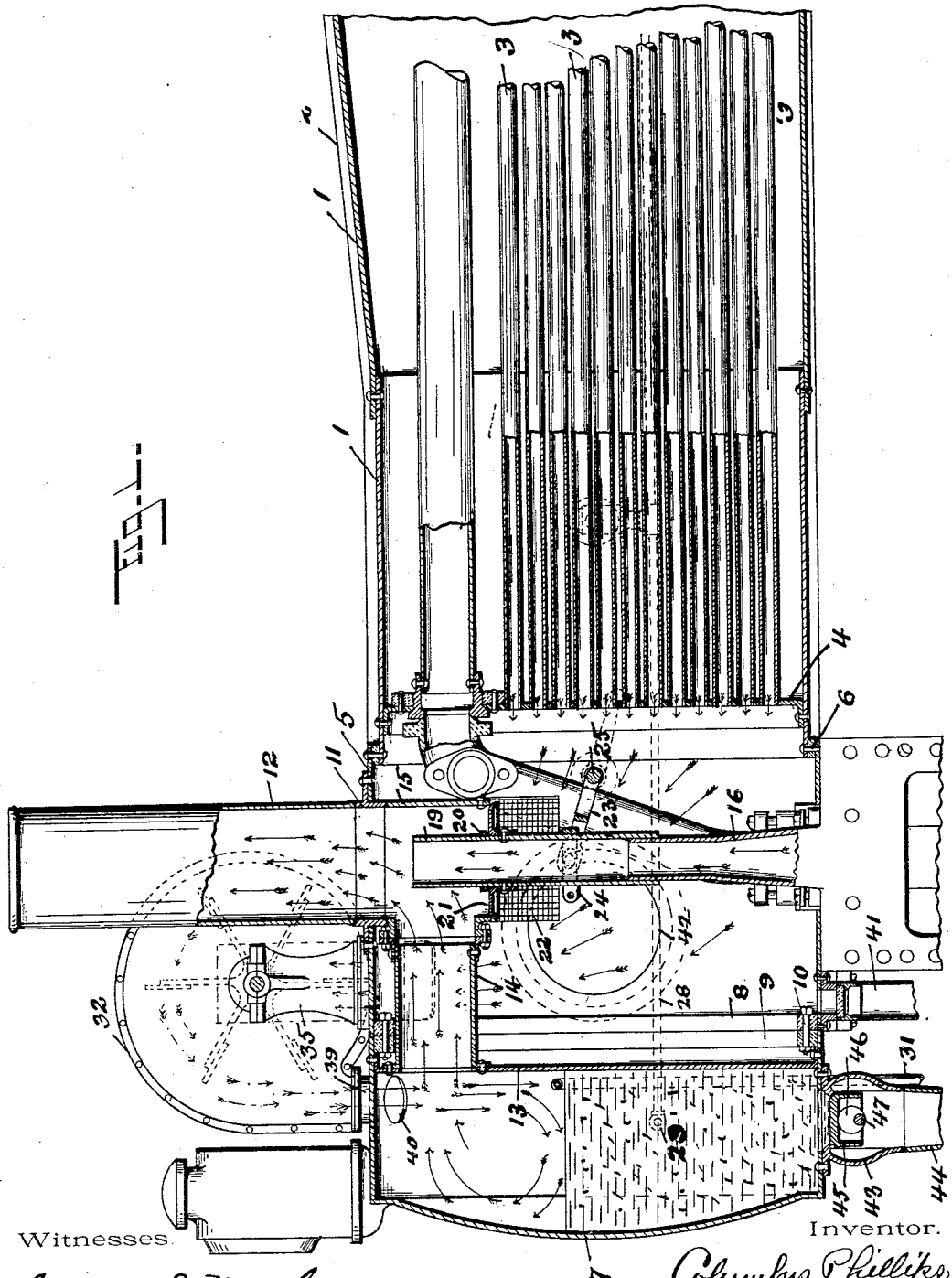
No. 704,097. Patented July 8, 1902.

C. PHILLIPS.

FURNACE.

(Application filed Apr. 18, 1901.)

(No Model.) 3 Sheets—Sheet 1.



Witnesses.

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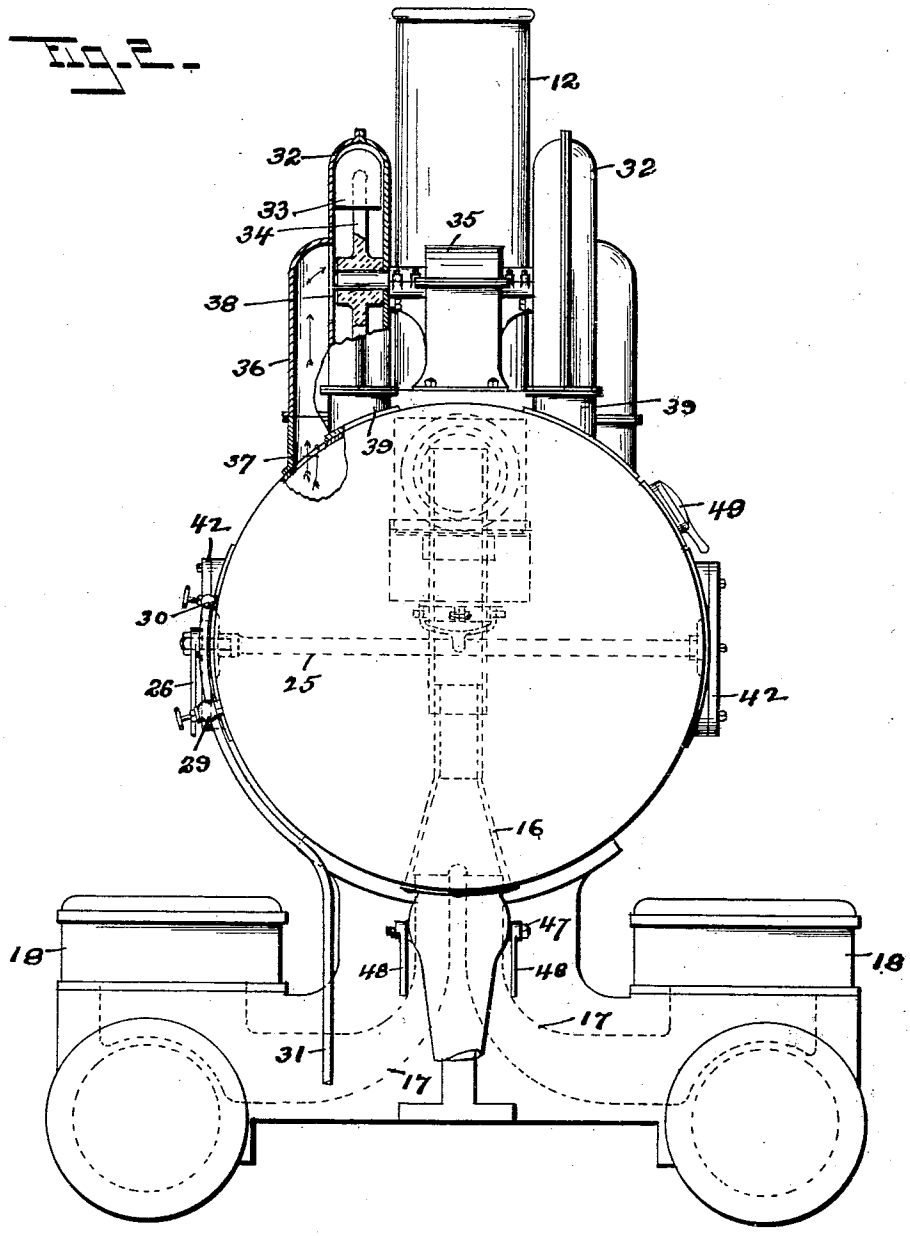
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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.



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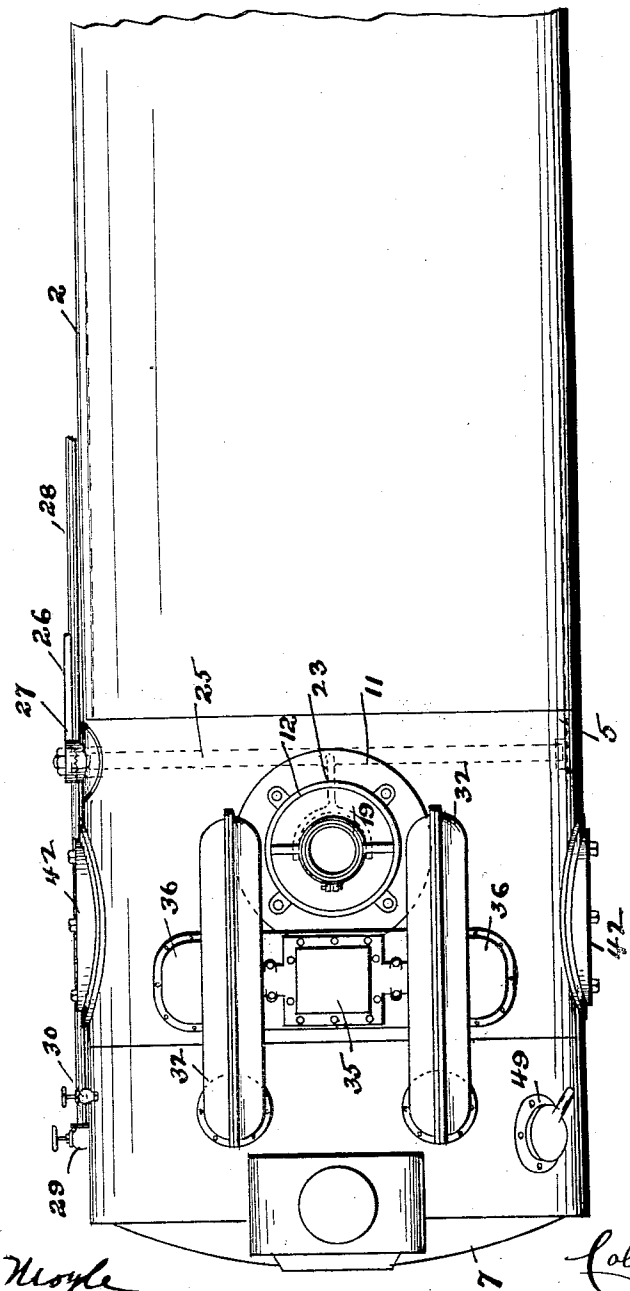


FIG. 3.

Witnesses.

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UNITED STATES PATENT OFFICE.

COLUMBUS PHILLIPS, OF MERIDIAN, MISSISSIPPI.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 704,097, dated July 8, 1902.

Application filed April 18, 1901. Serial No. 56,414. (No model.)

To all whom it may concern:

Be it known that I, COLUMBUS PHILLIPS, a citizen of the United States, residing at Meridian, in the county of Lauderdale and State of Mississippi, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in mechanical draft and spark arresters for locomotive-boilers, its object being, among other things, to provide a device to maintain a uniform artificial draft in the fire-box, and thereby cause a complete and economical combustion of the fuel, which will prevent the formation of smoke, means to prevent the escape of sparks or cinders through the stack, and, further, to construct and attach my improvements to the prevailing style of locomotive-boilers without affecting the present symmetrical proportions thereof and by adding the least possible weight thereto.

Under the present conditions of railroading, wherein a locomotive is called upon to draw a train of cars at an enormous rate of speed, much difficulty has been found in maintaining a uniform and constant steam-pressure in the boiler sufficient to give the maximum efficiency to the locomotive, which difficulty is due in a great measure to the imperfect and variable draft in the fire-box, produced by the exhaust-steam jet-draft, which is intermittent. A defective draft prevents the complete combustion of the fuel, which is the source of the smoke nuisance; but with a mechanical draft, as applied in my invention, the draft in the fire-box is controlled so as to produce perfect combustion of the fuel under varying conditions of the quality of the fuel and the work to be done by the locomotive.

In the practice of my invention I preferably use duplex fans, which are not affected by external influences, such as the climatic conditions, and they are so connected with the boiler that they may be used to create either a drawn or a forced draft in the fire-box. These fans are operated by an auxiliary engine which is controlled by a governor operated by the steam-pressure of the boiler and can also be controlled so that the draft in the fire-box will be permanent and uniform. Within the extended front of the boiler there is a compartment which is filled with water and into which the sparks or cinders are discharged, the water cooling them and arresting their movement, so that they do not pass out through the stack.

As my device can be attached to any form of locomotive-boiler, I do not limit myself to a boiler constructed only as herein shown and described.

Referring to the drawings, in which like numerals designate like parts in the several views, Figure 1 is a longitudinal sectional elevation of a locomotive-boiler with my improved device attached thereto. Fig. 2 is a front view thereof, partly in section; and Fig. 3 is a plan view.

The locomotive-boiler, as shown, is constructed with a body portion 1, having the usual jacket 2 surrounding the same and a plurality of flues 3 therein, supported at their forward ends by the head 4. The rear portion of the boiler is not shown, as its construction is immaterial to my invention, any of the forms common to the art being equally adapted to my invention, as well as the one herein shown.

Attached to the forward end of the body portion 1 by the rivets 6 is an extension 5, and attached to the forward end of the extension by the rings 8 9 is a cistern 7. The ring 8 is secured to the extension 5 and the ring 9 to the cistern 7, and both are clamped together by the bolts 10. The cistern 7 is separated from the extension 5 by the head 13, to which is attached the duct 14, which extends rearwardly and joins with a T 15, the vertical portion of which is concentric with the stack-base 11 and stack 12. The contour of the extension 5 and cistern 7 is the same as that of the body of the boiler. Hence there is no disfigurement of the symmetrical proportions of the boiler.

Projecting upwardly from the lower part of the extended front of the boiler is the exhaust-pipe 16, having connection through the passages 17 17 with the steam-chests 18 18 upon either side of the boiler, and movable vertically thereon is the extension-pipe 19, which is held at its upper end by a guide 20 within the interior of the T 15.

The extension-pipe 19 is moved vertically

by the yoke-arm 23, having connection with an adjustable split collar 24 and to a rock-shaft 25, rotatably mounted within the extended front of the boiler and having an operating-arm 26 upon its outer end, the hub of which is provided with notches which engage with similar notches in the face of the flange 27, riveted to one side of the extension 5. Through the operating-arm 26 the rock-shaft 25 is rotated and the extension-pipe 19 is given a vertical movement, and the engagement of the notches in the face of the flange 27 with those of the hub of the operating-arm 26 hold the pipe in any of its adjusted positions.

Surrounding the extension-pipe 19 is the valve-disk 21, which in its extreme upward position is seated against the lower open end of the T 15, and around said valve is a netting 22, the mesh of which is fine enough to prevent sparks or cinders passing therethrough.

The cistern 7 is filled with water from the feed-pipe of the injector through the pipe 28 and valve 29, and its level therein is limited by the gage-cock 30 and drain-pipe 31.

Attached to the exterior of the extended front of the boiler, near its forward end, are the duplex fans, which are of the ordinary construction, and, as herein shown, comprise a case 32 and fans 33, fixed to the arms of the spider 34, the outlets of the cases having connection with the interior of the boiler through the flanged pipes 39 and the apertures 40, concentric thereto. Joined to the fan-cases are the inlet-ducts 36, having connection with the interior of the extension 5 through the apertures 37 and with the interior of the fan-cases 32 by the aperture 38.

Between the fans is an auxiliary engine 35, the shaft of which projects outwardly from either side thereof and carries the spiders 34, as shown in Fig. 2. This engine may be of any preferred construction and is preferably connected directly with the spider; but, if desired, the fans can be geared or belted to the shaft, and thus multiply the number of revolutions thereof and permitting of the use of a smaller fan. The speed of this engine is regulated by a governor operated by the steam-pressure of the boiler, so that as the pressure increases the speed diminishes, and vice versa, thus making a perfectly automatic arrangement, whereby the draft produced by the fans varies, thus adapting the intensity of the fire to the requirements of the steam-pressure. When the maximum steam-pressure is attained, the fans are practically stopped and the fire is subjected to no draft, thus effecting a saving in fuel consumption. The journal-bearings for the engine-shaft are kept cool by water from the tender-tank, which can be forced around the bearings by a miniature pump operated, if desired, by the engine which drives the fans. After passing around the bearings this water can be returned to the tender-tank without loss. I have not shown the detailed construction of this engine, as engines adapted for this work are common to the art and can be readily purchased in the open market, and, further, it is immaterial as to the particular form of the engine or means that I use to rotate the fans, it being possible and practical to connect the fans with an electric or any other suitable motor.

The operation of my device is as follows: The cistern 7 is first filled with water to the proper level from the injector through the pipe 28 and valve 29. The valve-disk 21 being seated against the bottom of the T 15 cuts off communication with the atmosphere from the interior of the extended front or smoke-box of the boiler except through the fans. The fans are now put in motion by the engine 35, and the suction-draft created thereby draws the gases, sparks, or cinders through the flues 3 from the fire-box into the extension 5 and thence through the apertures 37 into the ducts 36, through the apertures 38, and into the fan-cases 32, from which they are discharged through the flanged pipes 39 and apertures 40 into the cistern 7. In the cistern they are thrown with considerable force against the surface of the water, which holds all of the heavy particles—such as sparks, cinders, &c.—and deflects from its surface the gases, which pass through the duct 14 into the T 15 and out through the stack 12. The exhaust-steam passes from the steam-chests 18 through the passages 17 into the exhaust-pipe 16 and thence through the extension-pipe 19 into the stack, thus forming a modified jet-draft which assists the passage of the gases through the duct 14 and stack 12. This jet-draft also materially lightens the work required of the rotary fans. In Figs. 1 and 2 I have illustrated the path of the sparks or cinders, gases, &c., from the flues 3 to the stack 12 by arrows. By this construction it is impossible for sparks or cinders to escape into the atmosphere, they all being caught and held within a specially-provided compartment.

The cinders and foreign matter that accumulate within the extension-front 5 are removed therefrom through the cinder-chute 41, and access to the interior is had through the manholes 42 42 upon either side thereof. The cinders are removed from the cistern 7 through the discharge-valve 43 and discharge-pipe 44. The discharge-valve can be constructed in any preferred manner; but, as herein shown, consists of a valve-disk 45, a cam 46 upon a shaft 47, and levers 48 upon either end of said shaft. A cap 49 covers an aperture through the shell of the cistern, which is provided for the admission of a rod to aid in removing the accumulation of sparks or cinders within the cistern.

The rotation of the fans, as herein shown, creates a suction-draft within the fire-box through the flues 3 and gives to the locomotive all of the advantages of a forced draft

now commonly used in stationary and marine boilers; but these fans can be used entirely for the purpose of creating a forced draft, which can be admitted into the closed ash-pan of the fire-box or through hollow grate-bars by any preferred means without departing from the spirit of my invention.

The air-supply to the fire-box, whether drawn or forced, can be made to pass through a pipe or system of pipes within the extension 5 and its temperture thereby raised to a high degree, which will facilitate a more economical combustion of the fuel and at the same time lower the temperature of the escaping gases which pass through the said extension.

By the use of this device as herein shown for creating an automatic mechanical draft a steady current of air can be drawn or forced into the fire-box of the boiler, and as it can be supplied in the proper amount for a complete combustion of the fuel the smoke is consumed before leaving the fire-box and a constant source of annoyance in locomotives is removed.

If an accident should displace the auxiliary engine or fans and render them inoperative, the extension-pipe 19 is lowered by means of the yoke-arm 23 and rock-shaft 25 through the operating-arm 29, as before described. The downward movement of this extension-pipe removes the valve-disk 21 from its seat and opens direct communication between the extension-front of the boiler and the stack 12. The gases, sparks, cinders, &c., are drawn through the flues 3 and the gases through the netting 22 into the T 15 and stack 12 by the exhaust-steam, which escapes through the exhaust-pipe 16, extension-tube 19, and stack 12 into the atmosphere, the cinders and sparks being arrested by the netting 22 and falling into the bottom of the extension 5, from which they are removed through the cinder-chute 41, as before described. By this arrangement the sparks, cinders, gases, &c., are removed from the fire-box by the ordinary jet-draft, which is now almost exclusively used, if for any reason the auxiliary engine or fan mechanism should become disabled.

There are minor changes and alterations that can be made within my invention aside from those herein shown and described, and I would therefore have it understood that I do not limit myself to the exact construction herein shown and described, but claim all that falls fairly within the spirit and scope of my invention.

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

1. The combination with a boiler; of a smoke-stack having a direct and indirect connection with the smoke-box; an adjustable pipe concentric with said smoke-stack for conveying a jet-draft thereto; and a valve adapted when in one position to close the said direct communication between the smoke-box and smoke-stack, substantially as described.

2. The combination with a boiler; of a smoke-stack having a direct and indirect connection with the smoke-box; an adjustable exhaust-pipe carrying a valve adapted when in one position to close said direct communication between the smoke-box and smoke-stack; a draft-inducing means; and a spark-arresting compartment in said indirect connection, substantially as described.

3. The combination with a boiler having a smoke-box therein and a spark-arresting compartment; of a smoke-stack having a direct communication with said smoke-box and an indirect connection therewith through said spark-arresting compartment; a draft-inducing means forming the sole medium of connection between said smoke-box and spark-arresting compartment; an adjustable pipe for conveying a jet-draft into said smoke-stack and having a valve connected therewith; and means for adjusting said pipe, so that said valve will cover or uncover the said direct communication between said smoke-box and smoke-stack, substantially as described.

4. In a boiler having a smoke-box therein and a spark-arresting compartment 7; of a smoke-stack connected therewith; means, as a duct 14 and T 15, for connecting said spark-arresting compartment with said stack; an exhaust-pipe 16 having an extension-pipe 19 movable thereon; and a valve 21 fixed to said extension-pipe and adapted to cover and uncover the opening into said stack from said smoke-box, all constructed and operating substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

COLUMBUS PHILLIPS.

Witnesses:
L. B. FERGUSON,
A. C. HUNTER.