No. 673,990. Patented May 14, 1901.

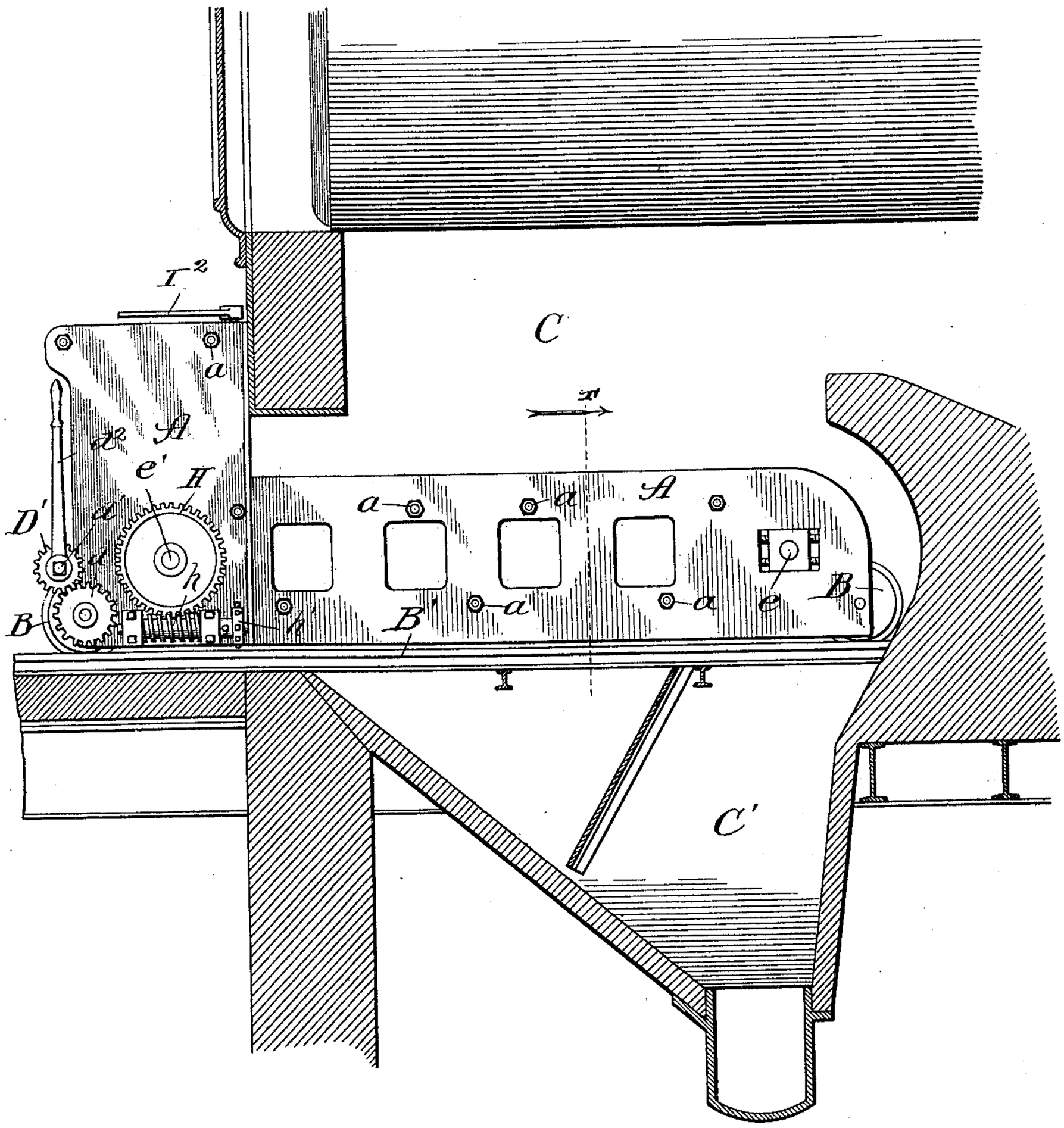
D. J. McKENZIE.

FURNACE.

(Application filed Feb. 15, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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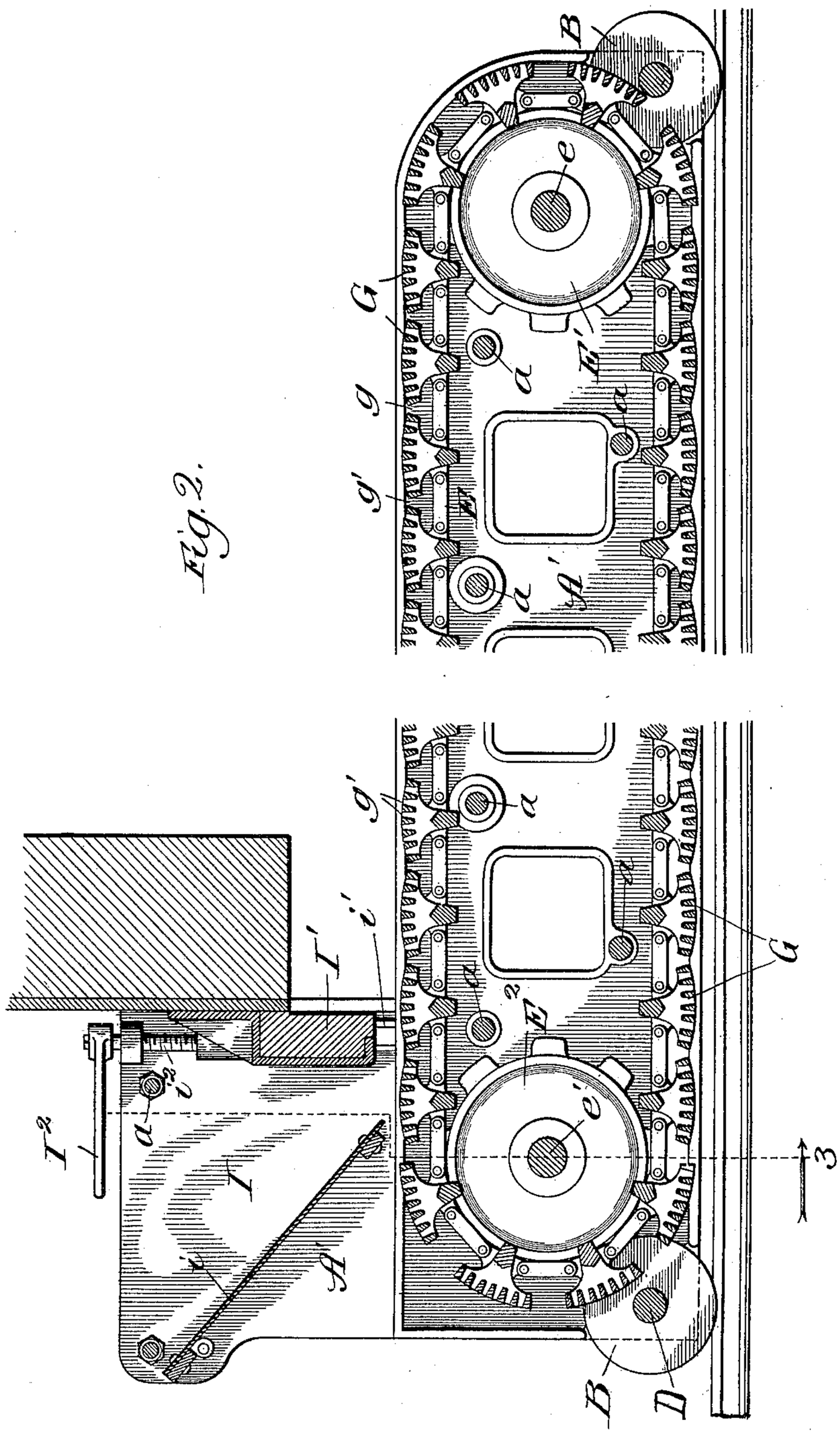
3 Sheets—Sheet 2.

Fig. 2.



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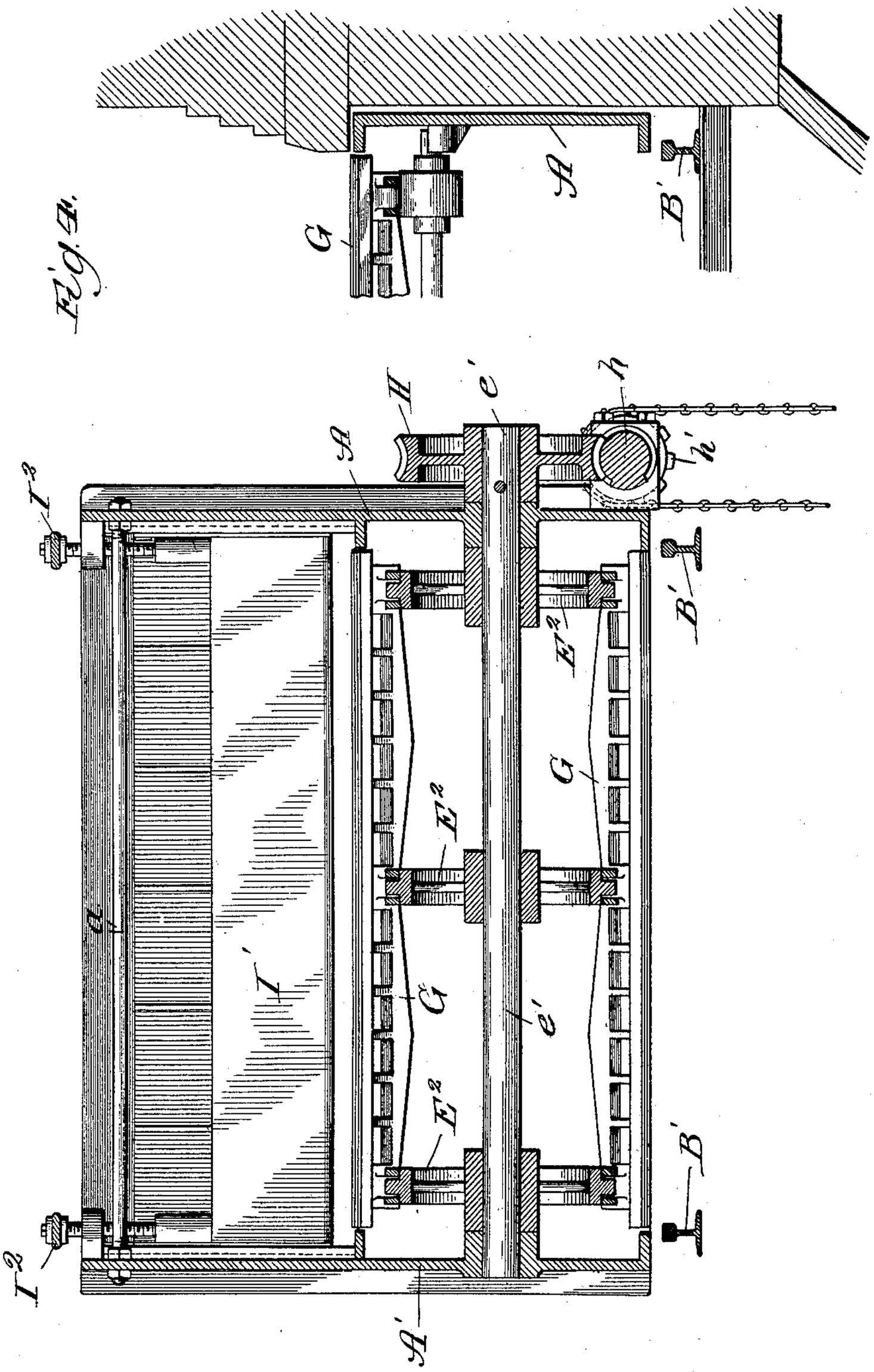

Fig. 3.

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UNITED STATES PATENT OFFICE.

DOUGAL J. McKENZIE, OF CHICAGO, ILLINOIS.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 673,990, dated May 14, 1901.

Application filed February 15, 1899. Serial No. 705,549. (No model.)

To all whom it may concern:

Be it known that I, DOUGAL J. McKENZIE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates particularly to that class of furnaces which are provided with automatic "stokers," and especially to the grate-bars by which the coal is fed into the furnace and the means for inserting and removing them therefrom.

The object of the invention is to provide a simple, economical, and efficient movable grate and operating mechanism; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of my improvements shown in connection with a vertical sectional elevation of a furnace; Fig. 2, a vertical longitudinal sectional elevation of my improvements; Fig. 3, a cross-sectional view taken on the line 3 of Fig. 2; and Fig. 4, a sectional elevation of a portion of the mechanism, taken on the line 4 of Fig. 1.

In constructing a movable grate in accordance with my improvements I make a frame portion of the desired size, shape, and strength to support the operative and other parts in position, which consists, preferably, of two side portions A and A′, held together by means of a plurality of stay-bolts *a*, so as to give the necessary rigidity to the mechanism, and is further provided with four flanged wheels B, mounted upon tracks B′ in such a manner that the frame, with all its attached mechanisms, may be moved in and out of the furnace C. This gives the movable grate two distinct and necessary movements, by means of which the ashes and clinkers are removed from the grate and the adhering clinkers from the furnace—first, its gyration upon the sprocket-wheels, and, second, its movement with the frame portion into and out of the furnace. This last movement is necessary in order to complete the cleaning of the grate by removing the clinkers which adhere thereto from the furnace, and the mechanism herein described for producing the movement in and out of the furnace should coöperate with the grate-gyrating mechanism herein described in cleaning the grate and removing clinkers from the furnace. To accomplish this, I provide the frame with four journal-bearings *k*, two of which are shown in Fig. 2 and one in Fig. 1. In these bearings in the frame I journal the rotatable shafts D, upon which the flanged wheels B are mounted to run on tracks B′, which are provided for sustaining the entire apparatus movably thereon. These flanged wheels so connected with the frame also hold the moving grate and burning fuel in the furnace while the fuel is in process of combustion and the grate is operating to feed the fuel and separate the ashes and clinkers therefrom. It is therefore necessary to make all of the parts of a material capable of sustaining a high degree of heat, preferably steel or iron, and for economy, efficiency, and simplicity I connect the shafts upon which the flanged wheels are mounted directly with the frame and mount upon one frame all of the operative parts, both for moving the grate gyratingly and into and out of the furnace, and in operative connection therewith to move the frame in and out of the furnace I provide one of the shafts D, upon which the flanged wheels are mounted, with a gear-wheel *d* in the following manner: I preferably extend the end of the shaft D through and beyond the side of the frame A and mount the gear *d* on the extended end of the shaft D and outside of the frame A, as shown in Fig. 1, the gear-wheel *d* meshing with a pinion D′, the shaft of which has a square head at *d*′, adapted to be engaged by a handle d^2. It will thus be seen that by vibrating this handle and engaging and disengaging it with the square-headed shaft the frame, with its supported mechanisms, may be inserted into or removed from the furnace whenever desirable or necessary.

In order to provide an endless movable grate upon which the fuel may be arranged and which feeds the fuel into the furnace and discharges the ashes into a pit C′, I provide three sprocket-chains E, which are passed around two sets of sprocket-wheels E′ and E^2, supported upon rotatable shafts *e* and *e*′. These sprocket-chains have secured thereto a plurality of grate-bars G, as shown particu-

larly in Figs. 2 and 3, and at such a distance apart as to leave spaces g between the same. The grate-bars are preferably curved on their upper surface and provided with a multiplicity of perforations g', extending therethrough, so that as fast as portions of the fuel are consumed the ashes may fall therethrough or air with its quantity of oxygen be admitted to the fuel to support combustion. It is necessary to rotate one or both of these sprocket-wheels which operate the endless grate so that it may be moved through its circuit in the furnace with its supply of fuel and to dump the ashes over and into the ash-pit. In order to accomplish this result, the shaft E′ is provided with a worm-wheel H, engaging with a worm h. One end of the worm h or its shaft is provided with a sprocket-wheel h', which may be connected with any kind of a prime mover, so as to give it the necessary rotation and through it and the worm-wheel to carry the endless grate into the furnace with the supply of fuel.

The movement of the endless grate may be so timed as to complete its circuit in any desired period of time—say to make a complete revolution once in an hour—and thus carry into the furnace-chamber the requisite supply of coal, which necessarily does away with the necessity of having a man constantly engaged in attending the furnace. It is necessary, however, that the coal should be supplied to the grate in an economical manner, and in order to accomplish this result the frame portion is provided with a hopper-chamber I, arranged at the front portion thereof, having an inclined bottom portion i and a gate portion I′, vertically movable on one wall thereof, so as to open or close an opening i' between the hopper-chamber and the furnace and to regulate the size of the opening between the gate and the grate-bars, so that the supply of fuel to the grate-bar can be fed in any desired quantity. This gate I′ is moved up and down by means of a screw i^2, which is operated by a handle I^2 and which not only serves to open and close the gate, but also to hold it in the desired position.

In operation the fuel is fed into the hopper-chamber and the engine or other motor which operates the worm h' is started. The endless grate is caused thereby to move through the furnace, in which a fire has been previously built and which has generated sufficient heat to support combustion therein, so as to carry a supply of fuel into the furnace. The movement of the grate carries the fuel into the furnace, where it is first partially and then completely consumed and finally dumped over into the ash-pit. Whenever it is desirable to clean the furnace, all that is necessary is to operate the handle d^2 and withdraw the entire grate from the furnace, all of which can be done simply, economically, and efficiently.

I claim—

1. In a furnace of the class described, the combination of a grate-receiving frame having a projected front end, a movable endless grate composed of a series of grate-bars, each grate-bar having a head and a central longitudinal rib beneath the head with a depending ear at each end and at the center for the attachment of links and have the links and depending ears constitute an endless link belt at each end of the grate and at the center, a front shaft, and a rear shaft mounted in the frame, sprocket-wheels on each shaft, one for each endless link belt, supporting the grate as a whole in the frame and moving it in its circuit through the furnace-chamber, and means for revolving one of the shafts to travel the grate, substantially as described.

2. In a furnace of the class described, the combination of a grate-receiving frame having a projected front end, a movable endless grate composed of a series of grate-bars, each grate-bar having a widened, crowned and perforated head and a central longitudinal rib beneath the head with a depending ear at each end and at the center for the attachment of links and have the links and depending ears constitute an endless link belt at each end of the grate and at the center, a front shaft and a rear shaft mounted in the frame, and sprocket-wheels on each shaft, one for each endless link belt, supporting the grate as a whole in the frame and moving it in its circuit through the furnace-chamber, substantially as described.

3. In a furnace of the class described, the combination of a grate-receiving frame having a projected front end, a movable endless grate composed of a series of grate-bars, each grate-bar having a head and a central longitudinal rib beneath the head with a depending ear at each end and at the center for the attachment of links and have the links and depending ears constitute an endless link belt at each end of the grate and at the center, a front shaft and a rear shaft mounted in the frame, sprocket-wheels on each shaft, one for each endless link belt supporting the grate as a whole in the frame and moving it in its circuit through the furnace-chamber, and a gear on the front shaft for revolving the shaft and traveling the grate through the furnace-chamber, substantially as described.

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