(No Model.) 2 Sheets—Sheet 1.

F. H. RICHARDS.

TRAVELING GRATE FURNACE.

No. 527,448. Patented Oct. 16, 1894.

Fig. 1.

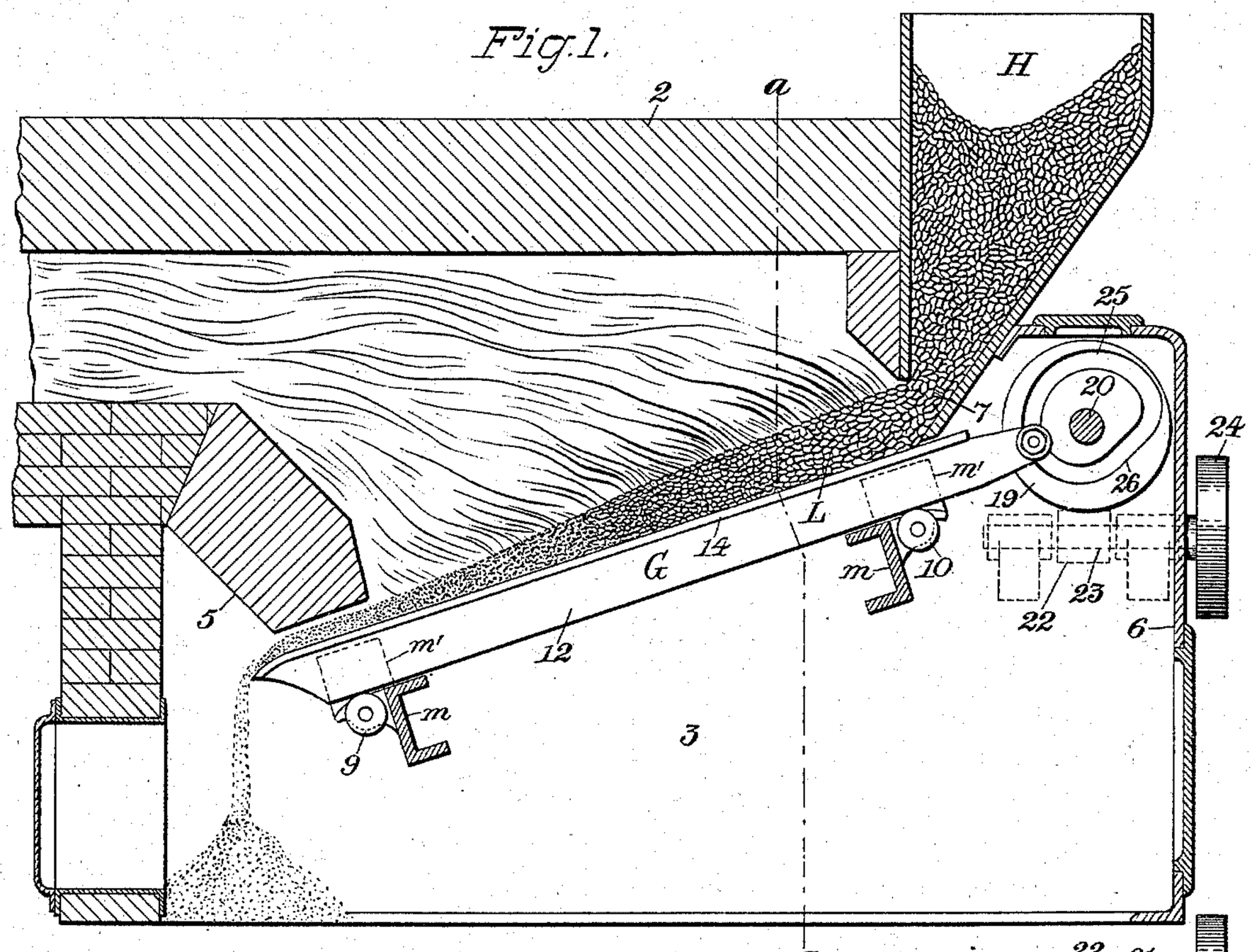
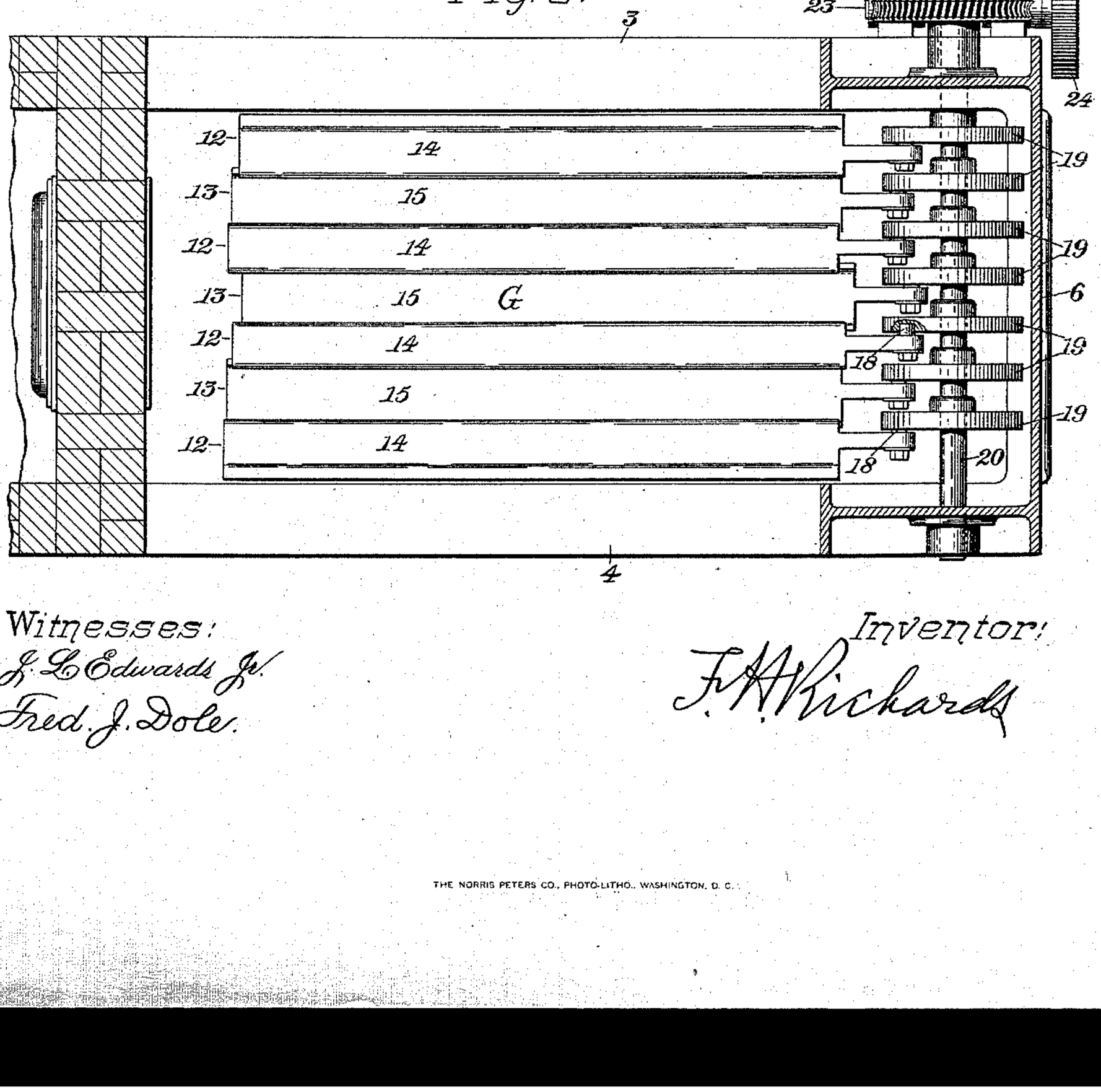


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

F. H. RICHARDS.

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No. 527,448. Patented Oct. 16, 1894.

Fig. 3.

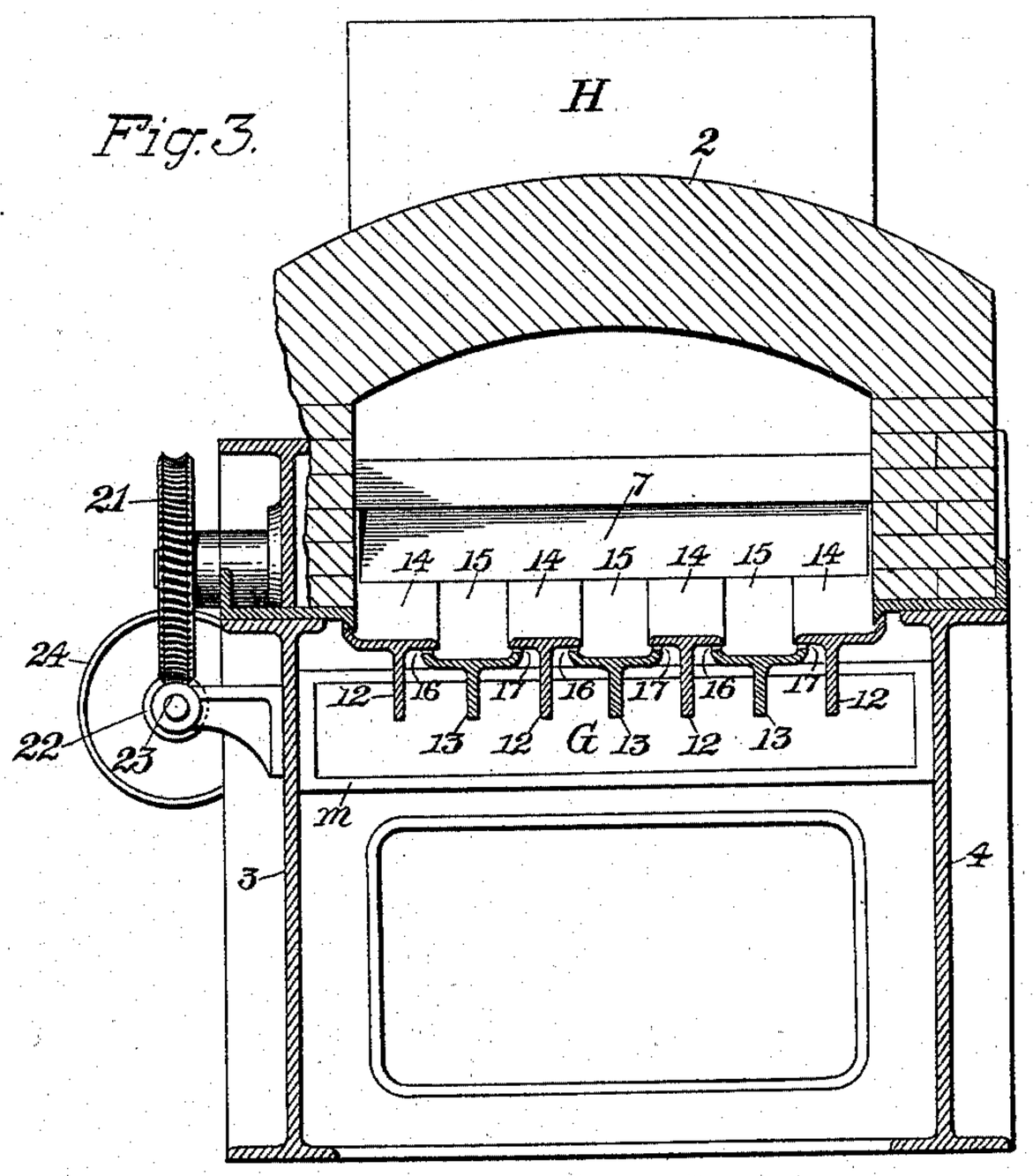


Fig. 4.

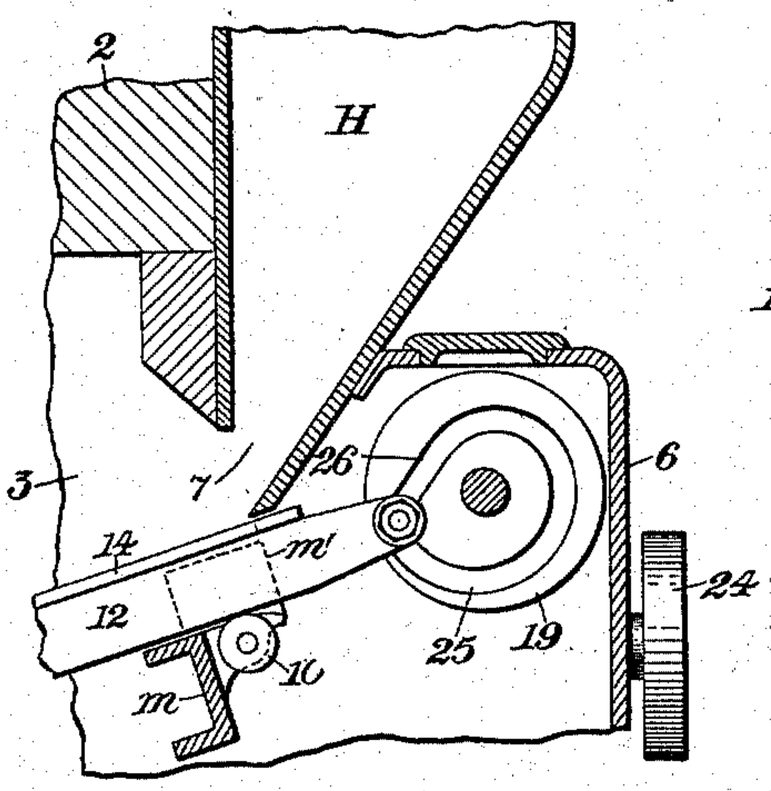
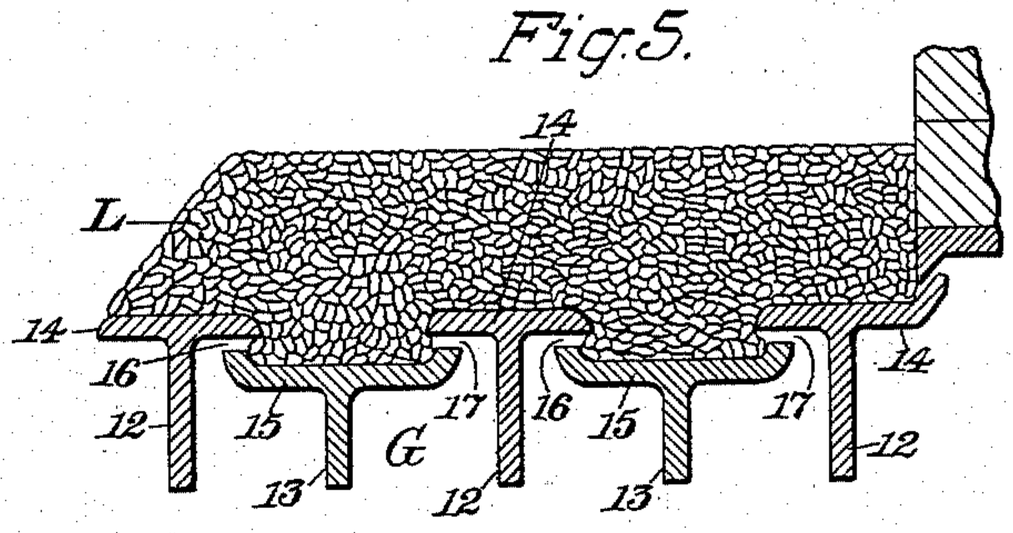


Fig. 5.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

TRAVELING-GRATE FURNACE.

SPECIFICATION forming part of Letters Patent No. 527,448, dated October 16, 1894.

Application filed November 27, 1893. Serial No. 492,053. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Traveling-Grate Furnaces, of which the following is a specification.

This invention relates to fuel-traveling grate mechanism for furnaces, the object of the invention being to furnish in connection with a furnace, an efficient non-rotary fuel-traveling grate adapted for carrying the fuel in a layer along in the furnace after the manner of the endless traveling grate, or chain-grate, heretofore used for that purpose.

In the drawings accompanying and forming a part of this specification, Figure 1 is a sectional side elevation of a furnace embodying my present improvements. Fig. 2 is a sectional plan view of the furnace showing the arrangement of the grate-bars and grate-bar-actuating mechanism. Fig. 3 is a transverse sectional elevation of the furnace taken in line *a*—*a*, Fig. 1 showing the parts at the right hand of said line as seen from a point at the left hand thereof. Fig. 4 is a detail view illustrating, in sectional side elevation, a portion of the right hand end of the furnace showing the grate and actuating mechanism in a position differing somewhat from that shown in Fig. 1, said figure being intended to illustrate the operation of the devices for imparting the required traveling movement to the grate-bars. Fig. 5 is a cross-sectional detail view, on an enlarged scale, illustrating the preferred form and arrangement of the grate-bars.

Similar characters designate like parts in all the figures.

The furnace illustrated in the drawings has the usual inclosing walls at the sides and ends thereof and is shown provided with an ordinary furnace roof. The side-walls are designated by 3 and 4, respectively the roof by 2, the usual bridge-wall by 5, and the front wall by 6. At the forward end of the furnace this is provided with the fuel-supply hopper H from which the fuel is admitted to the furnace-chamber through the inclined chute or opening 7, in a well known manner.

The furnace is provided with a reciprocatory fuel-traveling grate, designated in a general way by G, which grate is supported at its ends by suitable transverse supports, *m*, having suitable guides *m'* for guiding the movements of said grate. Air is supplied to the fuel upon the grate from below in any suitable manner. In practice, suitable grate-bar-supporting rollers, as 9 and 10, will be provided at one or more points in the length of the grate-bars for reducing the friction of the bars as they are moved longitudinally of the furnace.

My improved fuel-traveling grate consists of a series of grate-bars supported as before described and adapted to have a relatively slow forward movement together, and to have separately, or successively, a relatively rapid backward movement. The series of bars is carried forward with a relatively slow movement toward the left hand in Fig. 1 by means of suitable actuating devices, as hereinafter described, and during said forward movement of the majority of the series, the bars are, a portion of them at a time, retracted with a relatively rapid movement to their original positions. During this retractive movement, the fuel resting in a mass spread in a layer upon the series of bars has a greater resistance upon the several adjacent forwardly-moving bars than it has adhesion upon a backwardly-moving single bar. Therefore the layer or mass of fuel remains, in practice, unbroken by the retraction of one bar at a time so long as one or more bars on each side of the retracting bar continue to move forward together. By means of this organization of mechanism the layer L of fuel resting on the bars is carried regularly forward, after the same manner, substantially, as by the ordinary endless traveling grate. In practice, the proper operation of the mechanism will be facilitated by setting the grate somewhat inclined downwardly toward the rearward end thereof, as indicated in the drawings, so that gravity will co-operate with the forwardly-moving bars to prevent retraction of the fuel by the backwardly-moving bars.

In the preferred form thereof herein shown, the grate mechanism consists of the alternate "upper" and "lower" bars 12 and 13,

which bars are shown substantially of the same construction set side by side with the exception that the so-called upper bars have each a cap-piece, 14, while the lower bars 13 have the supporting plates 15 underlying the edges of the cap-pieces of the upper bars 12. This arrangement is shown best in Fig. 5 where the fuel is shown supported on said bars as in practice, the air being supplied to the fuel from below through the openings or air-spaces 16 and 17, which openings are prevented from clogging by the arrangement of the overlapping plates and caps 14 and 15, respectively.

As a means for imparting the requisite movement to the grate-bars, I have provided in connection with each grate-bar a grate-bar-driver, or cam, 19, which in the form thereof herein shown, (see Fig. 4) consists of a wheel having a relatively long or eccentric cam-face, 25, by means of which a relatively slow forward movement is imparted to the grate-bar, and a relatively short return-cam face, 26, by means of which a relatively rapid return-movement is imparted to the grate-bar, which cam-faces may be formed by grooving the face of the driver or in any well known manner known to the art.

The grate-bars 12 and 13 are shown provided with rollers or studs, 18, for engaging the cam-faces 25 and 26 of the grate-bar-actuating cams, or drivers, the drivers being herein shown as grooved to form said cam-faces. These cams, or drivers, are shown placed upon a shaft, 20, that is carried in bearings in the walls of the furnace. Said shaft is shown provided at one end with the worm-wheel 21 fixed thereon, which worm-wheel meshes with the worm 22 on the driving-shaft 23 supported in suitable bearings and provided with a driving pulley 24 whereby the entire mechanism may be actuated. As before stated the forward movement of the grate-bars is produced by the gradual incline or cam-face 25 of the driver, while the backward movement thereof is produced by the steeper or shorter cam-face 26. In Fig. 4 the driver is illustrated in a different position from that shown in Fig. 1 for more fully setting forth the operation of the mechanism, which will be readily understood by comparison of the several figures of the drawings in connection with this description thereof.

In practice, the grate-bar-drivers will be secured to the shaft 20 in slightly varying positions, and be so timed in their movements as to move forward the majority of the bars all together with a relatively slow movement and will move others of said bars backward with a relatively rapid movement, which arrangement will be fully understood by any one skilled in the art to which this invention appertains.

The cap pieces 14 of the upper bars 12 by overlapping the plates 15 of the lower bars 13 protect the air-spaces 16 and 17 between said bars and prevent their becoming clogged with fuel or clinker. The longitudinal movement of one bar relatively to the other also serves to grind or break up the material lodging in the air-spaces, thus keeping the air-spaces free from obstruction.

The general operation of the furnace is as follows: The grate-actuating devices being started in operation by operatively connecting the pulley 24 with some suitable source of power, (as for instance, a suitable motor connected by a belt, not shown) said devices actuate the several grate-bars after the manner hereinbefore set forth and impart to them a general and relatively slow forward movement of substantially uniform velocity throughout the forward stroke thereof and impart to a part of them at a time successive and relatively rapid backward movements. The fuel being supplied to the grate from the hopper through the chute or opening 7, is carried forward on the grate in a continuous layer, air being supplied to the fuel from below in any suitable manner to facilitate combustion thereof, after which the ash and cinder are discharged over the rear end of the grate-bars.

I claim—

1. A fuel-traveling grate for furnaces, consisting of a series of grate-bars supported for longitudinal movement, combined with rotary drivers and connections substantially as described for imparting a gradual and relatively slow longitudinal forward movement to the series of bars, and adapted for imparting a relatively rapid backward movement to a portion only of the bars at a time, and means for rotating said drivers, substantially as described and for the purpose set forth.

2. The herein-described fuel-traveling grate for furnaces, it consisting of a series of bars supported and adapted for longitudinal movement, in combination with bar-actuating devices which consist of differently disposed revoluble drivers having successive long and short cam-faces adapted respectively for imparting a relatively slow forward longitudinal movement to the majority of the grate-bars, and for imparting a relatively rapid backward movement to said bars, independently or successively, and connecting-devices between the grate-bars and their drivers and in constant bearing-contact with the bearing faces thereof, substantially as described and for the purpose set forth.

3. In a furnace, in combination, a series of longitudinally reciprocating grate-bars, a driving-shaft located transversely of the shaft adjacent thereto, means for revolving said shaft and grate-bar-actuators secured to said shaft and having long and short eccentric cam-faces in constant engagement with the grate-bars and set in successively advanced positions along said shaft whereby a revolution of said actuators will impart a general relatively slow advancing-movement, and successive relatively rapid return-movement to said grate-bars, substantially as described.

4. A fuel-traveling grate for furnaces comprising a series of lower grate-bars having fuel-supporting top plates, a series of upper grate-bars having top plates in longitudinal parallelism with and partially overlapping the top plates of the lower grate-bars and so disposed as to leave air-spaces between said plates, substantially as described, combined with rotary drivers and connections for imparting a relatively slow and gradual forward movement to the series of bars and adapted for imparting a relatively rapid backward movement to a portion only of the bars at a time, and means for rotating said drivers, substantially as described and for the purpose set forth.

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