicating with the boiler-flues for withdrawing the gases and the other communicating with the furnace-chamber for supplying fresh air thereto, and an
15 exhaust-steam pipe E, rising into and communicating with the rear compartment between the partition and the boiler-flues and separated from communication with the fan, which withdraws the gases from the boiler-flues, substantially as described.

2. The combination, with a furnace and a steam-boiler having front and rear compartments D D' at its forward end divided from
25 each other by a partition C, of the two exhaust-fans G G', both located in the front compartment and one connected with the furnace for supplying fresh air thereto, an exhaust-steam pipe rising in the rear compartment to deliver the exhaust-steam to the smoke-stack, and a partition extending through the rear
30 compartment and closing the latter against communication with the discharge-mouth of the exhaust-steam pipe, while permitting the flow of gases from the boiler-flues to one of the fans, substantially as described.

3. In a locomotive-engine, the combination, with a furnace and a steam-boiler having a compartment at its forward end, of a pair of
40 exhaust-fans G G', located in the compartment, a pair of fan-shafts geared together, an engine H, operating one of the fan-shafts, and flues which place the fans in communication, respectively, with the boiler-flues and the furnace, substantially as described.

4. In a locomotive-engine, the combination, with a furnace and boiler having a compartment at its forward end and an exhaust-fan in said compartment adapted to be operated
50 to create a draft from the furnace through the flues of the boiler, of a partition or hood d', connecting the flues and the exhaust-fan, and exhaust-tube E, extending through and terminating above said hood, substantially as
55 and for the purpose specified.

5. In a locomotive-engine, the combination, with a furnace and boiler having a compartment at its forward end and an exhaust-fan in said compartment adapted to be operated
60 to create a draft from the furnace through the flues of the boiler, of a partition or hood d', connecting the flues and the exhaust-fan, exhaust-tube E, extending through and terminating above said hood, an opening in said
65 hood, and a gate for closing said opening, said gate being adapted to be operated from the

outside of the locomotive, substantially as and for the purpose specified.

6. In a locomotive-engine, the combination, with a furnace and boiler having compartments D D' at its forward end and an exhaust-fan in said compartment D, of a hood d', connecting the flues of the boiler with the exhaust-fan, and mechanism for operating the fan to create a draft from the furnace through
75 the flues of the boiler, substantially as described.

7. In a locomotive-engine, the combination, with a furnace and boiler having compartments D D' at its forward end, exhaust-pipe E in the compartment D', and an exhaust-fan in said compartment D, of a hood d', adapted to cut off communication between the flues of the boiler and the exhaust-pipe and connecting the flues with the exhaust-fan, and mechanism for operating the exhaust-fan to create a draft from the furnace through the flues of the boiler, substantially as described.

8. In a locomotive-engine, the combination, with a furnace and boiler having compartments D D' at its forward end and a hood d', connecting the flues of the boiler with an exhaust-fan located in said compartment D, of exhaust-fans located in said compartment D,
95 one of said fans being connected with said hood and the other being adapted to draw a supply of fresh air from the outside of the locomotive, mechanism for operating said fans, and pipes connected with said fans for
100 conducting the gases from the boiler and the air back to the fire-box, substantially as described.

9. In a locomotive-engine, the combination, with a furnace and boiler having compartments D D' at its forward end and hood d', connecting said flues with an exhaust-fan located in the compartment D, of exhaust-fans G G', located in said compartment D, said fan G being adapted to create a draft from the furnace through the flues of the boiler and the exhaust-fan G' being adapted to draw a supply of fresh air from the outside of the locomotive, mechanism for operating the exhaust-fans, pipes adapted to conduct the gases from
115 the boiler and the air back to the furnace, pipe J, connecting the exhaust-fan G with the compartment D', and gate j' for closing said pipe J, said gate being adapted to be operated from the exterior of the locomotive,
120 substantially as specified.

10. In a locomotive, the combination, with a furnace and boiler having a compartment at its forward end, exhaust-fans located in said compartment, and mechanism for operating
125 said fans to create a draft from the furnace through the flues of the boiler and to draw a supply of fresh air from the outside of the locomotive, of pipes I I', connected with said exhaust-fans, for conducting the gases from
130 the boiler and the air back to the furnace, the furnace having tubular grate-bars M, pro-

vided with orifices *m*, and pipes *k'*, connecting the interior of said grate-bars with each other, said pipe *I* having a downward extension *i*, adapted to deliver its contents beneath the grate-bars of the furnace, and said
5 pipe *I'* having jets *l*, adapted to inject the air into the fire-box above the grate-bars and

having a downward extension *i'*, adapted to deliver air into the grate-bars, substantially as and for the purpose specified.

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Witnesses:

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NELLIE MCKIBBEN.