

No. 696,987.

Patented Apr. 8, 1902.

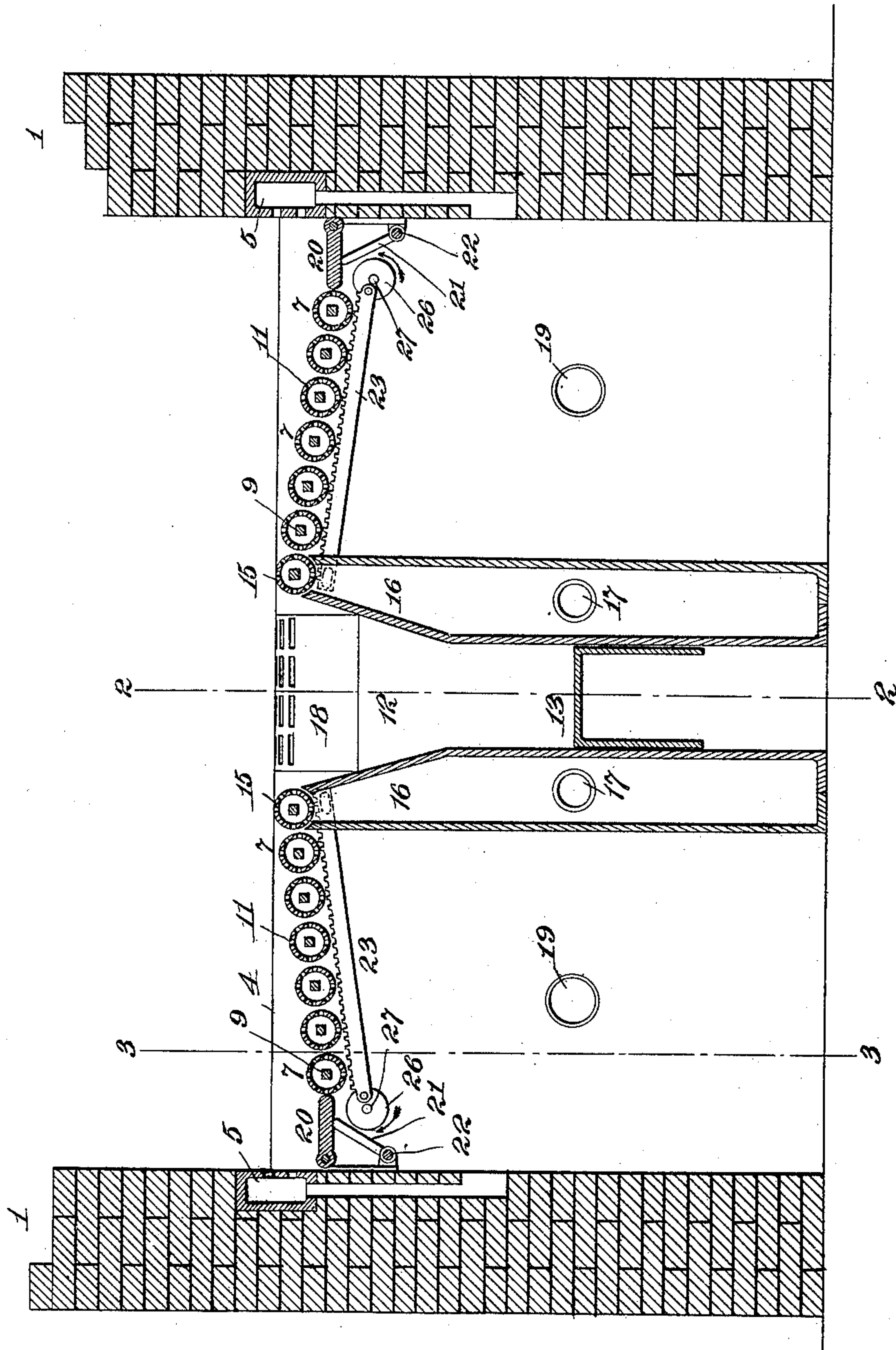
J. MACCORMACK.
FURNACE.

(Application filed Dec. 29, 1900.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1



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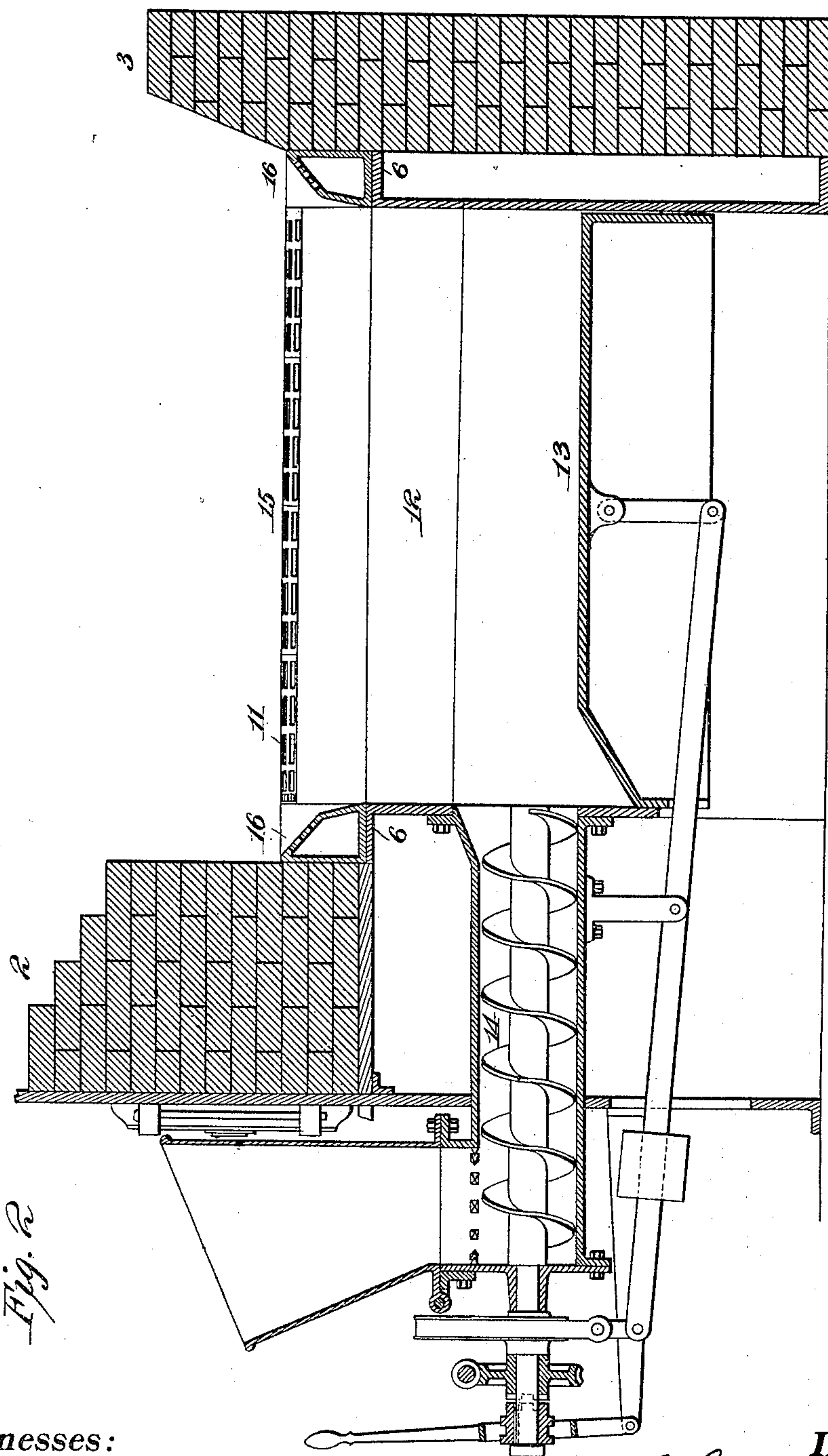


Fig. 2

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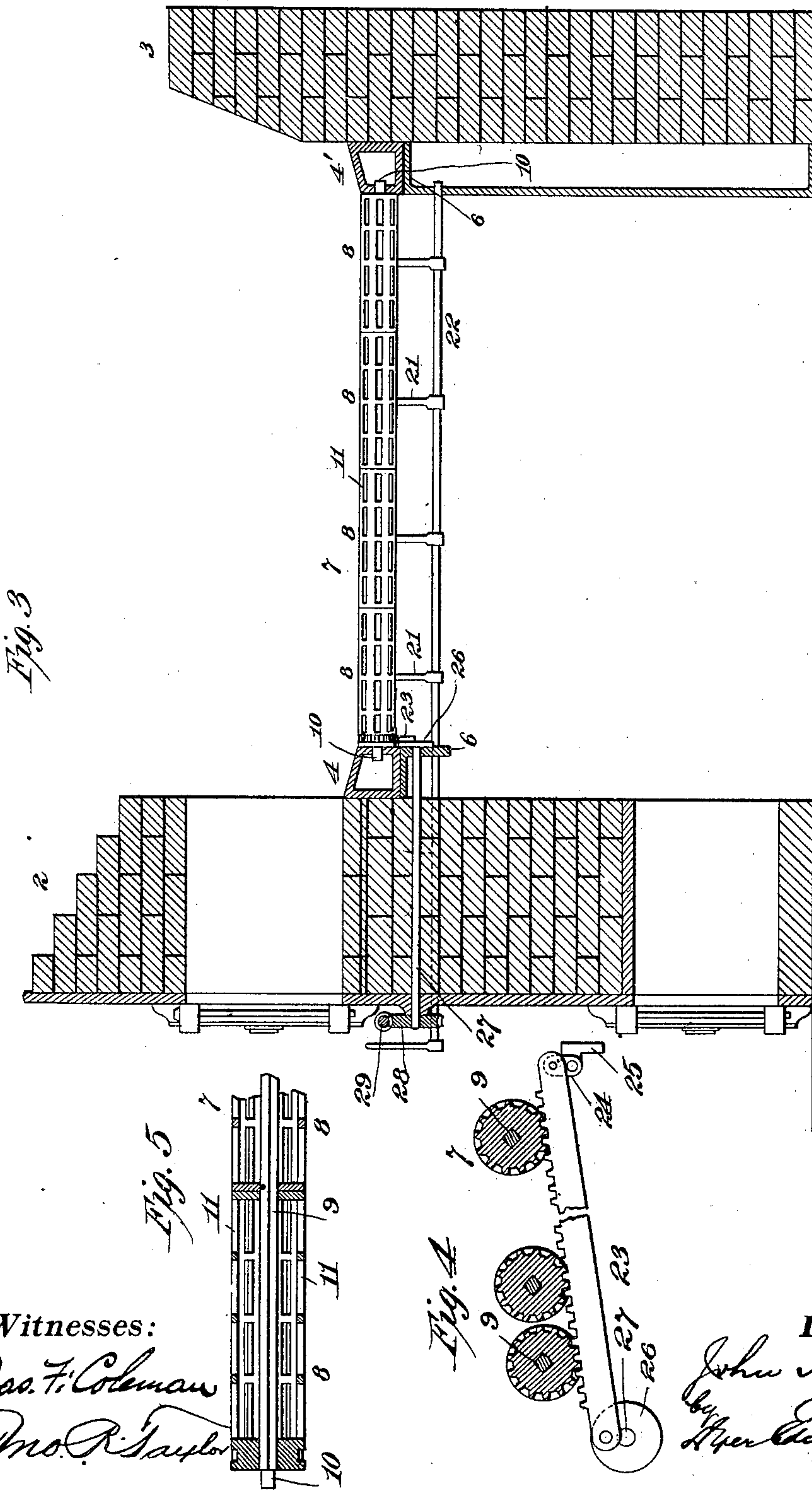
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Fig. 6

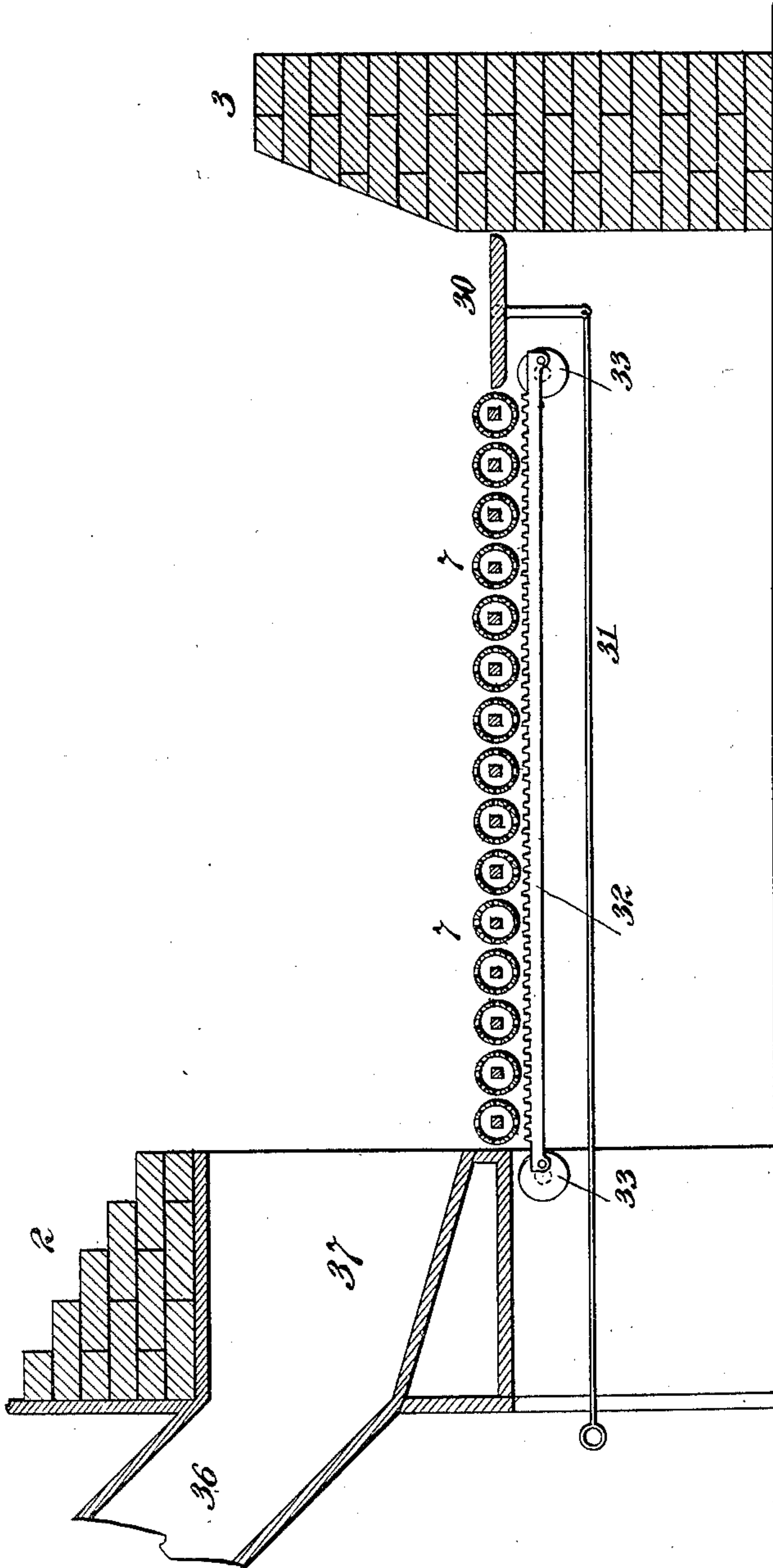
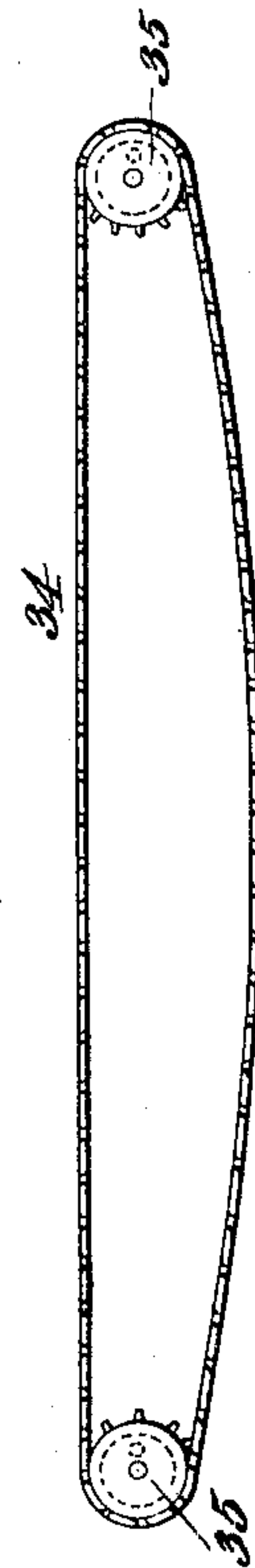


Fig. 7



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UNITED STATES PATENT OFFICE.

JOHN MAC CORMACK, OF BAYONNE, NEW JERSEY, ASSIGNOR TO ROYAL C. PEABODY, OF BROOKLYN, NEW YORK.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 696,987, dated April 8, 1902.

Application filed December 29, 1900. Serial No. 41,473. (No model.)

To all whom it may concern:

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

My invention relates to new and useful improvements in furnaces; and the improvements relate particularly to the grates thereof, to the mechanism for operating such grates, to the means employed for properly distributing air thereto, and to the devices used for removing the clinker.

My object generally is to improve and simplify the construction of furnaces designed especially for boiler-work, to provide for the automatic and uniform distribution of fuel over the entire available area of the grate-surface, to dispense with the necessity of stoking apparatus, although, as I shall describe, an automatic stoker may be used in connection with the improved furnace, to materially increase the life of the grate-bars under the effect of the heat, and to provide an improved twyer for feeding air or steam to the furnace to increase the combustion and which will be of materially longer life than the ordinary twyers as now used, as well as to accomplish other desirable results, as will more fully hereinafter appear.

Broadly stated, my invention comprises a furnace utilizing a series of grate-bars, some or all of which are made tubular in form, with numerous perforations extending through the walls thereof and adapted to be rotated substantially in unison and preferably intermittently in the same direction, whereby fuel fed thereto at one end of the furnace will be progressed by the rotating grate-bars from one to the other through the entire length thereof, while at the same time the rotation of the grate-bars will constantly present fresh surfaces into the zones of maximum temperature, while the other surfaces will be afforded opportunity for cooling.

My invention also consists in the utilization of a hollow grate-bar for the purposes of a twyer, said grate-bar being supported over a suitable metallic box, to which air under pressure is supplied, whereby air will pass

through the grate-bar, permitting the latter to operate as a twyer, in which way the life of the latter will be very greatly increased, since opportunity is offered for effective cooling.

The details of improvement also entering into the make-up of my invention will be more fully explained hereinafter, reference being made to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a cross-section of a boiler-furnace, illustrating my improved grate-bars used in connection with a central-feed automatic stoker; Fig. 2, a section on the line 2 2 of Fig. 1; Fig. 3, a section on the line 3 3 of Fig. 1; Fig. 4, an enlarged detail view illustrating one form of driving mechanism for rotating the grate-bars; Fig. 5, a detached longitudinal section of one of the grate-bars; Fig. 6, a longitudinal sectional view of a modification of my improved furnace, wherein an automatic stoker is dispensed with; and Fig. 7, a longitudinal sectional view of a suitable driving mechanism for operating the grate-bars shown in Fig. 6.

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

Referring first to the illustrative form of my device shown in Figs. 1 to 5, inclusive, 1 1 are the side walls of the furnace, 2 the front wall thereof, and 3 the bridge-wall, all constructed as heretofore. 4 4' are twyer-blocks carried on the front and bridge walls, respectively, of the furnace, and 5 5 are corresponding twyer-blocks, preferably embedded in the side walls of the furnace, as shown, and which may connect with the twyer-blocks 4 4'. All of these blocks are made, preferably, in sections, as is common, in order that they may be removed or interchanged when desired. The blocks 4 4' are carried on angles 6, as shown. Mounted in suitable bearings in the blocks 4 4' are the grate-bars 7, each formed of a series of sections 8 8, as shown, strung on a shaft 9, preferably rectangular in cross-section and rounded at its ends at 10 to take into the bearings therefor. The grate-bar sections are made, preferably, of cast-iron, although obviously other material may be employed in their manufacture, and they are provided with a series of openings 11, extend-

ing through their walls, as shown, and each preferably in the form of an elongated slot. I illustrate the grate-bars in the figures under consideration as being arranged in two sets inclining slightly away from a central magazine 12, located at the center of the ash-pit, whereby material introduced vertically upward through the magazine will be distributed equally to the two sets of grate-bars and by the latter will be fed uniformly over their entire area, as will be explained. Material is fed to and up through the magazine in any suitable way, the mechanism shown being that illustrated in my application for patent filed August 16, 1900, and numbered serially 27,011, in which the magazine is provided with a platform 13, which is vertically reciprocated therein by any suitable mechanism, said platform being supplied with fuel by a feed-worm 14, driven from the same mechanism. The two grate-bars 15 15 on both sides of the magazine constitute twyers; but in construction they are the same as said grate-bars and are designated by a distinctive numeral, since they perform additional functions. Each of these rotating twyers is mounted above the hollow wall 16 of the magazine, which walls are supplied with air under pressure through pipes 17, whereby the air will be blown through the rotating twyers, so as to be kept entirely cool and to properly supply the necessary oxygen for combustion. At its end the magazine 12 is provided with ordinary stationary twyer-blocks 18, as shown. If desired, a low-pressure pipe 19 may be located in the ash-pit on either side of the magazine to supply air below the grate-bars when a forced draft is desirable. At the outside of each grate-section I provide a clinker-receiving apron 20, onto which the clinkers from the grate-sections are deposited. Each apron is supported on a series of arms 21, keyed to a rock-shaft 22, which extends through the front wall 2, so as to be operative from the outside when it is desired to dump the clinkers from the aprons 20. Obviously the aprons 20 may be dispensed with and the clinkers from the grate-sections be permitted to fall into the ash-pit through an opening between the grate-sections and the side walls; but ordinarily I prefer to use an apron coöperating with each grate-section, as shown, whereby the blast will be directed through the grate-bars and not around the same, as would be the case if such an apron were not used. The rotating grate-bars 7 7, as well as the rotating twyers 15, are rotated in the same direction and preferably simultaneously by a series of intermittent feed movements, whereby material introduced onto each grate-section at the inner side adjacent to the rotating twyers will be slowly progressed over the entire area of the grate-sections until complete consumption has been effected. Any suitable operating devices may be employed for rotating the grate-bars and rotating twyers in this or in any other way. In the drawings I illustrate a toothed bar 23,

mounted beneath the grate-bars and rotating twyer of each set near the front of the furnace. This toothed bar at its inner end is carried on a lever 24, pivoted in a bracket 25 at the side of the magazine, and at its other end the toothed bar is connected to an eccentric 26 on a shaft 27. The teeth of the toothed bar 23 are so disposed as to engage with the slots or openings 11 in the several grate-bars and in the rotating twyer, or said grate-bars and twyer may be formed with special openings therein for the engagement of said teeth therewith. Each shaft 27 is rotated in any suitable way—as, for example, by being provided with a worm-gear 28 outside of the front wall, which gears on both shafts may be driven from a single driving-worm 29, as shown. The driving-worm 29 may be an ordinary screw-worm; but preferably said worm is formed with a drunken thread thereon, so as to drive the gears 28 intermittently, as will be understood. It will be obvious that as either shaft 27 is rotated in the direction of the arrow the elevation of the pivot connection with the toothed bar 23 above the horizontal plane of said shaft will engage the toothed bar with the several grate-bars and also with the rotating twyer, which rotating devices will then be rotated to a slight extent. As the connection with the toothed bar passes below the horizontal plane of the shaft 27 the toothed bar will be withdrawn downwardly from engagement with the rotating devices, so that the latter will remain stationary. Thus an intermittent feed movement will be given to the rotating twyers and grate-bars to slowly advance the fuel fed from the magazine to the grate-sections toward the side walls of the furnace, whereby the clinker will be fed from the grate-sections and will accumulate on the aprons 20, which can be dumped from time to time from the outside. By thus rotating the rotating twyers and grate-bars these elements will be effectively protected from the heat, as will be obvious, while at the same time provision is made for the passage of air therethrough for properly supplying the fuel with the necessary oxygen.

In Figs. 6 and 7 I illustrate my improvements in connection with an ordinary horizontal furnace, wherein the rotating grate-bars 7 are arranged in a single horizontal series, as shown. In this modification I show a centrally-pivoted clinker-receiving apron 30, which is operated by a rod 31, extending through the front wall, as shown. The grate-bars 7 are rotated, preferably intermittently, by means of a toothed bar 32, connected to the two crank-disks 33, which disks are driven simultaneously in any suitable way—as, for example, by means of a sprocket-chain 34, engaging sprocket-wheels 35 on the shafts of the crank-disks. By rotating the crank-disks simultaneously the toothed bar will be engaged successively with the grate-bars and disengaged therefrom to intermittently rotate them simultaneously. Fuel is fed to the

grate-bars in any suitable way—as, for example, through a chute 36, which connects with an incline 37.

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

10 1. In a furnace, the combination with an air-supply box, of a hollow perforated rotatable twyer partially surrounded by said box but extending out of the same, substantially as set forth.

15 2. In a furnace, the combination with a magazine and means for forcing fuel vertically upward through the same so that the fuel piles over its side, of a series of hollow rotating grate-bars extending substantially in line with the upper edge of the magazine and onto which the fuel therefrom flows, and a hollow rotary twyer interposed between the 20 fuel-magazine and said grate-bars, substantially as and for the purposes set forth.

25 3. In a furnace, the combination with a magazine and means for forcing fuel upwardly through the same so that the fuel piles over the sides of the magazine, of two sets of rotary grate-bars extending substantially in line with said sides and on which the fuel from the magazine flows, and a hollow rotary

twyer interposed between each side of said magazine and the adjacent grate-bars, substantially as and for the purposes set forth. 30

4. In a furnace, the combination with a series of rotatable grate-bars arranged side by side, of a toothed bar for engaging said grate-bars, and continuously-operating means for 35 advancing said toothed bar into engagement with the grate-bars, advancing the same to rotate said bars and then withdrawing the toothed bar from engagement with the grate-bars. 40

5. In a furnace, the combination with a series of rotatable grate-bars, arranged side by side, of a toothed bar for engaging said grate-bars, and a rotating shaft carrying an eccentric for moving said toothed bar into engage- 45 ment with the grate-bars, advancing the same to rotate said bars, and then withdrawing the toothed bar from engagement with the grate-bars.

This specification signed and witnessed this 50 28th day of December, 1900.

JOHN MAC CORMACK.

Witnesses:

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