

(No Model.)

6 Sheets—Sheet 1.

E. B. COXE.  
TRAVELING GRATE FURNACE.

No. 535,355.

Patented Mar. 12, 1895.

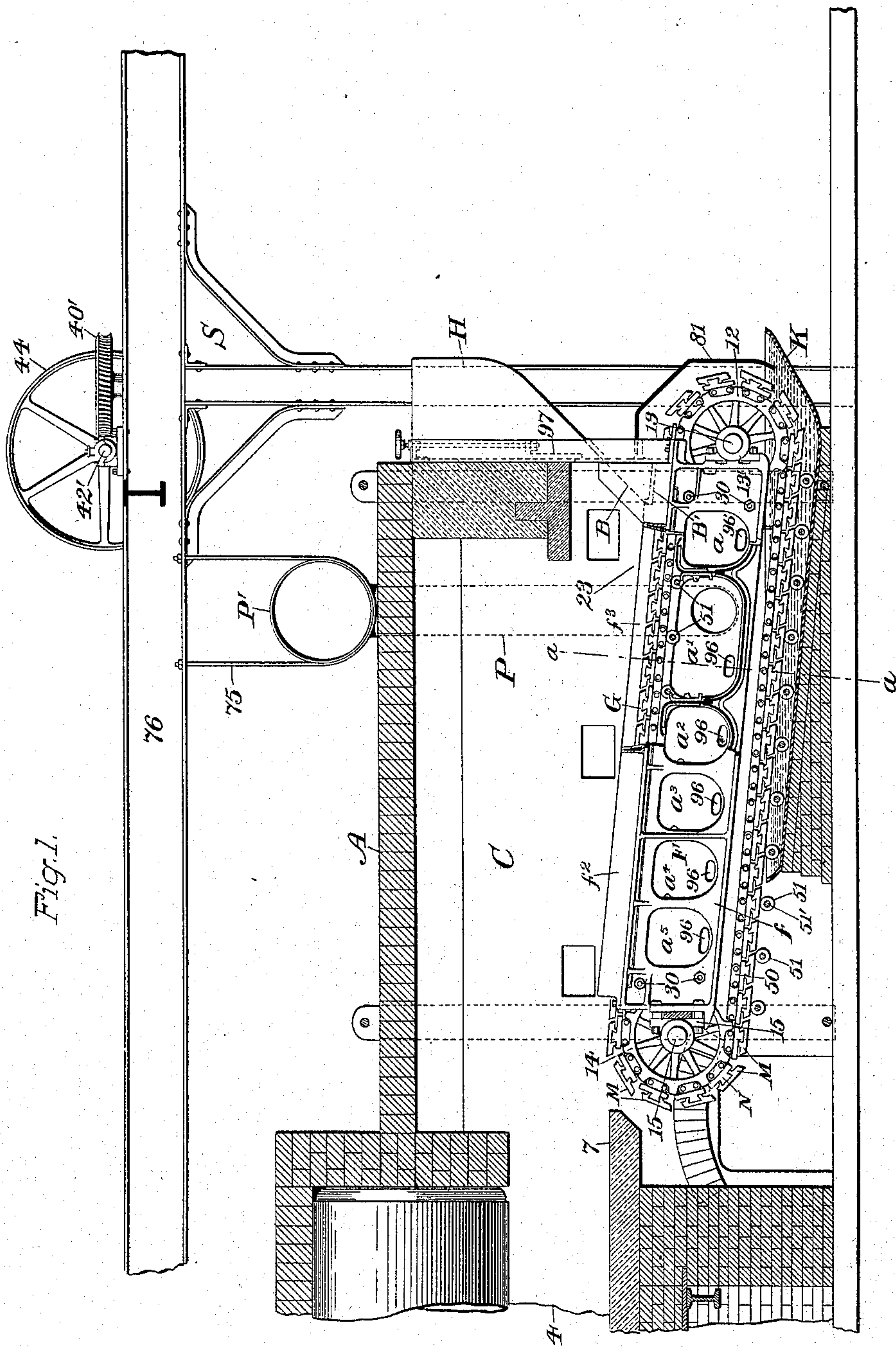


Fig. 1.

Witnesses:

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Inventor:

Eckley B. Coxé,  
By his Attorney,

F. A. Richards.

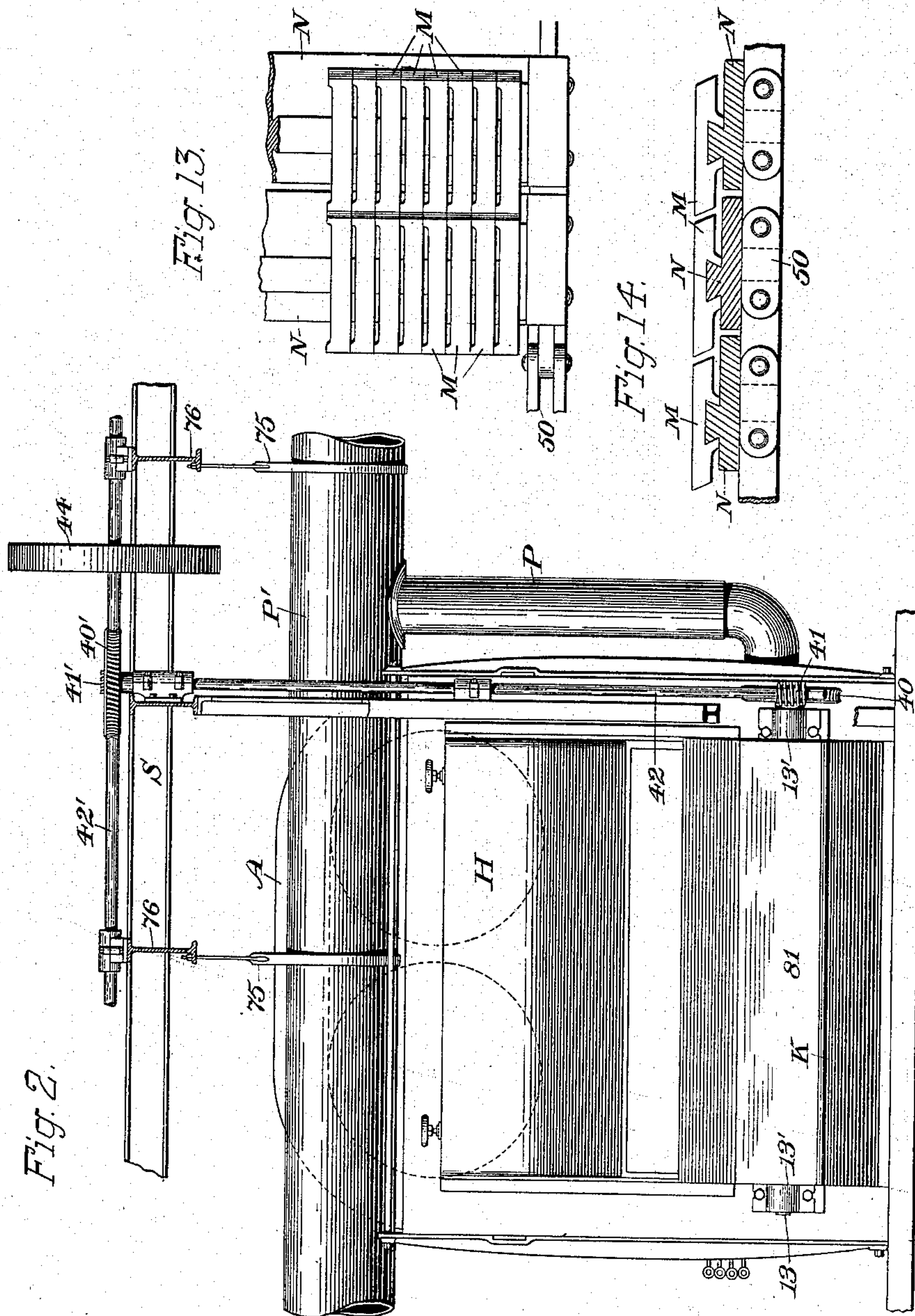
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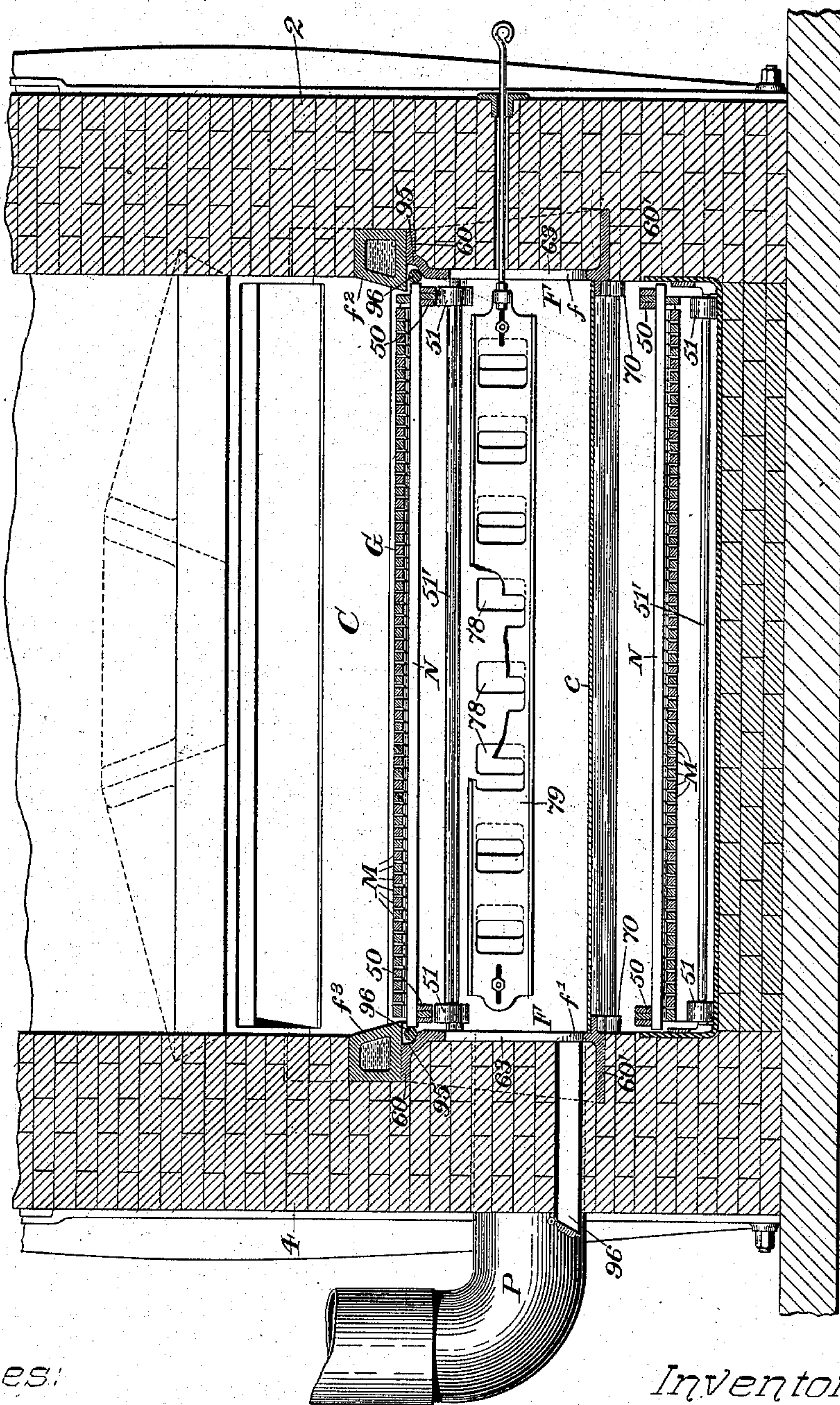
6 Sheets—Sheet 3.

E. B. COXE.  
TRAVELING GRATE FURNACE.

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Fig. 3



Witnesses:  
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(No Model.)

6 Sheets—Sheet 4.

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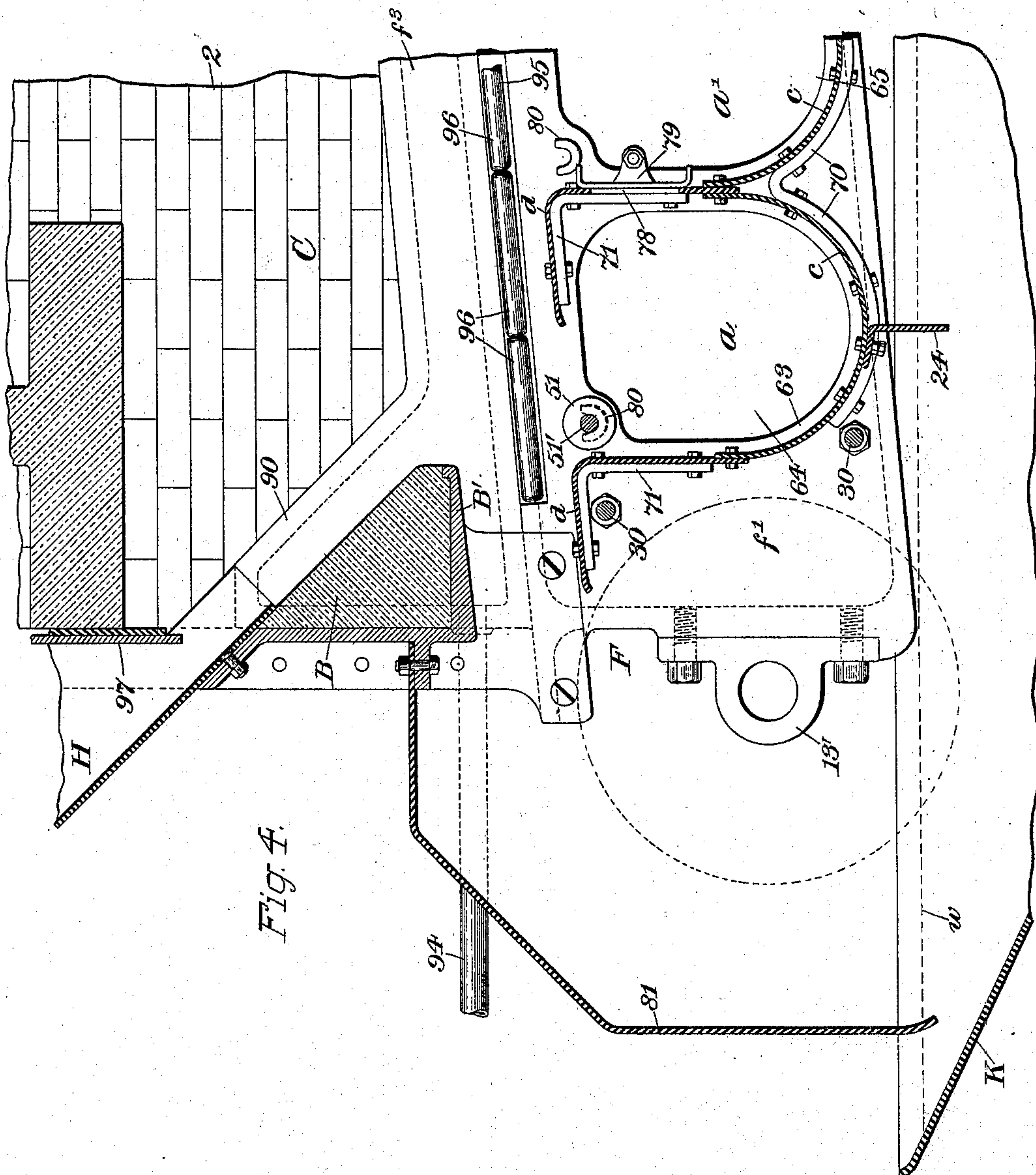


Fig. 4.

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6 Sheets—Sheet 5.

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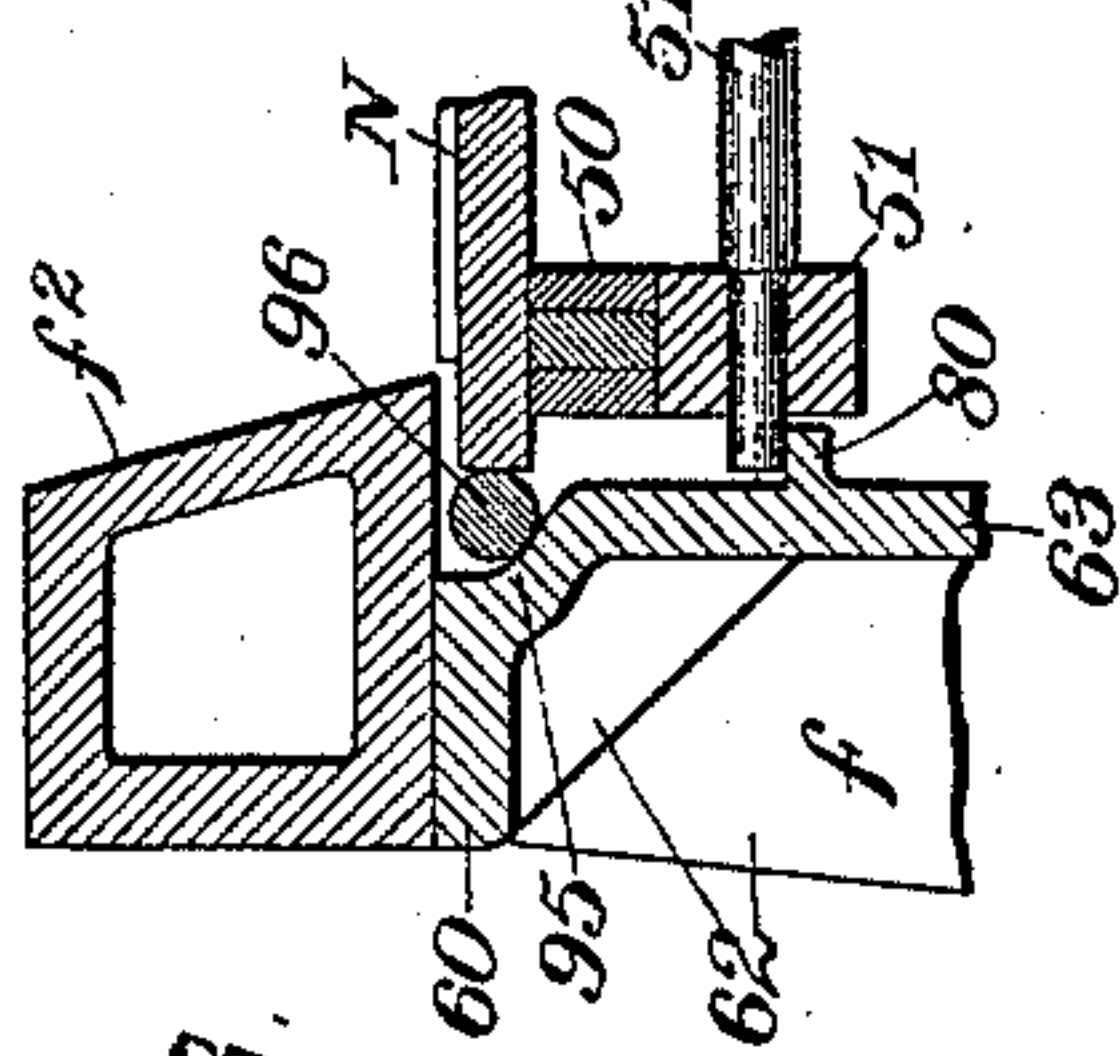


Fig. 7.

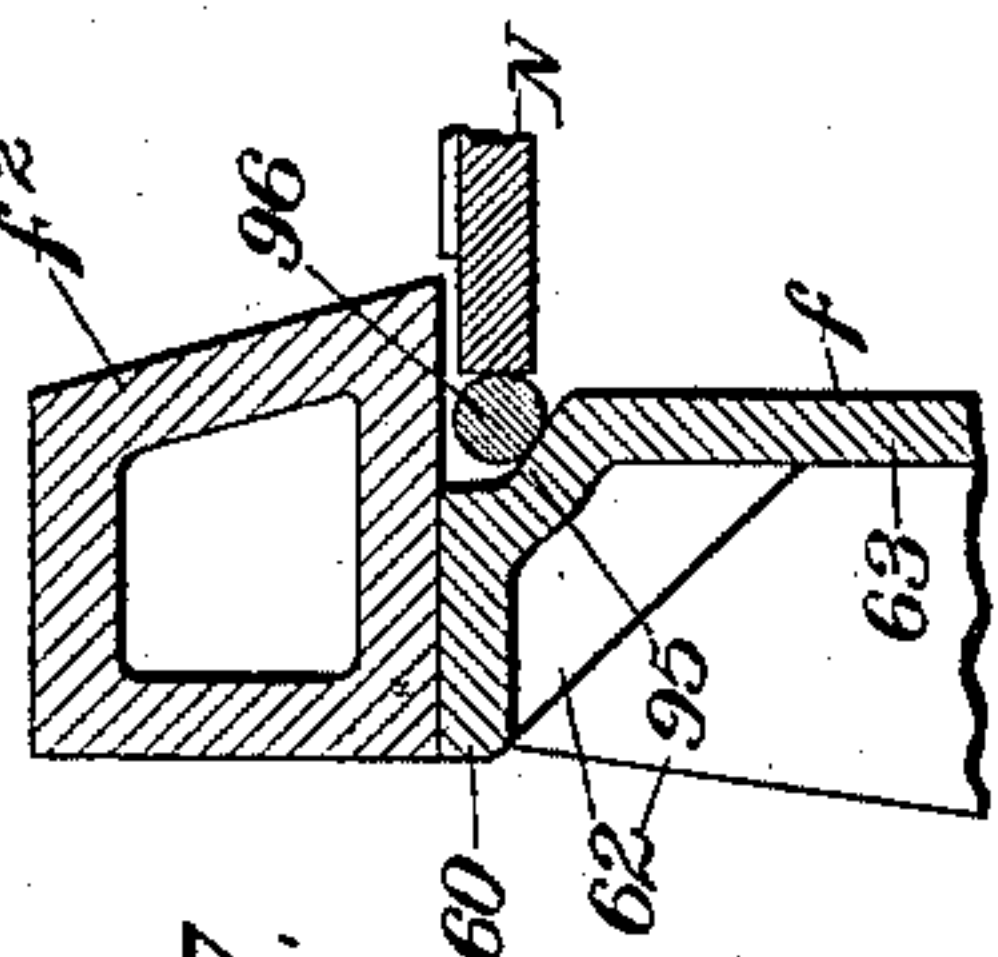


Fig. 8.

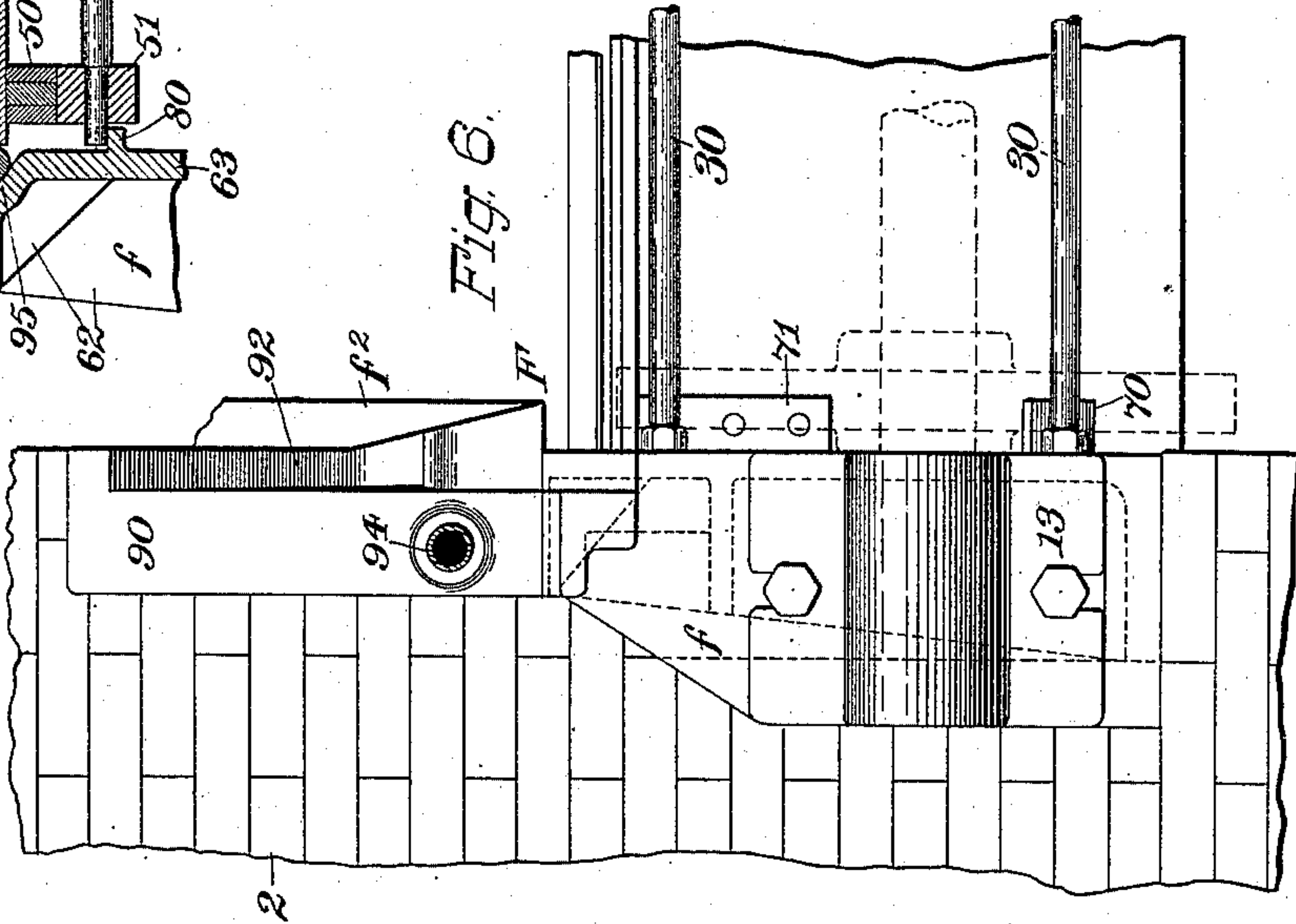


Fig. 5.

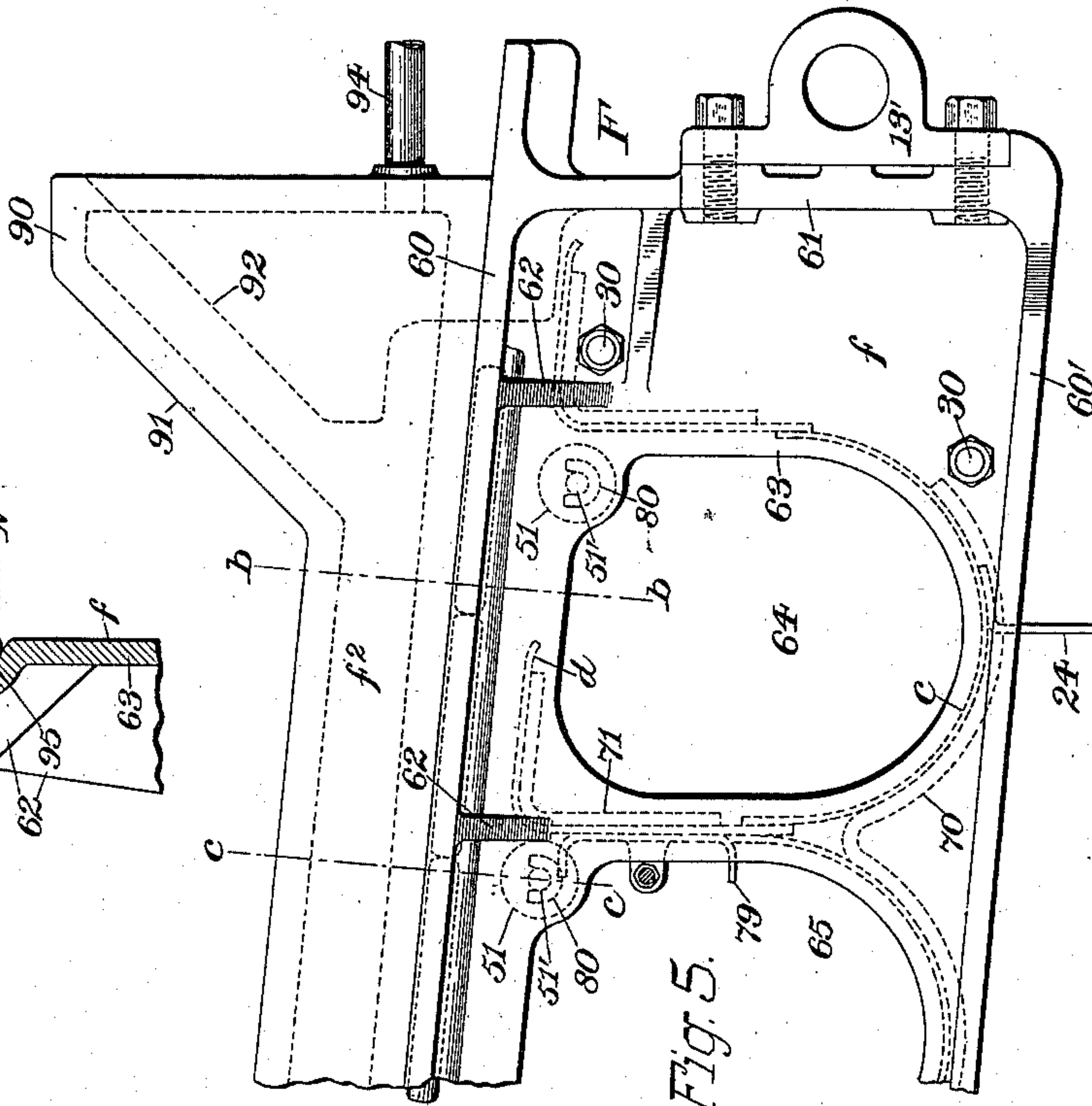


Fig. 6.

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(No Model.)

6 Sheets—Sheet 6.

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Fig. 11.

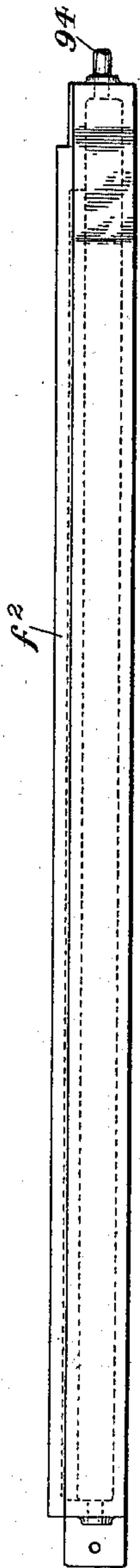


Fig. 10.

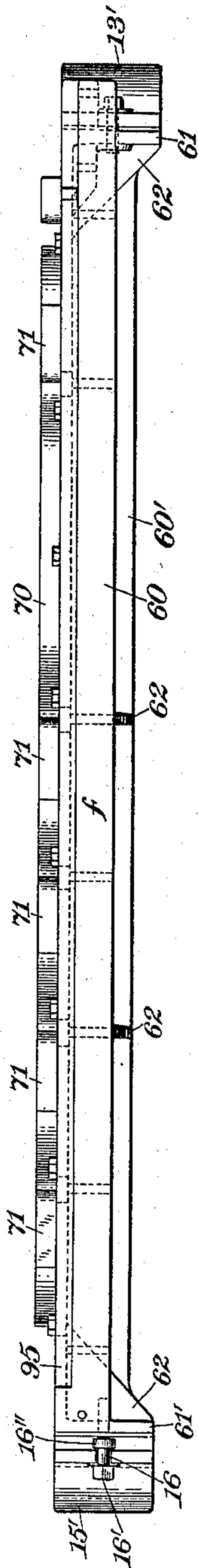


Fig. 9.

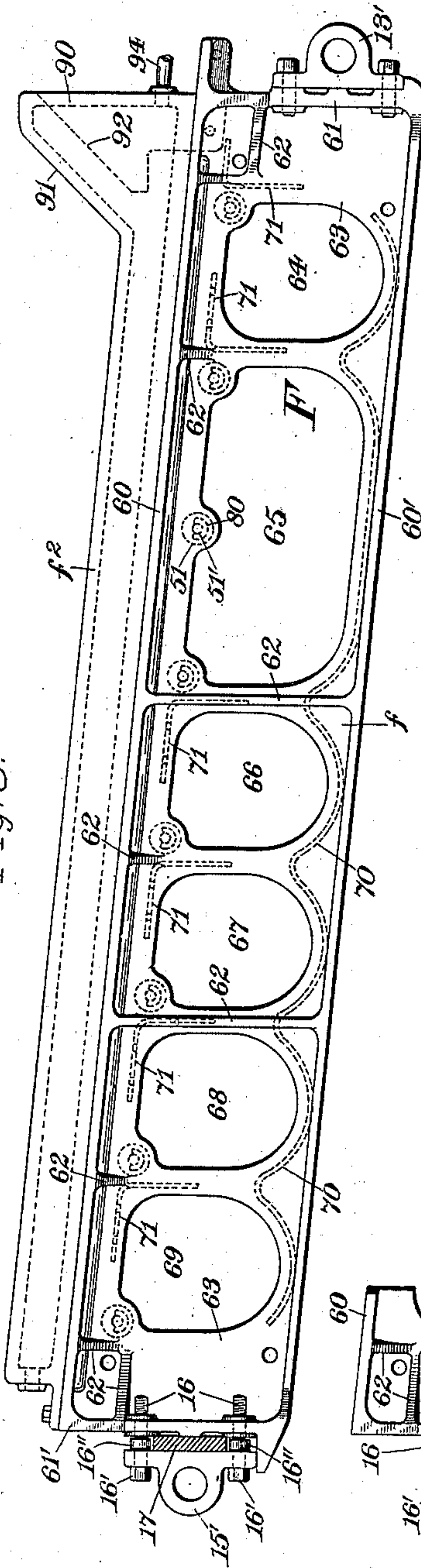
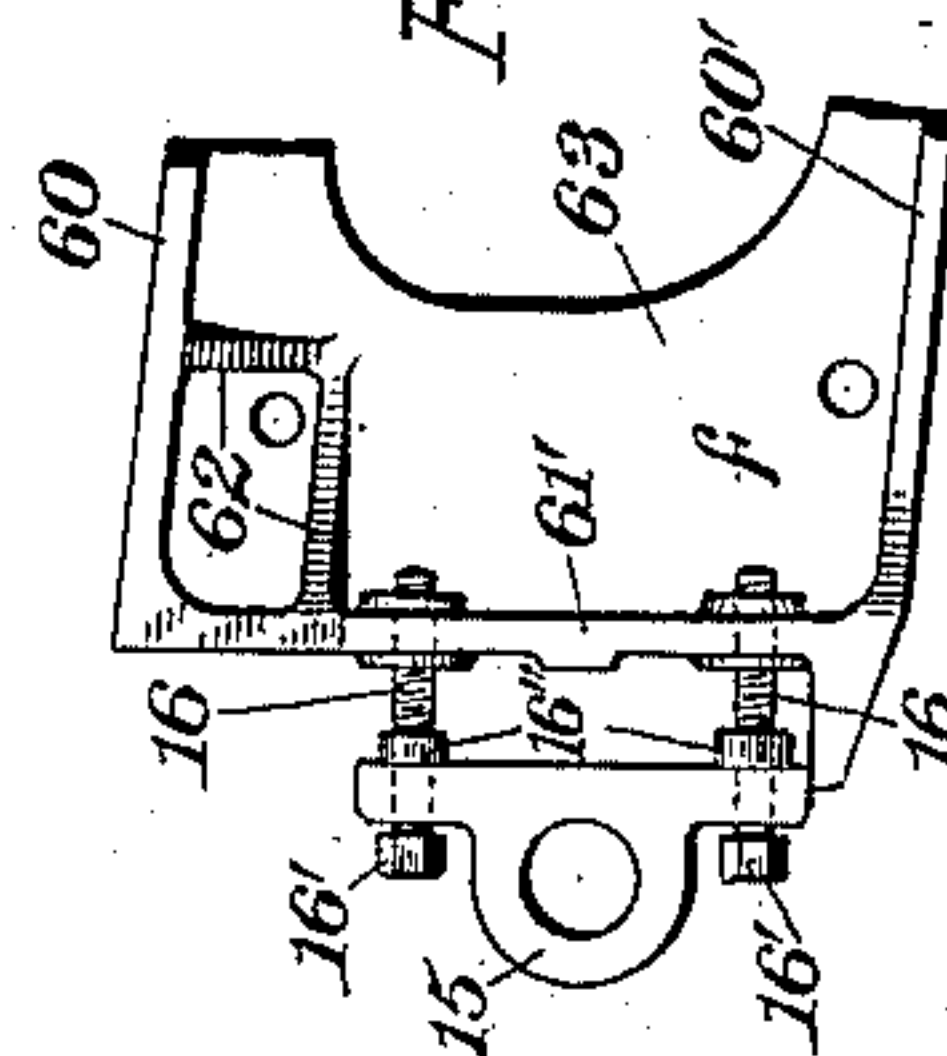


Fig. 12.



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# UNITED STATES PATENT OFFICE.

ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

## TRAVELING-GRATE FURNACE.

SPECIFICATION forming part of Letters Patent No. 535,355, dated March 12, 1895.

Application filed October 8, 1894. Serial No. 525,189. (No model.)

*To all whom it may concern:*

Be it known that I, ECKLEY B. COXE, a citizen of the United States, residing at Drifton, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Traveling-Grate Furnaces, of which the following is a specification.

This invention relates to traveling-grate furnaces, and is in the nature of an improvement upon the furnace described in Letters Patent of the United States No. 510,588, granted to me December 12, 1893, to which reference may be had, the present invention residing more particularly in the improved construction and organization of the furnace as a whole, and in the particular construction, arrangement and combination of the several elements comprising said furnace.

The object of my present invention is primarily to provide an improved furnace of the class specified in which the parts thereof will have the combined qualities of lightness, stability and efficiency and may be readily and quickly assembled and disassembled, and to secure a furnace which, as a whole, will be more effectual and satisfactory in its operation and easier of manipulation and repair than furnaces of this class as heretofore made.

Another object of the invention is to provide means in connection with and adapted for taking up longitudinal expansion of the traveling-grate.

In the drawings accompanying and forming part of this specification, Figure 1, Sheet 1, is a sectional side elevation of a portion of a traveling-grate furnace embodying my present improvements. Fig. 2, Sheet 2, is a front elevation of the same, as seen from the right hand in Fig. 1. Fig. 3, Sheet 3, is a vertical cross-section of a portion of the furnace, on an enlarged scale, taken in line *a—*a**, Fig. 1 and looking toward the front right-hand end of said figure. Fig. 4, Sheet 4, is an enlarged longitudinal sectional view of a portion of the front end of the furnace, the grate-mechanism and certain of the parts thereof being removed. Fig. 5, Sheet 5, is a side elevation, on an enlarged scale, of a portion of the front end of the frame which carries the grate-mechanism and air-supply chambers. Fig. 6 is a front view of said side frame as seen from the right hand in Fig. 5 said figure showing the

said side frame supported in position by the side-wall of the furnace. Figs. 7 and 8 are cross-sectional views, taken in line *b—b* and *c—c*, respectively, of Fig. 5 looking toward the left hand in said figure, said figures showing portions of the side frame, grate-mechanism and the air-seal intermediate to the grate and side-frame. Fig. 9, Sheet 6, is a side elevation, on a slightly reduced scale of one of the side-frames which carry the grate-mechanism and air-supply chambers. Fig. 10 is a plan view of the same, the upper member which constitutes one of the water-boxes of the furnace being removed. Fig. 11 is a plan view of the water box or upper member of said frame. Fig. 12 is a side elevation of a portion of the rear end of the lower member of said frame showing the means and manner of adjusting one of the carriers of the traveling grate to compensate for longitudinal expansion and contraction of said grate. Fig. 13, Sheet 2, is a plan view of a portion of the traveling grate proper on a scale similar to that shown in Figs. 7 and 8, and Fig. 14 is a sectional side view of the same.

Similar characters designate like parts in all of the figures.

In the furnace shown in the drawings, the furnace-chamber C is inclosed by the usual side-walls 2 and 4, and is covered by a roof A, which, in practice, will be made of fire-brick or other like material. At the rearward end of the furnace is the usual bridge-wall and at the forward end thereof is the ignition-block B over which the fuel is delivered to the traveling furnace-floor, designated in a general way by G, the fuel being supplied from a hopper H, set at the forward end of the furnace.

As a means for carrying the operative parts of the furnace-mechanism, to wit—the endless traveling grate and its supporting means, and as a means for supporting the air-supply apparatus, the ignition-block and portions of the furnace-chamber-inclosing walls, I have shown my improved furnace provided with a framework, designated in a general way by F, which framework comprises, in part, two longitudinally and remotely-disposed side-frames, *f* and *f'*, respectively, preferably connected together at their ends by stay-rods, and preferably embedded within a masonry



of the side-walls 2 and 4, respectively, of the furnace-chamber with their inner faces preferably flush with the inner faces of said side-walls; two water-boxes,  $f^2$  and  $f^3$ , supported upon the upper edges of the two side-frames  $f$  and  $f'$ , respectively, with their inner edges projecting beyond the inner faces of the said side-frames, as most clearly shown in Figs. 3, 5, 6, 7 and 8, and an ignition-block-supporting beam  $e$  secured at its opposite ends to and extending between the two side-frames  $f$  and  $f'$ . The construction and organization of these parts will be hereinafter more fully defined.

The traveling grate or furnace-floor proper, designated in a general way by  $G$ , will preferably be of a construction similar to that of the traveling grate described in Letters Patent of the United States No. 515,656, granted to me February 27, 1894, to which reference may be had, it consisting of a series of grate-bar-carrying beams  $N$ , supported at opposite ends upon a pair of endless chains 50, which run upon chain-wheels 12 and 14, that are carried by shafts, 13 and 15, respectively, and a series of grate-bars or floor-plates  $M$ , removably-carried upon said beams, said grate-bars being so disposed as to leave air-spaces of the requisite area between successive grate-bars. Inasmuch as the particular construction and organization of the parts comprising the traveling grate proper constitute no part of my present invention, and inasmuch as said grate is fully described in Patent No. 515,656, referred to, a detailed description thereof is deemed unnecessary in the present application.

According to my present invention, the chain-wheel shafts 13 and 15, respectively, are journaled in bearings, 13' and 15' respectively, one shaft 13 at the forward end of the grate-mechanism-carrying framework  $F$ , and the other shaft 15 at the rearward end of said framework, as most clearly shown in Fig. 1 of the drawings. These bearings 13' and 15' are in the nature of journal-boxes which are removably secured to the ends of the side-frames  $f$  and  $f'$ . (See Fig. 9, Sheet 6.)

In furnaces of this class employing endless traveling grates, the carrier-wheel shafts of the traveling grate have usually been journaled in fixed bearings, and considerable difficulty has been experienced in securing the proper tension or tautness of the traveling grate when assembling the same in working position, and no provision has been made for drawing the endless grate taut after it has once been set in working position. This matter of adjustment of the endless traveling grate after the assembling thereof to not only compensate for longitudinal expansion and contraction thereof, but to facilitate setting-up, is of considerable importance in the art to which this invention appertains. As a convenient means for drawing the endless grate taut longitudinally and for loosening the same after it is assembled in working position upon

its carrier-wheels, I have provided journal-bearings for the chain-wheel-carrying shafts which are adjustable one toward and from the other and in the direction of travel of said grate, as most clearly shown in Figs. 1, 9, 10 and 12 of the drawings. In the form thereof herein shown, the two journal-boxes at one end of the framework which support one of the grate-carrying shafts and herein shown as the one 15' at the rear end of said framework, are adjustably-secured one to each frame  $f$  and  $f'$ , at a point intermediate to the upper and lower edges of said frame, preferably by means of carrier-screws or adjusting-screws, 16, screwed into the ends of the frames  $f$  and  $f'$  and each having a head 16', that forms an abutment for the outer face of the flange of the journal-box and having a remotely-disposed flange 16'' which forms an abutment for the inner face of said journal box, the flanges of said journal boxes being slotted at their ends midway of their width so as to straddle the shank of the adjusting screws intermediate to the head and flanges thereof, as will be readily understood by reference to Figs. 9, 10 and 12 of the drawings.

The traveling grate and the chain-wheels which carry the same are supported intermediate to the two side-frames  $f$  and  $f'$  with the outer side-edges of the grate in close proximity to the inner faces of said frames  $f$  and  $f'$  and with the outer side edges of the grate-bar-carrying beams of the upper run of said grate underlying the inner side-edges of the water-boxes  $f^2$  and  $f^3$  supported upon said side-frames  $f$  and  $f'$ , respectively.

In securing the proper adjustment of the endless traveling grate after the same has been placed in position upon its carrying-wheels 12 and 14, and the shafts 13 and 15 of said carrier-wheels, or chain-wheels, are fitted in the bearings 13' and 15', respectively, the journal-boxes at the rear end of the framework will be moved outward as shown in Fig. 12 by means of the adjusting-screws 16 the requisite distance to draw the endless grate taut, and, if desired, bearing-blocks, 17, may be inserted between the inner faces of the journal boxes and the outer end-faces of the side-frames  $f$  and  $f'$ , respectively, after which the adjusting-screws may be tightened to bring the shaft 15 into proper alignment.

To secure lightness of construction and at the same time the requisite strength in the side-frames  $f$  and  $f'$  to carry the mechanism before described in connection with said side-frames, these side-frames are each in the nature of channeled beams, preferably of cast metal, and each has outwardly projecting flanges, 60 and 60', at their upper and lower edges, respectively, and each has similar end-flanges, 61 and 61', at opposite ends thereof with strengthening ribs, 62, intermediate thereto. The flanges 60 at the upper edges of the side frames will be of suitable width to form bearings for the water-boxes  $f^2$  and  $f^3$  supported upon said side-frames  $f$  and  $f'$ ,



respectively. The lower flanges 60' are of sufficient width to form a suitable supporting base for said side-frames, which base, in practice, will rest upon and be supported by the masonry comprising the side walls 2 and 4 of the furnace chamber, and the end-flanges 61 and 61' will be of sufficient width to form suitable bearing faces for the journal-boxes 13' and 15', respectively. The webs 63, which constitute the side-walls of the side-frames, will preferably be transversely recessed or cored out to form side openings, 64, 65, 66, 67, 68 and 69, the functions of which will be hereinafter described.

As a means for supplying air to the fuel at varying pressures at successive points in the length of the furnace-chamber to secure the best practical results in the combustion of said fuel after the manner described in Letters Patent of the United States No. 499,715, granted to me June 20, 1893, I have provided an air-blast apparatus which is shown located underneath the upper run of the grate and comprises a series of air-blast chambers, herein shown as six in number and designated by  $a$ ,  $a'$ ,  $a^2$ ,  $a^3$ ,  $a^4$ , and  $a^5$ , respectively, located intermediate to and secured to the side-frames  $f$  and  $f'$  in a manner substantially as hereinafter described.

As illustrated most clearly in Figs. 4, 9 and 10, each side frame is provided upon its inner face near the lower edge thereof with projecting flange 70, the contour of which corresponds to the cross-sectional shape of the base-portion  $c$  of the walls of the successive air-supply chambers,  $a$ ,  $a'$ ,  $a^2$ ,  $a^3$ ,  $a^4$  and  $a^5$ , respectively, said flange 70 being herein shown as segmentally curved, said curved segments being adapted for supporting the base-portions  $c$  of the walls of said chambers, which are secured thereto preferably by bolts, as most clearly shown in Fig. 4. As a means for forming a support and bearing for the upper portion  $d$  of the walls of the successive air-supply chambers, the side-frames are each provided with a series of L-shaped flanges 71 upon their inner faces near their upper edges, the depending portions of which successive flanges are in parallelism with and adjacent to the side-edges of the successive side openings of the side-frames, and the upper longitudinally-disposed portions of which flanges are in parallelism with and adjacent to the upper edges of said openings and extend, the major portion of them, over and terminate near the center of the upper edge of said openings, as shown in said Figs. 4, 9 and 10. The successive air-supply chambers consist of the lower curved walls  $c$ , which are bolted at their opposite ends to the lower flanges 71 of the two side-frames  $f$  and  $f'$ , and the side-walls  $d$  which are bolted to said lower walls, and extend upward and around and are bolted to the L-shaped flanges as illustrated most clearly in Fig. 4, the upper edges of the side walls of the successive air-supply chambers terminating, the major portion of them,

at a point above the upper edges of the side openings in the side-frames and approximately central with relation to the width of the air-supply chambers the space intermediate to the terminating end of said side wall and the side-wall of the next adjacent air-supply chamber furnishing an air-supply outlet adjacent to the upper run of the grate of the requisite area for the efflux of air required at this point in the length of the furnace-chamber.

Air is supplied to the air-supply chambers from a supply-pipe  $P$ , communicating, preferably, with the larger air-supply chamber  $a'$  which is located adjacent to the ignition point of the fuel-carrying run of the grate or at that point where the maximum supply of air is required for securing the best results in the combustion of the fuel. The supply-pipe  $P$ , will receive its supply of air from any suitable air-supply such as a blower or air-pump (not shown). In the present instance the supply-pipe  $P$  is shown as a tributary of a main supply-pipe  $p'$ , suspended by a hanger, 75, above the roof of the furnace-chamber, said hanger being secured to a beam which constitutes one member 76 of a frame or scaffolding, designated in a general way by  $S$ , and which may be of any desired construction, the main supply pipe  $P'$ , extending transversely of the furnace and being adapted for supplying air to the air-supply apparatuses of a series or battery of furnaces set side by side.

As a means for supplying air from the chamber  $a'$  to the other chambers  $a$ ,  $a^2$ ,  $a^3$ ,  $a^4$  and  $a^5$ , and as a means for regulating the supply of air to said chambers to secure the requisite varying pressures at different points in the length of the furnace-chamber, the walls intermediate to and dividing the air-supply chambers one from another have each a series of transverse perforations 78, therein and are each provided with a perforated slide-valve or gate 79, adapted for increasing or decreasing the areas of the openings in said walls as required to increase or decrease the volume of air passing from one chamber to another to thereby secure the requisite air-pressure in each air-supply chamber. These valves will be supported and will be operated from the outside of the furnace walls in the usual manner.

In practice, the upper and lower runs of the endless traveling grate will be supported at their opposite sides by rollers 51, carried upon shafts 51', the upper ones of which extend crosswise of the furnace-chamber between the side-frames  $f$  and  $f'$ , and as a convenient means for supporting and permitting the ready removal of the upper roller carrying shafts 51', the side-frames  $f$  and  $f'$  are provided with a series of inwardly projecting semi-circular flanges or sockets 80, adapted for receiving the ends of said shafts as will be readily understood by reference to Figs. 1, 6, 8, 9 and 10 of the drawings. The lower roller-carrying shafts will be supported in



suitable sockets having a connection with the side-walls 2 and 4 of the furnace-chamber.

For the purpose of preventing the leakage of the air-blast forwardly of the ignition-point 23 in the furnace, an air-seal tank K is shown arranged after the manner described in my prior patent, No. 510,588, dated December 12, 1893, to which reference may be had. One portion 24, of the air-supply chamber *a*, and one portion of a hood 81, at one end of and covering the forward end of the grate-mechanism, extends downward below the water-line *w*, in said tank so as to effectually cut off communication between the extreme forward portion of the grate-mechanism chamber and the rearward portion thereof as will be readily understood by reference to Figs. 1 and 4 of the drawings.

As a means for imparting a traveling movement to the upper and lower runs of the grate in opposite directions, the shaft 13 is provided at one end thereof with a worm-wheel 40, and is driven by means of a worm 41, upon a vertically-disposed intermediate shaft 42, carried in bearings upon an upright of the scaffolding or frame S, which shaft carries at its upper end a worm-wheel 40', which is driven by a worm 41' upon a horizontally-disposed driving shaft 42', journaled in bearings upon a horizontal member of said scaffolding as shown most clearly in Figs. 1 and 2, which shaft 42' carries a driving pulley 44, which may be driven by a belt (not shown) extending to any suitable source of power.

The water-boxes  $f^2$  and  $f^3$  will preferably be of angular construction in cross-section as shown most clearly in Figs. 7 and 8, and will each have an upward extension at the forward end thereof, as shown at 90, having an inclined inner face 91, which coincides, substantially, to the inclination of the inner face of the ignition-block B and has its outer end inclined at the inner side thereof as shown at 92 to form an abutment for preventing inward movement of the ignition-block when the same is secured in place, whereas the inner face of the extension 90 forms a base upon which to lay the bricks constituting the forward end of the side-walls of the furnace-chamber. These water-boxes are cored out, as shown in Figs. 7 and 8, and is shown by dotted lines in Fig. 5, to form a receptacle for water which is admitted thereto through a pipe 94, at the forward end of said water-boxes and is discharged through an opening at the rearward ends of said water-boxes.

By the construction and arrangement of the metallic framing hereinbefore described, it will be seen that the side-frames, water-boxes, and traveling grate may be placed in working position in a unitary condition within the furnace-chamber, sufficient of the side-walls of the furnace being first laid to form a base upon which to support the side-frames, after which the remaining portion of the side-walls may be built upon and around said frames, the ignition block with its support-

ing beam, B', being then secured in place and the hopper H and hood 81 being bolted to said ignition-block-carrying beam.

As illustrated most clearly in Figs. 3 and 4, the upper inner edges of the side-frames are longitudinally recessed or inwardly curved, as shown at 95, to form pockets having downwardly inclined faces for the reception of gravity air-seals 96, which are in the nature of elongated rollers adapted for bearing against the side-edges of the grate-bar-carrying beams of the endless grate and covering the spaces intermediate thereto to thereby prevent leakage of air at the side-edges of said grate.

Communicating with the interior of the successive air-supply chambers, from the outside of the furnace, are a series of traps or cleaning flues 96, through which dirt and ashes or analogous deposits in the air-supply chamber may be drawn out.

As a means for regulating the supply of fuel to the traveling grate, a gate, 97, is provided which may be of usual construction and which will preferably be located within the hopper H and adapted for opening and closing the discharge-opening of said hopper.

Having thus described my invention, I claim—

1. The herein-described traveling grate furnace, consisting of the furnace-chamber C having suitable inclosing-walls; a grate-mechanism - and - air - chamber - supporting frame arranged longitudinally and at an inclination within said furnace-chamber and consisting of two remotely-disposed, transversely recessed side-frames supported by the side-walls of the furnace-chamber and carrying at opposite ends thereof journal-boxes, the boxes at one end being adjustable relatively to the boxes at the other end, a series of air-supply chambers having inlet and outlet openings and secured at their ends to flanges upon the side-frames, as set forth, means for supplying air to said air-supply chambers, carrier-wheels having shafts journaled in the journal boxes of said side-frames, an endless grate carried by said carrier-wheels and comprising a series of transverse grate-beams supported at their ends upon endless chains carried over said wheels, and a series of longitudinally-disposed grate-bars removably carried by said beams, means for supplying and regulating the supply of fuel to the upper run of said traveling grate, supporting rollers for the upper and lower runs of the traveling grate, a water-tank located below the forward end of the lower run of said grate, transverse partitions or cut-off plates extending into and below the water-line of said tank, and driving-mechanism for the endless traveling grate consisting of a worm-wheel carried by the forward carrier-wheel shaft, an intermediate vertically-disposed worm-shaft carrying a worm at the lower end thereof in mesh with the worm-wheel of the carrier-wheel shaft and carrying a worm-



wheel at the upper end thereof, a horizontally-disposed driving-shaft carrying a worm in mesh with the worm-wheel of the intermediate worm-shaft and means for driving said shaft, substantially as described and for the purpose set forth.

2. In a furnace of the class specified, the combination with the furnace-chamber and with its inclosing walls; of a frame-work consisting of two longitudinally- and remotely-disposed side-frames having a series of transverse openings therein, and having flanges upon the inner faces thereof adapted for supporting the walls of the air-supply chambers, and having also laterally projecting flanges in position and adapted to be engaged by the furnace-walls and to maintain said frames in position; an air-supply apparatus comprising a series of successive air-supply chambers having inlet and outlet openings, and having the walls thereof secured to the inner flanges of the side-frames, substantially as described and for the purpose set forth.

3. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of two longitudinally and remotely-disposed side frames embedded one in each of the side-walls of the furnace-chamber and having inwardly-projecting flanges adapted for supporting an air-supply apparatus and having journal-boxes at opposite ends thereof, the boxes at one end being adjustable relatively to the boxes at the other end, an endless traveling grate supported intermediate to said side-frames upon revoluble carriers carried upon shafts journaled in said journal boxes, means for imparting a traveling movement to said grate, a series of air-supply chambers located intermediate to said side-frames and having their walls fixed to the inner flanges of said side-frames and having inlet and outlet openings, and means for supplying air to said successive air-supply chambers at varying pressures, substantially as described and for the purpose set forth.

4. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of two transversely recessed side-frames having inwardly-projecting air-chamber-supporting flanges, and having journal-boxes at opposite ends thereof, the boxes at one end being adjustable relatively to the boxes at the other end, an endless traveling grate adjustably-carried upon revoluble carriers having shafts journaled in said journal-boxes, means for imparting a traveling movement to said grate, a series of rollers interposed between the side edges of the upper run of the traveling grate and the upper edge of the side-frames, an air-blast apparatus comprising a series of successive air-supply chambers secured to the inner flanges of the side-frames and having valve-regulated openings intermediate to said chambers, and means for supplying air to one of said chambers, and through said chamber to

the succeeding chambers, substantially as described and for the purpose set forth.

5. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of two side frames supported by the masonry of the side-walls of the furnace and having inwardly-projecting air-chamber-supporting flanges and having journal-boxes adjustably and removably-secured to the opposite ends thereof, two hollow water-boxes secured one to the upper edges of each side-frame and having upwardly inclined extensions at the forward ends thereof constructed to form an abutment for an ignition-block, an ignition-block carried upon a transverse beam having flanges at the opposite ends thereof secured to the two side-frames, which ignition-block abuts at its forward face at opposite ends thereof against the upwardly-inclined portions of the water-boxes, an endless traveling grate supported intermediate to the two side-frames upon revoluble-carriers carried upon shafts journaled in the journal-boxes of the side-frames, means for imparting a traveling movement to said grate, a series of air-supply chambers located intermediate to and secured to the inner flanges of the two side-frames, and means for supplying air at varying pressures to said successive air-supply chambers, substantially as described and for the purpose set forth.

6. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing-walls, of two transversely-recessed inwardly and outwardly flanged side-frames having their outwardly extending flanges in position and adapted to be engaged by the furnace-walls to maintain said frames in position, and having air-seal-receiving pockets at the upper edges thereof, water-boxes secured to the upper edges of said side-frames with the inner edges thereof extending beyond the inner faces of said side-frames, an endless traveling grate supported for traveling movement between the side walls with the side edges of the upper run thereof in close proximity to the upper edge of the side-frames, air-seal rollers supported in the air-seal pockets of the side-frames and bearing against the side edges of the upper run of the grate, a series of air-supply chambers secured at their opposite ends to and supported by the inner flanges of the side-frames, means for imparting a traveling movement to said grate, and means for supplying air to said air-supply chambers, substantially as described and for the purpose set forth.

7. In a furnace of the class specified, two longitudinally and remotely-disposed side-frames having a series of transverse recesses and having outwardly projecting flanges near the upper and lower edges of the inner faces thereof, a series of air-supply chambers located intermediate to said side-frames and each comprising a bottom wall secured to the lower flanges of the side-frames and side-walls secured to said bottom walls and to the upper



flanges of said side-frames, and each chamber having an inlet and an outlet opening, and means for supplying air thereto, substantially as described and for the purpose set forth.

5 8. In a furnace of the class specified, a grate-mechanism-and-air-chamber-carrying frame consisting of two longitudinally and remotely-disposed channeled side-frames, each of which  
10 has a series of outwardly projecting air chamber-supporting flanges upon the inner faces thereof, and each of which has a journal-box at each end thereof, one of which journal-boxes is adjustable relatively to the other, substantially as described and for the purpose set  
15 forth.

9. In a furnace of the class specified, a grate-mechanism-and-air-chamber-carrying frame consisting of two longitudinally and remotely-disposed channeled side-frames secured together by stay-rods, and each having a series  
20 of outwardly-projecting air-chamber-supporting flanges upon the inner faces thereof; each having a journal-box at each end thereof, one of which journal-boxes is adjustable relatively  
25 to the other, and each having an air-seal roller-receiving pocket, or recess, at the upper inner edge thereof, substantially as described and for the purpose set forth.

10. In a furnace of the class specified, a  
30 grate-mechanism-and-air-chamber-carrying frame consisting of two longitudinally-and-remotely-disposed channeled side-frames, each of which has a series of outwardly-projecting air-chamber-supporting flanges upon the inner  
35 faces thereof, journal-boxes at opposite ends thereof, one of which journal-boxes is adjustable relatively to the other, semi-circular bearing-flanges, or sockets, formed integral with the inner faces of each of said side-frames near the upper edge thereof, and each  
40 having air-seal receiving-pockets at the upper inner edge thereof, substantially as described and for the purpose set forth.

11. In a furnace of the class specified, the  
45 combination with the furnace-chamber and its inclosing walls, of two longitudinally-and-remotely-disposed side-frames supported in the masonry of the side-walls of the furnace-chamber and having air-chamber-supporting  
50 flanges upon the adjacent faces thereof and having semi-circular bearings or shaft-supporting flanges upon their adjacent faces near the upper edges thereof, grate-supporting  
55 rollers carried upon transverse shafts supported in semi-circular bearings upon the in-

ner faces of the side-frames, an endless traveling grate supported upon said rollers and carried at opposite ends by revoluble carriers having shafts journaled in bearings secured to the ends of said frames, air-supply chambers fixed to the chamber-supporting flanges of the side-frames, means for actuating said traveling grate, and means for supplying air to said air-chambers, substantially as described and for the purpose set forth. 65

12. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing-walls, of the endless traveling grate-mechanism comprising two side-frames longitudinally-and-remotely-disposed and inclined with relation to the furnace-chamber and adapted for supporting the endless traveling grate, an endless traveling grate carried over chain-wheels secured to shafts journaled in bearings upon opposite ends of the side-frames, means for adjusting one of said shafts relatively to the other shaft, and actuating mechanism for said grate consisting of a horizontal driving-shaft located above the furnace, a vertical intermediate worm-shaft, a worm-wheel and worm connecting said intermediate shaft with the driving-shaft, and a worm and worm-wheel operatively connecting said intermediate shaft and one of the chain-wheel shafts, substantially as described and for the purpose set forth. 85

13. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing-walls of an endless traveling grate comprising connected transverse grate-bar-carrying beams and grate-bars removably-secured to said beams carried upon chain-wheels at opposite ends of the furnace-chamber secured to transverse shafts journaled in bearings independent of the side-walls of the furnace-chamber at opposite ends, respectively, of a carrying frame, a grate-mechanism-carrying frame, consisting of two longitudinally-and-remotely-disposed side-frames having chain-wheel-shaft-supporting bearings at opposite ends thereof and having a series of air-supply chambers secured thereto, and means substantially as described for adjusting one of said chain-wheel shafts relatively to the other shaft, substantially as described and for the purpose set forth. 105

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