No. 620,103. Patented Feb. 28, 1899.

B. D. CHILDREY.

GRATE FOR UNDERFEEDING FURNACES.

(Application filed Apr. 25, 1898.)

(No Model.) 3 Sheets—Sheet 1.

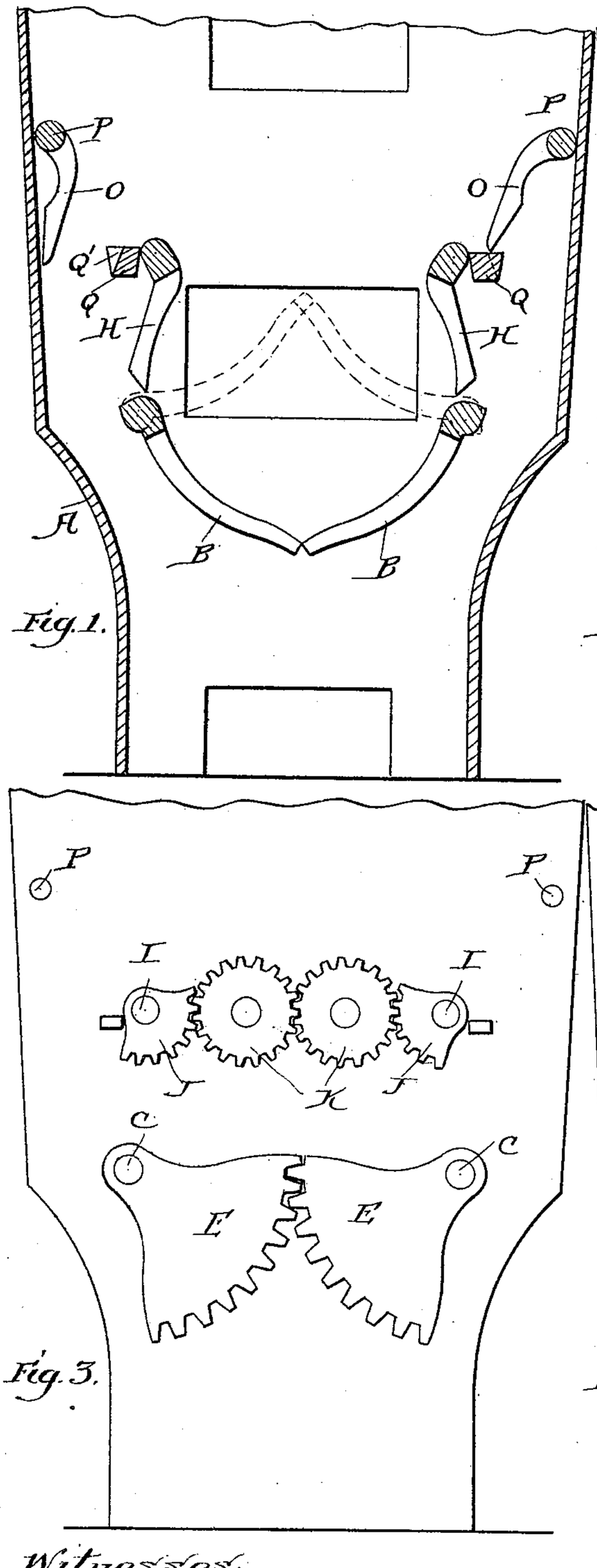

Fig. 1.

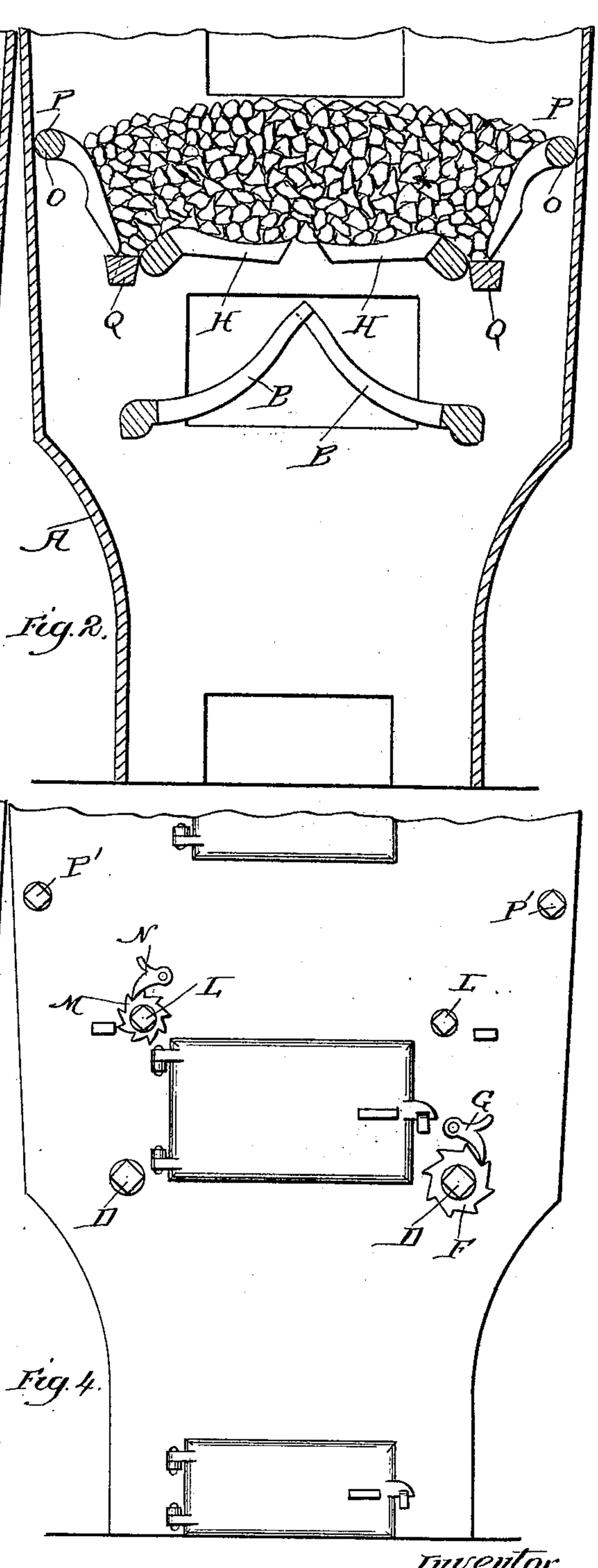

Fig. 2.

Fig. 3.

Fig. 4.

Witnesses:
H. B. Hallock.
Samuel Stuart

Inventor.
Benjamin D. Childrey.
by W. C. Hazelton Jr.
Attorney.

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Fig. 5.

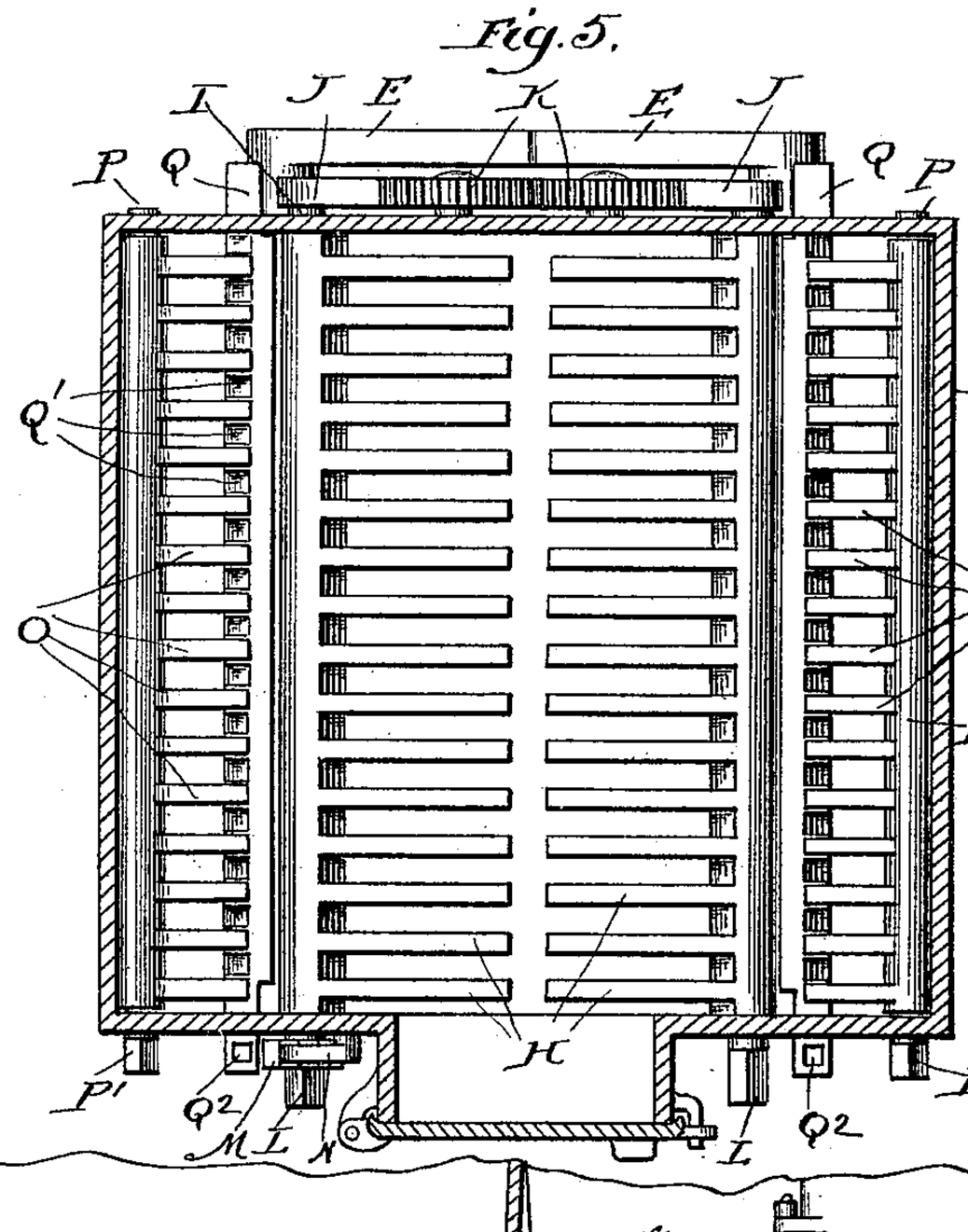


Fig. 6.

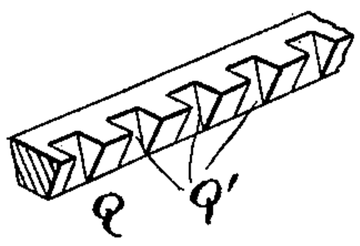


Fig. 7.

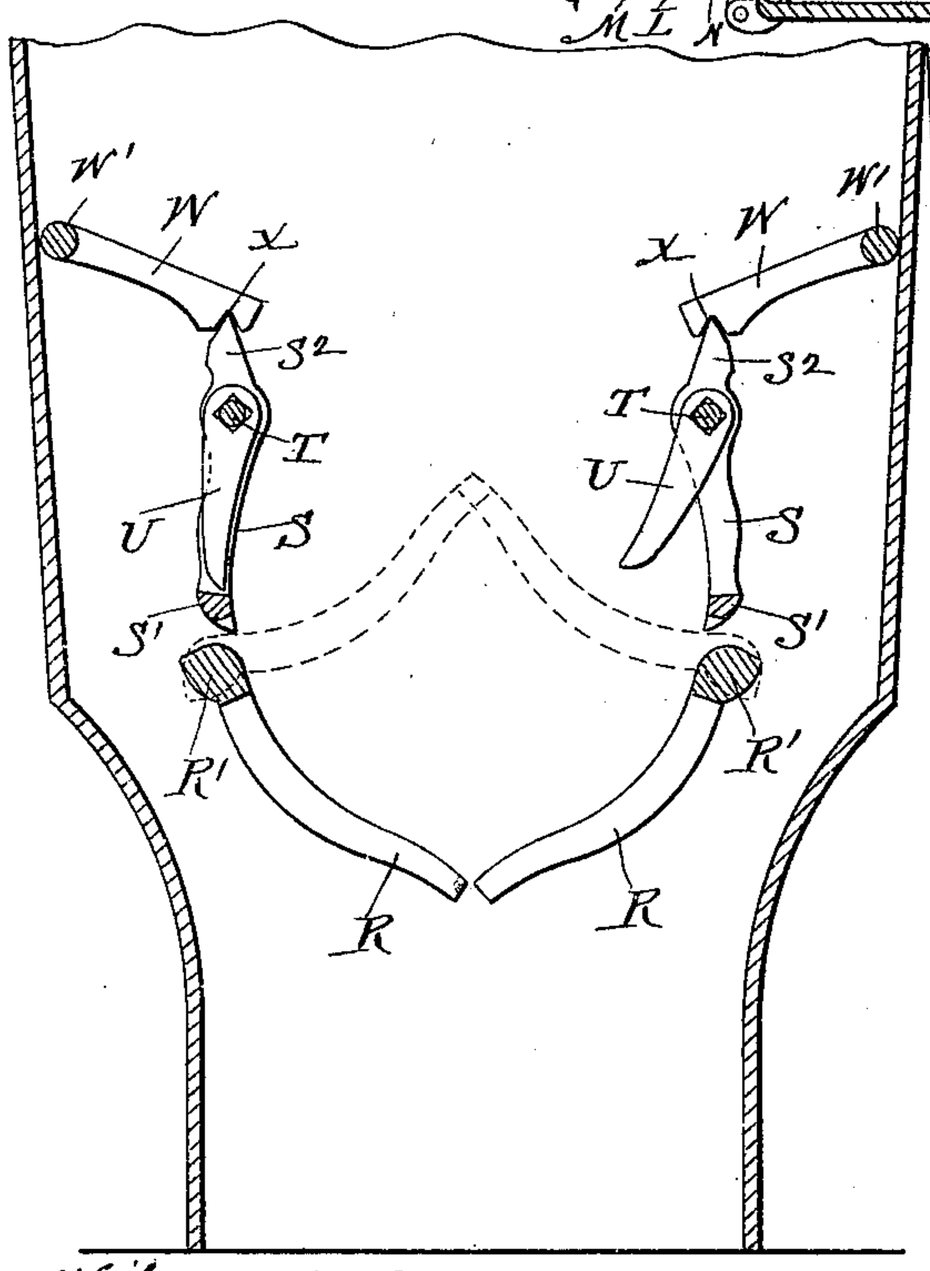
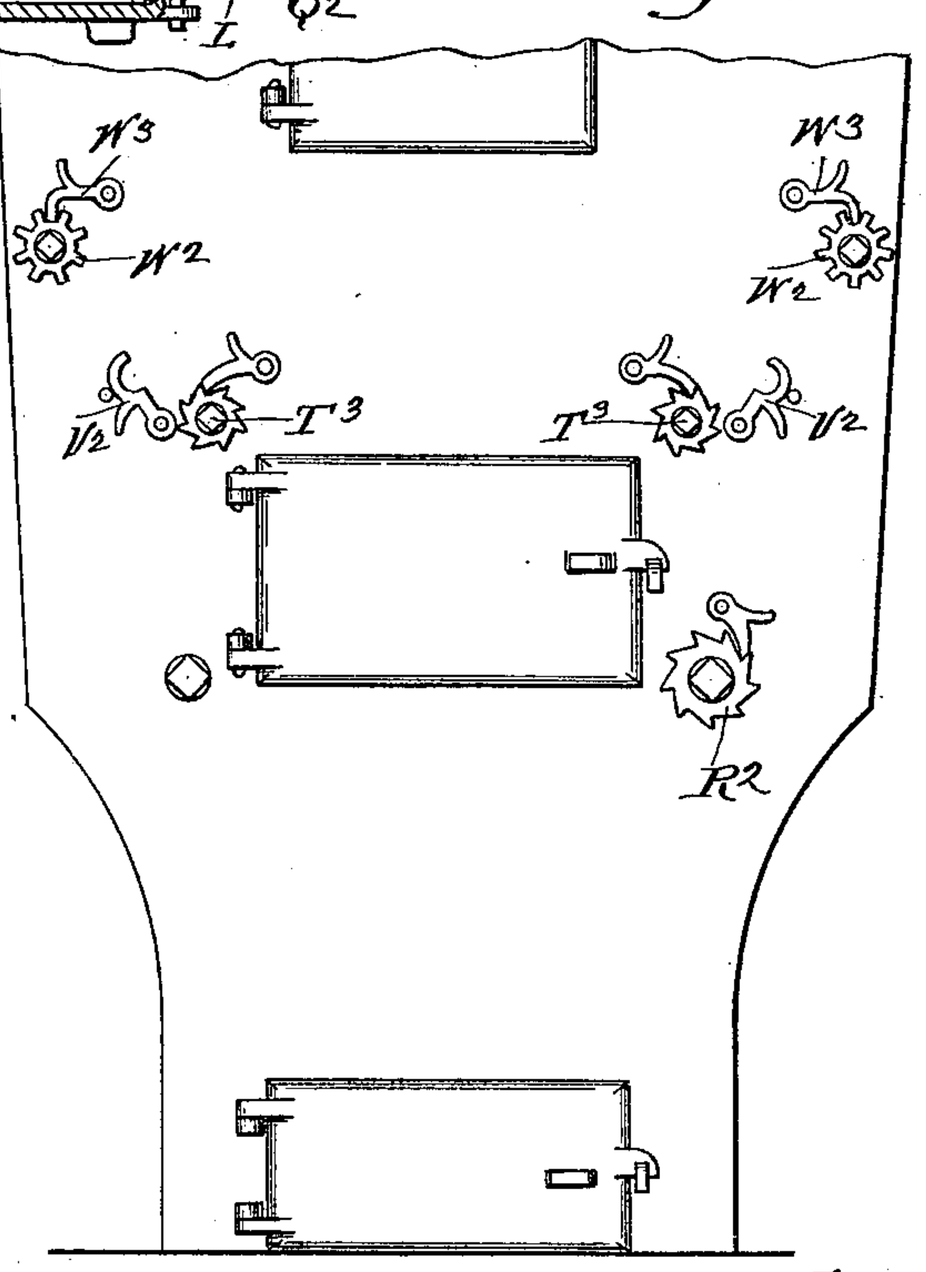


Fig. 8.



Witnesses:
H. B. Hallock.
Samuel Stuart

Inventor:
Benjamin D. Childrey
by Geo. C. Hazelton, Jr.
Attorney.

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Fig. 9.

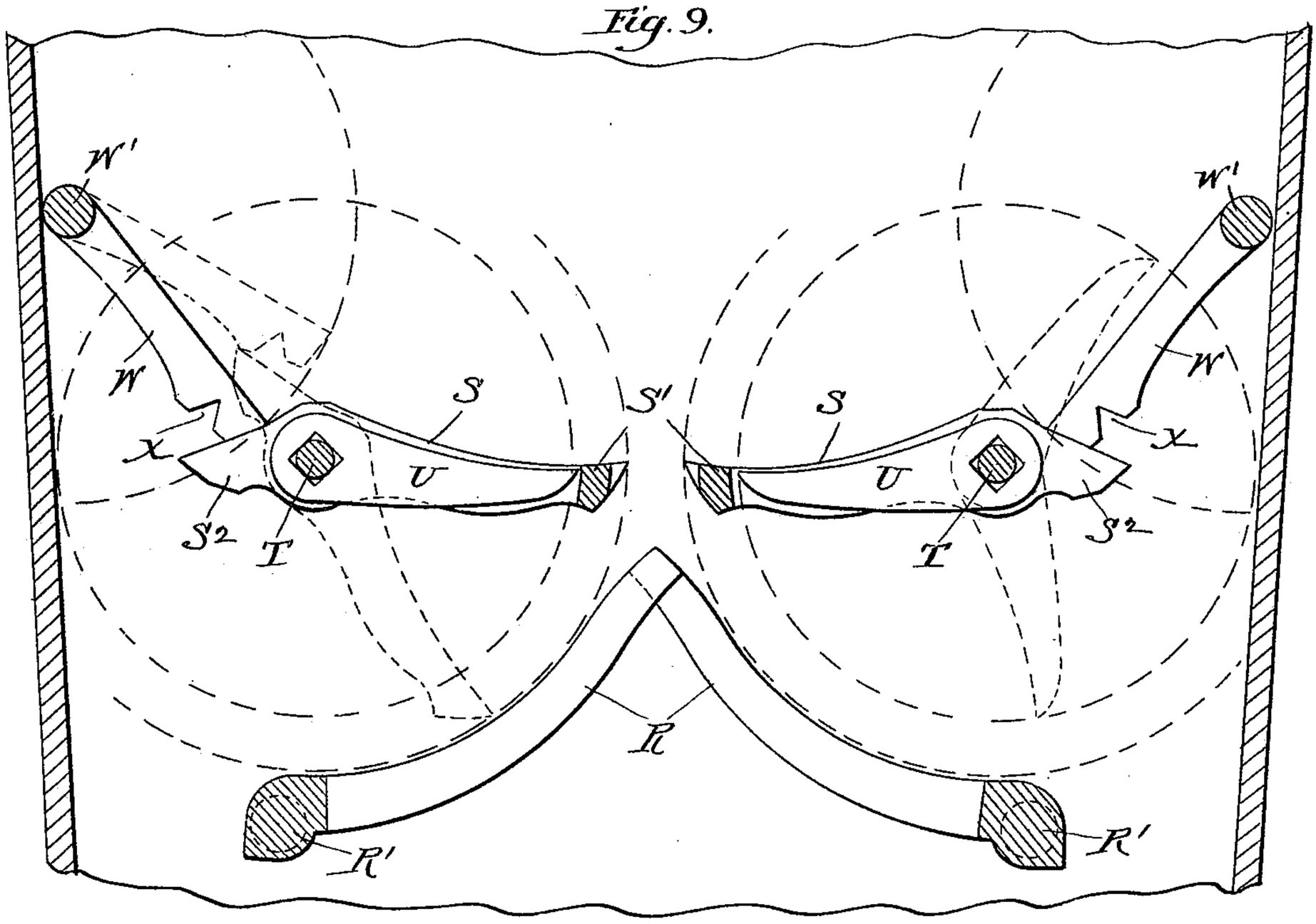


Fig. 10.

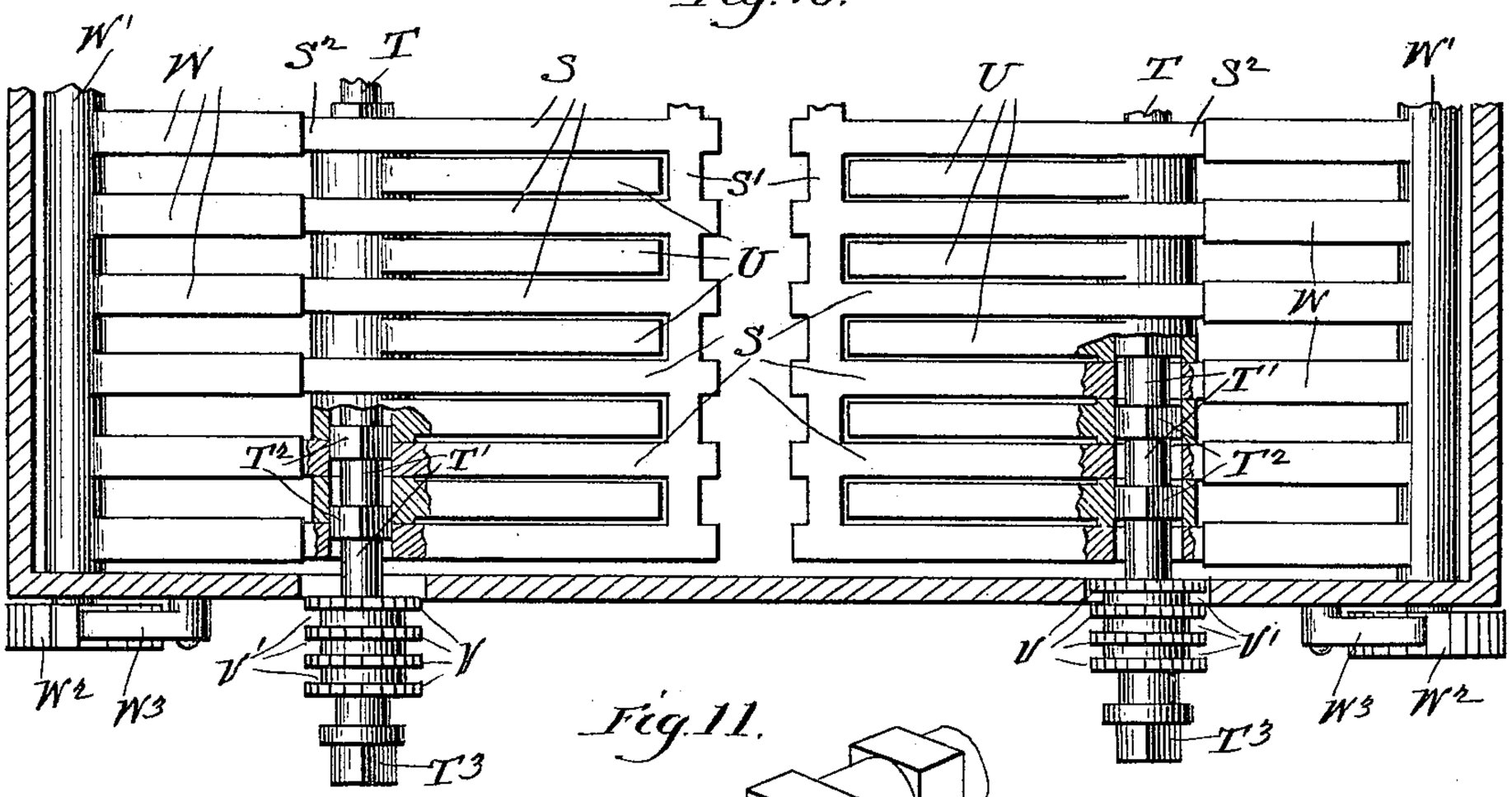
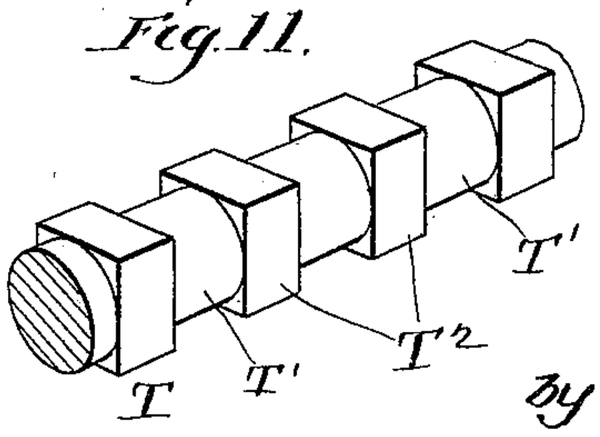


Fig. 11.



Witnesses:
H. B. Hallock.
Samuel Stuart

Inventor:
Benjamin D. Childrey
by Wm. C. Hazelton
Attorney.

UNITED STATES PATENT OFFICE.

BENJAMIN D. CHILDREY, OF PHILADELPHIA, PENNSYLVANIA.

GRATE FOR UNDERFEEDING FURNACES.

SPECIFICATION forming part of Letters Patent No. 620,103, dated February 28, 1899.

Application filed April 25, 1898. Serial No. 678,721. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN D. CHILDREY, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a certain new and useful Improvement in Grates for Underfeeding Furnaces and Means for Operating the Same, of which the following is a specification.

My invention relates to a new and useful improvement in grates for underfeeding furnaces and means for operating the same, and has for its object to provide effective devices of this description by which fuel may be fed beneath the fire-bed of the furnace and then elevated thereto in such manner as to maintain a live energetic surface upon the fire-bed, thereby avoiding the many disadvantages attendant upon top-feed furnaces and more economically utilizing the fuel in that substantially the entire heat generated by combustion will act directly upon the surfaces to be heated and with the further advantage of avoiding the partial banking of the fire when fresh fuel is fed thereto.

A further object of my invention is to provide for the stoking of the fire and the removal of clinkers or other objectionable accumulations; and, finally, the prime object of my invention is to so construct and arrange a grate as to render it especially adapted for use in connection with a closed furnace—that is to say, one to which atmospheric air is not fed by the ordinary methods for the support of combustion—since in such a furnace it is essential to avoid opening doors of any description above the fire-bed, as this has a tendency to destroy the effect of the heat generated by combustion, chill the surfaces which are being heated, and interfere with the combustion.

With these ends in view this invention consists in the details of construction and combination of elements hereinafter set forth and then specifically designated by the claims.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same, the operation and construction will now be described in detail, referring to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a section of a simple form of furnace having my improved grates adapted thereto; Fig. 2, a similar view showing the sustaining grate-bars in their elevated position supporting the fire-bed; Fig. 3, an elevation of a portion of the furnace, showing the means for operating the grates; Fig. 4, a similar view taken from the opposite side of the furnace, showing the ratchets and pawls for holding the grates in any adjustment; Fig. 5, a horizontal section showing the grates in plan; Fig. 6, a perspective of a portion of one of the notched bars which serve to support the side grates in their active position or permit them to be swung outward for the removal of clinkers and the like; Fig. 7, a further embodiment of my improvement, in which stoking-bars are provided in connection with the supporting-grates; Fig. 8, an elevation of a portion of the furnace, showing the mechanism for operating and holding the several grates in their adjustments; Fig. 9, an enlarged diagrammatical view of the grate-bars, showing the several positions which they may assume; Fig. 10, a section of a portion of the furnace, showing the grate-bars in plan and the stokers arranged within the interdental spaces; and Fig. 11, a perspective of a portion of one of the operating-rods for these grate-bars and stokers.

In carrying out my invention as shown in Figs. 1 to 6, inclusive, A represents the furnace, which may be of any size or construction, as I do not desire to lay stress upon this feature, since my improvement is adapted for use in connection with a variety of furnaces. Grate-bars B are hung in the lower portion of this furnace upon suitable trunnions C, which latter project through the walls of the furnace and are squared, as indicated at D, so as to be adapted to receive the socket of a suitable lever for operating these bars, as is well understood, and the opposite end of these trunnions have secured thereon the segmental gears E, which mesh together, as clearly shown in Fig. 3, so as to cause the bars to move in unison when either of them is operated. A small ratchet F is also secured upon one of the trunnions, having teeth with which the pawl G is adapted to engage, so as to hold the grate-bars in any

position to which they may be adjusted. These grate-bars when in their lowered position, as shown in Fig. 1, form a basket or magazine, into which the fuel may be fed through a suitable door or opening prior to being elevated to the fire-bed, a process of which will be hereinafter set forth.

H represents the sustaining-grates, each of which is hung upon the trunnions I, these trunnions projecting through the walls of the furnace and having secured upon the rear ends thereof the segmental pinions J, which mesh with the two idle-gears K, the latter meshing together so as to bring about a uniformity of movement of the sustaining-grates when they are operated, which is effected by the squared portions L of the trunnions I by the application of a suitable wrench or lever thereto, one of the trunnions having a ratchet M secured thereon, with which the pawl N engages to hold the grates in their adjustment. Side grates are hung within the furnace upon the trunnions P, which have their front ends squared, as indicated at P', for convenience in operating these grates, and the latter are supported in their active position by the bars Q, which have formed thereon a series of notches Q', and these bars are arranged to slide longitudinally and have the holes Q^2 therein, by means of which they may be so manipulated that when these bars are in a position carrying the notches Q' out of alinement with the ends of the grates O said grates will rest upon the bars, as clearly shown in Fig. 2 and also upon the right side of Fig. 1, by which arrangement when the sustaining grate-bars H are elevated the fire-bed will be properly supported and confined, as shown; but when it is desired to swing the grates O outward for clearing the fire from clinkers or other foreign non-combustible substances this is accomplished by sliding the bars Q lengthwise sufficiently to cause the notches Q' to come in alinement with the ends of the grates O, when the latter will be free to swing outward to the position shown upon the left side of Fig. 1.

From the foregoing description the feeding of fuel to the fire-bed will be obviously as follows: The grate-bar B, being in the position shown in Fig. 1, the fuel is first fed to this magizine, as before stated, and when the same is properly supplied these grate-bars are swung upward to the position shown in dotted lines in this figure, and they are so curved that when in this position the grates H may be swung inward and upward, and the ends thereof will pass in close proximity to the upper surfaces of the bars B, and in so doing carry the fuel which rests thereon and which has been previously elevated by said bars B to the fire-bed, which operation will force the fuel previously contained within said bed upward, and in so doing will convex the upper surface thereof, thereby giving to the base products of combustion, such as ashes and clinkers, a tendency to move toward the sides of the fire-bed, from whence they may be removed by the proper manipulation of the grate-bars O, as before described.

After the grate-bars B have been relieved of the fuel by the grates H the first-named bars may be returned to their normal position, reëstablishing the magazine, into which fresh fuel may be fed, to be afterward elevated in a similar manner.

In Fig. 7 to 11, inclusive, another embodiment of my improvement is shown, in which not only is provision made for the elevation of the fuel to the fire-bed beneath, but a series of stoker-bars are provided for agitating and clearing the fire when occasion requires, and in this construction R represents the magazine grate-bars, which are hung upon the trunnions R', the same being connected together in the same manner as that described in connection with my first construction, a special ratchet R^2 being provided for holding these grate-bars in the desired adjustment.

The sustaining grate-bars S are connected together at their outer ends, as shown at S', and are hung upon the operating-rods T, said rods being journaled within the walls of the furnace in such manner as to have a limited longitudinal movement therein, and have alternately round sections T' and square sections T^2, the grate-bars being so hung thereon as to permit these operating-rods to be moved lengthwise to bring either the round sections or the square sections into the eyes of the grate-bars, which are square. The result of this is that when the round sections are in the eyes of the grate-bars the turning of the rod upon its axis will not operate said grate-bars, but when the square sections are in said eyes and the rod is revolved the grate-bars will be operated. U indicates the stoker-bars, each of which is located within one of the interdental spaces of the grate-bars S and are hung upon the rods T, and the eyes of these stoker-bars are also squared, so that in like manner when they are upon the round sections of the rod T the revolving of the rod will not affect these stoker-bars, but when they are upon the squared sections of said rod then any rotation of the rod will bring about a corresponding movement of the stoker-bars.

Now it is obvious that when the squared sections T^2 of the rod T lie partly within the eyes of the stoker-bars and the eyes of the grate-bars both the stoker-bars and the grate-bars would be under control of the operating-rods T, the outer ends of which are squared, as indicated at T^3, for the application of a suitable wrench or lever. For the purpose of adjusting the operating-rods T and securing them in their proper adjustment relative to the stoker-bars and grate-bars, so as to insure the operation either of the grate-bars independently of the stoker-bars or the stoker-bars independently of the grate-bars, or both of said bars in unison, I

provide a series of ratchets V upon the outer portions of the rods T, and these ratchets are so placed as to form spaces V′ therebetween, which latter are for the reception of the latches V^2, and when one of these latches is turned into one of the spaces it is obvious that that particular operating-bar cannot thereafter be moved lengthwise until the latch has been swung out of the space. Thus it will be seen that by swinging this latch into engagement with one or the other of the spaces the operating-rod will be held in such position as to bring its squared portions T^2 wholly into engagement with the eyes in the grate-bars S or wholly within the eyes of the stoker-bars U or partially in engagement with the eyes of each of said bars, with the result above set forth. This permits the swinging of the grate-bars S inward and upward or the elevation of the fuel from the magazine-bars R to the fire-bed, and during such process the stoker-bars may be moved in unison therewith or not, as the case may require, and when the fire-bed at any time becomes clogged or dead it may be agitated by the operating of the stoker-bars independent of the grate-bars. W represents the side grate-bars, which are hung within the furnace by the trunnions W′, so as to have the proper amount of swinging movement therein, and each of these trunnions has thereon a lock-latch W^2, with which the locking-pawl W^3 is adapted to engage. The result is that these grate-bars may be swung to a number of positions and there held by the locking-pawl.

The grate-bars W not only serve the purpose of confining the fire-bed within certain limits, but they also act to hold the grate-bars S in a number of positions when the round sections of the operating-rods T lie wholly within the eyes of the grate-bars S, and this is necessary, since at these times the grate-bars S would be free to swing and would therefore not be capable of supporting the fire-bed. To bring about this result, the grate-bars S have formed therewith extensions S^2, with which the ends of the grate-bars W may come in contact, as clearly shown in Fig. 9, to support said bars S in their horizontal position, and notches X are formed in the grate-bars W for engagement with the extreme ends of the extensions S^2, thereby holding the grate-bars S in their vertical position, as shown in Fig. 7. Dotted lines in Fig. 9 also illustrate other positions in which the grate-bars S may be held by the bars W, and as the latter are locked against any movement by the locking-pawls W^3 the desired result is had.

It will also be noted by reference to the dotted lines in Fig. 9 that the stoker-bars may be so swung as not only to clear the grate-bars S of obstructions, but may also be so swung as to likewise clear the grate-bars W of the base products of combustion.

From what precedes it follows that a perfect underfeed mechanism is provided, which may be adapted to a variety of furnaces; but of course I do not wish to limit myself to the exact constructions here shown, as it is obvious that these may be varied to a considerable degree without departing from the spirit of my invention, the gist of which rests in the broad idea of providing a series of grate-bars or their equivalents for first receiving and then elevating, step by step, fuel to the fire-bed, so as to add said fuel to that already contained within the fire-bed from the under side thereof, whereby the upper surface of said fire-bed is not banked, but the heat emanating therefrom is free to radiate to the surfaces to be heated, and my invention may be used in connection with furnaces which receive the oxygen to support combustion from beneath or above the grate-bars, or both.

Having thus fully described my invention, what I claim as new and useful is—

1. In a device of the character described, a movable magazine located beneath the fire-bed and adapted to rotate and elevate the fuel, and grate-bars adapted to swing open to receive the fuel.

2. An apparatus for feeding fuel to the under side of a fire-bed consisting of a receiving member so constructed as to force the fuel upward, a sustaining-grate adapted to work in conjunction with the receiving member whereby the fuel may be carried from the latter to the fire-bed, and means for removing the base products of combustion from the fire-bed, as specified.

3. In combination with a furnace, a series of grate-bars so arranged as to form a receiving-magazine for the fuel, means for operating said grate-bars to force the fuel upward, a series of sustaining grate-bars adapted to swing in such manner as to convey the fuel from the receiving-bars to the fire-bed, and side grates for confining the fire-bed, and means for removing the base products of combustion from the fire-bed, as specified.

4. In combination with a suitable furnace, a series of receiving grate-bars pivoted within the furnace and adapted to form a magazine and force the fuel contained thereon upward, means for operating said grate-bars, a series of sustaining grate-bars adapted to receive the fuel from the receiving-bars and force it upward to the fire-bed, means for operating these last-named bars, side grate-bars for confining the fire-bed, means for holding the last-named bars in their active position, and means for swinging the same to remove the base products of combustion from the fire-bed, as specified.

5. In combination with a suitable furnace, a series of receiving grate-bars adapted to form a magazine, means for swinging said bars so as to force the fuel thereon upward, a series of sustaining-bars also adapted to be swung upward to carry the fuel from the re-

ceiving-bars to the fire-bed, a series of stoking-bars so arranged as to agitate the fire-bed, means for operating said stoking-bars, side bars for confining the fire-bed and adapted to work in conjunction with the stoker-bars, and means for operating the side bars, as and for the purpose set forth.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

BENJAMIN D. CHILDREY.

Witnesses:

H. B. HALLOCK,

SAMUEL STUART.