(No Model.) 4 Sheets—Sheet 1.

F. D. SHEPHERD.

FIRE BOX FOR LOCOMOTIVES.

No. 552,671. Patented Jan. 7, 1896.

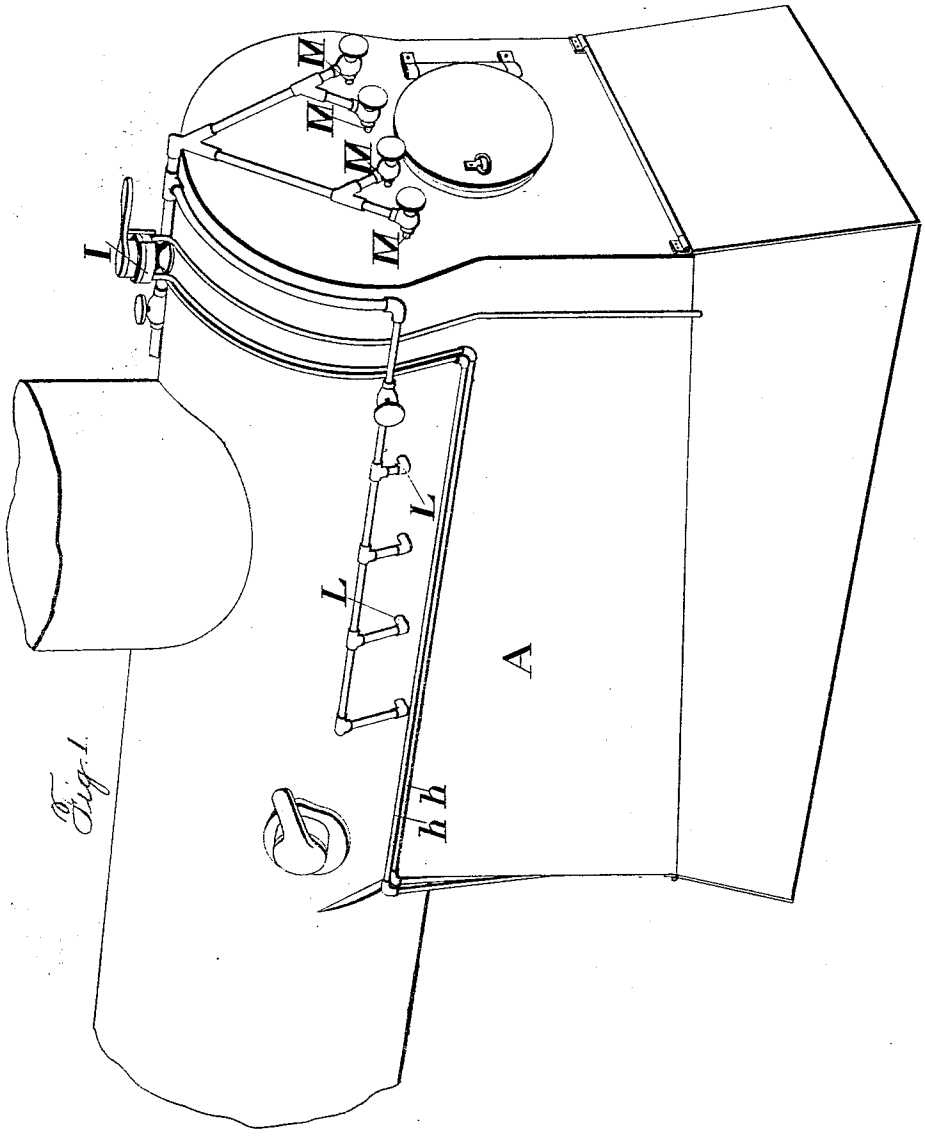

Fig. 1.

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Inventor.
Frank D. Shepherd
by Prindle and Russell
his Attorneys

(No Model.) 4 Sheets—Sheet 2.

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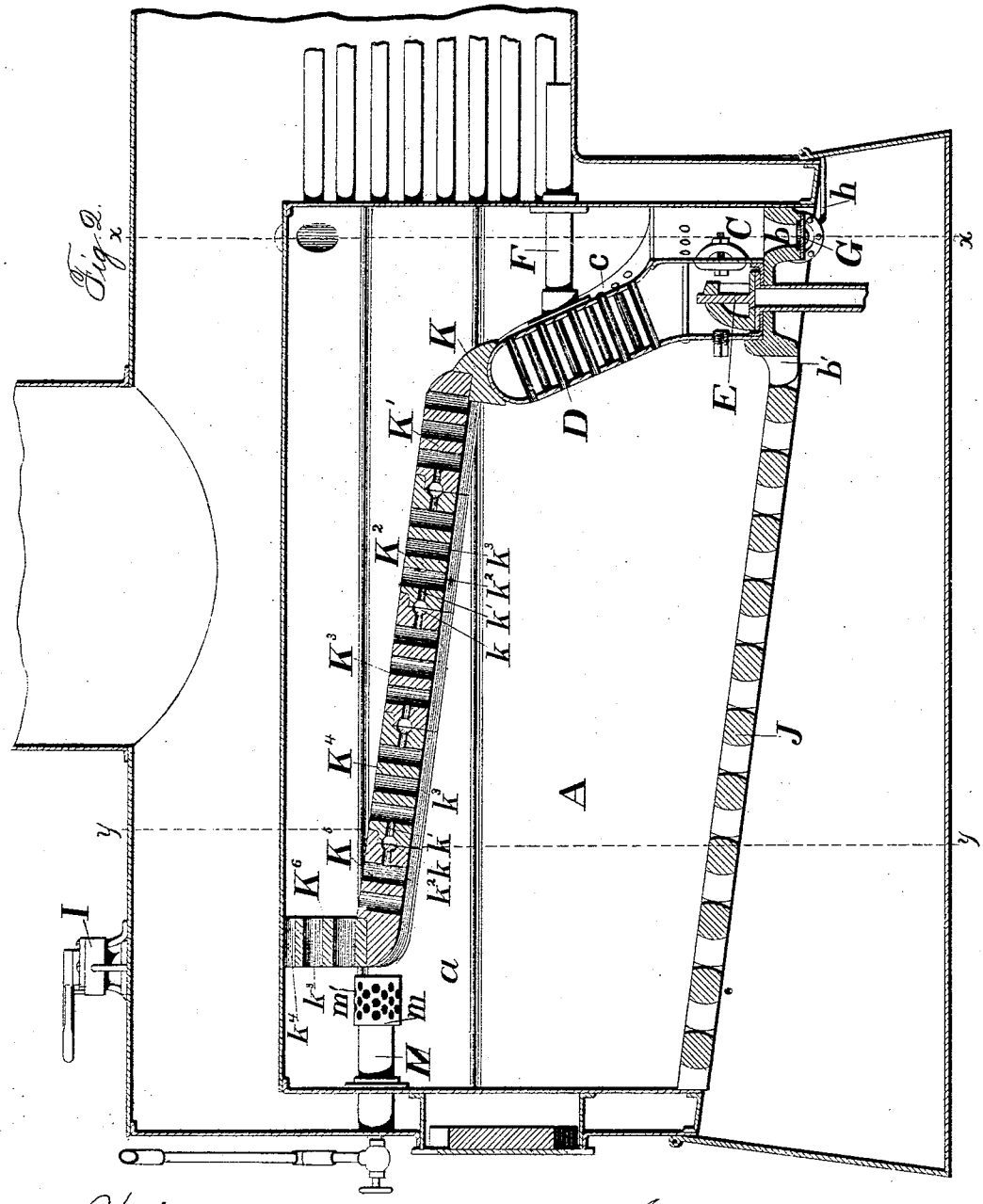

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(No Model.)

4 Sheets—Sheet 3.

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Fig. 4.

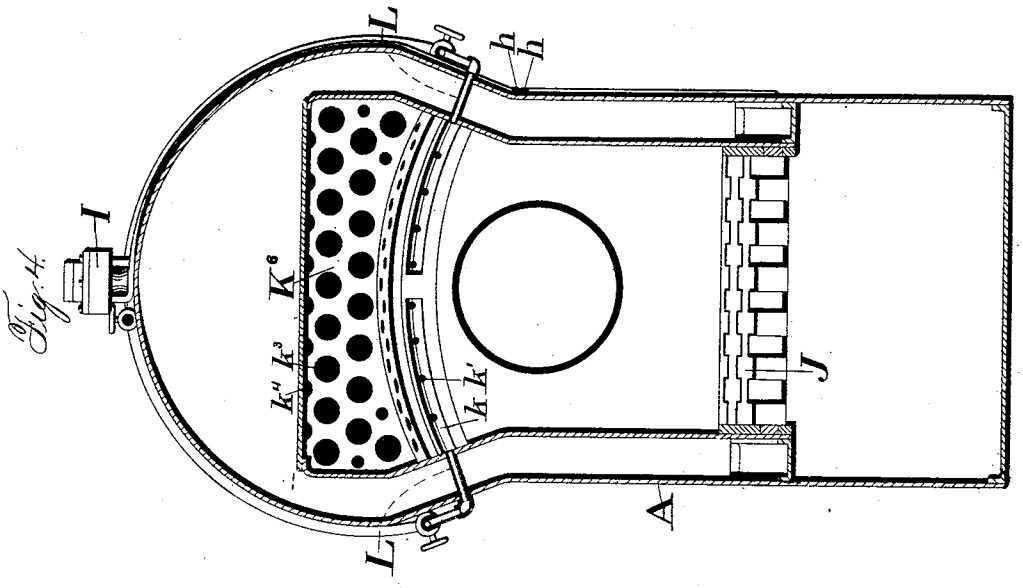
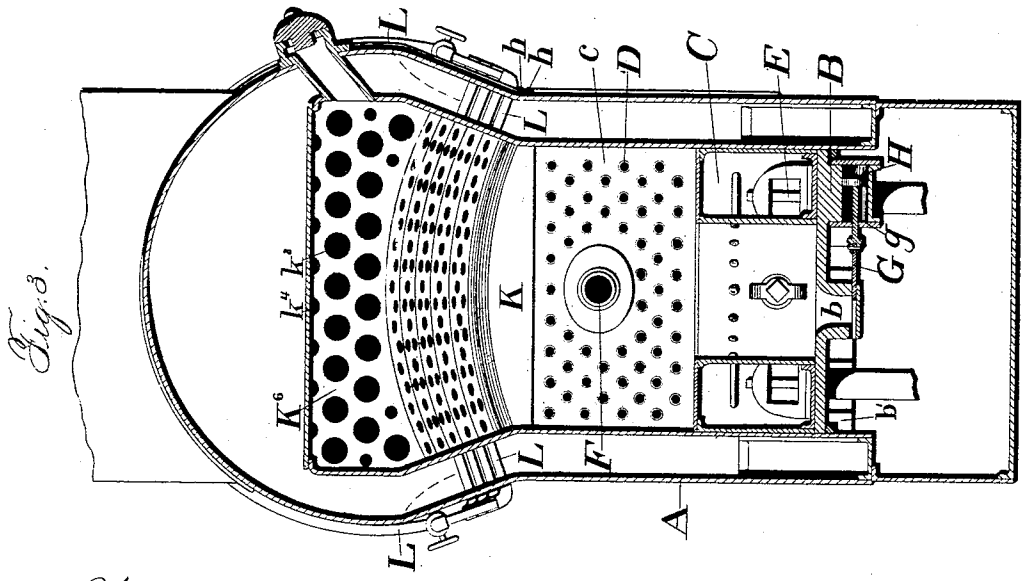


Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

F. D. SHEPHERD.

FIRE BOX FOR LOCOMOTIVES.

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Fig. 5.

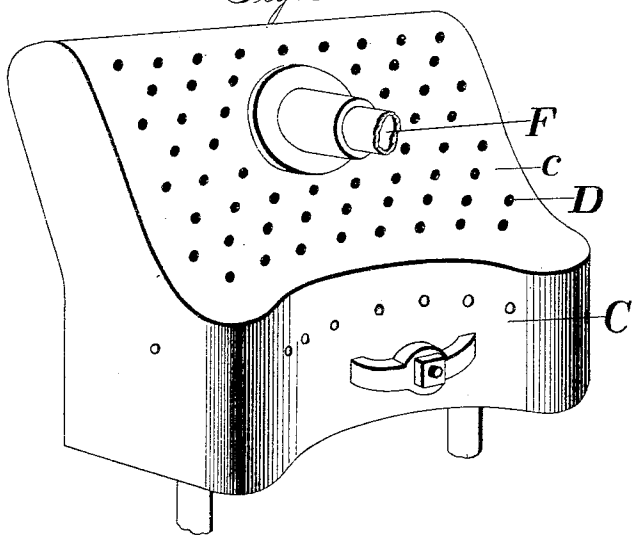
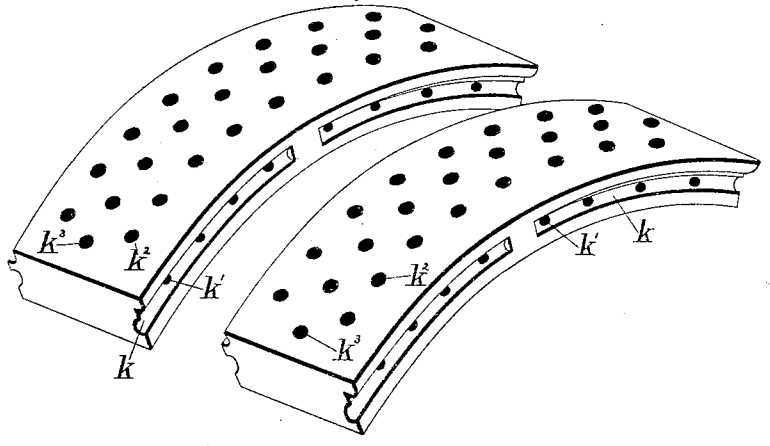


Fig. 6.



Witnesses:
Frank P. Prindle.
Henry C. Hazard.

Inventor:
Frank D. Shepherd
by Prindle and Russell
his attorneys

UNITED STATES PATENT OFFICE.

FRANK D. SHEPHERD, OF AURORA, ILLINOIS.

FIRE-BOX FOR LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 552,671, dated January 7, 1896.

Application filed July 11, 1895. Serial No. 555,617. (No model.)

To all whom it may concern:

Be it known that I, FRANK D. SHEPHERD, of Aurora, in the county of Kane, and in the State of Illinois, have invented certain new and useful Improvements in Fire-Boxes for Locomotives; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of the fire-box of a locomotive-boiler constructed in accordance with my invention. Fig. 2 is a longitudinal section of the same. Figs. 3 and 4 are transverse sections upon the lines *x x* and *y y*, respectively, of Fig. 2; Fig. 5, a detail perspective view of the feed-water heater; Fig. 6, a like view of two of the brick arch-sections separated from each other.

Letters of like name and kind refer to like parts in the several figures.

The design of my invention is to render more perfect than heretofore the combustion of the fuel in the furnaces of locomotives and other steam-boilers; and to this end said invention consists in the fire-box or furnace, and in the construction and combination of the parts thereof, substantially as and for the purpose hereinafter described.

As my invention has been designed more especially with reference to locomotives, I illustrate the same as applied to the fire-box or furnace thereof; but it is of course to be understood that this involves no limitation thereunto of such features of the invention as are adaptable to other steam-boiler furnaces.

In its general construction the fire-box A shown does not differ essentially from the common form, and is designed for use with a fire-tube boiler of usual construction.

Resting upon and fastened to a base or bed plate B at the forward end of the fire-box, close to the rear flue-sheet of the boiler, is a feed-water heater, comprising a suitably-braced lower portion C, having its side toward the boiler-sheet made concave, and an upper contracted portion *c* that inclines upward and rearwardly and is braced with horizontal tubular stay-bolts D. Connection is made at each side of the heater, through its bottom, with the injectors or other sources of supply of water, a check-valve E being provided at each inlet and hooded or covered at the side sheet of the heater adjacent to the fire to cause the water entering the heater to strike the side sheet farthest from the fire. The connection F between the heater and the boiler is located at the transverse center of the upper portion *c* of the former. Hand-holes are provided at suitable points for cleaning purposes.

For the removal of ashes accumulating between the flue-sheet and the feed-water heater an opening *b* is provided through the bed-plate B, that is adapted to discharge ashes into the ash-pan. Such opening, if left uncovered either permanently or even for more than the briefest interval, would be objectionable by reason of the admission of cold air, and accordingly a slide or cover G is provided upon the under side of said bed-plate B, which is adapted to be reciprocated to close and unclose it. Inasmuch as such slide is at a place inaccessible to the fireman to be operated by hand, and since it is desirable to have the opening *b* uncovered and covered rapidly, said slide is connected to a piston *g* in a small cylinder H, bolted to the under side of the bed-plate B. Steam may be alternately admitted to opposite sides of the piston *g* through pipes *h* and *h*, that run to a three-way valve I, receiving steam from the boiler, and preferably mounted upon the top of the fire-box in convenient reach of the fireman.

The top edge of the bed-plate B is provided with fingers *b'* and *b'* that form part of the dump-grate J, of the usual construction, provided at the bottom of the fire-box.

Extending from the feed-water heater to a point near the rear end of the fire-box at sufficient height above the fire-door as not to interfere with firing is a brick arch composed of a series of sections constructed and arranged as follows: Resting upon and supported by the top edge of the feed-water heater is a section K, having its upper side curved and rabbeted to receive the front edge of a second section K', having its rear edge recessed or rabbeted at its upper side to receive an overlapping rib or projection upon the front edge of a third section K^2. The rear edge of the latter is constructed precisely like the similar edge of the second section, and is overlapped by the front end of a

section K^3 constructed precisely like the section K^2, and the rear edge whereof is also engaged in like manner by a fifth similar section K^4. Overlapping the rear edge of the latter is a sixth section K^5, upon the rear portion of the upper side of which rests a seventh vertical section K^6, whose upper edge is flat and abuts against the under side of the crown-sheet of the fire-box. At their ends all of the several sections except the first and last are inclined and rest upon and are supported by a correspondingly-inclined surface *a* upon each side of the fire-box, and said sections are made successively shorter from the last one to the first, so that they decline toward the front end of the fire-box to increase the space above the arch from the rear to the front to provide for the forwardly-increasing volume of gases. In the rear edge of the section K′ and the front edge of the section K^5 and in both edges of the three intervening sections there is a semicircular groove that extends from each end of the section to within a short distance of the center thereof, which form when the sections abut a circular passage between them. Each passage thus formed communicates with a pipe L, passing through the side wall of the fire-box from the outside, which connects with a source of supply of air under pressure, preferably the main reservoir of the air-brake system, a suitable reducing-valve being placed in the connection with said reservoir. Each groove forming a passage *k* is connected by a number of small horizontal openings *k′* with vertical openings k^2 passing entirely through the section. In addition to the vertical openings k^2 each section provided with the latter has an additional row of vertical openings k^3 not connected with the air-supply. The vertical section K^6 has a number of horizontal openings k^3 for the passage of the flame and other products of combustion, and in its upper edge a number of grooves k^4 to enable the latter to pass close to the crown-sheet.

By the construction described a large volume of air is discharged into the fire-box and at such points as to effect the thorough mixing of the gases and its mingling therewith, so as to produce most perfect combustion.

In addition to the air supplied through the pipes L and L provision is made for supplying more air to the fire-box to promote combustion by employing several—preferably four—diffusing-tubes M and M, passing through the water-space of the fire-box at the rear end of the fire-box and located just above the fire-door, and arranged in a curved line corresponding with the curvature of the brick arch. At the inner end of each tube M is an enlargement *m*, provided with numerous small air-discharging holes *m′* and *m′* that cause the thorough mixing of the air emitted therefrom with the gases. Air is supplied to the tubes M from the same source as the pipes L are supplied, and to enable the quantity of air passing through each tube to be regulated at will a suitable valve is provided for each.

The construction and position of the feed-water heater is such that in addition to its primary object of heating the water it supports the brick arch, it directs the general course of the flames, so that they enter the boiler-tubes more nearly horizontally than they would without such a deflector, and it prevents lumps of coal being constantly thrown against the ends of the flues, to the injury of the beaded ends of the latter.

It is of course understood that a suitable valve will be provided in the main pipe connection with the air-supply to enable the air at will to be completely cut off from the fire-box.

Having thus described my invention, what I claim is—

1. The combination of a fire box, an arch comprising a substantially horizontal portion having vertical openings, and a vertical portion at the rear end of the fire box having horizontal openings, substantially as and for the purpose specified.

2. The combination of a firebox, a feed water heater therein, a bed plate for the heater, having an opening for the discharge of ashes, and a power actuated slide for covering and uncovering such openings, substantially as and for the purpose set forth.

3. The combination of a fire box, a feed water heater therein, a bed plate for the heater having an opening for the discharge of ashes, a slide to cover and uncover such opening, and a steam actuated piston connected to said slide, substantially as and for the purpose described.

4. The combination of the fire box, the feed water heater at the forward end thereof, the horizontal sectional arch, the front section of which rests upon said heater, and having vertical and horizontal openings, pipes communicating with the latter for supplying air thereto, the vertical member of said arch at the rear end thereof having horizontal openings, and the air supplying tubes having each a number of discharge openings, substantially as and for the purpose shown.

5. The combination of the fire box, the feed water heater therein the water inlet having a hood to direct the water to the side of the heater away from the fire in the box, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 4th day of June, 1895.

FRANK D. SHEPHERD.

Witnesses:
H. C. LITTLE,
E. T. PRINDLE.