

No. 740,668.

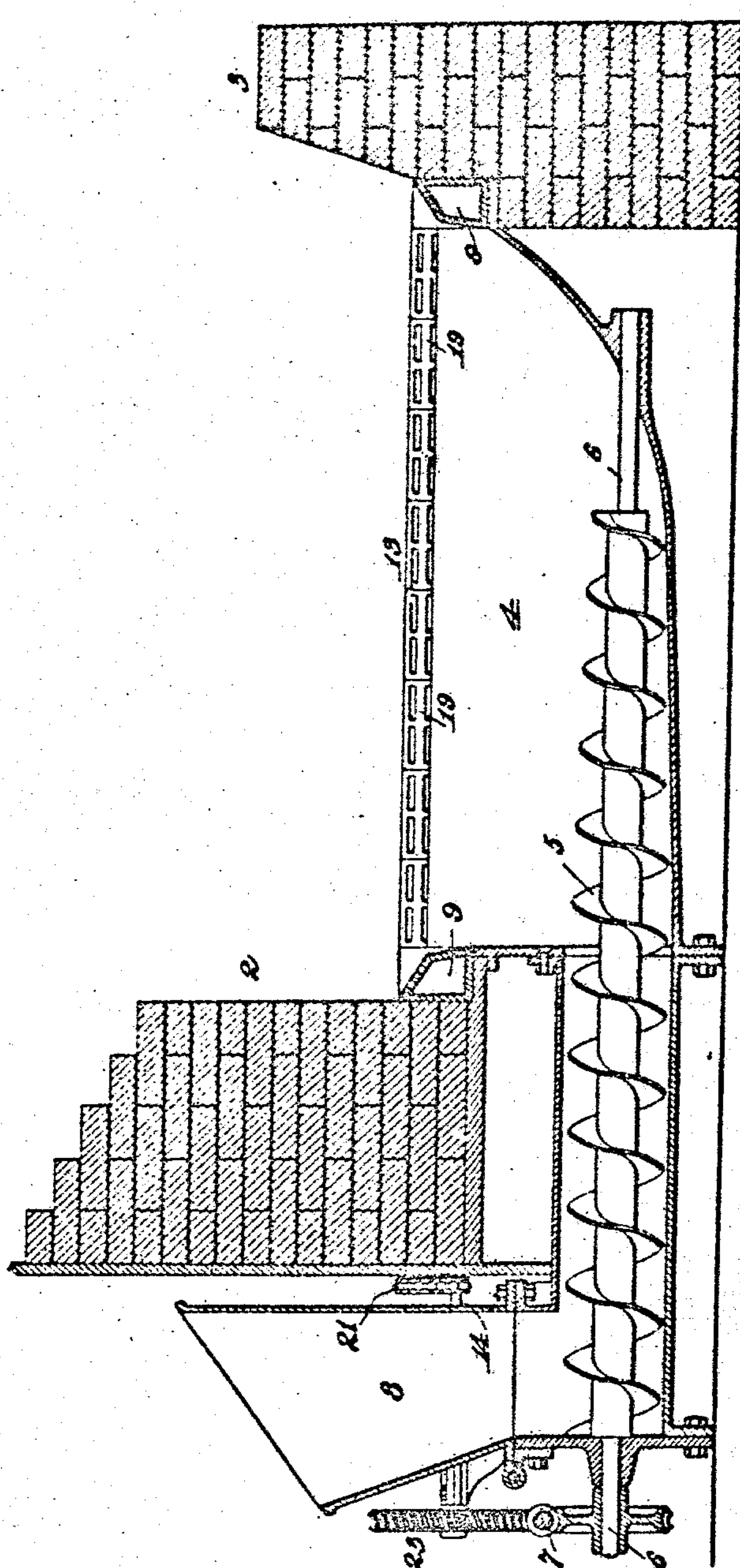
PATENTED OCT. 6, 1903.

J. MACCORMACK.  
FURNACE.

APPLICATION FILED JAN. 23, 1903.

3 SHEETS—SHEET 1.

Fig. 1



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3 SHEETS—SHEET 2.

Fig. 2

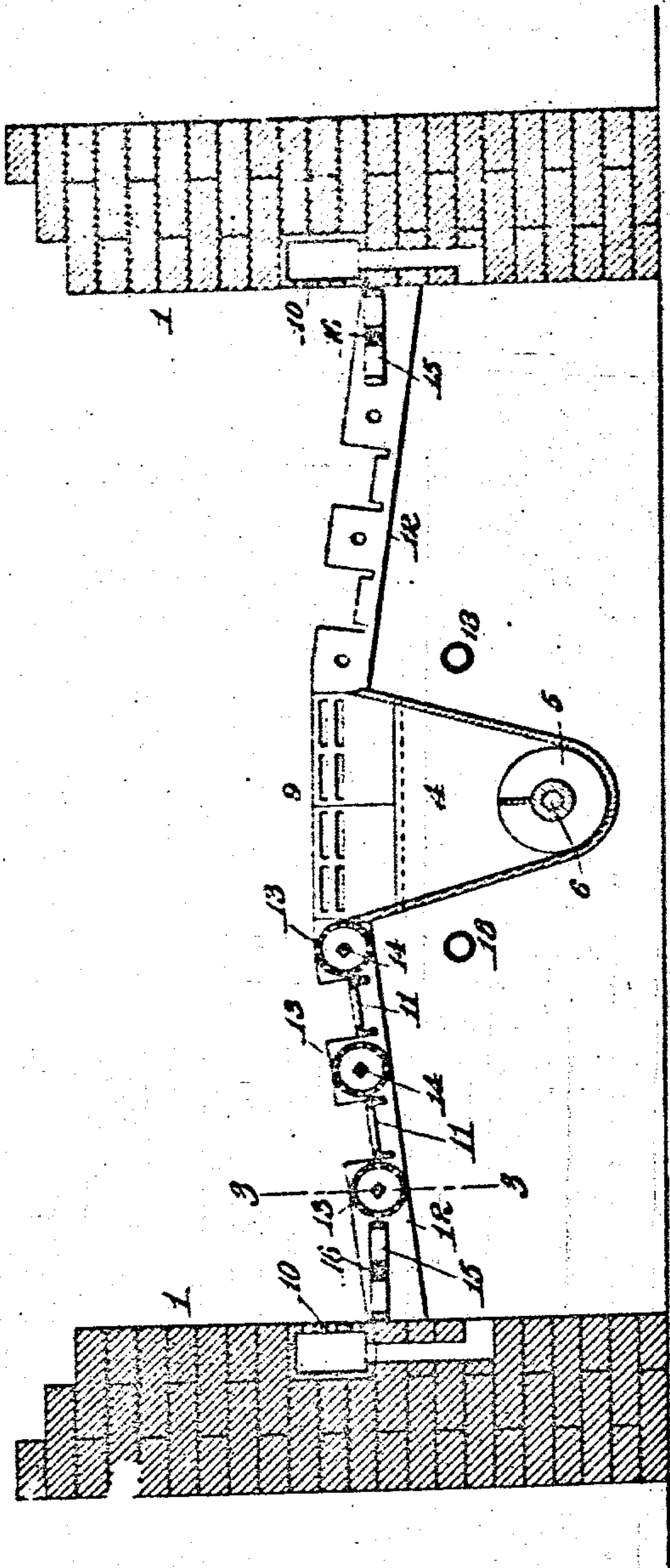
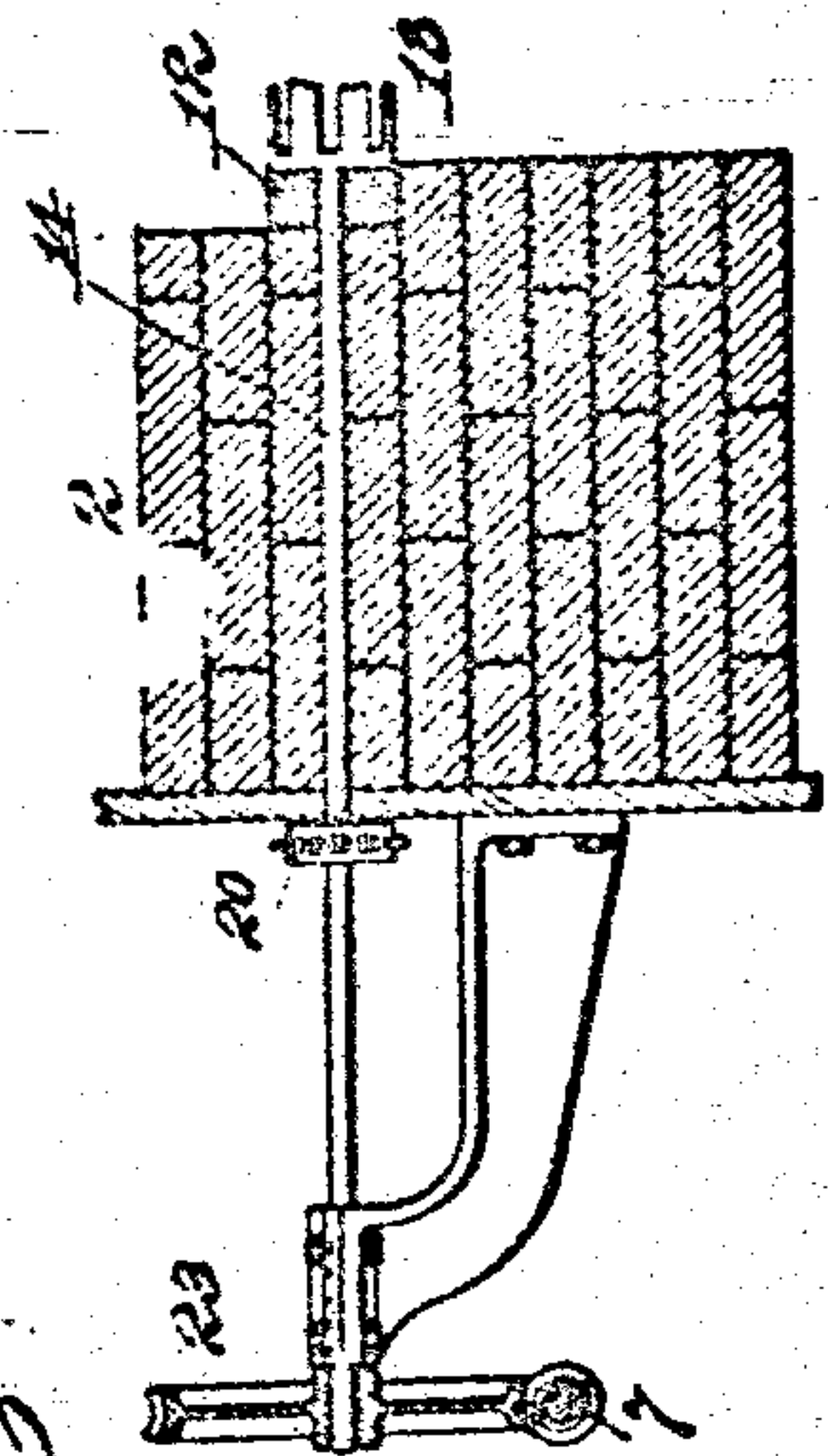


Fig. 3



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3 SHEETS-SHEET 3.

Fig. 4

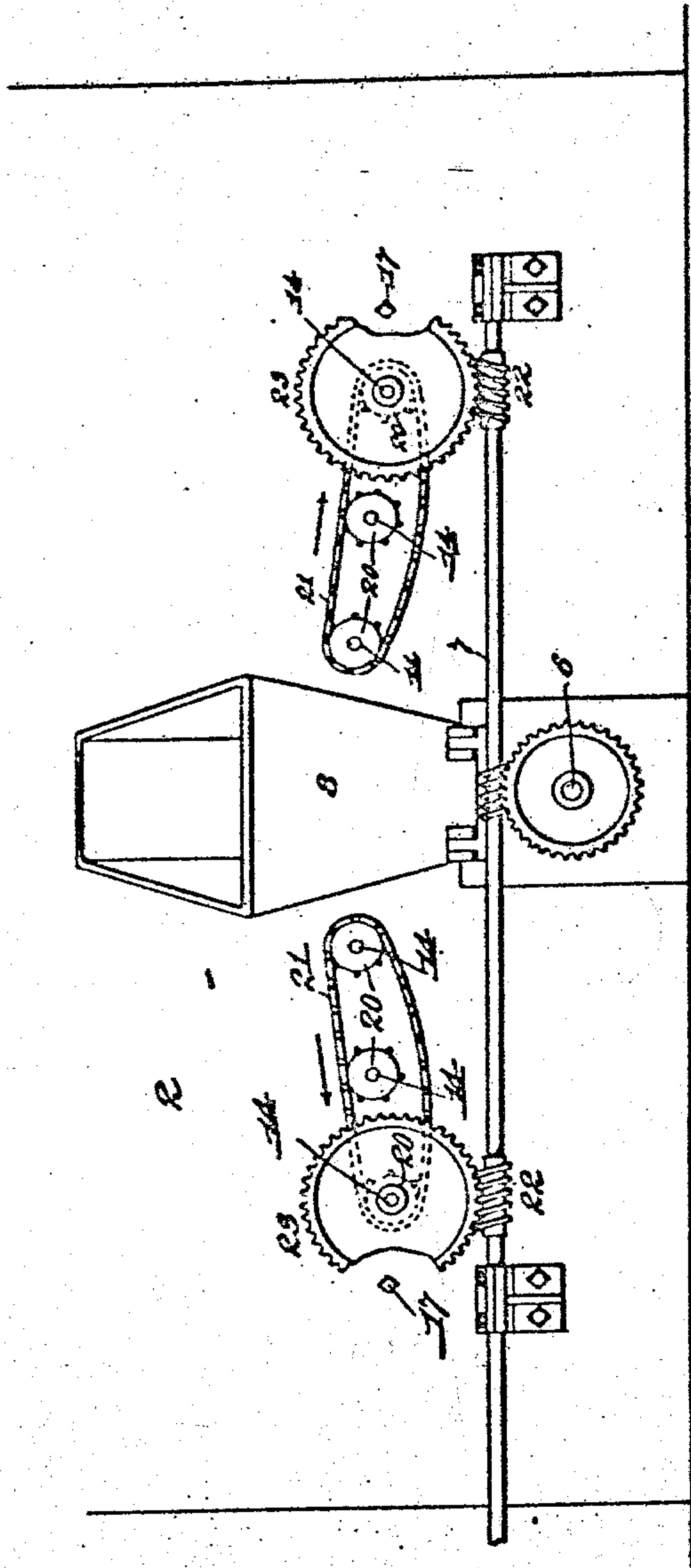
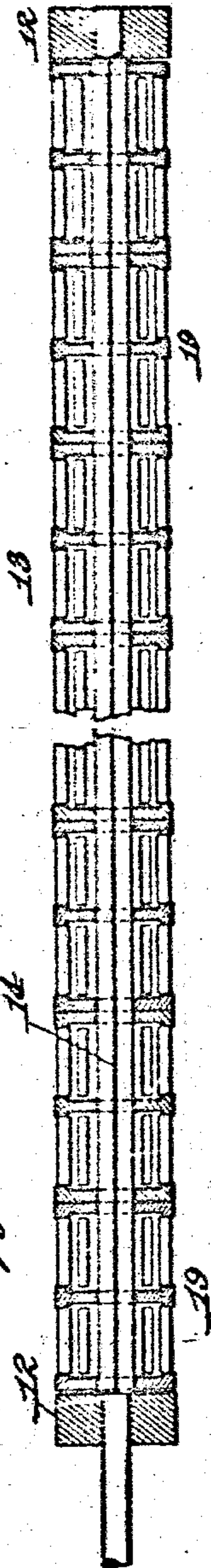


Fig. 5



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# UNITED STATES PATENT OFFICE.

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## FURNACE.

SPECIFICATION forming part of Letters Patent No. 740,668, dated October 6, 1903.

Application filed January 28, 1902. Serial No. 91,569. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN MACCORMACK, a citizen of the United States, residing at Bayonne, in the county of Hudson and State of New Jersey, have invented a certain new and useful Improvement in Furnaces, of which the following is a description.

My invention relates to various new and useful improvements in furnaces of the type employing automatic stoking devices; and my object is to provide a new and useful arrangement of the grate-surface for facilitating and improving the combustion and also to provide new and improved mechanism for effecting the feed of the fuel from the magazine and distributing it with the proper uniformity over the grate-surface.

Broadly stated, the invention consists of a grate-surface employing stationary grate-bars of any suitable and improved form in combination with means between the grate-bars for automatically effecting the feed of the fuel successively over the same toward one or both sides of the furnace. The means which I prefer to employ in combination with the stationary grate-surfaces for securing the desired result comprise a plurality of hollow rotary grate-bars, which in addition to performing a feeding function also facilitate the combustion of the fuel by supporting it while it is subjected to currents of air either by natural or forced draft.

In the preferred embodiment of the invention, therefore, it consists of a grate-surface formed of alternately-arranged stationary and rotary grate-bars, the latter being by preference arranged on a plane somewhat above the stationary grate-bars, so that the latter will extend practically in line with the diameters of the rotary grate-bars, thus effecting the closing of the spaces between the rotary and stationary grate-bars, preventing the formation of pockets between the two in which the fuel might be crushed and allowing the fuel in transit to accumulate in small quantities on the stationary grate-bars until complete combustion thereof is secured.

The invention also preferably contemplates the employment of a clinker-apron cooperating with the grate-surface and toward which the fuel will be fed, said apron being in the

form of a grate on which combustion of any unconsumed fuel can take place and which in the operation receives the clinkers from the grate-surface and permits the latter to be dumped, when desired, into the ash-pit. The grate-surface as a whole is also preferably inclined from the feed-magazine toward the side wall or walls of the furnace, which facilitates the travel of the fuel over the same.

In order that the novel features of my invention may be understood, attention is directed to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a longitudinal sectional view illustrating my improved furnace in its preferred form and showing a well-known type of automatic stoker for supplying the fuel to and feeding it out of the fuel-magazine. Fig. 2 is a cross-sectional view showing the grate-bars in section on one side of the fuel-magazine and illustrating one of the bearing-plates for the shafts of the rotary grate-bars on the other side; Fig. 3, a section in line 3 3 of Fig. 2, showing the shaft of one of the rotary grate-bars and illustrating in part the mechanism for rotating the same; Fig. 4, an exterior view of the furnace, showing the mechanism for operating the grate-bars; and Fig. 5, a longitudinal section on an enlarged scale, illustrating the preferred form of rotary grate-bars.

In all of the above views corresponding parts are represented by the same numerals of reference.

The furnace is provided with the usual side walls 1 1, a front wall 2, and a bridge-wall 3. A fuel-magazine 4 is mounted on the ash-pit floor and receives fuel from any suitable and approved automatic stoker. In the drawings I show a feed-screw 3 of varying pitch, carried on a shaft 6 and driven by worm-gearing from a driving-shaft 7. The stoker, which is of a well-known form, is not claimed herein, and it may be replaced by any other desired automatic stoking mechanism. A hopper 8 feeds the fuel to the screw 5, as will be obvious. The front and rear ends of the magazine are protected by twyers 9 9, secured to or embedded in the front and bridge walls, respectively, and, if desired, twyers 10 may be placed in the side walls 1, receiv-



ing air from the space below the grate-surface, as shown, or in any other way. Mounted within the furnace, and preferably on each side of the magazine 4, are stationary grates 11, which are of any suitable and approved form. These grates are supported by plates 12, carried by the front and bridge walls of the furnace. In the embodiment of the invention shown each stationary grate is made in the form of an inverted channel, the flat member of which is suitably slotted or perforated to permit air to pass up through the same. This makes a convenient arrangement, as it gives great longitudinal strength to resist strains which may be imposed on the bar by extreme changes in temperature. The grate-bars 11 may be of cast-iron or of any suitable material.

With the preferred embodiment of the invention shown in the drawings I arrange on either side of each stationary grate a rotating grate-bar 13, each bar being mounted on a shaft 14, carried in bearings in the supporting-plates 12. It will be observed that one of these hollow rotary grates is arranged closely adjacent to the top of the magazine, so that that particular grate-bar at each side acts as a side twyer for protecting the magazine from the effect of the heat. One of the hollow rotary grates will also be mounted on the outside of each outermost stationary grate-bar, so as to conduct the clinkers and any unconsumed fuel to a clinker-apron 15, as shown. Each clinker-apron is preferably made in the form of a grate-surface carried on a central supporting-shaft 16, mounted in the supporting-plates 12. This shaft is extended through the front wall of the furnace, and at its outer end it is provided with a rectangular head 17 for receiving a wrench in order to permit the clinker-apron to be turned for the purpose of dumping any clinkers in the ash-pit. The stationary grate-bars 11 are preferably arranged substantially in line with the horizontal diameters of the rotary grates, so as to thereby occupy a plane below the effective surface of the rotary grate-bars. This arrangement permits the grate-bars to be placed closely together to thereby prevent the formation of openings between them through which fuel could pass, and it also prevents the formation of pockets into which fuel could be fed by the rotation of the rotary grate-bars. At the same time by arranging the stationary grate-bars the fuel in the course of transit across the grate-surface will be allowed to accumulate slightly on the stationary grate-bars, so as to be entirely consumed, permitting ash to fall through the grate-openings of the stationary bars. Air to support combustion is fed through the rotary and stationary grate-bars, as well as through the clinker-aprons, from the ash-pit below the

grate-surface. The draft may be either natural or forced, and in the latter case a blast-pipe 18 may be arranged in the ash-pit on either side of the magazine for the purpose.

As shown in Fig. 6, each rotary grate-bar is made, preferably, of hollow cast sections 19, keyed to the shaft 14, so as to turn therewith. These sections may be of cast metal or of some refractory material, like fire-brick. The several shafts 14 of the rotary grate-bars extend through the front wall 2 and are provided at their ends with sprocket-wheels 20, over which runs a sprocket-chain 21. The main driving-shaft 7 is provided with worms 22 thereon, each driving a worm-gear 23 on the end of one of the shafts 14 for each set of grate-bars. It will be seen that the rotation of the shaft 7, therefore, drives the sprocket-chains 21 and continuously operates both sets of rotary grate-bars.

In operation the fuel will be supplied to the hopper 8 and by the feed-screw 5 will be fed into the magazine 4, so as to fill the latter. As fresh fuel enters the magazine from below it will be piled up over the sides of the magazine and will flow uniformly over both grate-surfaces. The rotating grates 13 will carry the fuel successively from one stationary grate-bar to the other, and during its passage toward the clinker-aprons 15 on each side the fuel will be effectively consumed. Clinkers will be carried by the travel of the fuel toward the clinker-aprons and will accumulate thereon, from which they can be dumped from time to time. Any unconsumed fuel which may be fed onto the clinker-aprons will also be consumed thereon.

The entire arrangement is effective for the purpose and can be operated with good efficiency. The parts are interchangeable and are simple in construction. The driving mechanism used is effective and durable.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

In a furnace, the combination with a fuel-magazine and means for supplying fuel to the same, of a pair of inclined grate-surfaces composed of alternately-arranged stationary and rotary grate-bars, said stationary bars arranged on the plane of the diameters of the rotary bars, forming relatively deep pockets between said rotary bars, and a centrally-pivoted clinker-apron at the end of each of the grate-surfaces for receiving the clinkers from the same, substantially as set forth.

This specification signed and witnessed this 13th day of January, 1902.

JOHN MACCORMACK.

Witnesses:

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