

(No Model.)

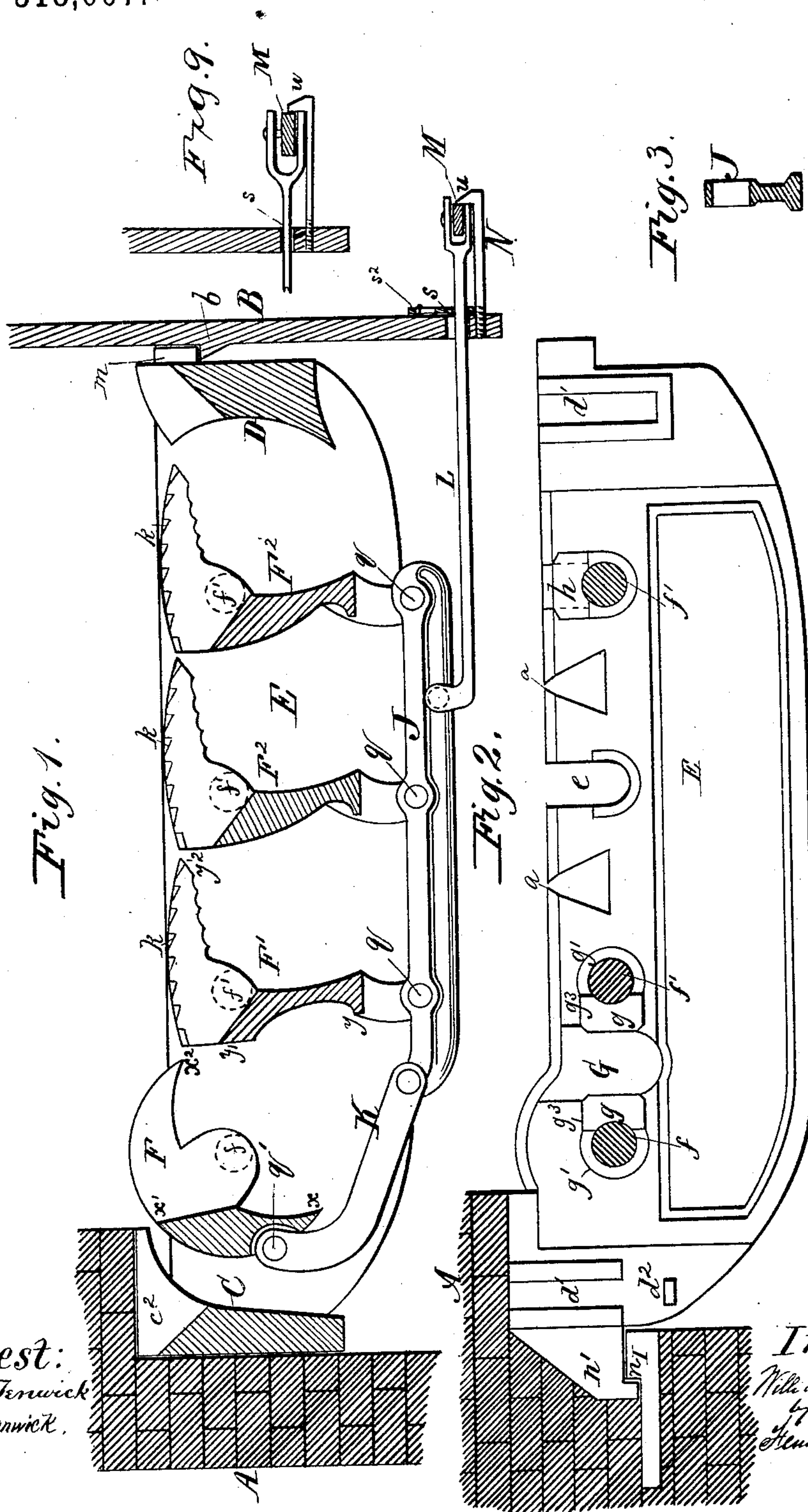
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W. McCLAVE.

GRATE.

No. 318,007.

Patented May 19, 1885.



Attest:
B.C. Fenwick
Robt. Fenwick,

Inventor:

Willa was Mc Clave
by his attys
Hewitt and Lawrence

(No Model.)

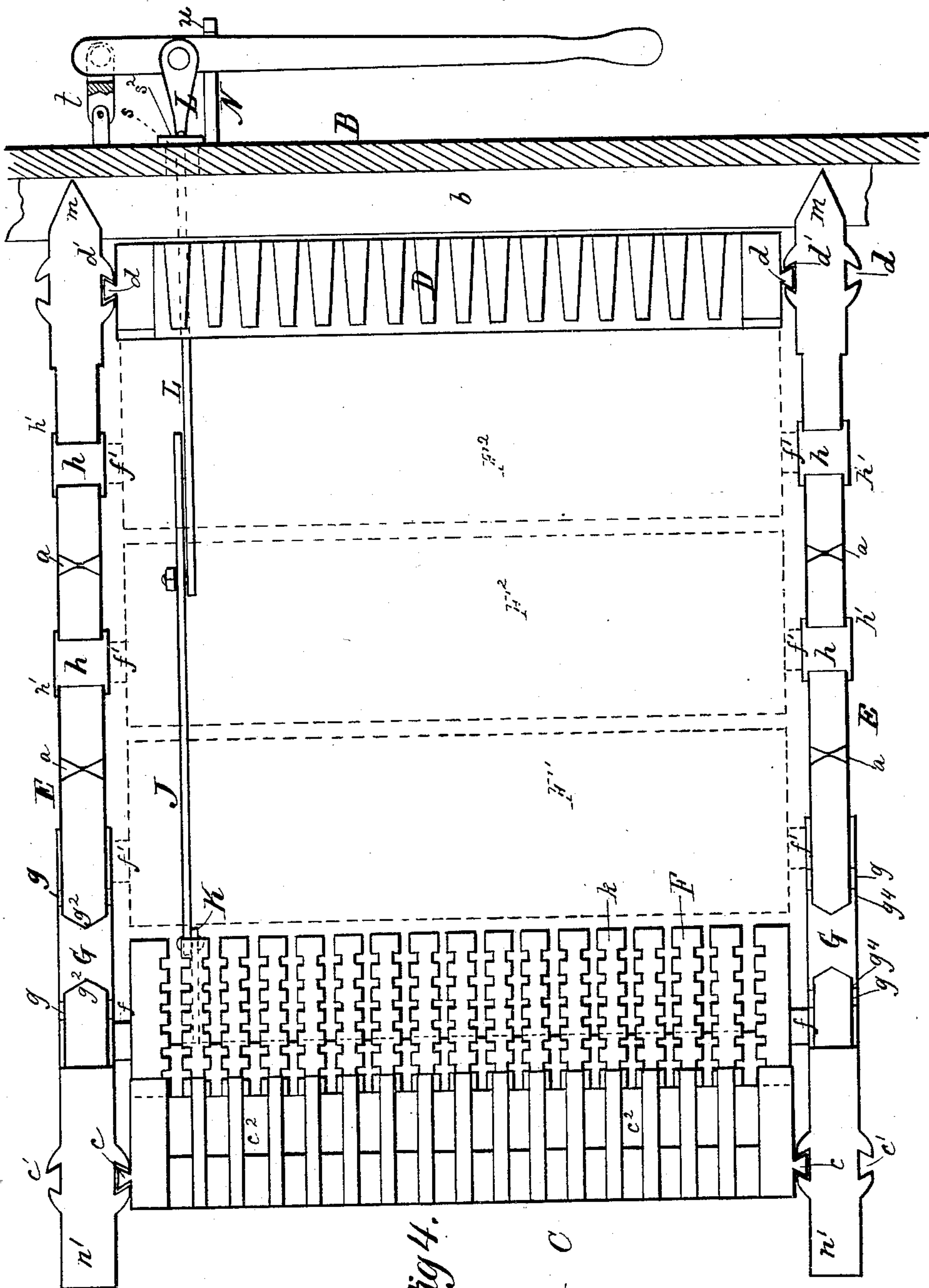
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Fig 4.

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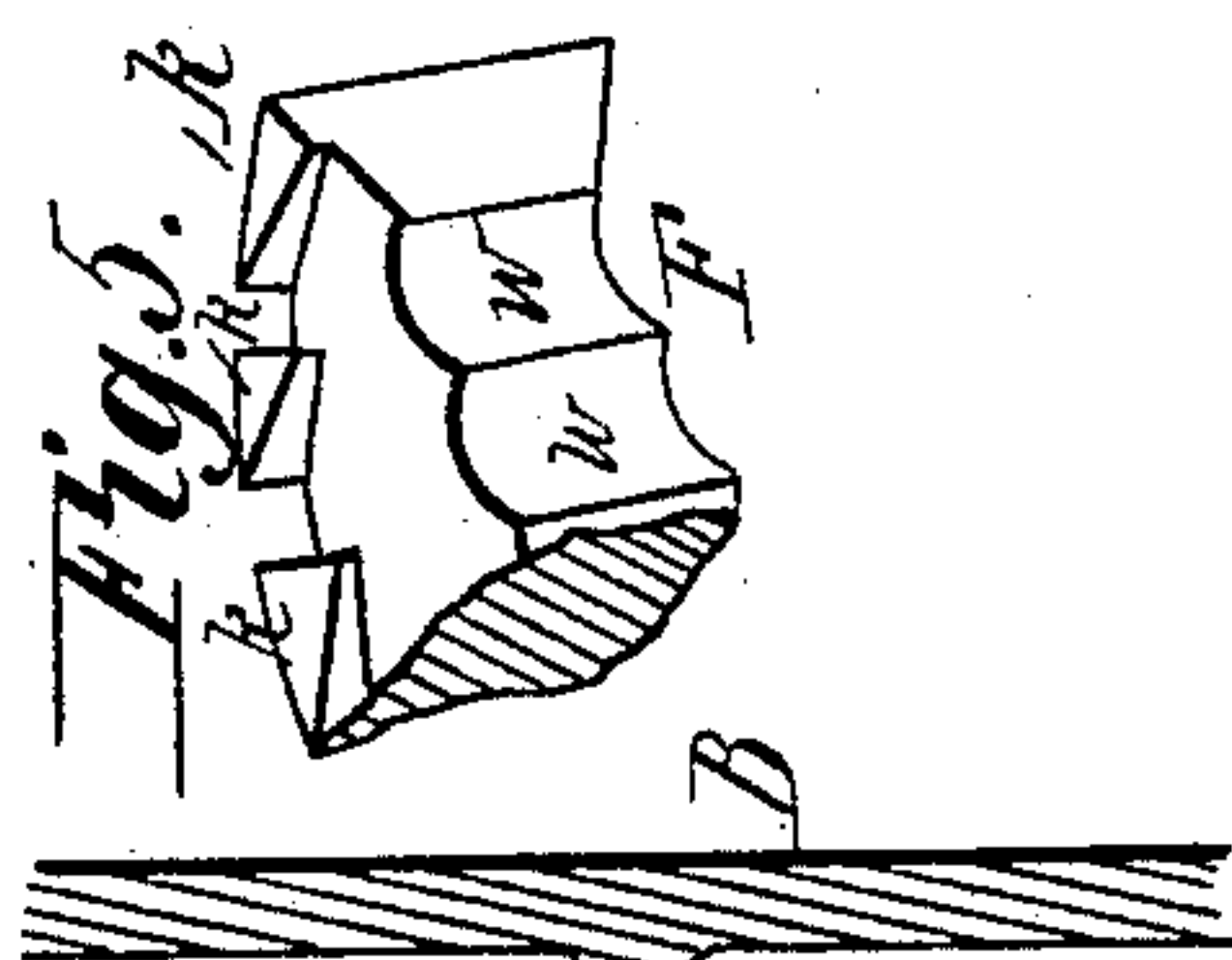


Fig. 5.

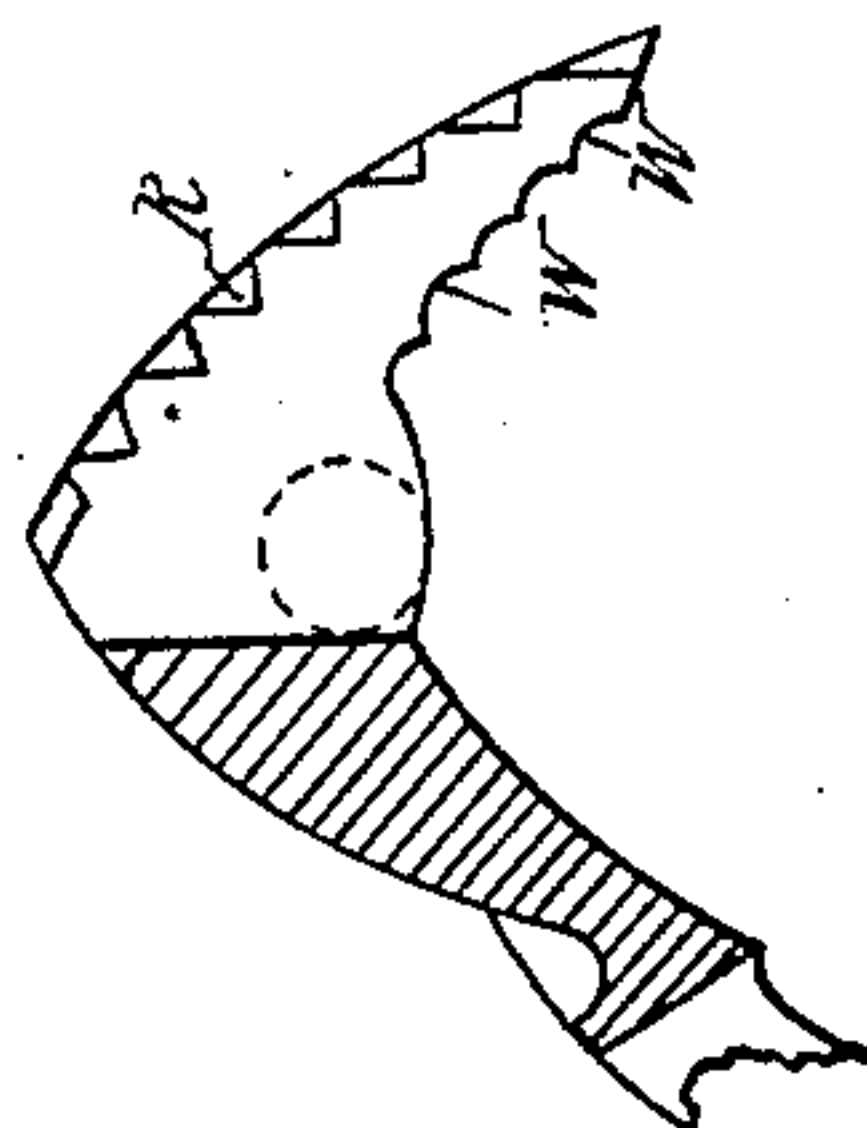


Fig. 6.

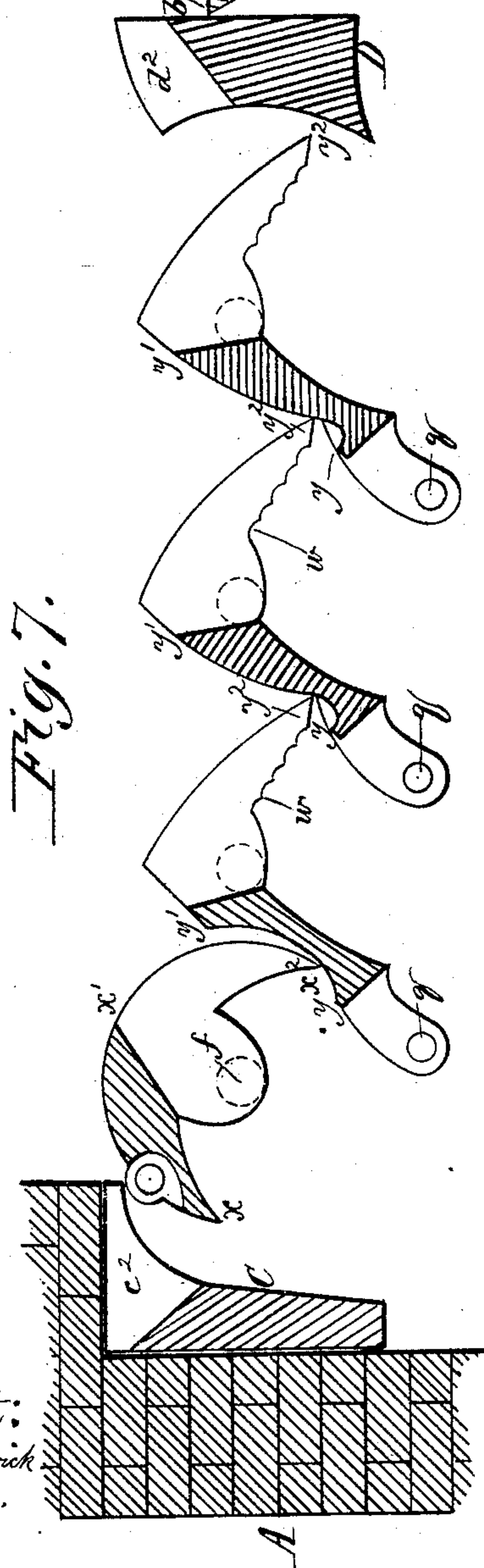


Fig. 7.

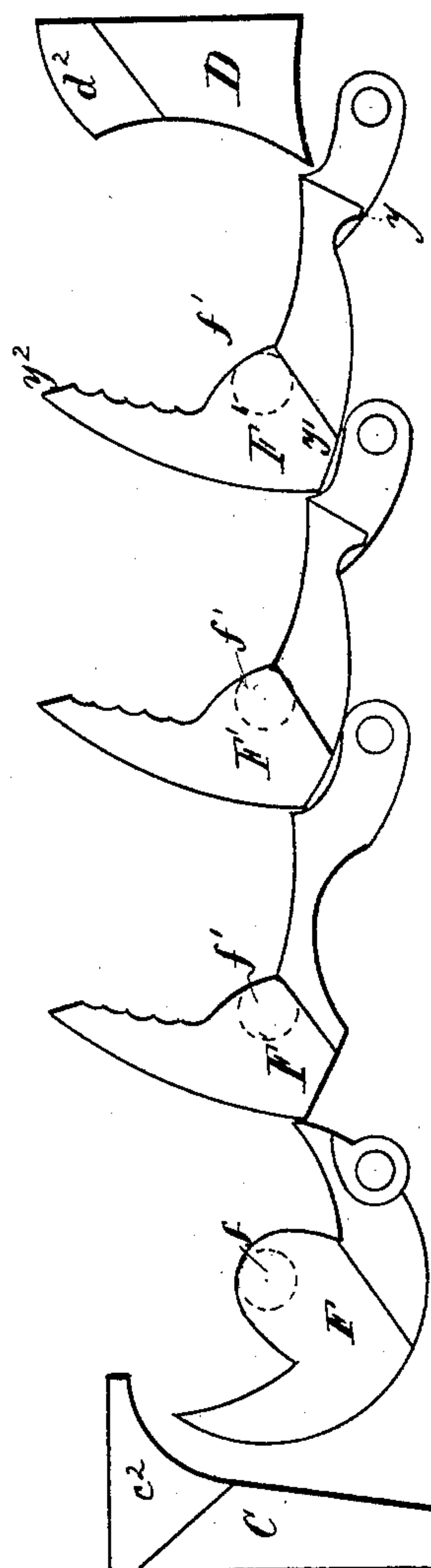


Fig. 8.

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UNITED STATES PATENT OFFICE.

WILLIAM McCCLAVE, OF SCRANTON, PENNSYLVANIA.

GRATE.

SPECIFICATION forming part of Letters Patent No. 318,007, dated May 19, 1885.

Application filed July 25, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM McCCLAVE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented a new and useful Improvement in Grates for Stoves, Furnaces, Heaters, and other Fuel-Burning Structures, of which the following is a specification.

Heretofore patents numbered, respectively, 10 267,910 and 272,733, for improvements in grates for burning culm and other hard fuel, have been granted to me, and in practice the constructions shown in said patents have been found to operate well when employed for forming a grated fire-bed for the kinds of fuel mentioned; but for burning bituminous or soft coals, which are liable to become so finely broken up before they are consumed as to pass out with the ashes during the shaking operation, it is important to maintain a practically unopened grated surface or fire-bed during the operation of shaking the grate for the removal and discharge of the ashes; and to improve my aforesaid patented grates so as to better adapt them for burning both hard and soft coals is one of the leading objects of my present invention, the nature of which consists, first, in the grate-sections having a novel form, relative arrangement, and limited vibration of 30 their upper surfaces in a direction the reverse of the direction of movement of their shaking-bar, whereby an efficient shaking motion is permitted for the discharge of the ashes without unduly opening the discharge-spaces between the grate-sections and thereby causing a premature dump or discharge of the unconsumed disintegrated soft coal, and while this is the case a very good draft through the fire-bed is maintained during the regular burning 40 of the fuel on the grate, and no interference with the facilities for "cutting out" or discharging masses of refuse, clinker, or other matters, which have spent their usefulness from being burned out, experienced; second, in grate-sections having a form which affords draft, permits an efficient shaking movement for discharge of ashes, without unduly opening the discharge-passages, and allows a long "cut-out" movement, the said shaking and cut 50 movements being the reverse of each other, and the shaking movement limited; third, in a por-

tion of the grate-sections secured to their journal-bars by halved boxes and grooved and flanged vertical key-blocks; fourth, in the combination of the shaking-bar, the link and rod 55 connections thereof, the grate-sections, the adjustable shaking-lever, and a stop-plate for limiting the extent of the shaking movement of the sections while it does not interfere with the long cut-out movement of said sections 60 when the shaking-lever is adjusted to move clear of it; fifth, in a mode of shaping the under surface of the grate-sections with a double bevel, so that the improved upper surface may be produced without inconvenience by the casting 65 process; sixth, in the ribs or teeth for grate-sections provided with a fluted under surface for grasping the clinkers during the operation of crushing them by the sections; seventh, in the journal-bars of the grate-sections provided 70 with hooking projecting ends in combination with hooking bearers embedded in the walls of the furnace, so as to render the grate more firm while being operated; eighth, in an end grate-section of crescent or analogous 75 shape in combination with a fellow grate-section and the overhanging or under-curved stationary end portion of the fire-bed, whereby the said end section can pass under said end portion for the purpose of cutting out clink- 80 ers and debris, and during the shaking movement the practically unopened fire-bed of the furnace be maintained at the rear end as well as at other parts of the fire-bed; and, ninth, in certain other combinations and constructions, 85 as hereinafter described and specifically claimed.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a portion of a furnace with my invention of improved grate- 90 sections, journal-bars, and other parts in their ordinary operating position. Fig. 2 is a sectional view through the journals of the grate-sections and an end wall, showing a bearer, journal-bar, half-boxes, key-block, and a flanged cap. Fig. 95 3 is a cross-section of the shaking-bar. Fig. 4 is a plan view of the vibrating grated end section and a fellow grate-section (shown by dotted outline only) resting in journal-bars and confined and protected by the halved boxes 100 and key-blocks and flanged caps, also showing the front wall of a furnace in horizontal

section with the journal-bars resting upon a ledge of the same. In this view, also, other grate-sections are shown in dotted lines, while a front grated bar, the shaking-bar, lever, and stop are shown in full lines in plan view. Fig. 5 is a broken inverted perspective view of one of the ribs of a vibrating grated section, and Fig. 6 is a detail end view of a grated section set in the position it occupies while being drawn from the mold in which it is cast. Fig. 7 is a diagram view showing the grate-sections moved from their ordinary working position to the full extent for shaking out the ashes; and Fig. 8 is a diagram similar to Fig. 7, showing the grate-sections moved to the full extent for cutting out clinkers or other refuse matter. Fig. 9 is a vertical detail section showing the hole in front of furnace for the connecting-rod of the shaking-bar to play in, made of a size corresponding to the rod and the space between the prongs or jaws of said rod increased so as to have the prongs placed farther apart.

In the drawings, A is an end wall of the ash-pit section, and B the front plate of a furnace. C and D are the rear and front stationary grated portions of the fire-bed. E E are the journal-bars resting on the ledge *b* of the front plate, B, and on the bearers I of the wall A, the bearers being embedded in the wall and formed, respectively, with a hooking-ledge, *n*, against which the hooking-lugs *n'* of the bars E catch and are firmly retained, as shown in Fig. 2. On each end of the journal-bars dovetail grooves *c'* are formed, and into these grooves projections *c* of the stationary grated portions C D of the fire-bed are passed and retained in the ordinary manner by the ribs forming the grooves at one end, and by an additional stop, *d'*, at the other end, as will be understood from the drawings. The journal-bearings E are formed with expansion-slots, *a*, so that their upper portions may expand when they become too intensely heated, and thus save the bearings from danger of breakage when expansion and contraction take place. Near one end these bearings are formed with open half-boxes *g'*, which are overhung by projections *g*³, and beyond these half-boxes they are formed with oblong journal-openings *e*, as shown. Into the overhung half-boxes *g'* the journals *f* of a crescent-shaped vibrating-grate section, F, and of an angular grate-section, F', are inserted, and then half-boxes *g* are passed down through large vertical spaces formed in the journal-bar between the half-boxes *g*, and a flanged key-block, G, inserted into said space between the half-boxes *g*, as shown. The shape of the key-blocks is shown clearly in Fig. 1, and it will be seen that the half-boxes *g* will be held from rising by the overhanging projections *g*³ of the half-boxes *g'*, and that the key-blocks will be kept from lateral movement by the dovetail connection *g*², formed between them and the projections *g*³, of the journal-bars, and also by their own flanges *g*⁴. This mode

of confining the journals of the grated end section, F, prevents this section from jumping upward while the operation of shaking is being performed, and this is quite essential, inasmuch as this end section is not held down by the shaking-bar J as are the other grated sections, but is thrust upward by said bar and its connecting-link K. The other grated sections, F², have their journals inserted into the oblong journal-openings *e*, and covered by means of flanged caps *h*, as illustrated in Figs. 2 and 4 of the drawings. The flanges *h'* of these caps prevent them from moving laterally and their gravity keeps them from rising. The journals of the sections are thus completely excluded from contact with the burning fuel, and they will not be burnt out or caused to bind in their boxes.

It is contemplated by me to make all of the journal-boxes similar to those employed on the crescent-shaped section F, in which event key-blocks G will be substituted for the flanged caps, and the openings *e* will be shaped to receive flanged key-blocks G, and the journal-bars will be formed with half-boxes *g'* and projections *g*³, and half-boxes *g* will be interposed between the journals *f* and the key-blocks, as before described. The grate-sections F' F² are formed with lugs having pivots *q*, and by means of the said pivots are connected to the shaking-bar J, and these sections are connected by means of the shaking-bar J and the link K to the lug *q'* of the crescent-shaped section F, as shown. The shaker-bar is moved back and forth by means of the connecting-rod L, which plays through a large slot, *s*, in the front plate, B, of the furnace. To the outer end of the connecting-rod an operating-lever, M, is pivoted. This lever has its fulcrum *t* on the front plate of the furnace, and it is guided by a stop-plate, N, in its movements. The stop-plate N is just long enough, and has its stop *u* so located and just high enough to arrest and hold the lever when the grate-sections have been moved from the position shown in Fig. 7 to the position shown in Fig. 1, which is the extent of their shaking movement. By lifting the connecting-rod in its large slot *s* high enough to have the lever M clear the stop *u*, the movement of the sections can be carried from the position shown in Fig. 1 to the position shown in Fig. 8, which is the position they occupy when a cut-out consisting of a mass of clinker and other matters is to be made. The end section, F, has a periphery of about a crescent shape; and at the center of the inner side of this crescent-shaped section a lug is provided at each end to support the journals. The pivoted or attaching portion of this section is made solid from the point *x* to *x'*, and from point *x'* to *x*² it is toothed, as shown in Fig. 4. By making this section of the form shown, and pivoting it as described, it will pass under the grated end portion, C, and thus act perfectly as a cut-out section at this portion of the fire-bed, as illustrated in Fig. 8, and while this is so the crescent form works

perfectly with the fellow section F' for maintaining a practically unopened grate-surface during the shaking operation, as illustrated in Figs. 1 and 7. The sections F' and F'' are all alike, and their solid surfaces from the point y to y' are curved in the manner shown, so that the point y^2 of the grated portion (included from y' to y^2) shall just about clear the said curved solid portion, both in descending forward or rising backward. Any other equivalent form to that shown may be adopted, provided the points y^2 maintain about the relation shown to the solid parts included between y and y' during the shaking of the grate, as illustrated in Figs. 1 and 7, and that the points y^2 and x^2 occupy the positions shown in relation to the parts y and y' during the cutting out of clinking or other refuse matter.

In order to prevent narrow oblong pieces of fuel falling down between the ribs or bars of the sections, the said ribs or bars are formed with a number of teeth, k , as shown in Figs. 4, 5, and 6; and in order to cast these teeth upon the angular and crescent shaped grate-sections they are formed with a double bevel—that is, beveled on their side and bottom, as illustrated plainly in Fig. 5—and thus shaped the patterns for the sections can be drawn out of the sand without danger of fracturing the mold, provided the pattern is set in the mold in the position shown in Fig. 6. On the under side of each toothed rib or bar of a section, flutes w are provided, and by this construction the ribs are enabled to take a firmer hold upon the clinkers and other matters for the purpose of crushing them during the cutting-out operation. The stationary grated portions D and C are provided with grooves formed with a downward inclination, as shown at c^2 and d^2 , so as to afford circulation of air and free escape of ashes into the ash-pit, as will be understood from the drawings.

In an extensive practical use of my invention of grates heretofore patented in connection with boiler-furnaces, it has been demonstrated that a grated fire-bed must be adapted for burning different kinds of fuel—such as large hard coal, fine hard coal or culm, and bituminous or soft coal; that the grated fire-bed must be adapted for supporting these different kinds of coal without liability of passing down unconsumed when the grate-sections are simply shaken or vibrated to their limited extent, and at the same time free circulation-spaces for air and steam mixed, or air alone, must be provided all over the fire-bed; that the grated sections should be adapted for forming pockets for temporarily catching and holding the mass of ashes, clinkers, or other matters when they are moved through the superincumbent mass of burning fuel for the purpose of cutting out clinkers and other refuse, and then of freeing and forcing down into the ash-pit this cut-out mass of material, and in the act of doing this form a proper grated fire-bed for sustaining the thus cleaned superincumbent mass; that the rear end sec-

tion of the grated bed should pass under the rear wall of the furnace in order to effect a perfect cut-out at that point; that the shaking action of the sections should be limited while the cutting-out section should not be interfered with by the means which effect said limited shaking action; that the journal-bars should be held firm by metal bearers on the rear wall, and said bearers and a portion of the journal-bars should be embedded in the masonry; that the grate-sections should be held firm against upward movement when they are shaken, and also their journals kept from the destructive action of burning coal, as in constructions where the journals are exposed to the direct contact of such coal, and that the ribs of the sections should have numerous side teeth which will arrest oblong pieces of fuel, and these, in order to admit of the casting of the peculiar-shaped sections which I employ should be double-beveled in the peculiar manner herein shown and described.

My present invention meets all of the foregoing requirements, and provides a grated fire-bed adapted in nearly if not all respects for the burning of the various grades and kinds of fuel economically and effectually.

In carrying my invention into operation I prefer to adopt the arrangement of lever shown in Fig. 9, in which construction the fulcrum end of the lever will be slotted or loosely fitted upon the fulcrum-pin at t , so as to permit the lever to be raised above the stop u between the prongs or jaws of the rod. It is also contemplated to have the shaking-lever stand vertical, and the stop-plate in a corresponding position, and thus provide for moving the lever in a vertical instead of a horizontal plane.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with shaking and stop devices consisting of lever M , rod L , working-bar J , and plate N , having stop n , of grated sections hung on journals and pivoted to the working-bar J , and having their back surfaces constructed as at $y y'$, and their front portions, y^2 , standing and working nearly against the surfaces y and y' during the normal position of the sections and also while being shaken to a limited extent, the construction, arrangement, and combination of the parts being such that a grated fire-bed is formed when the sections are in their normal positions, and the sections of this bed can be shaken to a limited extent without liability of forming too large escape-passages for the coal resting upon the bed, substantially as described.

2. The combination, with the working-bar J , of grate-sections F and F' , hung on journals and formed on their back surfaces as at $y y'$, and having their front portions, y^2 , standing and working nearly in contact with the surfaces $y y'$ during the normal state of the sections and while being shaken to a limited

extent, and also forming closed pockets when the sections have been moved completely back for effecting a cut-out of clinker and other substances, substantially as described.

5 3. The combination of the stop-plate N, applied to the furnace-wall, the lever M, rod L, bar J, having rod L pivoted to it, oscillating grate-sections F' F², pivoted to bar J, and having the construction as at *y y'*, and their front
10 portion, *y*², in the relation to the portion *y y'*, substantially as and for the purpose described.

4. The combination of stop-plate N, lever M, rod L, working-bar J, oscillating grate-sections F' F², and wall of furnace with opening *s*, larger than the rod L, whereby the desired and proper shaking of the grate-sections can be effected, and also, when required, the stop *n* of the plate N can be passed, and a cut-out of clinker and ashes and other refuse substances effected, substantially as described.
20

5. The combination, with the oscillating grate-sections, journal-bars, and half-boxes, of the key-blocks G, for holding down the sections and protecting the journals from the
25 burning substances upon the fire-bed, substantially as described.

6. The combination, with the shaking-bar,

grate-sections F' F², connecting-rod, adjustable shaking-lever, and stop-plate, of the grate-section F and link K, substantially as and for 30 the purpose described.

7. The grate-sections herein described and shown, formed with pocket portions from *y* to *y'*, and with ribs having teeth with an under double-beveled surface, substantially as described. 35

8. The grate-sections herein described and shown, formed with ribs fluted on their under surface, substantially as described.

9. The combination of the journal-bars 40 formed with embedded hooking projecting ends with the embedded hooking bearers and the masonry wall of the furnace, substantially as described.

10. The vibrating end grate-section of crescent shape, in combination with a fellow angular-shaped grate-section and the overhanging or undercut portion of the fire-bed, substantially as described. 45

WILLIAM McCLAVE.

Witnesses:

BENJAMIN S. REYNOLDS,
ELIEZER D. JENKINS.