(No Model.) 3 Sheets—Sheet 1.

A. WARNE.

FURNACE FIRE FEEDER.

No. 302,365. Patented July 22, 1884.

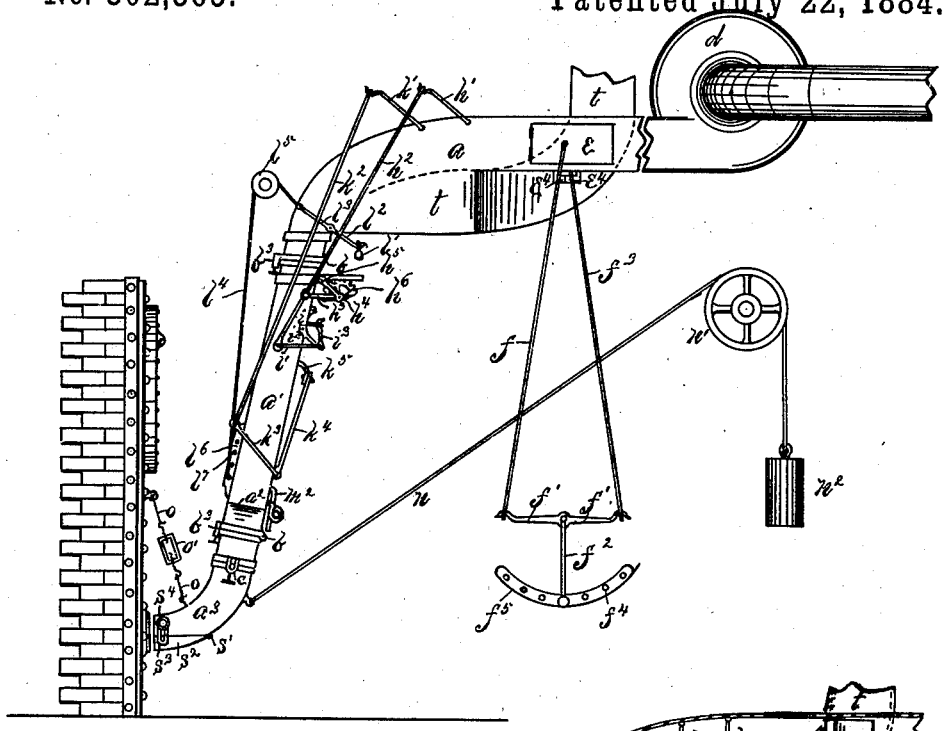

FIG 1

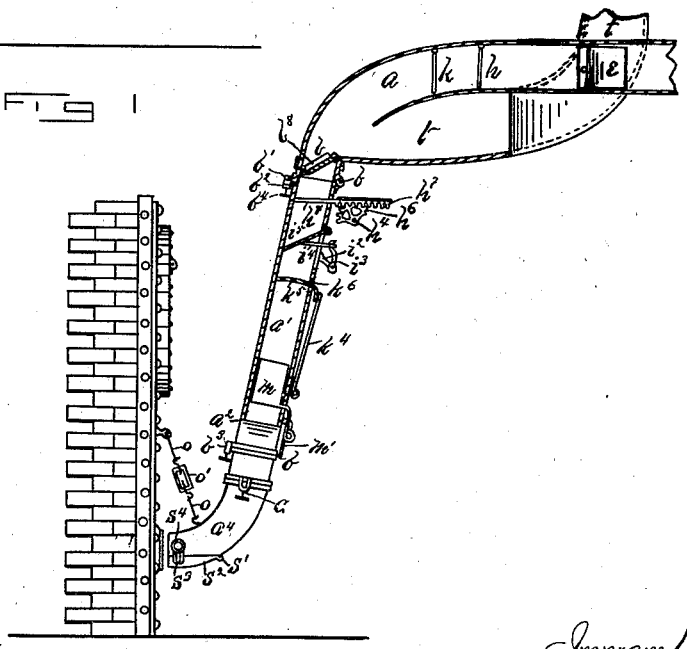

FIG 2

Witnesses:
Otto Goddick
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Inventor
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By W. T. Miller
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(No Model.) 3 Sheets—Sheet 2.

A. WARNE.

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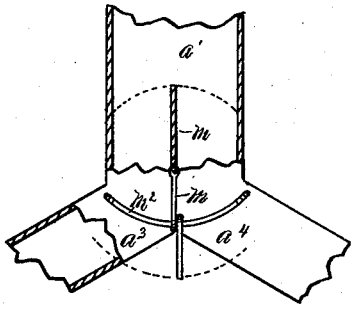

Fig 3

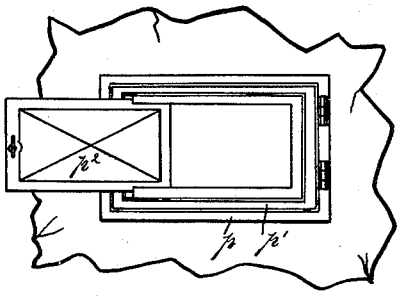

Fig 4

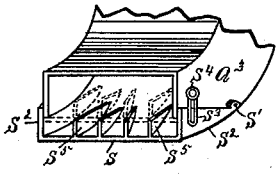

Fig 6

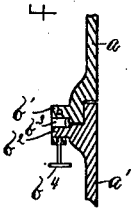

Fig 5

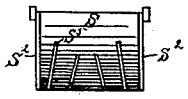

Fig 7

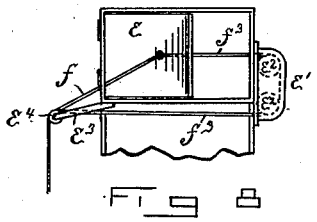

Fig 8

Witnesses:
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(No Model.) 3 Sheets—Sheet 3.

A. WARNE.

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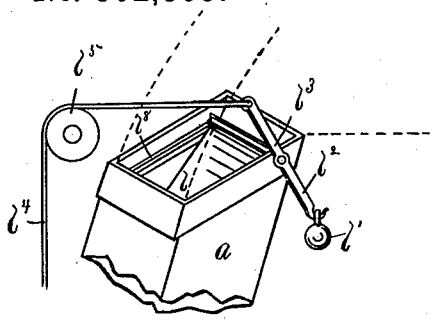

Fig 9

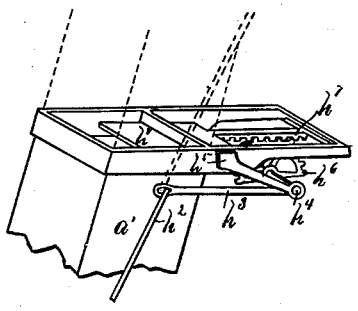

Fig 10

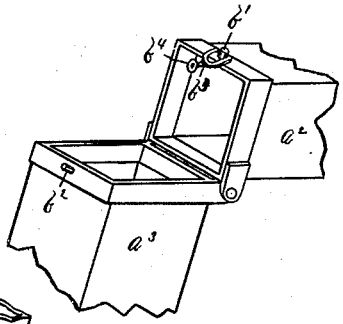

Fig 13

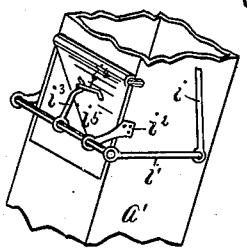

Fig 11

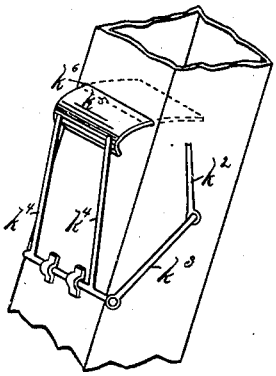

Fig 12

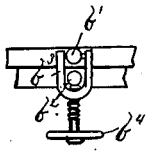

Fig 14

Witnesses:
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H. Marling

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By,
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Attorney.

UNITED STATES PATENT OFFICE.

ARTHUR WARNE, OF BUFFALO, NEW YORK.

FURNACE-FIRE FEEDER.

SPECIFICATION forming part of Letters Patent No. 302,365, dated July 22, 1884.

Application filed April 6, 1883. Renewed January 28, 1884. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR WARNE, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Furnace-Fire Feeders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to that class of furnace-fire feeders through which any light finely-divided fuel—such, for example, as the refuse of planing-mills—is automatically conducted through a conduit to the fire-pit of a furnace from any point near to or far from such furnace by means of a powerful blast of air from a suction-fan; and it consists, substantially, of certain novel arrangements and combinations of parts by means of which, first, the blast of air from the suction-fan, however powerful, is under complete and automatic control; second, the danger from fire by back-pressure is entirely avoided; third, the apparatus can be quickly and easily moved out of the way when access to the furnace-doors is desired; fourth, the mouth of the feeder can be readily and accurately adjusted to and from the furnace-doors; fifth, the fuel can be distributed readily to any and all parts of the furnace.

I will now proceed to more fully describe the manner in which I have accomplished these objects just named.

In the drawings, Figure 1 is a side elevation of my improved apparatus. Fig. 2 is a vertical sectional view of a portion of Fig. 1. Fig. 3 is a detail view of the deflecting-valve and its operating mechanism. Fig. 4 is a front view of one of the furnace-doors. Fig. 5 is a sectional view of a fastening device for the hinged sections. Figs. 6 and 7 are views of the fuel-distributer. Fig. 8 is a view of the valve for regulating the supply of fuel. Figs. 9, 10, 11, and 12 are enlarged detached perspective views of the different valves for regulating and controlling the blast of air. Fig. 13 is an enlarged perspective view of one of the hinged joints in the conduit; and Fig. 14 is an enlarged front view of the fastening device for the hinged sections.

Referring to the drawings, the main conduit for the passage of the fuel is composed, substantially, of two sections—the upper section, *a*, and the intermediate section, *a'*. The section *a'* is divide at the point a^2 into two branches, each leading to separate doors of the furnace. One of these sections is shown at a^3 in Fig. 1, and the other at a^4 in Fig. 2. The section *a'* is hinged to section *a* at the point *b*, so that it may be swung back out of the way when desired, and is securely held in operative position by the fastening device clearly shown in Fig. 5, in which the flanged and shouldered ends of the two sections are provided with the lugs b' b^2. The lug b' upon the section *a* has pivoted to it the bail b^3, having the tightening-screw b^4, which bail is swung under the lug b^2 of the section *a'*, and there held securely by means of the tightening-screw b^4. (See Fig. 13.) Each of the lower branches, a^3 and a^4, is similarly hinged and secured, so that they can be either independently swung back out of the way or swung with the section *a'*, to which they are hinged.

c c are similar fastening devices, two in number, upon each branch a^3 or a^4, which enables its lower portion to be entirely removed when desired.

d is the suction-fan, which is located at any convenient point, and which supplies the feeder with fuel by means of its suction and blast.

The suction *a* of the conduit is provided at or near the point where it commences to curve downwardly with the customary valve, E, for regulating the quantity of shavings or fuel to be fed. This valve is a hinged section of the side of the conduit, and is moved into such conduit any required distance to cut off a portion of the passing fuel by the following apparatus, which forms a part of my invention.

A casing, E', (see Figs. 1 and 8,) is secured to the side wall of the conduit opposite the hinged valve E, in which are vertically arranged two pulleys, E^2 E^2. Just below the hinged valve E, and secured to the conduit, is the projecting arm E^3, provided at its outer

end with two pulleys, E^1 E^4. A cord or chain, f, is secured at a point on the outer face of the valve E, and passes down over one of the pulleys E^1, and is secured to one of two arms, f' f', of a crank-lever, f^2. Another cord or chain, f^3, is secured at a point on the inner face of the valve E, and passes around the pulleys E^2 E^2 and under the conduit to and over one of the pulleys E^1 and down to the other arm, f', of the lever f. By turning the lever f^2 and securing it in any one of the holes f^4 in the curved bar f^5 the valve E can be held securely in any desired position and a portion of the fuel thrown out into the fuel-room when it is found necessary to do so.

In the section a of the conduit I have arranged two swinging valves, h and k, pivoted to the top wall of the conduit. These valves are swung forward more or less by the blast of air from the suction-fan, and when such blast is turned off they return to their normal vertical position by the force of gravity, the valves being made somewhat heavy for that purpose. These valves are connected with certain other valves and cut-offs in the section a', and by their movements, as just described, serve to automatically regulate the valves and cut-offs connected therewith. To be more explicit, the valve h has the lever h' rigidly secured thereto and adapted to move therewith. To the outer end of this lever h' is loosely secured the connecting-rod h^2, which is in turn loosely secured to a short lever-arm, h^3, rigidly attached to a journal, h^4, pivoted in the bracket h^5 of the conduit-section a'. Upon the journal h^4 is rigidly mounted the toothed segment h^6, which engages with and operates the toothed bar h^7, which forms a rigid extension of the sliding valve h^8. (See Fig. 10.)

i is another connecting-rod, loosely secured to and forming a continuation of the rod h^2. To the end of this rod is connected the arm i' of a crank-lever pivoted in the bracket i^2, the other arm, i^3, of which crank-lever is loosely connected to the short rod i^4, attached to the swinging valve i^5, which forms a portion of the wall of the conduit-section a' when closed. (See Fig. 11.)

The swinging valve k has the lever k' rigidly secured thereto and adapted to move therewith. To the outer end of this lever k' is loosely attached the connecting-rod k^2, which is in turn loosely attached to one arm, k^3, of a crank-lever pivoted to the conduit-section a', the other arm, k^4, of which has rigidly attached to its upper end the valve k^5, which is adapted to work back and forth across the interior of the conduit-section through a slot, k^6, in the front wall thereof. (See Fig. 12.) Another pivoted valve, l, adapted to swing downwardly, is located near the lower end of conduit-section a. This valve, like the valves h and k, is operated by the blast of air from the suction-fan, and is automatically closed when the blast is shut off by the weight l' upon the lever-arm l^2, which is rigidly secured to the valve l and moves with it. To regulate the extent to which the valve l may be opened by the blast, a lever-arm, l^3, similar to lever-arm l^2, is rigidly attached to such valve, and a cord, l^4, is secured to its outer end, which cord passes over a pulley, l^5, and down to the plate l^6, where it may be secured in any one of the holes l^7 with which the plate l^6 is provided.

l^6 is a frame against which the valve l rests when in closed position, to form a comparatively tight joint. (See Fig. 9.)

At the point where the section a' of the conduit is divided into the branches a^3 and a^4 is located the valve m, for closing up either one of the branches and feeding from the other only. This valve m has a lever, m', rigidly attached thereto, which is loosely bent around the curved guiding-rail m^2, its end which extends beyond such guiding-rail being used to turn the valve from one side to the other. Each branch a^3 a^4 has a cord, n, secured to it, which cord passes over a pulley, n', and carries a counter-weight, n^2, at the other end, which enables either of the hinged branches a^3 or a^4 to be easily and quickly moved back from the furnace, and held in such position when access to the furnace is desired; or the section a, with its branches a^3 a^4, can together be similarly manipulated.

In order to hold the discharge-openings of the branches in the desired position with relation to the furnace-doors, and to keep them carefully adjusted in such position, I have secured them removably to the furnace-front, above the furnace-doors, by the wires or chains o o, which have the turn-buckle o' attached midway, so that by manipulating such turn-buckle the desired adjustment can be easily and reliably effected. I prefer to keep the discharge-openings of the feeder a short distance away from the furnace-doors, as clearly shown in Fig. 1, preferably within from one to two inches therefrom, to enable the fireman to instantly detect the state of the fire with respect to the amount of fuel introduced into the furnace.

The furnace-doors I preferably construct as clearly shown in Fig. 4, in which p is the casing to which is hinged the open frame p'. This frame is provided with grooves or ways, in which the removable plate p^2, forming the main portion of the door, slides. By this construction I have a door which is not only adapted to receive the fuel from the feeder, but can be quickly adapted for use as an ordinary furnace-door when it is found necessary to dispense for a time with the feeder.

I have constructed the discharge-openings of the feeder in such a manner that the disposition of the fuel can be easily regulated. This improved construction is clearly shown in Figs. 6 and 7, in which s is the pivoted bottom, hinged at s', a short distance back of the discharge-opening. This bottom is provided with the side pieces, s^2, which lap over upon the sides of the main portion of the discharge-

opening, and are provided with the oblong loops s^3, which encircle the buttons or thumb-screws s^4, secured upon the sides of the discharge-opening. s^5 are spreaders arranged radially upon the movable bottom s, as clearly shown in Fig. 7. By moving the hinged bottom s up or down, the distance to which the fuel can be thrown is correspondingly regulated, while at the same time the radial spreaders operate to thoroughly distribute the fuel horizontally within the furnace.

t is a passage opening into the conduit-section a on its under side and at or near its junction with section a', through which passage the surplus air can escape. This passage t is preferably extended back to the room from which the shavings are first started to the furnace, being intended to provide for the return to the shavings-room of any fuel which might pass with the surplus air into and through such passage t.

It will be seen from the foregoing detailed description that the danger from fire by back-pressure when the blast is shut off is entirely avoided, as the valves h and k close by their own weight when the blast ceases, and by means of their connection with the valves h^2 and k^5 automatically close these valves as well, and in the same manner open the valve i^5, so that if any sparks should happen to pass back as far as the valve they would be thrown out into the furnace-room. The automatic valve l also serves as a similar additional precaution.

I claim—

1. In a furnace-fire feeder, the lower conduit-section, a', carrying the discharge opening or openings a^3, hinged to the upper conduit-section, a, as and for the purpose stated.

2. In a furnace-fire feeder, the lower conduit-section, a', carrying one or more branches or discharge-openings, a^3, at its lower end, extending from such conduit-section a' to the door of the furnace, and hinged, as shown, so that they may be readily swung back from such furnace-door to permit of access thereto, substantially as shown and described.

3. In a furnace-fire feeder, the upper conduit-section, the lower conduit-section, and one or more branches or discharge-openings, the lower section being hinged to the upper section, and the discharge opening or openings being also hinged to the lower conduit-section, as and for the purpose stated.

4. In a furnace-fire feeder, the lower and upper conduit-sections, hinged as shown, combined with a counter-weight, as and for the purpose stated.

5. In a furnace-fire feeder, the lower conduit-section and its one or more hinged branches or discharge-openings, combined with a counter-weight, as and for the purpose stated.

6. In a furnace-fire feeder, the upper and lower conduit-sections and the one or more branches or discharge-openings, hinged together as shown, combined with a counter-weight, as and for the purpose stated.

7. In a furnace-fire feeder, the discharge opening or openings, combined with an adjusting device secured to such discharge opening or openings and to the front of the furnace, as and for the purpose stated.

8. In a furnace-fire feeder, the combination, with the swinging valve h, of the sliding valve h^8, connected, as shown, to the valve h, so as to be operated automatically thereby, substantially as shown and described.

9. In a furnace-fire feeder, the combination, with the swinging valve h, of the swinging valve i^5, connected, as shown, to the valve h, so as to be operated automatically thereby, substantially as shown and described.

10. In a furnace-fire feeder, the combination, with the swinging valve h, of the sliding valve h^8 and the swinging valve i^5, both connected to the valve h, as shown, so as to be automatically operated thereby, substantially as shown and described.

11. In a furnace-fire feeder, the combination with the swinging valve k, of the sliding valve k^5, connected thereto, as shown, so as to be automatically operated thereby, substantially as shown and described.

12. In a furnace-fire feeder, the swinging valve l, the attached lever l^2, with its counter-weight l', the attached lever l^3, with its cord or chain l^4, the frame l^8, the pulley l^5, and the perforated plate l^6 l^7, all combined and operating substantially as shown and described.

13. In a furnace-fire feeder, as a means of operating the regulating-valve E, the cords $f f^3$, the pulleys E^2 E^2, the bracket E^3, with its pulleys E^4 E^4, the crank-lever f' f' f^2, and the adjusting-plate f^4 f^5, all combined and operating substantially as shown and described.

14. In a furnace-fire feeder, the discharge-opening provided with a movable and adjustable bottom, as and for the purpose stated.

15. In a furnace-fire feeder, the discharge-opening provided with the radial spreaders s^5, as and for the purpose stated.

16. In a furnace-fire feeder, the discharge-opening provided with a movable and adjustable bottom, having the radial spreaders s^5, as and for the purpose stated.

17. In a furnace-fire feeder, as a means of attachment for the hinged and removable conduit-sections, the fastening device consisting of the lugs b' b^2 upon the flanged and shouldered ends of such sections, the swinging bail b^3, and tightening-screw b^4, substantially as shown and described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR WARNE.

Witnesses:
H. H. LITTLE,
W. T. MILLER.