

No. 667,607.

Patented Feb. 5, 1901.

J. THURELL.
GRATE.

(Application filed Sept. 29, 1900.)

(No Model.)

2 Sheets—Sheet 1

Fig. 1.

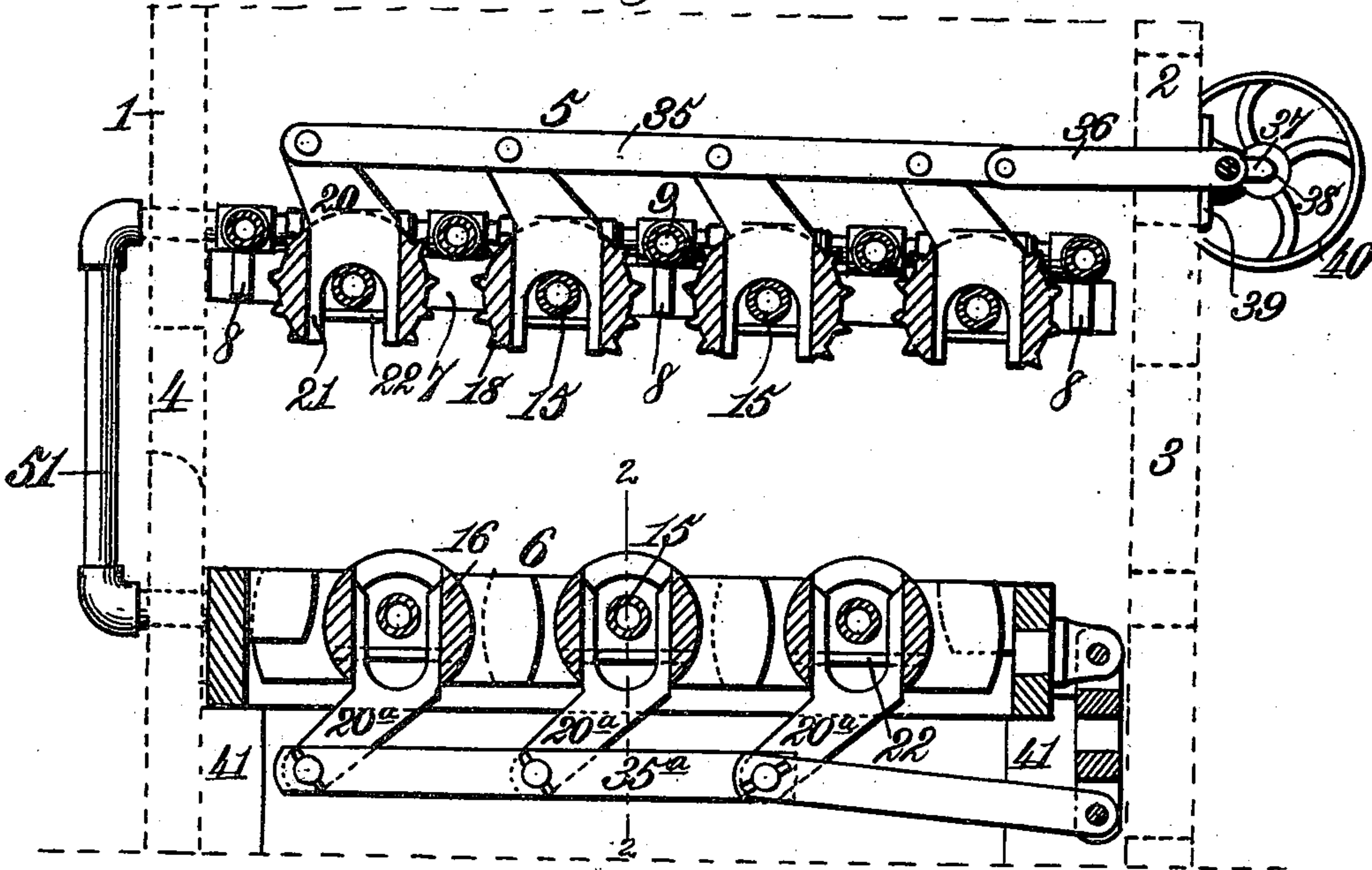


Fig. 2.

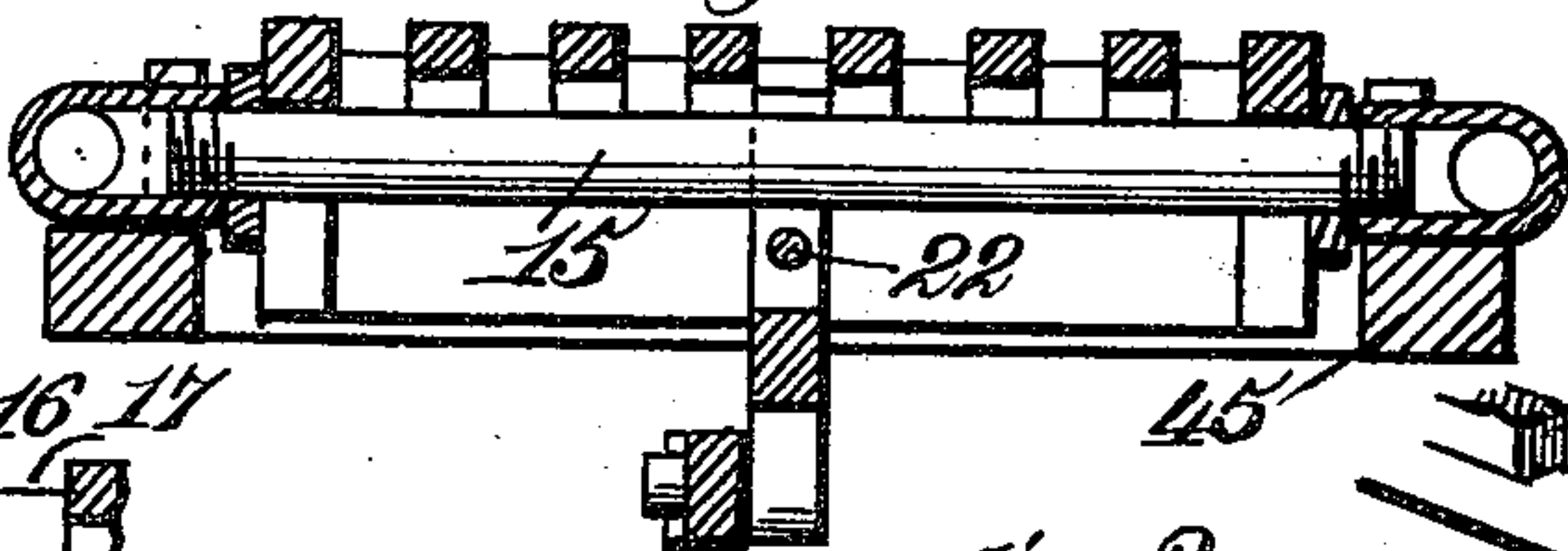


Fig. 3.

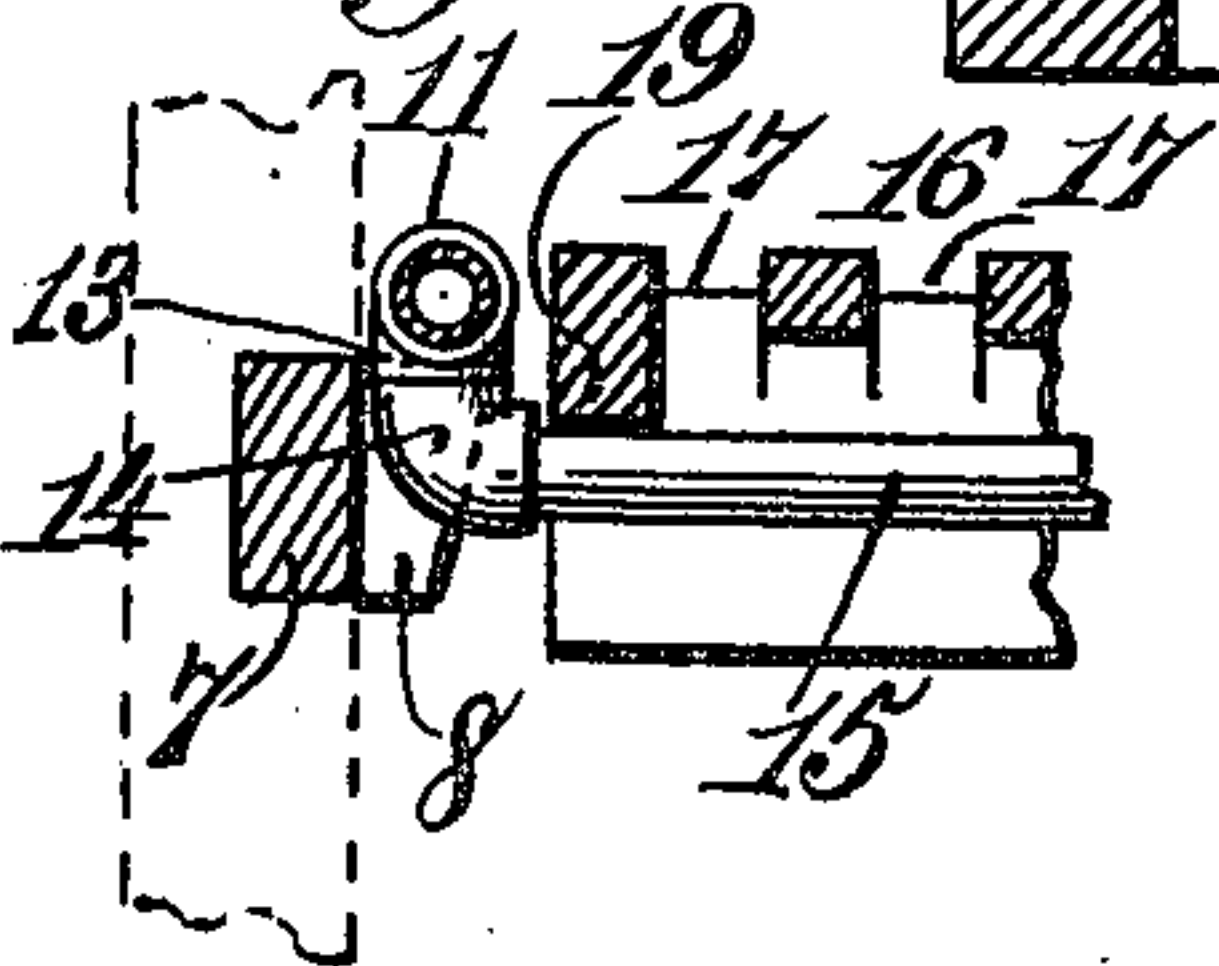


Fig. 4.

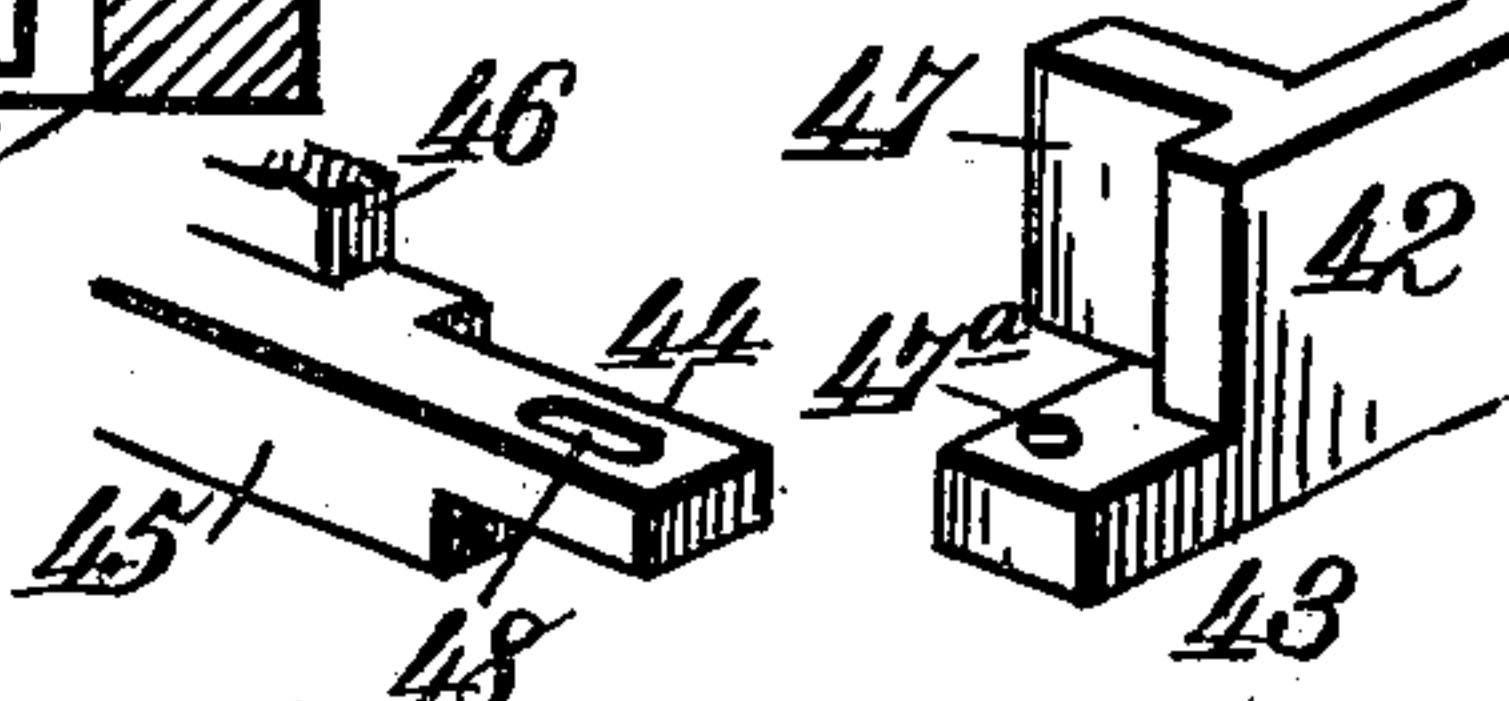


Fig. 5.

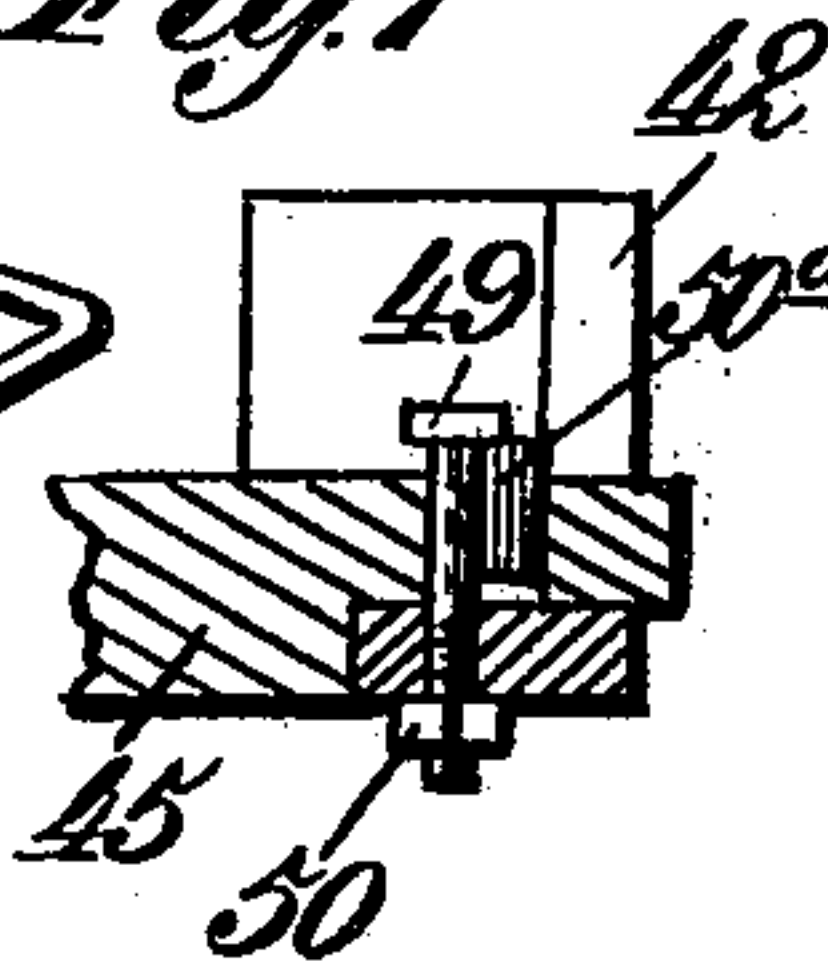
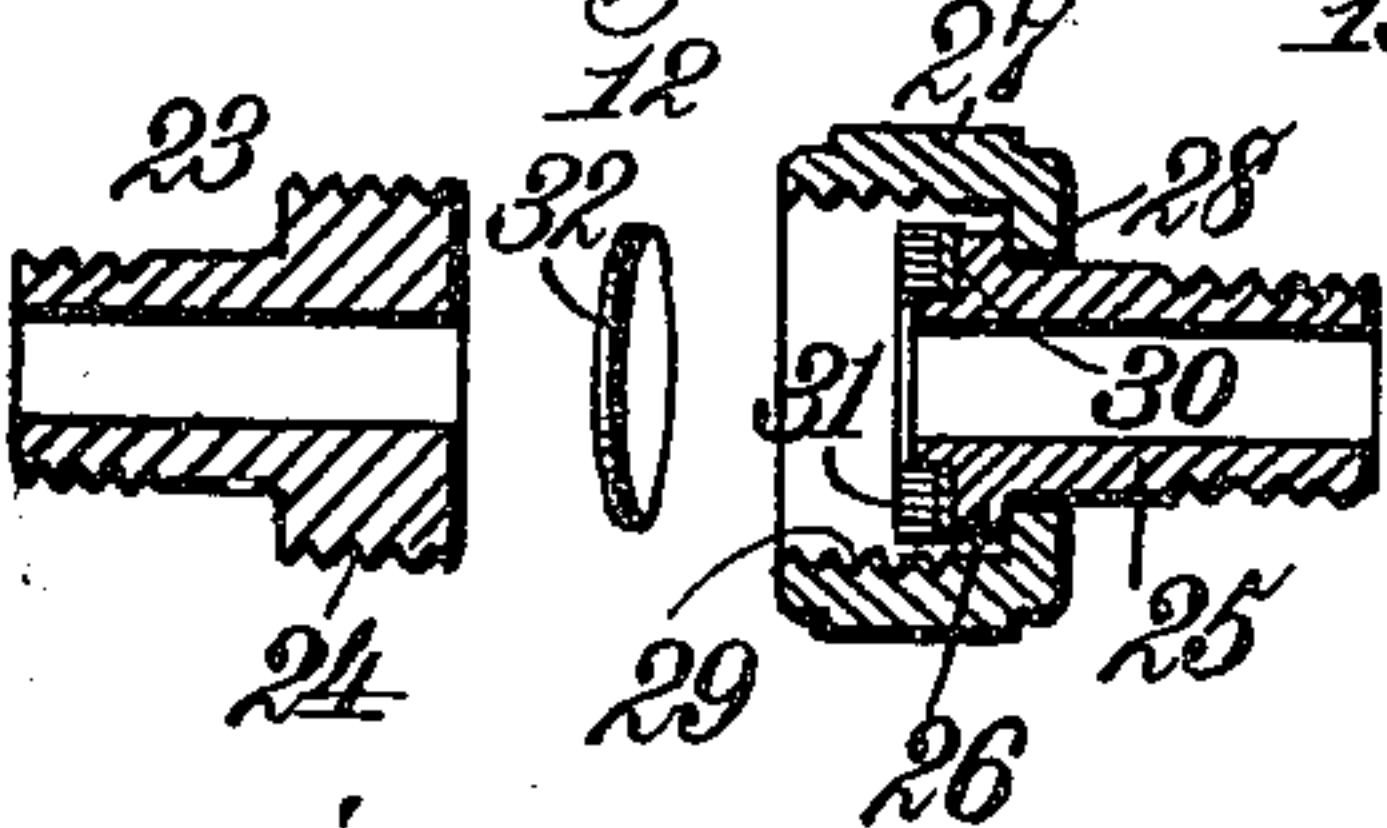


Fig. 6.



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2 Sheets—Sheet 2.

Fig. 4.

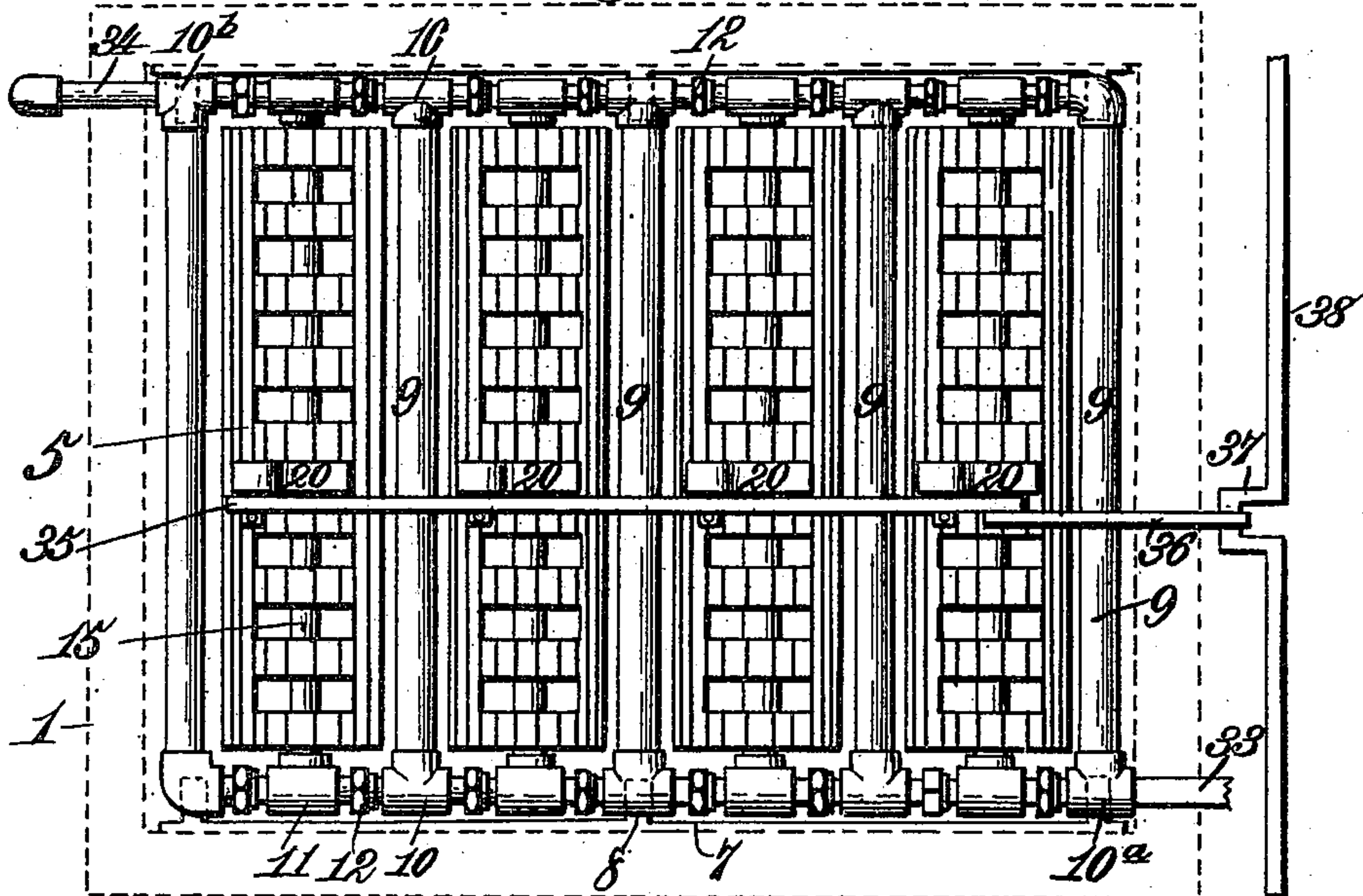
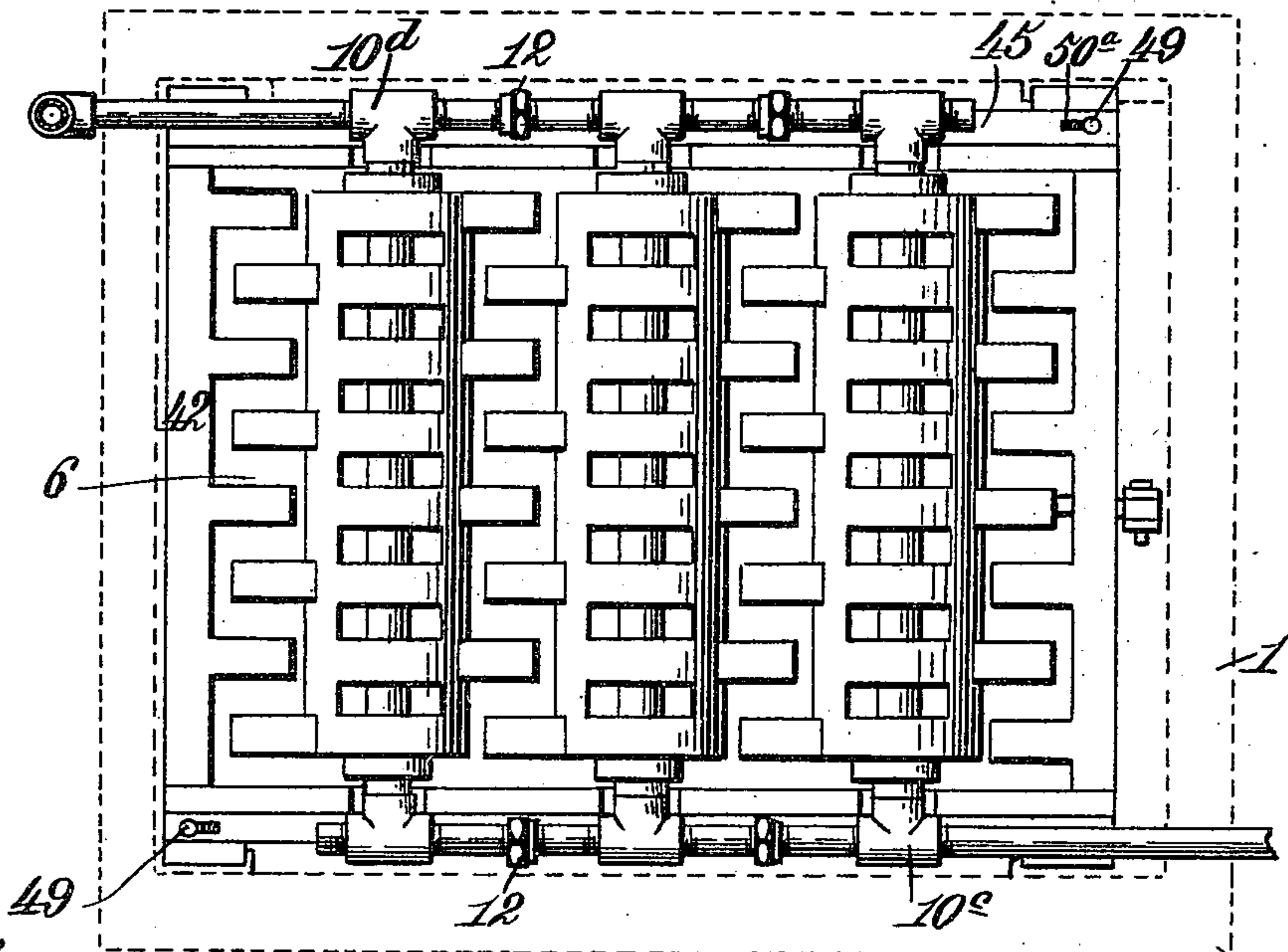


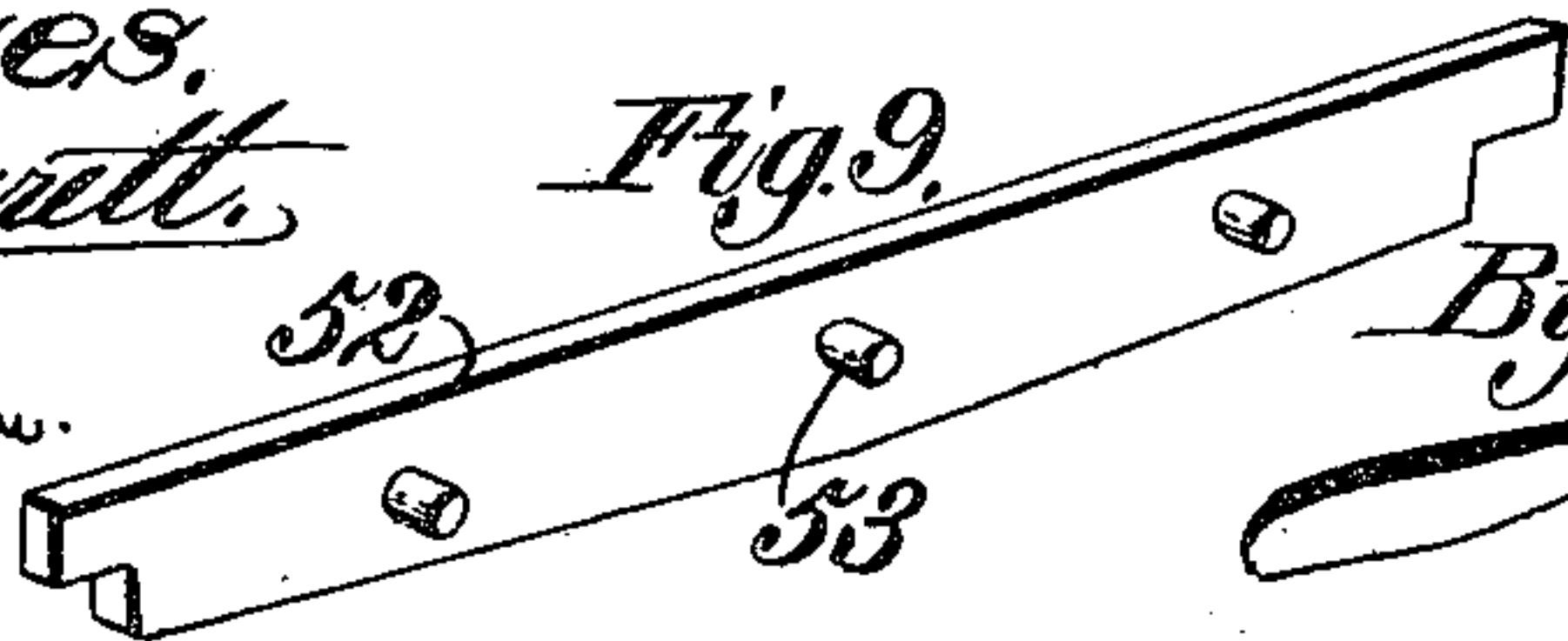
Fig. 5.



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Fig. 9.



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UNITED STATES PATENT OFFICE.

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GRATE.

SPECIFICATION forming part of Letters Patent No. 667,607, dated February 5, 1901.

Application filed September 29, 1900. Serial No. 31,560. (No model.)

To all whom it may concern:

Be it known that I, JOHN THURELL, a citizen of the United States, residing at North Adams, in the county of Berkshire and State of Massachusetts, have invented new and useful Improvements in Grates, of which the following is a specification.

This invention relates to grates, and more especially to grates for furnaces and the like, and has for one object to provide a duplex grate wherein one grate is arranged above the other, the arrangement being such that the unconsumed or partially-consumed particles of fuel in the upper part will be shook down or raked onto the fire on the lower grate and be there completely consumed.

It also has for its object to combine with a rocking grate a water-circulating system, the arrangement being such as to permit of a free circulation of air between the water-pipes and grate-sections.

It has for another object to so construct the grate-supporting frames and the water-pipe connections that the grate-sections may be extended or contracted longitudinally to a limited extent to accurately fit the same to the furnace structure and to adjust the grate-bars closer together or farther apart.

Finally, it has for its object to improve and simplify the construction and render more efficient and economical the operation of this class of grates generally.

To these ends my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, and particularly pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a vertical longitudinal sectional view of my improved grate. Fig. 2 is a transverse sectional view taken on the line 2 2 of Fig. 1. Fig. 3 is a diagrammatic view illustrating the circulation of the water. Fig. 4 is a top plan view of the upper grate. Fig. 5 is a similar view of the lower grate. Fig. 6 is a detail sectional view illustrating one of the pipe-couplings and its check and packing. Fig. 7 is a similar view showing the manner of securing together the ends or cor-

ners of the lower grate-frame. Fig. 8 is a detail sectional view illustrating the manner of supporting the ends of the grate-bars of the upper grate. Fig. 9 is a detail view illustrating one of the side bars of a modified form of grate-frame.

Referring to the drawings, the numeral 1 indicates the furnace structure; 2 and 3, the furnace-doors, giving access, respectively, to the upper and lower grates; 4, the offtake-flue, and 5 and 6 respectively the upper and lower grates. Built in or attached to the inner sides of the furnace are two grate-supporting bars 7, each comprising a substantially rectangular bar provided on its inner side with ribs or flanges 8, which form supports upon which the upper grate 5 is adapted to rest. The upper grate comprises a rectangular frame formed of pipes or tubings as follows:

The numeral 9 indicates a plurality of transverse pipes, each having screwed on its opposite ends T's 10, and said T's 10 are joined or connected together by T's 11 and couplings 12, a coupling 12 being disposed between the adjacent ends of each pair of T's 10 and 11, as most clearly shown in Fig. 4 of the drawings. Each T 11 is provided with a vertical depending branch 13, in the lower end of which is screwed an elbow 14, and in the ends of each two corresponding or pair of elbows 14 is screwed a transverse pipe 15. As shown most clearly in Fig. 1 of the drawings, this manner of connecting the pipes 15 to the sides of the grate-frame causes them to lie in a plane somewhat below that of the said frame, as is shown in Figs. 1 and 8 of the drawings.

Loosely arranged on the water-pipes 15 are grate-bars, each comprising a longitudinal shell 16, segment-shaped in cross-section and comprising the greater portion of a complete circle. Formed transversely in the upper sides of the shells are segmental slots 17 to permit of the passage of air through the grate-bars. The interiors of the shells are preferably provided with a plurality of ribs 18 to aid in holding the fuel in place on the grate-bars; but these ribs, if preferred, may be omitted. Formed on the ends of the grate-bars are inwardly-projecting flanges 19, that

rest on the water-pipes 15. The grate-bars straddle the water-pipes, and the only portions thereof that are in contact with said pipes are the flanges 19. An unobstructed space is thus formed entirely around the water-pipes, and between the latter and the grate-bars for the circulation of air which escapes up through the slots 17, thereby aiding in protecting the grate and pipes from the destructive effects of the fire.

The numeral 20 indicates rocker-arms, there being one for each grate-bar, each of said rocker-arms being forked or bifurcated to form a yoke 21, which is inserted through one of the slots 17 and straddles the water-pipe. Pins 22 are inserted in the yokes below the water-pipes and pass through the sides of the grate-bars and fasten the latter in place on the water-pipes. The pipes 9, intermediate the grate-bars, serve as stationary grate-bars and, as most clearly shown in Fig. 1, lie in the same plane as the grate-frame and substantially in the same plane with the upper surfaces of the grate-bars.

Each of the couplings 12, before referred to, is constructed substantially as follows: The numeral 23 indicates a nipple enlarged and exteriorly screw-threaded, as at 24, and the numeral 25 indicates a corresponding nipple provided near one end with an annular flange or collar 26. Arranged on the nipple 25 is a sleeve 27, having an inwardly-projecting annular flange 28, that is adapted to engage the flange 26 on the nipple 25, said sleeve being internally threaded, as at 29, to screw over the threaded end 24 of the nipple 23. Arranged on the inner end of the nipple 25 is a packing comprising a metallic washer 30, that rests on the flange 26, and a packing-ring 31, formed of vulcanized fiber or any other material suitable for the purpose and resting on the washer 30. The sleeve 24 is arranged to engage the threaded end of the nipple 23 and draws the two nipples 23 and 25 up together, compressing the packing tightly between the two, thereby making a water-tight joint.

The couplings 12 on alternate sides of the grate-frame between the pipes 9 are provided with checks 32, which may conveniently consist of metallic disks of copper or other suitable metal and which are arranged between the ends of the nipples 23 and the packing-rings 31, said disks or checks operating to prevent the passage of water through the couplings in which they are placed. To the T 10^a, arranged on one side and at one end of the upper grate, is connected a feed-water pipe 33, and to the corresponding T 10^b at the other end and on the other side of said grate is connected a water-discharge pipe 34. The water entering by the pipe 33 passes through the adjacent pipe 9 and thence into the next pipe 15 and successively through the succeeding pipes 9 and 15 and finally out through the discharge-pipe 34. The circulation of wa-

ter thus maintained through the grate-bar-supporting water-pipes and the water-pipes arranged between the grate-bars operates as a cooling medium to preserve the grate-bars, the water-pipes, and the grate-supporting frame from the destructive effects of the fire, prevents the warping of the parts, and increases the life of the grate. Moreover, it operates to heat the feed-water before it is admitted to the boiler, as will more fully hereinafter appear. To each of the rocker-arms 20, before referred to, is connected a connecting-rod 35, by means of which all the grate-bars may be simultaneously rocked about the pipes 15. This may be accomplished by hand, and by providing the arrangement shown in Fig. 1 of the drawings it may be accomplished by power. Referring to said figure, the numeral 36 indicates a pitman pivotally connected at one end to the rod 35 and at its other end pivotally connected to a crank 37, forming a part of a shaft 38, which is journaled in suitable bearings 39 and provided with a pulley 40, which may be driven by a belt or the like from any suitable driving mechanism. It will be evident that by using washers 30 and packing-rings 31 of different thicknesses the distance between the grate-bars may be varied to a limited extent, either to bring the grate-bars nearer together or to place them farther apart or to expand or contract to a limited extent the lengthwise dimensions of the grate-frame, so as to cause the latter to accurately fit the interior of the furnace structure.

Arranged beneath the upper grate above described is the lower grate, which is supported in a rectangular frame resting on brackets or abutments 41, formed on or attached to the furnace-walls, as best shown in Fig. 5 of the drawings. The frame comprises two end or cross bars 42, which are rabbeted at their ends, as at 43, (see Fig. 7,) and rest on the brackets 41, and overlapping and resting on said rabbeted ends of the cross-bars 42 are the rabbeted ends 44 of the side bars 45. The side bars 45 are provided with notched or recessed flanges 46, and lugs 47 are formed on the inner sides of the end cross-bars 42, as shown. A bolt-hole 47^a is formed in each end of both end cross-bars 42, and a corresponding slot or elongated bolt-hole 48 is formed in each overlapping end of the side bars 45. Bolts 49 are passed through the corresponding bolt-holes 47 and 48 and are tightened up by nuts 50, said bolts operating to hold the side and end bars rigidly together when the nuts are tightened up. Fitted in the slot or elongated bolt-hole 48 on one side of the bolt 49 is a key 50^a, which operates to hold the side bar against endwise movement. The lower grate consists of water-pipes 15, grate-bars 16, and T's 10 11, connected by couplings 12 in substantially the same manner as in the upper grate, excepting that all the grate-bars are rocking bars and the

end T's 10^c and 10^d extend entirely through the end bars 42 of the grate-frame. The rocker-arms 20^a of the lower grate-bars are pivotally connected to a rod or pitman 35^a, by means of which the grate-bars may be rocked or dumped. The pipe 34, leading from the upper grate, is connected to the nipple 10^c on the rear end of the lower grate by a pipe 51, and the nipple 10^d at the front end of the lower grate is connected to a pipe (not shown) that leads to the boiler.

In practice a fire is built on both the upper and lower grates, and the particles of fuel that are not consumed or only partially consumed in the upper fire may be shook or raked down through the upper grate onto the fire on the lower grate and be there thoroughly consumed. Moreover, the smoke and products of combustion drawn through the upper grate are consumed in the combustion-chamber between the two grates and finally escape through the uptake-flue 4. The water enters the pipe 33, passes through the front pipe 9, thence passes successively through the water-pipes and grate-bars of the upper grate alternately in opposite directions, as indicated by the arrows, and thence through the rear cross-bar. From the latter the water passes through the pipe 51 to the lower grate and alternately through the water-pipes of the latter, as before, and out through the nipple 10^d to the boiler, the water in its passage through the grates becoming highly heated and also operating to protect the grates from the destructive effects of the fire. The course of the water in circulating through the grates will be readily understood by referring to the diagrammatic view in Fig. 3 of the drawings. Often in taking measurements for grates and in building the furnaces for their reception inaccuracies occur, so that the grates will not properly fit the furnaces. By the improved means above described, however, the grates may be extended or contracted lengthwise to accurately accommodate them to the furnace, for by using packings 30 and 31 of different thicknesses the grate-bars and water-pipes will manifestly be drawn closer together or moved farther apart. Also by shifting the keys 50^a to one side or the other of the bolts 49 the frame of the lower grate will be lengthened or shortened.

In some grates where the water circulation is not desired the water-pipes and connections may be dispensed with, and in such case the side bars are omitted and in their stead are employed side bars 52, (see Fig. 9,) provided on their inner sides with laterally-projecting cylindrical lugs 53, on which the ends of the grate-bars are directly hung or journaled.

I have shown and described my improved grate as being particularly designed for steam-boiler furnaces; but it will be apparent that it may be used in connection with heaters of various different descriptions.

Having described my invention, what I claim is—

1. In a heater, the combination with two independently-rocking grates arranged one above the other, of means for circulating water successively through the grate-bars of one of the grates and then circulating the entire and same body of water in a similar manner through the other grate, substantially as described.

2. The combination with a grate-frame, of a plurality of transverse water-pipes supported by said frame and alternately communicating with each other at their ends, grate-bars supported on said water-pipes, and means for adjusting the water-pipes toward and away from one another, substantially as described.

3. The combination with a grate-frame longitudinally extensible and contractible, of a plurality of transverse water-pipes supported on said frame and alternately communicating with each other at their ends, grate-bars supported on said water-pipes, and means for adjusting the water-pipes and the ends of the grate-frame toward and away from one another, substantially as described.

4. The combination with a grate-frame, of a plurality of transverse water-pipes, T's fitted on the opposite ends of each of said water-pipes, couplings adjustably connecting the adjacent ends of the T's together, and grate-bars supported on the water-pipes, substantially as described.

5. The combination with a rectangular grate-frame comprising side and end bars overlapping one another at the ends, the ends of the side bars being provided with elongated bolt-holes, of bolts fitted in the ends of the end bars and passing through said elongated bolt-holes, keys fitted in the said elongated bolt-holes to one side of said bolts, and transverse grate-bars adjustably supported on the side bars of the grate-frame, substantially as described.

6. The combination with a grate-frame, a plurality of transverse water-pipes supported on said frame, and means for circulating water through said pipes, of grate-bars supported on the water-pipes and each comprising a shell segment-shaped in cross-section, said grate-bars loosely straddling the water-pipes and provided with transverse slots in their upper sides, each of said grate-bars being provided with inwardly-projecting flanges at its opposite ends which rest on the water-pipes and hold the grate-bar out of contact with the water-pipe, substantially as described.

7. The combination with a grate-frame, a plurality of transverse water-pipes supported on said frame, and means for circulating water through said pipes, of grate-bars supported on the water-pipes and each comprising a shell segment-shaped in cross-section, said grate-bars loosely straddling the water-pipes and provided with transverse slots in their upper sides, rocker-bars, one for each grate-bar, forked at their lower ends and in-

serted in one of said transverse slots, pins passing through the forked ends of the rocker-bars and through the grate-bars beneath the water-pipes, and a connecting-rod connecting the ends of said rocker-bars, substantially as described.

In testimony whereof I have hereunto set

my hand in presence of two subscribing witnesses.

JOHN THURELL.

Witnesses:

ED. JARVIS,

W. P. MEADE.