

No. 756,379.

PATENTED APR. 5, 1904.

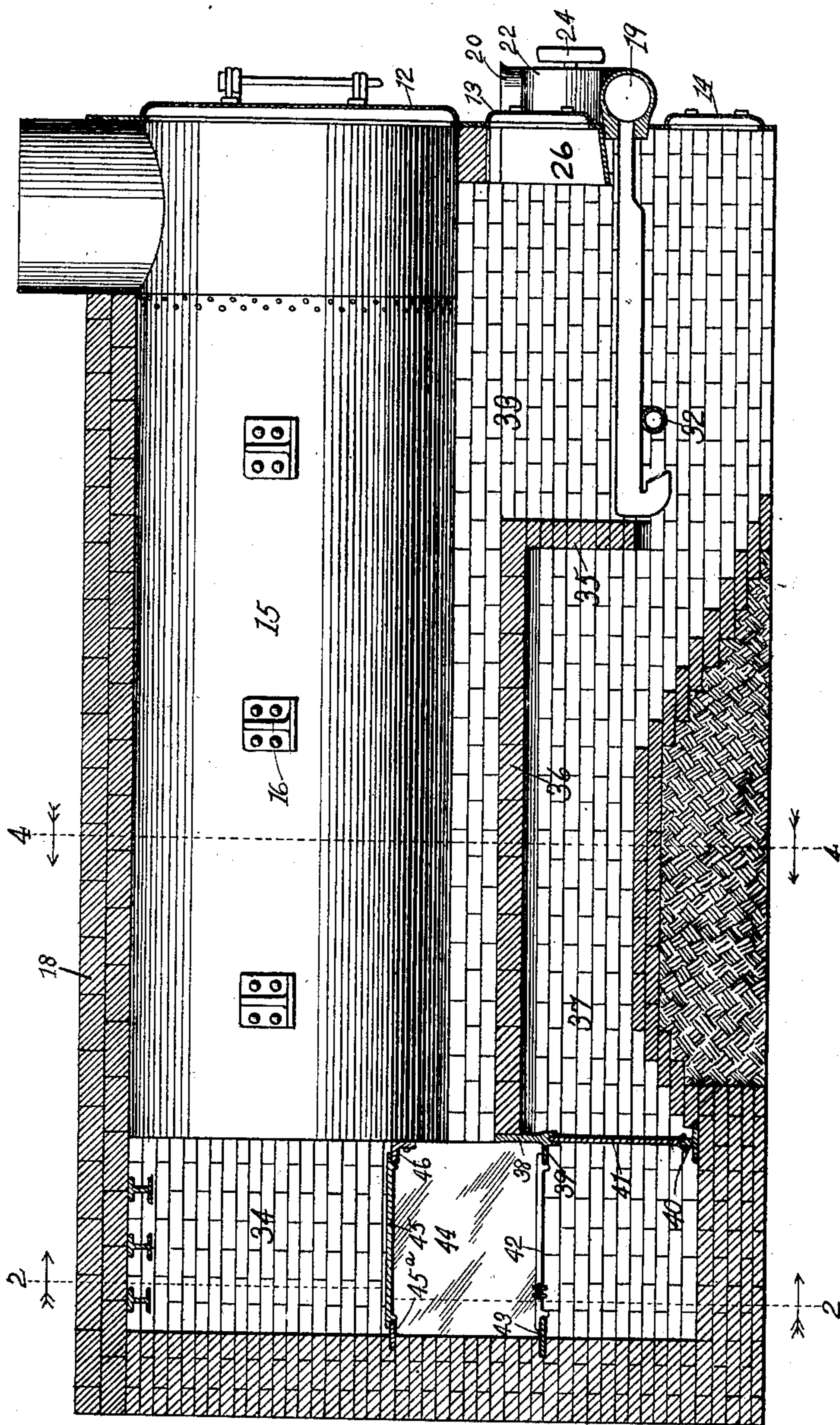
P. J. KRAETSCH.  
SMOKE CONSUMING FURNACE.

APPLICATION FILED FEB. 20, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses.  
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J. J. Feibrock

Inventor P. J. Kraetsch.  
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3 SHEETS—SHEET 2.

Fig. 2.

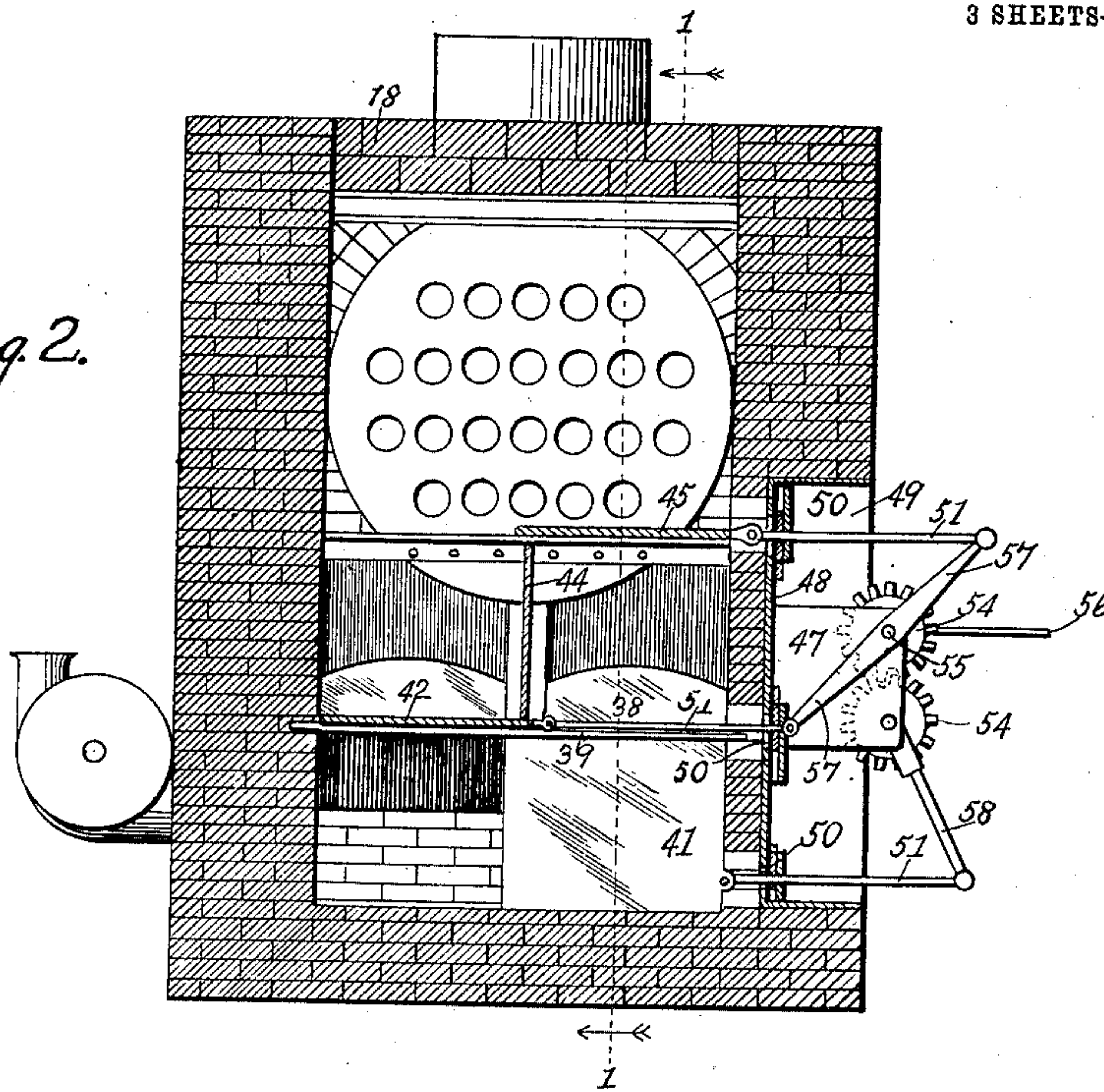
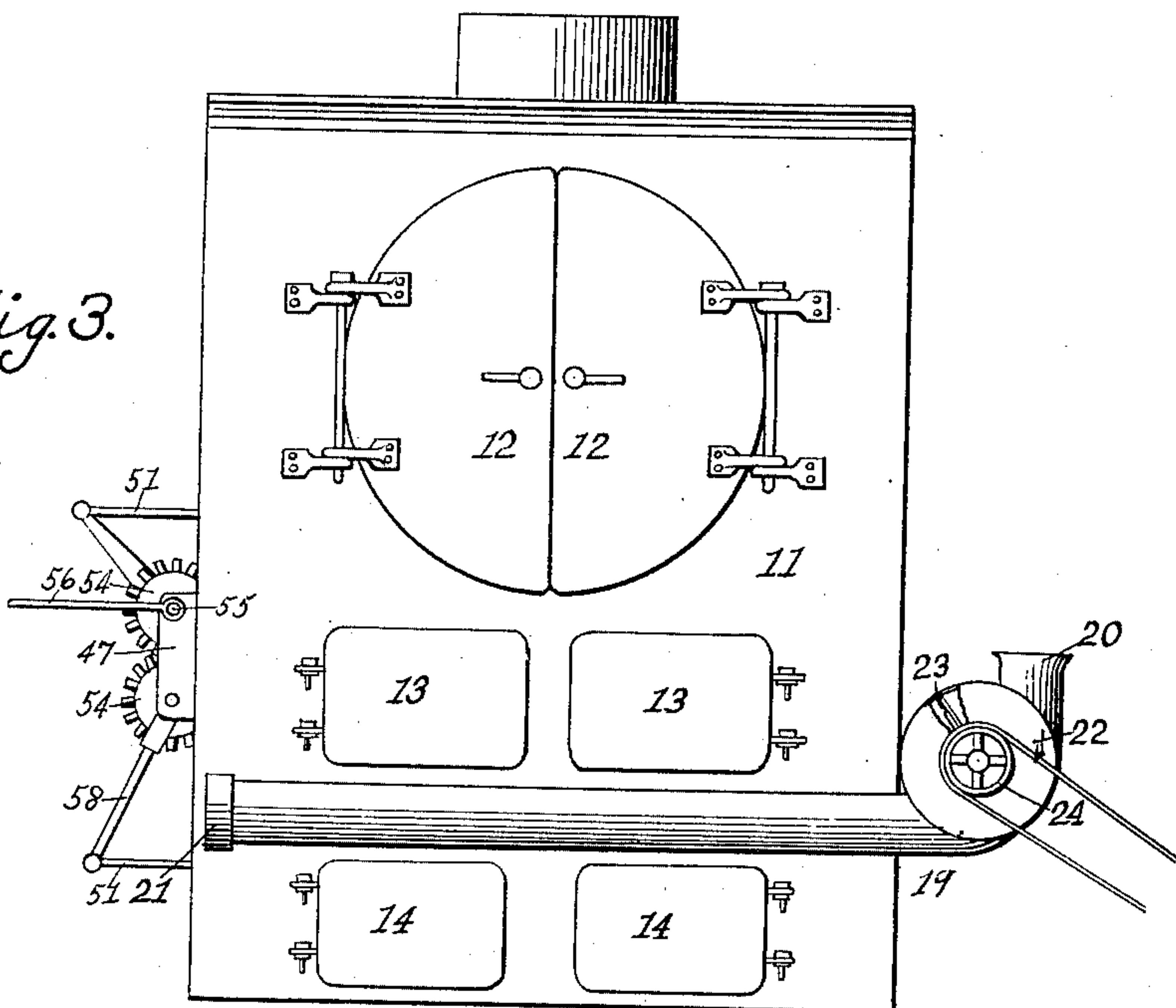


Fig. 3.



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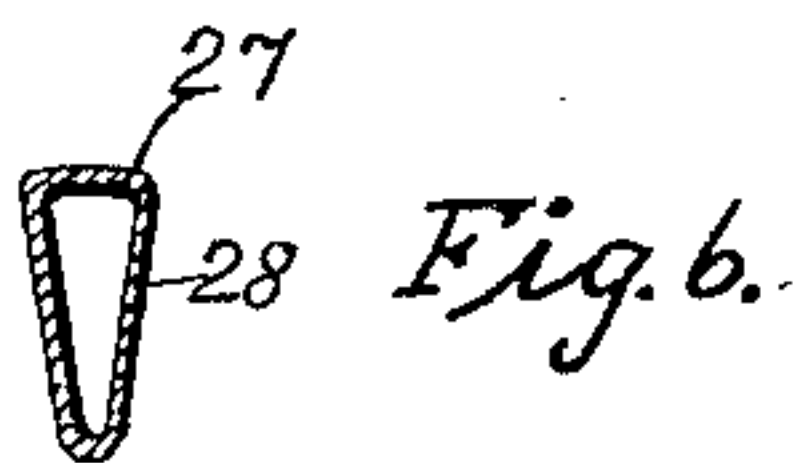
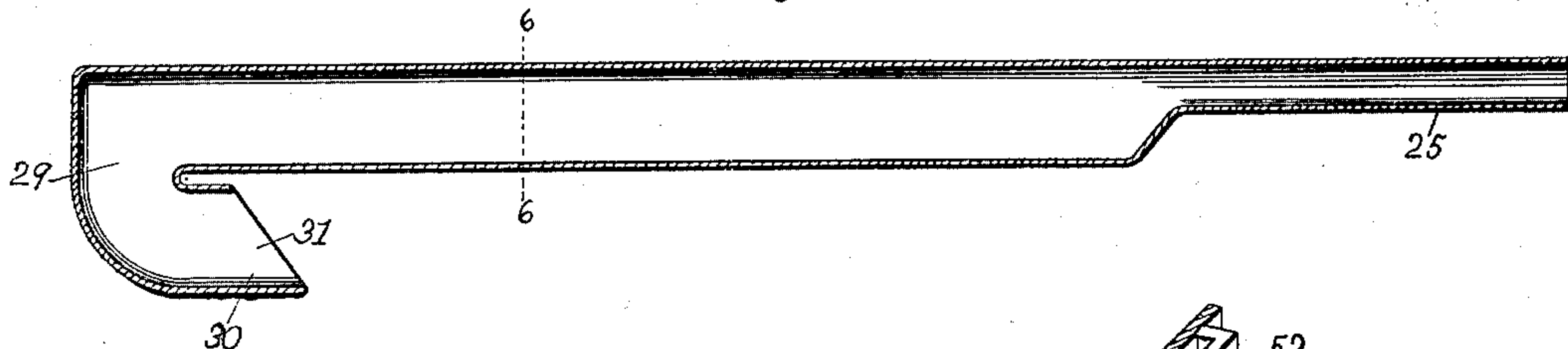
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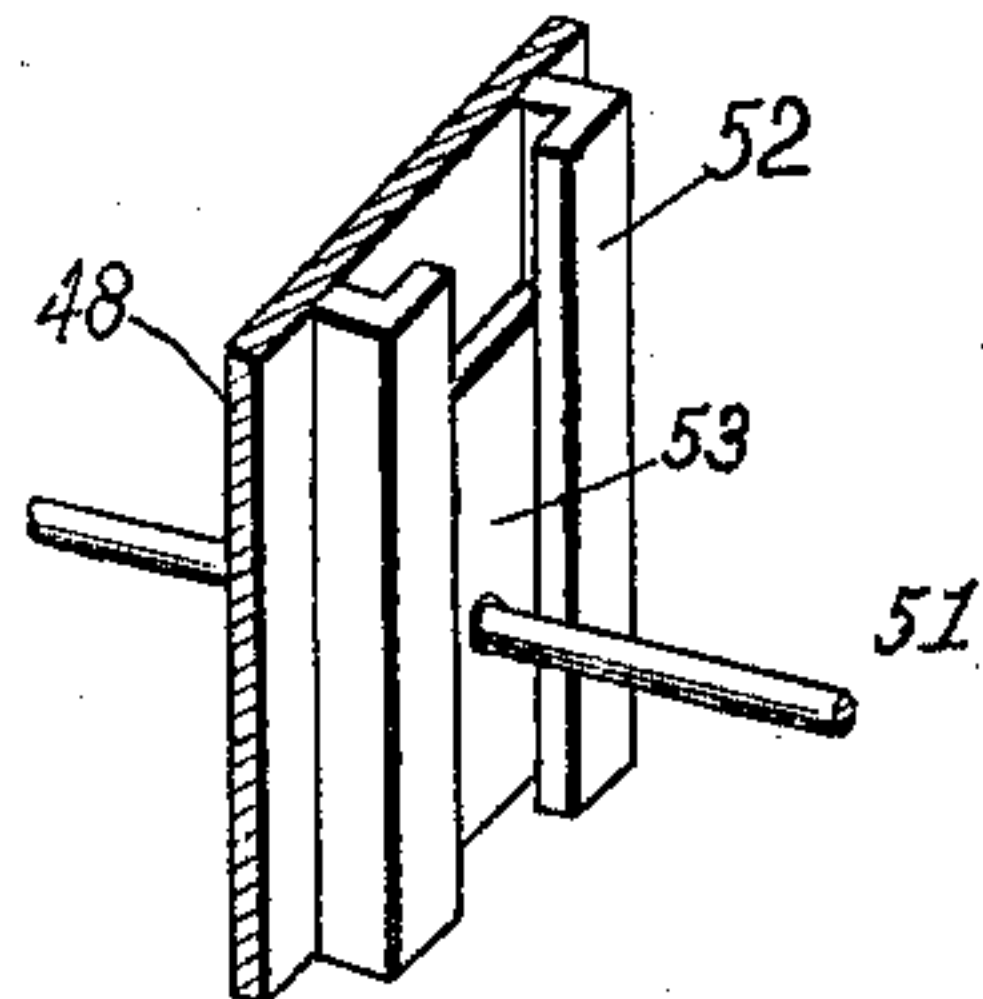
NO MODEL.

3 SHEETS—SHEET 3.

*Fig. 5.*

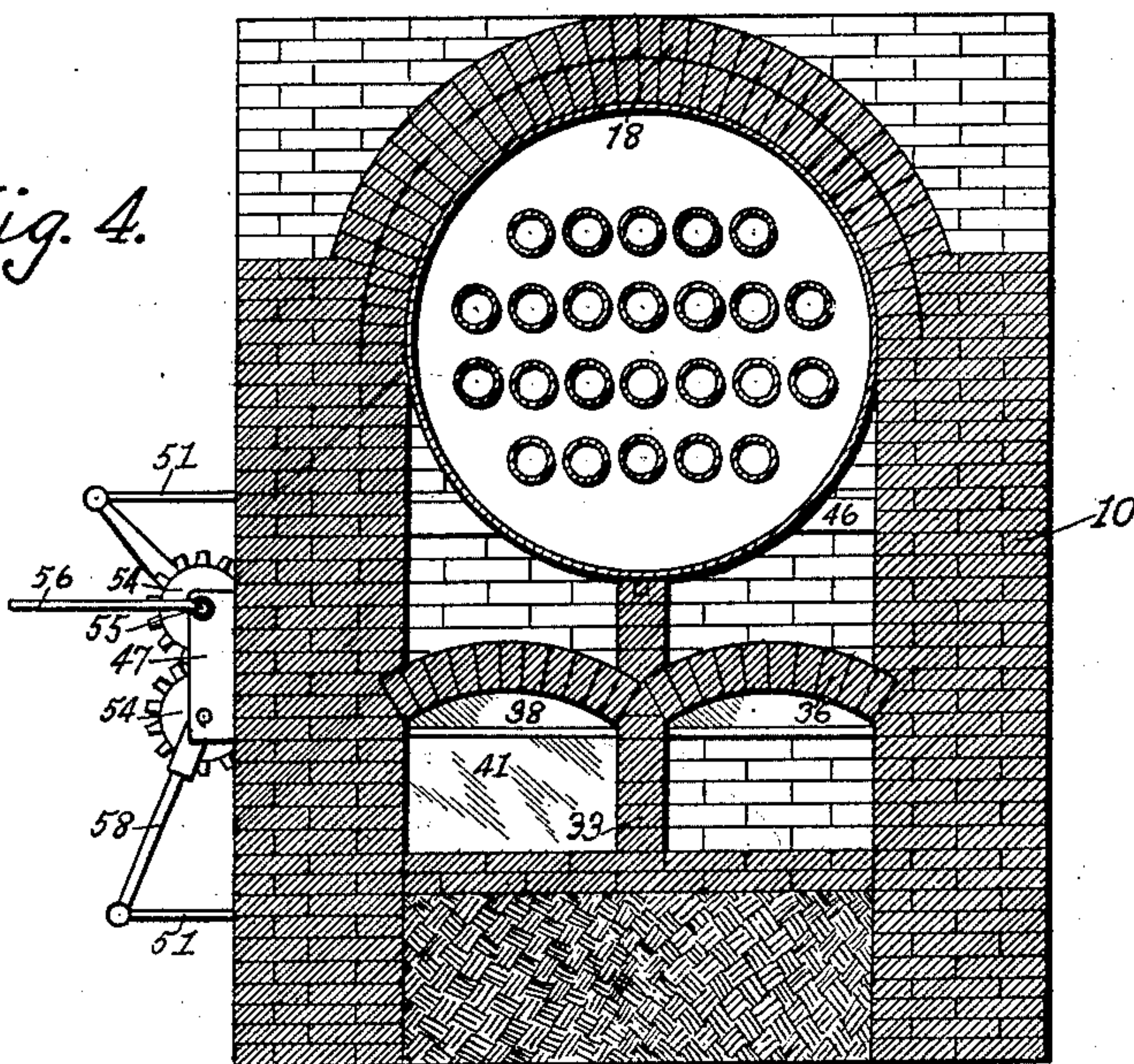


*Fig. 6.*



*Fig. 7.*

*Fig. 4.*



Witnesses.  
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# UNITED STATES PATENT OFFICE.

PAUL J. KRAETSCH, OF DES MOINES, IOWA.

## SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 756,379, dated April 5, 1904.

Application filed February 20, 1903. Serial No. 144,245. (No model.)

*To all whom it may concern:*

Be it known that I, PAUL J. KRAETSCH, a citizen of the United States, residing at Des Moines, in the county of Polk and State of Iowa, have invented certain new and useful Improvements in Smoke-Consuming Furnaces, of which the following is a specification.

The objects of my invention are to provide a boiler-furnace in which the combustion-chamber is divided longitudinally beneath the boiler to form two independent fireplaces in which the products of combustion are maintained separate throughout the entire length of the boiler, to the end that the products of combustion arising from one of the fires may be returned after passing to the rear of the boiler and discharged under the grates of the other fireplace, thereby thoroughly consuming all of the smoke and gases, economizing fuel, and preventing the discharge of black smoke from the flue.

A further object is to provide simple and easily-operated means whereby the fireman may quickly and easily regulate the draft-passages so that the products of combustion from one fire may pass under and through the other fire. In a furnace of this class it is intended that the fireman shall feed fuel to the fires alternately, and the products of combustion from the fire to which the fuel is being fed are intended to be passed under and through the other fire, which is supposed to be burning brightly and to be in condition for consuming the smoke and gases arising from the fire to which the fuel is being fed.

A further object is to provide a furnace of this class in which a forced draft may be provided for both fires and the said forced draft passed through hollow grate-bars, thus preventing the grate-bars from becoming burned out.

My invention consists in certain details in the construction, arrangement, and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 shows a longitudinal sectional view through the entire furnace, taken on the indi-

cated line 1 1 of Fig. 2. Fig. 2 shows a transverse sectional view through the complete furnace, taken on the indicated line 2 2 of Fig. 1. Fig. 3 shows a front elevation of the complete furnace, a portion of the rotary fan-casing being broken away to show the fan. Fig. 4 shows a transverse sectional view of the furnace on the indicated line 4 4 of Fig. 1. Fig. 5 shows a longitudinal sectional view of one of the grate-bars. Fig. 6 shows a transverse sectional view on the line 6 6 of Fig. 5; and Fig. 7 shows an enlarged detail perspective view illustrating one of the slides covering the openings through which the draft-regulating rods are passed.

Referring to the accompanying drawings, I have used the reference-numeral 10 to indicate the side walls of the furnace. These walls are made of brick in the ordinary way. The numeral 11 indicates the furnace-front, having at its upper portion the doors 12 to provide access to the end of the boiler, also having the doors 13, through which the fuel is fed to the furnace, and the doors 14 leading to the ash-pits. The reference-numeral 15 indicates a boiler of ordinary construction supported by brackets 16 on the side walls of the furnace. The numeral 17 indicates the rear walls of the furnace, and 18 the arched top. All of these parts are of the ordinary construction, and a detailed description thereof is deemed unnecessary.

The reference-numeral 19 indicates a hollow pipe open at one end at 20 and closed by means of a cap 21 at its other end.

The numeral 22 indicates a rotary fan-casing in which a fan 23 is mounted to be driven by a pulley 24. This fan communicates with the pipe 20 and when driven forces a current of air through the pipe 19, the outlet for which is through the grate-bars, as will hereinafter appear. Referring to Fig. 5 of the drawings, it will be seen that each grate-bar is hollow, one end thereof (indicated by the numeral 25) is round, and this rounded end is inserted in and communicates with the pipe 19. This rounded portion stands directly beneath the metal apron 26, which is immediately in the rear of the doors 13. The body portion of each grate-bar, upon which the fuel rests, is



substantially wedge-shaped in cross-section, as shown in Fig. 6. This body portion has a rounded top 27 and straight tapering sides 28. At its rear end each grate-bar is curved downwardly at 29 and then forwardly at 30, parallel with the body portion, and its extreme end is inclined at 31, so that a current of air forced through it will be discharged toward the central portion of the grate-bar body and upwardly, and obviously the current of air passing rapidly through this hollow grate-bar will prevent the grate-bar from burning up. The rear end portions of the grate-bars rest upon a hollow cross-piece 32, as clearly shown in Fig. 1 of the drawings.

The reference-numeral 33 indicates a vertical partition-wall extending from the furnace-front to the rear of the boiler and from the longitudinal center of the boiler downwardly to the base of the furnace, thus completely dividing the combustion-chamber of the furnace.

In the rear of the boiler and in the rear of the partition-wall 33 is a chamber 34, through which the products of combustion are directed in various ways by draft-regulating plates, as will hereinafter appear.

Immediately in the rear of each fireplace is a bridge-wall 35, extending from a point beneath the rear ends of the grate-bars upwardly to a point near the bottom of the boiler, and immediately in the rear of each bridge-wall 35 is an arch 36, extending to the chamber 34, thus providing a chamber 37, leading from the chamber 34 beneath the arch 36 and the bridge-wall 35 to the ash-pit beneath the grate-bars.

Immediately in the rear of the arches 36 is a plate 38, its top being flush with the top of the arches and its bottom being grooved to provide a track, as will hereinafter appear. Formed on the lower edge of this plate 38 is a rib 39, projecting toward the rear of the furnace for purposes hereinafter made clear. Immediately beneath the plate 38 is a metal track 40, also extending completely across the furnace, and slidingly mounted between the plate 38 and the track 40 is a draft-plate 41, with its top inserted in the groove in the plate 38 and its lower edge provided with a groove to fit over the track 40. This draft-plate 41 is of a length sufficient to close either one of the passage-ways 37, and by sliding the plate 41 longitudinally either one of these draft passage-ways 37 may be closed, while the other one remains open. A second draft-regulating plate (indicated by the reference-numeral 42) is provided to stand in a horizontal plane and to move transversely of the furnace. Its one edge is mounted upon the rib 39 and its other edge rests upon a guide 43 in the rear wall 17. This plate 42 is of a length substantially that of half the width of the chamber 34. Immediately in the rear of the partition-wall 33 is a dividing-plate 44, extending from the rear of the boiler to the

rear walls 17 and extending from the draft-plate 42 upwardly to a point directly beneath the boiler-flues. The numeral 45 indicates a third draft-regulating plate of a length to cover the space between the plate 44 and one of the side walls, said plate being slidingly mounted upon the guide 45 at one edge in the rear wall and the guide 46 at its other edge secured to the boiler. In order to change the course of the products of combustion, it is necessary that these three draft-regulating plates be moved at the same time—two of them in one direction and the other in an opposite direction—and I have provided means whereby this may be conveniently and easily done by an operator at the front of a furnace, as follows: The reference-numeral 47 indicates a bracket mounted on a plate 48, which is fixed in a recess 49 in one of the side walls of a furnace adjacent to said draft-regulating plates. This plate 48 is provided with slots 50, through which the rods 51 are passed. There are three of these rods 51, and each one is pivoted at its inner end to one of the draft-regulating plates. I have provided means for preventing the escape of the products of combustion through these slots 50, as follows: In Fig. 7 of the drawings I have shown a part of the plate 48, to which the guides 52 are fixed at the sides of the slots 50, and a sliding plate 53 is mounted in these guides and provided with a round opening through which the rod 51 may move both longitudinally and without leaving an opening through which the products of combustion may escape, and each of these rods is provided with a similar device. Mounted in the bracket 47 are the two pinions 54, in mesh with each other. The upper pinion is mounted on a shaft 55, which extends to the front of the furnace, and a lever 56 is fixed thereto at the front of the furnace. On the rear end of the shaft 55 is a lever 57, the upper end of which is pivoted to the rod 51, which connects with the draft-regulating plate 45, and the lower end of which is pivoted to the rod 51, which connects with the draft-regulating plate 42. Fixed to the lower one of the pinions 54 is an arm 58, the lower end of which is pivoted to the rod 51, which is attached to the damper-regulating plate 41. The lever 57 and the arm 58 are so arranged and disposed relative to the pinions that the draft-regulating plates 41 and 45 will be held in position at one side of a central line through the furnace while the draft-regulating plate 42 is at its opposite limit of movement, and vice versa.

Assuming that the draft-regulating plates are in the position shown in Fig. 2 of the drawings and assuming that a bright fire is burning on the side of the furnace opposite from the side to which the pinions are attached and assuming, further, that it is desired to place fresh fuel upon the grate-bars on the same side as the pinions, it is obvious



that the products of combustion arising from the fire on the side opposite from the pinions will be deflected upwardly by the bridge-wall and thrown against the boiler and that they will pass to the rear of the boiler and then upwardly in the chamber 34 and that they will return through the boiler-flues and discharge through the smoke-flue at the front of the boiler in the same way as is done with the ordinary furnace now in use. The smoke and gases arising from the fire on the opposite side will be passed rearwardly to the chamber 34 and will be confined by the draft-regulating plates 44 and 45 so that they can only pass downwardly. They will also be prevented by means of the plate 41 from passing forwardly under the same side of the furnace and will be compelled to return through the passage-way 37 under the arch 36 on the opposite side of the furnace. One of the reasons for providing a forced draft for my improved furnace is to aid and accelerate the smoke and other products of combustion in passing through this tortuous route. These products of combustion after returning through the chamber 37 will pass upwardly through the grate and through the fire that is burning brightly upon this grate, and obviously all of the volatile products of combustion will be consumed, thus making the fire much hotter and utilizing the fuel to its maximum capacity and burning up all of the black smoke and soot which otherwise might be discharged from the flue. After passing through the fire the products of combustion from both fires are commingled and pass through the boiler-flues, as before explained. When it is desired to place fresh fuel on the other fire, the operator simply turns the handle 56 to its opposite limit of movement, thus drawing the draft-regulating plate 42 toward the side to which the pinions are fixed and forcing the draft-regulating plates 41 and 45 to the opposite side. Obviously when this is done the fire on the side nearest the pinions will have a direct draft, while the fire on the opposite side will take the indirect course, as before explained. The fan for providing the forced draft not only aids in carrying the products of combustion through the various passage-ways, but it also cools the grate-bars, thus preventing them from being burned out by the fire passing upwardly through them, but also provides a large quantity of fresh air, which is commingled with the products of combustion and is passed upwardly through the grate-bars, so that as soon as these products of combustion with the fresh air reach the fire they will immediately become ignited and will burn fiercely and brightly and utilize the fuel to its maximum capacity.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States therefor, is—

1. In a furnace, a fireplace and a combustion-chamber, a vertical wall dividing the fireplace and combustion-chamber longitudinally, a horizontal wall on each side of the vertical wall dividing the combustion-chamber into upper and lower passage-ways, a chamber communicating with all of said passage-ways, a stationary partition in the latter chamber in line with the partition between the upper passage-ways, a horizontal draft-plate above the stationary partition in the latter chamber, a horizontal draft-plate below it, a vertical draft-plate below the lower horizontal draft-plate controlling the lower passage-ways, and draft-plate-operating mechanism connected to each of the draft-plates jointly moving the upper horizontal and the lower vertical draft-plates in one direction and the lower horizontal draft-plate in an opposite direction.

2. In a furnace, a fireplace and a combustion-chamber, a vertical wall dividing the fireplace and combustion-chamber longitudinally, a horizontal wall on each side of the vertical wall dividing the combustion-chamber into upper and lower passage-ways, a chamber communicating with all of said passage-ways, a stationary partition in the latter chamber in line with the partition between the upper passage-ways, a horizontal draft-plate above the stationary partition in the latter chamber, a horizontal draft-plate below it, a vertical draft-plate below the lower horizontal draft-plate controlling the lower passage-ways and draft-plate-operating mechanism comprising two meshed pinions, a lever attached between its ends to one of the pinions, rods attached to the ends of said lever and connected to the upper and lower horizontal draft-plates, a lever attached to the other pinion and a rod connecting the latter lever to the vertical draft-plate.

3. The combination with a furnace, having two independent fireplaces, of two independent combustion-chambers beneath the boiler, a chamber in the rear of the boiler communicating with said combustion-chambers, and two independent draft passage-ways communicating with the said chamber and discharging beneath the fireplaces, of a vertical partition 44 dividing the chamber into two parts directly in the rear of the combustion-chambers, a slide 45 mounted on tracks 45<sup>a</sup> and 46, a slide 42 mounted on the tracks 39 and 43, a slide 41 mounted on the tracks 38 and 40, rods 51 pivoted to each slide, pinions 54 in mesh with each other, a lever 57 connected with one of the pinions and having its ends pivoted to the rods 51 of the slides 45 and 42, and an arm 58 connected with the other pinion and pivoted to the rod 51 of the slide 41, substantially as and for the purposes stated.

4. In a device of the class described, the combination of two pinions in mesh with each other, a lever connected with one of the pin-

ions, rods attached to the ends of the lever, an  
arm connected with the other pinion, a rod at-  
tached to said arm, a draft-regulating plate  
pivoted to each rod and slidingly mounted, a  
5 slotted plate through which the said rods pass,  
a plate for each rod, having an opening therein  
through which the rod is passed, and guides

for holding the latter plates against the slotted  
plate, substantially as and for the purposes  
stated.

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