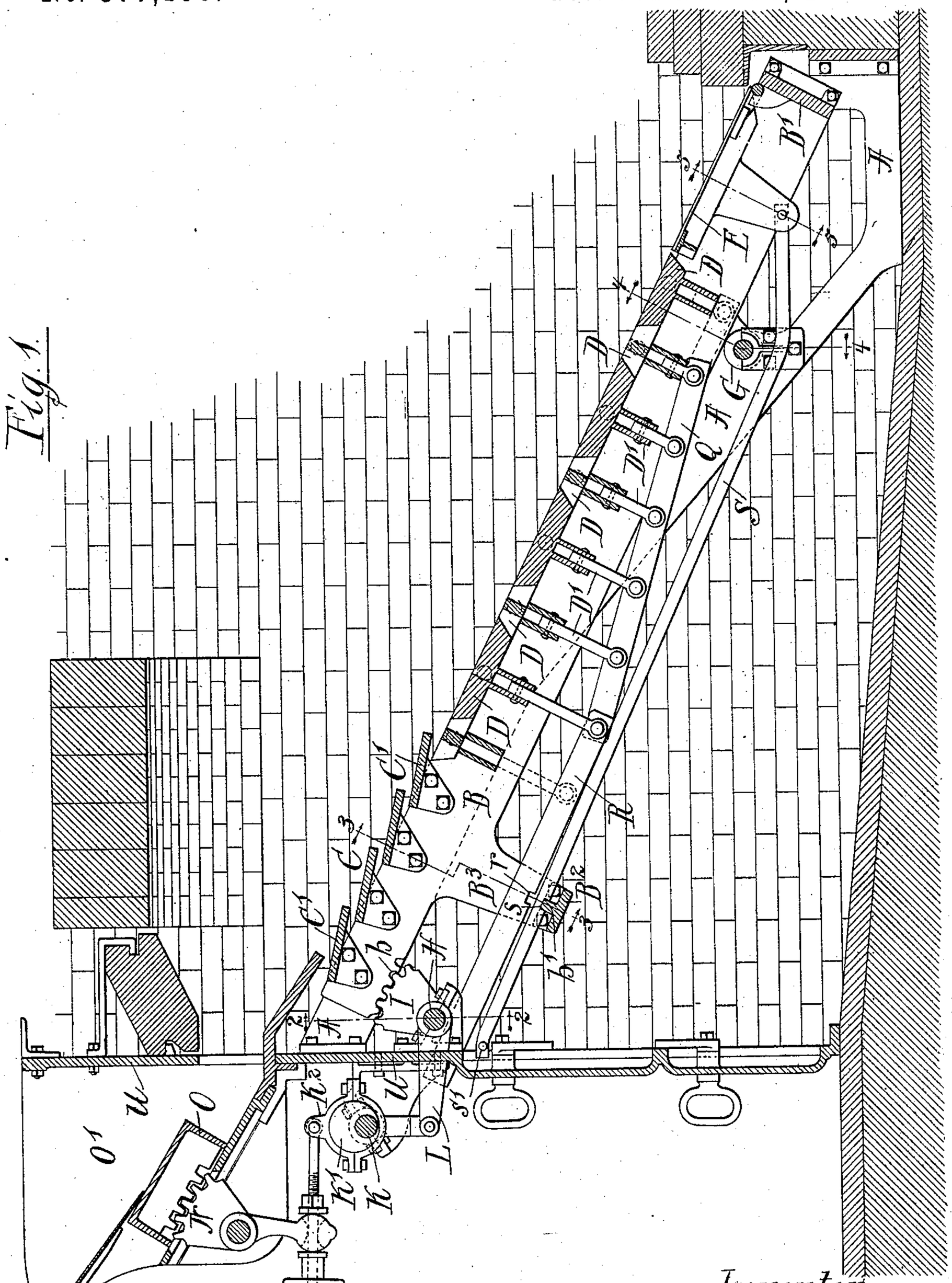
(No Model.) 2 Sheets—Sheet 1.

H. E. LONGWELL.

FURNACE GRATE.

No. 577,190. Patented Feb. 16, 1897.

Fig. 1.



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Clinton Hamlink

Inventor:-
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(No Model.) 2 Sheets—Sheet 2.

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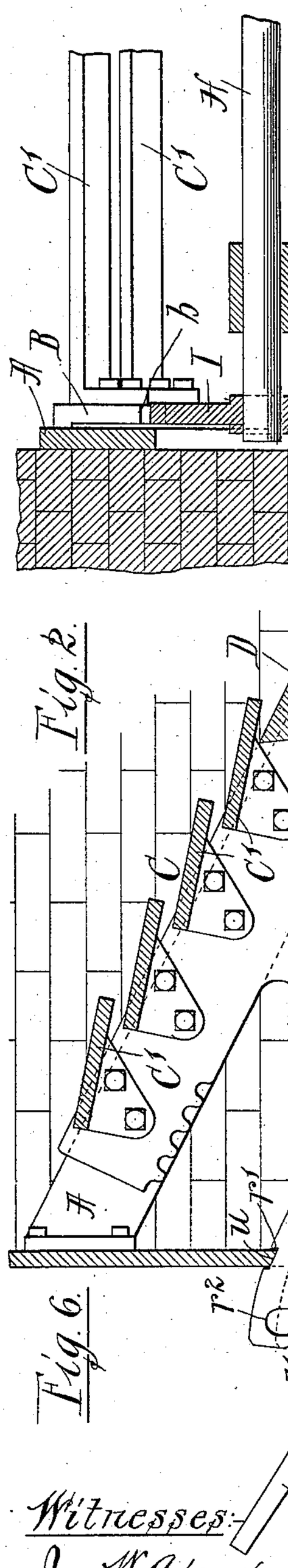

Fig. 5.

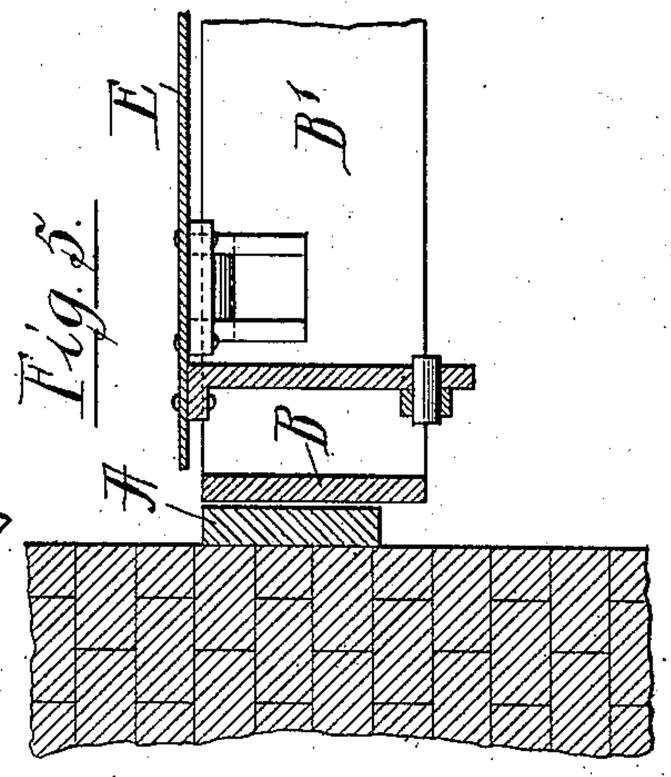

Fig. 2.

Fig. 4.

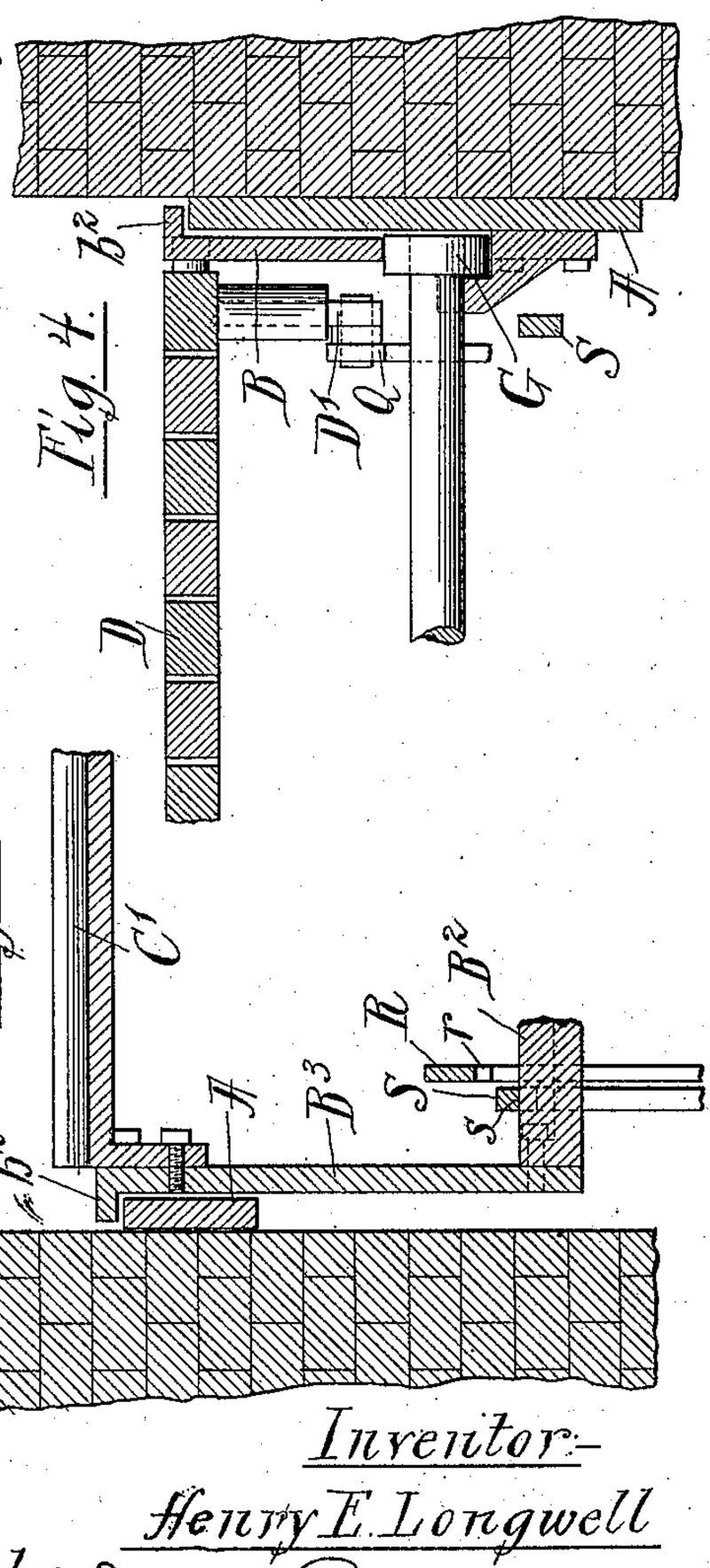

Fig. 6.

Fig. 3.

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UNITED STATES PATENT OFFICE.

HENRY E. LONGWELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTINGHOUSE, CHURCH, KERR & COMPANY, OF ORANGE, NEW JERSEY.

FURNACE-GRATE.

SPECIFICATION forming part of Letters Patent No. 577,190, dated February 16, 1897.

Application filed September 26, 1894. Serial No. 524,139. (No model.)

To all whom it may concern:

Be it known that I, HENRY E. LONGWELL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnace-Grates; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to furnace-grates of mechanical stoking apparatus.

There are two general types or classes of mechanical stokers in use at this time in this country—first, a traveling chain grate which carries the fuel from front to rear of the furnace, but has no means of agitating the burning mass of fuel for the purpose of breaking up clinker and rattling out fine ashes, and, second, the inclined grate in which the feeding forward of the fuel thereon is dependent upon its being agitated by a rocking or shaking motion of the grate-bars.

The inability of the traveling chain grate to agitate the bed of burning coals in my judgment lessens seriously the general utility of this style of stoker, aside from the fact that it is of necessity a cumbrous and complicated device. At the same time I believe that the feeding of the fuel along the grate should not be dependent upon an agitation of the fire. Both feeding and agitation are important functions of a mechanical stoker, but they should in my opinion be independent of each other, or at least the grate should be so constructed that the feeding action may be effected without agitation of the fire-bed when desired. Again, the agitating action of the grate should be confined to a limited portion of said grate, namely, that part of the grate upon which the fuel is fully ignited. The agitation of fresh or unignited fuel entering the furnace is not only useless, but is detrimental, inasmuch as it causes sifting and, in the case of hard coal especially, retards ignition and facilitates the admission of air at a point where it does no good. The extent of agitation necessary or desirable is of course dependent on the quality of the fuel, a clean-burning coal with little refuse obviously requiring less agitation than a dirty coal which clinkers badly.

In accordance with these views my invention has for one of its principal objects to provide a grate adapted to feed forward the fuel thereon without agitation of the fuel, and to this end the grate is inclined and has a bodily reciprocatory movement substantially in its own plane.

Another principal object of the invention is to provide a grate adapted for the agitation of the incandescent portion only of the fuel thereon.

A further object of the invention is to provide a construction whereby the shaking or agitating operation of the grate may be effected automatically when desired and may also at will be locked against agitating movement or on occasion may be disengaged from both the mechanical actuating means and the locking means, so that it may be operated by hand.

Other and minor objects of the invention will hereinafter appear.

In the accompanying drawings I have illustrated one form of construction of my invention which is adapted in design to the present pattern of furnace-front now used in connection with what is well known as the "Roney Mechanical Stoker," the drawings showing the Roney feed-hopper and coking-arch as illustrated and described in Letters Patent of the United States No. 409,304, granted to him on the 20th day of August, 1889.

In the drawings the entire grate will be seen to be a movable structure within its inclosure, the fixed bars, the shaking-bars, and the dump-grate, which make up the inclined structure, being all mounted in one frame, which rests on suitable supports and has a bodily-reciprocatory motion in the inclined direction of its own length. In these bodily movements of the grate the fuel is carried forwardly or downwardly with the grate in its downward movement, but is carried upwardly on the upward or return movement of the grate. This reciprocatory movement of the grate is not necessarily accompanied by any separate movement of the grate-bars and therefore the feeding of the coal is or may be independent of the agitation of the fire-bed.

In the preferred construction of the invention shown in the drawings the upper part of the grate consists of a series of overlapping

shelves bolted to suitable side pieces of the grate-frame and having no independent or rocking movement of their own, their only movement being that in which they accompany the main frame of the grate upward and downward in the reciprocation of the entire grate. Next below these fixed or non-rocking grate-bars are provided shaking grate-bars, mounted in the same reciprocatory frame, said shaking bars being shown as of the interprojecting-finger type. In the bottom or lower end of the grate-frame a dump-grate is also mounted, and this dump-grate therefore also shares the reciprocal movement of the main frame, besides having its independent dumping movement, which is controlled by hand at the will of the attendant.

Means are shown for automatically giving to the entire inclined grate its reciprocal lengthwise movement in its own plane. Means are also shown by which an automatic rocking movement may be given to the shaking bars of the grate when desired, and a construction is shown by which these rocking grate-bars may be disconnected from the actuating mechanism and either locked to move only with the main frame or left free to be moved by hand.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of my improved grate and its actuating mechanism. Fig. 2 is a transverse vertical section in the line 2 2 of Fig. 1. Fig. 3 is a transverse section of the grate in the line 3 3 of Fig. 1. Fig. 4 is a transverse section in the indirect line 4 4 of Fig. 1. Fig. 5 is a transverse section in the line 5 5 of Fig. 1. Fig. 6 illustrates a modification of the device for independently operating the rocking grate-bars by hand.

A A represent the fixed side bearers of the furnace, and B B the side frame-bars of the movable grate.

C is the upper part of the grate, which may be composed of the overlapping grate-bars C′ C′ C′ shown, or it may consist of a bed-plate either perforated or imperforate, as desired, said fixed part of the grate being bolted or otherwise secured to the side frame-bars B.

D D D are rocking grate-bars, which are here shown as being of the fingered variety, but may be of other form, if preferred.

E is a dump-grate hinged to the cross foot-bar B′ of the main grate-frame, said bar B′ being in the present instance bolted to the side frame-bars B.

G is one of two opposite rollers carried on the fixed side bearers A A and placed beneath the side bars B of the grate-frame near their lower ends.

H is a transverse shaft supported in suitable bearings on the furnace-front, each end of said shaft carrying a toothed sector I, which engages in a toothed rack *b*, formed on the under edge of each of the side frame-bars B, thus supporting the upper end of the grate and making it possible by oscillation of the shaft H to transmit a bodily reciprocal motion to the entire grate.

K is the driving-shaft, suitably supported externally to the furnace-front, on which is mounted an eccentric K′, having, desirably, about a two-inch throw. This eccentric transmits motion to a rocker-arm L, and thence, through the shaft H and sector I, to the grate. I have found a motion of one inch on the grate and one and one-half to two revolutions of the driving-shaft per minute to give good results.

M is a link attached to the eccentric-strap K^2, which imparts reciprocal motion through the sector N to the pusher O in the hopper O′, substantially in accordance with the Roney construction of feeding mechanism hereinbefore referred to.

B^2 is a cross-bar connecting the two side frame-bars B near their upper ends, being connected at its opposite extremities with depending brackets B^3, that are integrally or otherwise joined with the side frame-pieces B.

Q is a bar connecting with the depending lugs D′ on the rocking grate-bars D.

R is a link attached to the bar Q and provided with a notch *r* in its lower edge, which is adapted to engage with a rib *b′* on the upper surface of the cross-bar B^2. When this notch *r* in the bar R is engaged with the rib *b′*, said shaking or rocking bars D are held against rocking movement, said notch *r* being desirably placed in such position as to lock said rocking bars D in a common plane, as shown in Fig. 1.

The link R extends through the furnace-front U and has a second notch *r′* on its upper edge, as shown in Fig. 6, which is adapted to engage with the upper edge of the hole *u* in the grate-front, through which it passes. If the outer end of the link R be lifted, so as to disengage its lower notch *r* from the rib *b′* and to engage its upper notch *r′* with the edge *u* of the furnace-front, and the said link R be there sustained, it is obvious that the connecting-bar Q will be held stationary while the entire grate is making its longitudinal movements and that the rocking bars D will therefore be given a continuous though slow rocking movement. As shown, the depending lugs D′ on the bars D differ in length, those on the upper bars being the longer and said lugs gradually diminishing in length toward the lower bars. In this construction, which is preferred, the rocking motion of the lower rocking bars D is the greater.

The link R, while adapted to engage either with the grate-front or other relatively stationary part and with the bar B^2, which is an accessory of the grate, may also be placed in a mid-position, in which it is in neither of these engagements and is free to be reciprocated by hand, so that a more vigorous shaking may be given to the grate-bars D and a more vigorous agitation of the fire-bed thereon effected when desired.

As a suitable means for shaking the rocking grate-bars by hand the device illustrated

in Fig. 6 is suggested, wherein T is a bell-crank lever, the long arm t of which is to be seized and vibrated by hand, and the short arm t' is adapted to engage at its upper end with the notch r^2 in the under edge of the link R. When said short arm t' of the bell-crank T is in the position shown by full lines in Fig. 6, it upholds the link R in engagement with the furnace-front, but when engaged with the notch r^2 the link R is disengaged at both of its notches r and r' and vibration of the bell-crank by hand causes the reciprocation of the link R and the rocking of the grate-bars D to any extent desired.

S in Fig. 1 is a rod for operating the dump-grate. It is provided with a notch s for engaging with the rib b' to hold the dump-grate in its ordinary position in the plane of the grate, but when said rod S is lifted, so as to disengage it from the rib b', the dump-grate is allowed to drop on its hinges and to discharge the clinkers and ashes thereon into the ash-pit beneath. The rod S preferably terminates inside the furnace-front and has the hole s in the upper and outer extremity thereof, by which a hook or handle may be engaged therewith.

The inclined position of the dump-grate shown has the advantage of insuring a good air-seal at the lower end of the grate structure, since I have found it desirable to take every precaution against the entrance of air to the furnace at other points than through the burning coal.

Free expansion of the movable grate is provided, but at the same time air-leakage is prevented by providing the side bars B of the grate-frame with flanges b^2, which overlap the side bearers A, as indicated in Fig. 4, ashes working into the overlapping joint between the side grate-frame bars and the side bearers to close the same.

In the construction above set forth the difficulty commonly encountered of sifting the freshly-introduced coal is practically eliminated.

I do not wish to be limited to the exact forms of the parts herein shown and above described, inasmuch as many variations may obviously be made in these without departure from my invention.

One modification which I have found to be desirable in some cases consists in providing separate links and connections for separate groups of the shaking grate-bars. As shown in the drawings, it will be noted that only one bar Q and link R are shown, said single bar Q being connected with all the shaking grate-bars D which are given motion. I have found that by employing two sets of these connections Q and R, one set arranged at one side of the grate and the other at the other side, and by connecting each of said bars Q with a limited number only of the shaking grate-bars, D as, for example, one bar Q with an upper group of said grate-bars and the other bar Q with a lower group of the grate-bars, either an upper or a lower group of said grate-bars D may be independently actuated by hand, independently locked, or independently actuated automatically.

I am aware that it has been proposed heretofore in a horizontal rotating grate to give motion to pivoted grate-bars by means of a connection between such bars and a stationary part of the stove or furnace in which the grate is used, and employment of such connection is not herein claimed as my invention. I do, however, desire to claim the construction herein described, in which an inclined furnace-grate which has fixed grate-bars and in which the grate is bodily moved primarily for the purpose of accomplishing the downward feed of the fuel over the stationary bars, which are arranged in stepped order, is provided with a plurality of shaking bars having connection with a relatively stationary part. This construction has the important advantage of enabling shaking bars to be used in such a bodily-reciprocatory inclined grate without the employment of actuating means other than the device used to give bodily motion to the main grate, thereby securing in such an inclined grate the feature of stationary bars reciprocating with the grate itself for the upper part of the grate and rocking bars for the lower part of the grate without requiring the employment of separate actuating means for the two kinds of grate-bars.

I claim as my invention—

1. A longitudinally-reciprocatory inclined furnace-grate provided with shaking bars in position to support the incandescent fuel, said shaking bars being movable bodily with the grate, but independently movable thereon, said grate being provided also at its head or receiving end with bars or an equivalent fuel-support having no movement independently of the grate as a whole.

2. A longitudinally-reciprocatory inclined furnace-grate provided with pivoted shaking bars in position to support the incandescent fuel, said shaking bars being movable bodily with the grate, but independently movable thereon, said grate being provided also at its head or receiving end with bars, or an equivalent fuel-support having no movement independently of the grate as a whole, in combination with a connection or connections between points on said shaking bars remote from their pivots, and a relatively stationary part whereby the movement of the grate as a whole results in a shaking movement of said shaking bars.

3. An inclined longitudinally-movable grate comprising a fixed section of bars or their equivalent at its upper end, a section of independently-shaking bars located below the fixed section and which move bodily with

the grate, and a dumping-grate at the foot or lower end of the main grate, which also moves bodily with the main grate, the entire grate, so composed, having a bodily-reciprocatory movement.

4. A longitudinally-reciprocatory inclined grate provided with a section of shaking bars, and a connection leading from said shaking bars adapted to be engaged with either a stationary part or with an accessory of the grate, respectively to shake or to lock said grate-bars.

5. A longitudinally-reciprocatory inclined grate provided with a section of shaking bars, and a connection leading from said shaking bars and adapted either to engage a stationary part for the purpose of operating said bars, to engage an accessory of the grate for the purpose of locking said bars, or to be disengaged from both whereby said bars may be operated by hand or otherwise independently.

6. In combination with an inclined, longitudinally-reciprocatory grate provided with a series of shaking bars, as D, a link R having notches r, r', for respectively engaging movable and stationary parts and also provided with the notch r^2, and a hand-lever, as T, having an arm t adapted to engage the notch r^2, and when so engaged, to hold the link clear of engagement at both its notches r and r', whereby the shaking bars may be operated independently.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

HENRY E. LONGWELL.

Witnesses:

ALBERT H. GRAVES,

HENRY W. CARTER.