

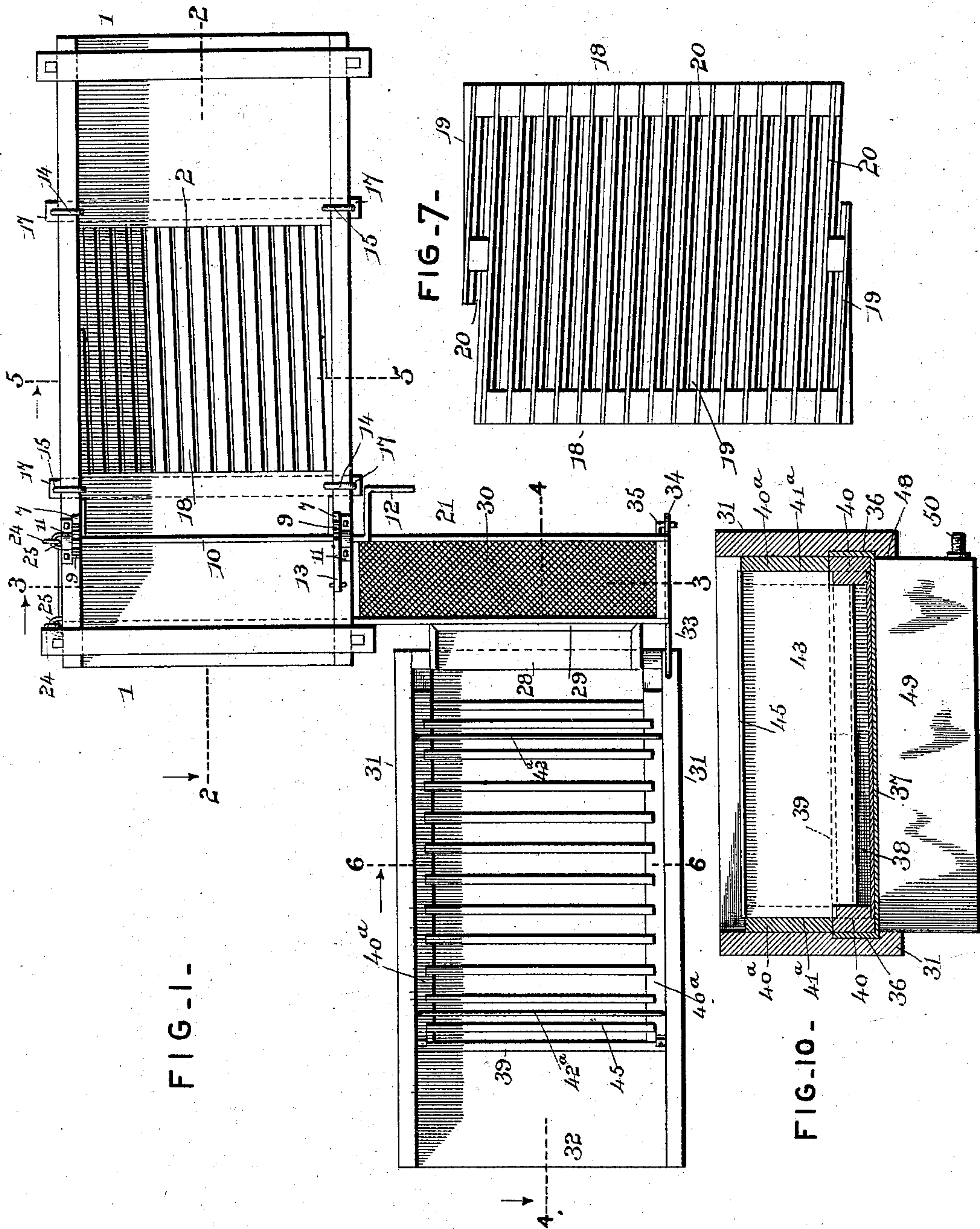
(No Model.)

3 Sheets—Sheet 1.

L. S. PIERCE.  
COMBINED SEPARATOR AND AMALGAMATOR.

No. 560,750.

Patented May 26, 1896.



Inventor

Lucius S. Pierce

Witnesses  
Jas. K. McEachran  
D. P. Holmquist

By His Attorneys.

C. A. Snow & Co.

(No Model.)

3 Sheets—Sheet 2.

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FIG. 9.

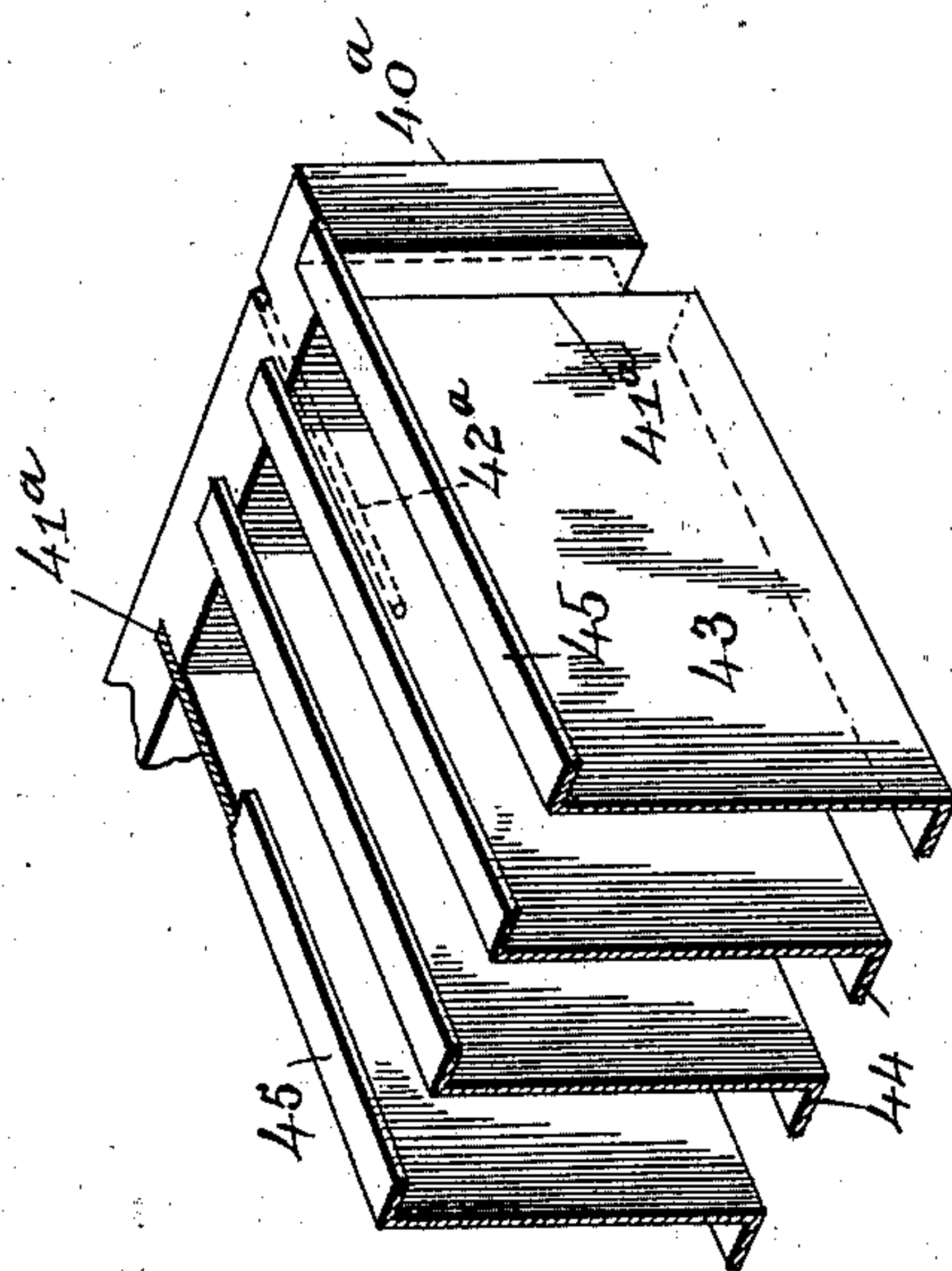


FIG. 2.

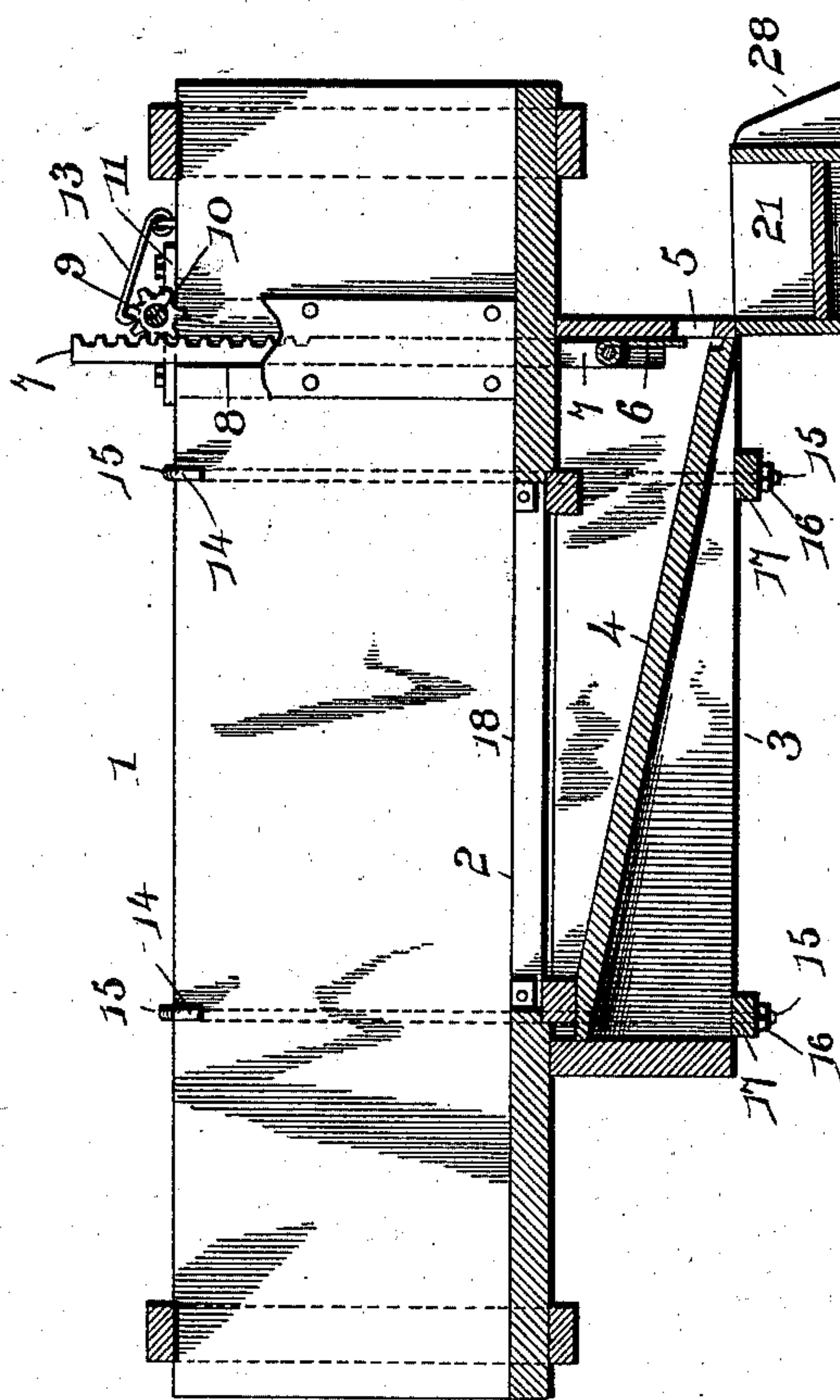
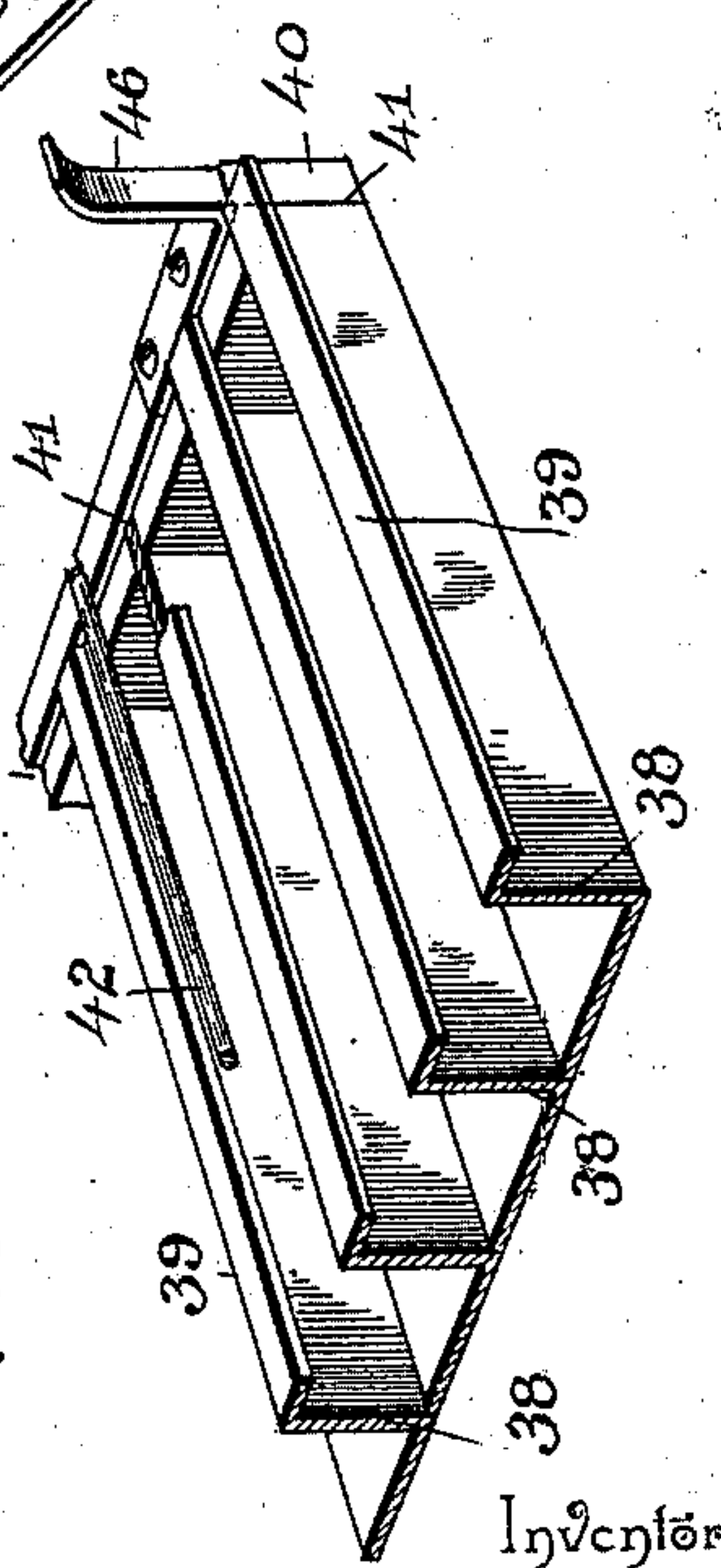


FIG. 8.



Inventor

Lucius S. Pierce

Witnesses

Jas. K. McEachran  
D. P. Holmhaugen.

By His Attorneys.

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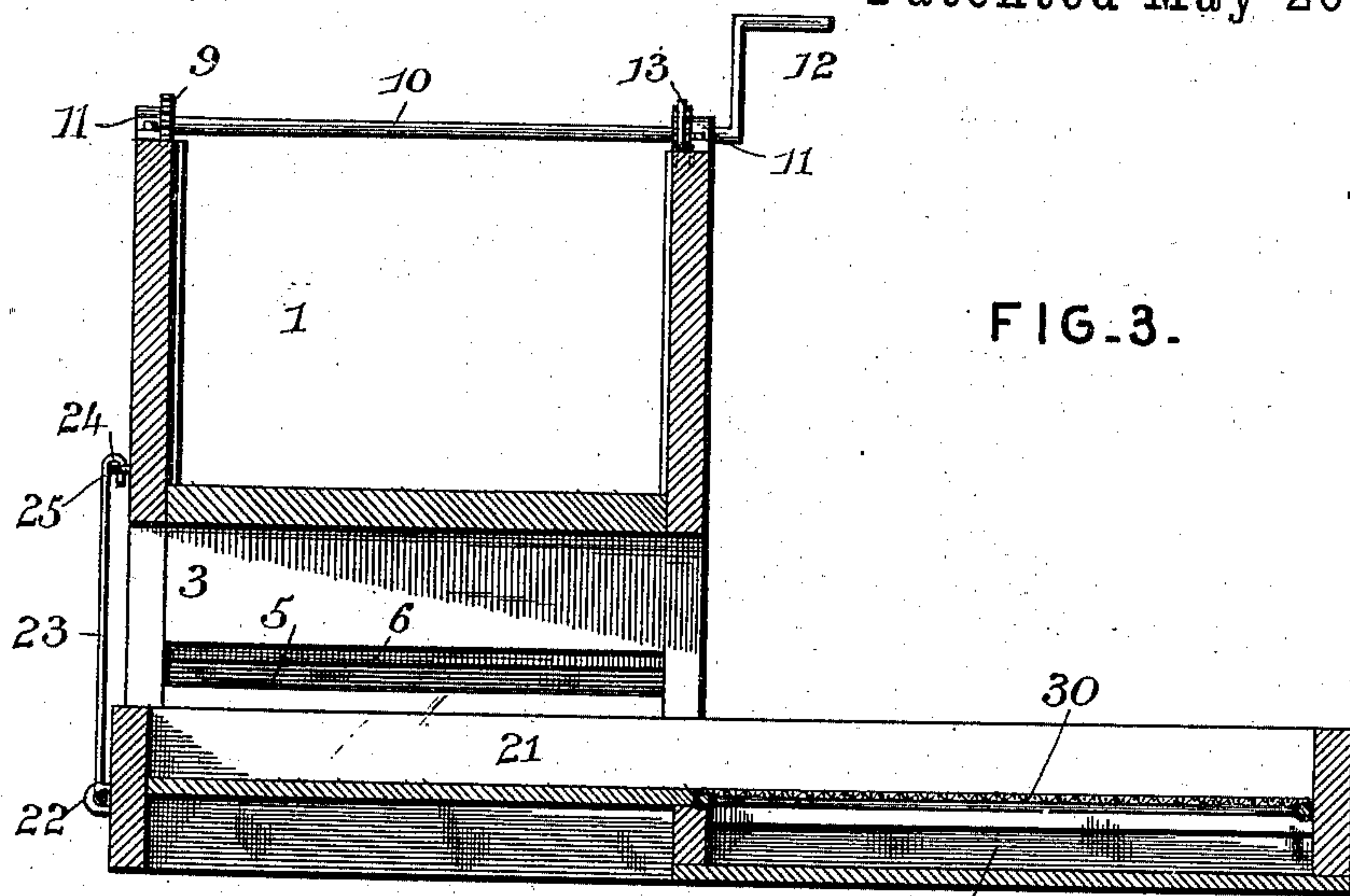


FIG. 3.

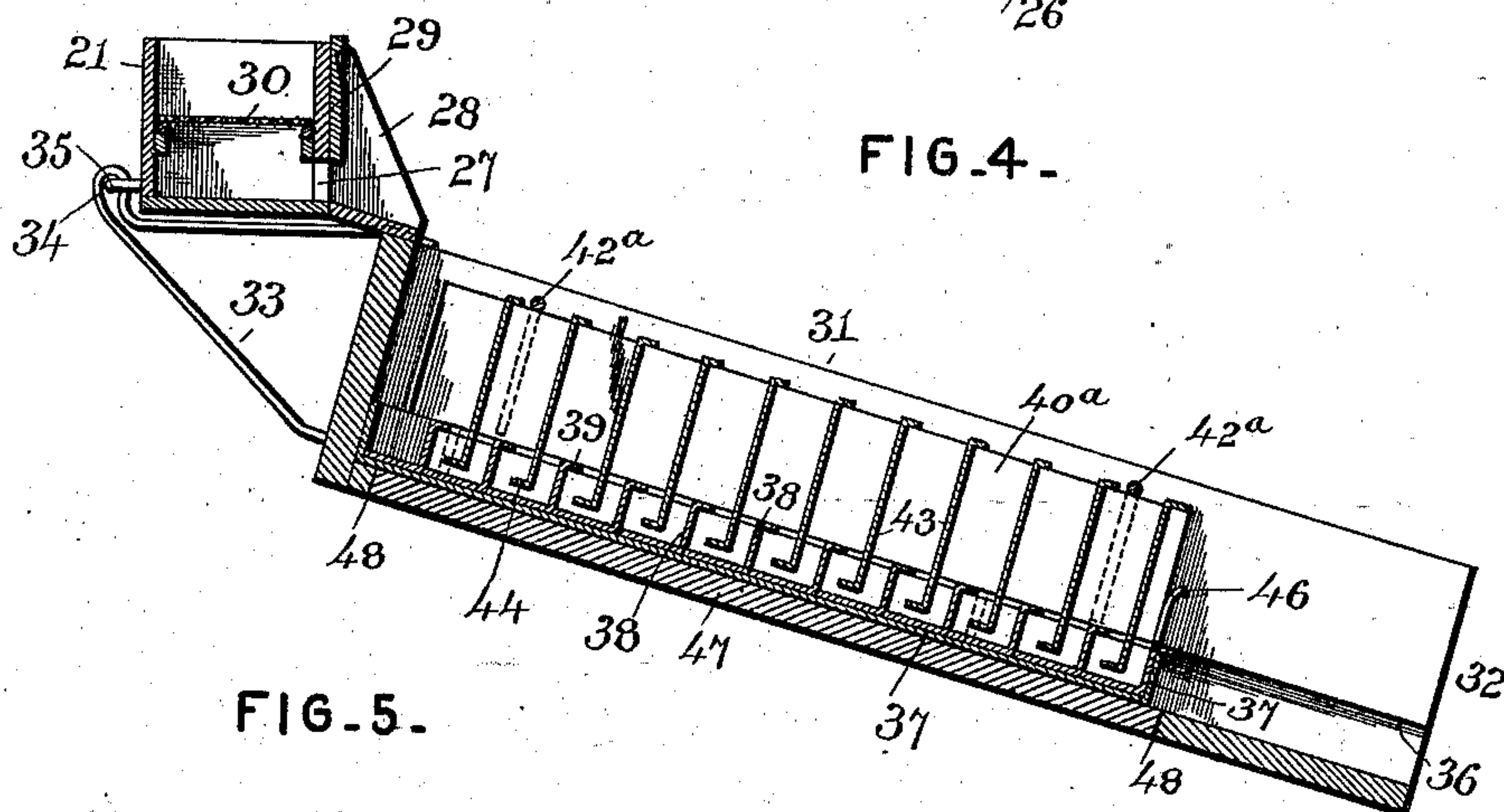


FIG. 4.

FIG. 5.

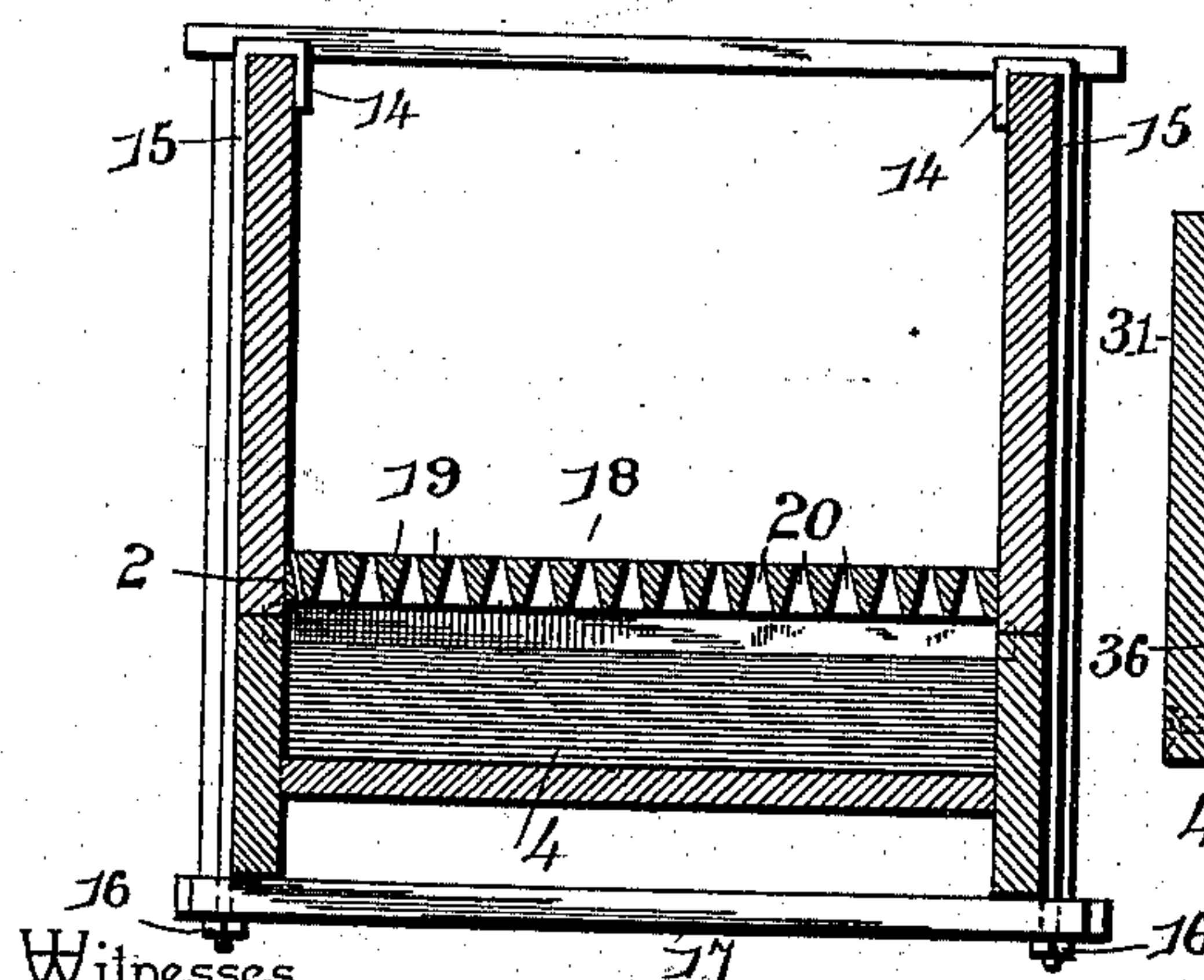
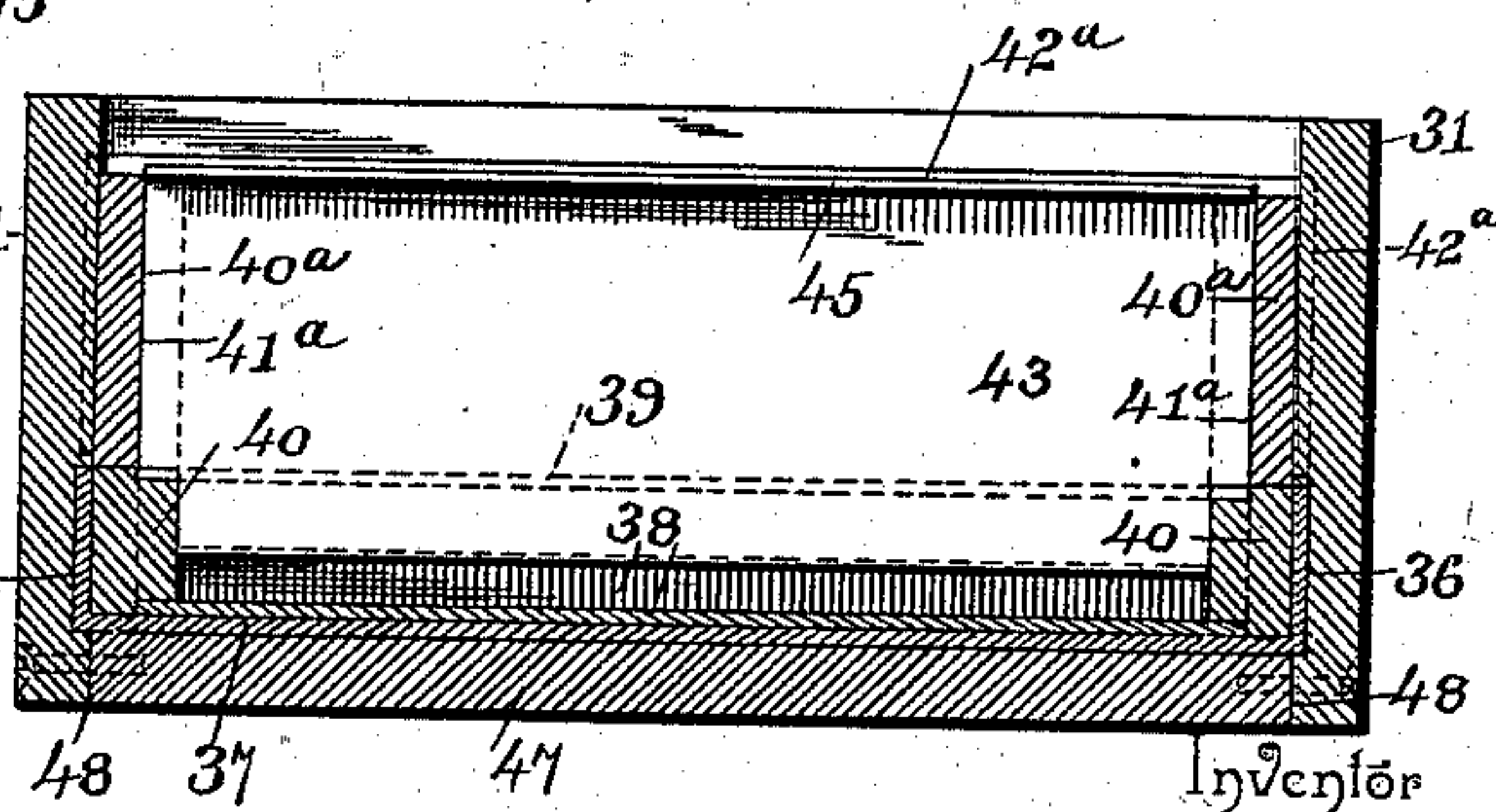


FIG. 6.



Inventor

Lucius S. Pierce

Witnesses

Jas. H. McLaughlin

D. P. Stoughton

By *Trus* Attorneys.

*Chas. H. Co.*



# UNITED STATES PATENT OFFICE.

LUCIUS S. PIERCE, OF RED CLIFF, COLORADO.

## COMBINED SEPARATOR AND AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 560,750, dated May 26, 1896.

Application filed February 12, 1895. Serial No. 538,128. (No model.)

*To all whom it may concern:*

Be it known that I, LUCIUS S. PIERCE, a citizen of the United States, residing at Red Cliff, in the county of Eagle and State of Colorado, have invented a new and useful Combined Separator and Amalgamator, of which the following is a specification.

This invention relates to separators and amalgamators; and it has for its object to provide a new and useful apparatus of this character having efficient means for the thorough separation of gold from gold-bearing substances and its complete collection by means of amalgamation.

To this end the main and primary object of the present invention is to construct a combined separator and amalgamator used in conjunction with an ordinary flume or sluiceway to secure the desired separation and amalgamation of the gold.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a plan view of a separator and amalgamator constructed in accordance with this invention. Fig. 2 is a longitudinal sectional view on the line 2 2 of Fig. 1. Fig. 3 is a transverse sectional view on the line 3 3 of Fig. 1. Fig. 4 is a longitudinal sectional view on the line 4 4 of Fig. 1. Fig. 5 is a transverse sectional view on the line 5 5 of Fig. 1. Fig. 6 is an enlarged detail sectional view on the line 6 6 of Fig. 1. Fig. 7 is a detail bottom plan view of the grill or grating for the bottom discharge-opening of the flume or sluiceway. Fig. 8 is a detail in perspective, partly in section, of the lower set of amalgamated riffle-plates. Fig. 9 is a similar view of the upper set of riffle-plates. Fig. 10 is a transverse sectional view of the amalgamating-box with the heating-tank fitted within the bottom thereof.

Referring to the accompanying drawings, 1 designates a section of a flume or sluice-box that is designed to carry water, together with gold-bearing substances, from which the particles of gold are to be separated and collected. At one or more points the flume 1 is provided with a bottom discharge-opening 2, through

which the flow from the flume is allowed to pass into a bottom discharge-box 3, that is removably secured to the bottom of the flume under the bottom discharge-opening 2 thereof. The removable bottom discharge-box 3 is open at the top to receive the flow from the flume and is provided with an inclined bottom 4, that directs the flow of water and gold-bearing substances toward one end of the box 3, which is provided at such end with a transverse discharge-opening 5, the flow through which is regulated or cut off by means of a vertically-adjustable cut-off gate 6. The vertically-adjustable cut-off gate 6 is arranged transversely within one end of the box 3 and works over the inner side of the opening 5 to provide for covering and uncovering the said opening. The flow-regulating gate 6, that is arranged to work within the box 3, over the end discharge-opening 5 thereof, has suitably connected to its opposite ends the lower ends of the opposite vertically-movable rack-bars 7. The vertically-movable rack-bars 7 are arranged to work in suitable guides or ways 8, formed in the opposite sides of the flume 1, and the teeth at the upper end of said rack-bars are adapted to be engaged by the adjusting-pinions 9. The adjusting-pinions 9 are mounted on a single adjusting-shaft 10, journaled transversely at the top of the flume 1 in suitable bearings 11, and said adjusting-shaft 10 is provided at one end with a hand-crank 12, providing means for turning the shaft to raise and lower the gate 6. A lock-dog or pawl 13 is pivotally mounted on the upper edge of one of the sides of the flume and is adapted to be thrown into engagement with one of the pinions 9 to lock the shaft against rotation and hold the gate 6 stationary in its adjusted position.

The bottom discharge-box 3 is removably clamped in position to the bottom of the flume 1 by means of opposite pairs of securing rods or bolts 14, provided at their upper ends with hooks 15, engaging over the upper side edges of the flume 1 and being bolted at their lower ends, as at 16, to opposite ends of transverse securing-bars 17, arranged under and clamped against the box 3 to hold the same firmly in position. The flow of water and gold-bearing substances does not pass directly into the box 3 through the bottom discharge-opening



2 of the flume, but is first subjected to a separating action through a grill or grating 18. The grill or grating 18 is substantially rectangular in form and removably fits within the bottom discharge-opening 2 to act in the capacity of a separating-screen for separating larger rock, &c., from the sand and other fine substances that are designed to be passed through the apparatus.

The separating grill or grating consists of a connected series of parallel spaced grill-bars 19, that are spaced sufficiently apart from each other to form longitudinal spaces or openings 20 therebetween, and through which openings or spaces the sand and fine rock pass into the bottom discharge-box 3 below the grill or grating. The parallel spaced grill-bars 19 are triangular-shaped in cross-section to form therebetween downwardly-flaring spaces, which effectually prevent a wedging of the substances, which are sufficiently large to pass through the openings or spaces at the top surface of the grill or grating, and by reason of the disposition of the said grill-bars the same are provided with flat upper sides, presenting a smooth and unobstructed surface for the flow that passes through the flume 1. The said grill-bars 19 that are triangularly-shaped in cross-section are disposed at an angle or obliquely to the length of the flume 1, so that the water and rock in passing over the grill or grating 18 must necessarily pass over two or more of the longitudinal openings or spaces 20 of the said grill or grating, thereby allowing the sand and gold to work through the grill or grating into the box 3, while the rock and gravel are carried on beyond the grill or grating by the flow of water. It will be noted that any small rock or gravel that may happen to become fastened in the longitudinal spaces or openings of the grill or grating will be forced through and into the box 3 by the rock in the afterflow, whereby the grill or grating will be kept constantly clean or clear, so that the sand and particles of gold may always readily pass through the grill or grating and into the box 3.

The sand and gold which find their way into the bottom discharge-box 3 are directed through the end discharge-opening 5 of said box into one end of an independent combined separating and feed trough 21. The combined separating and feed trough 21 is open at the top throughout its entire length and is arranged transversely below and at direct right angles to the flume 1. The said trough 21 is so arranged as to bear at one top edge transversely under the discharging end of the box 3, so that the trough will receive the entire flow from the said discharge-box, and at one end the combined separating and feed trough 21 has pivotally connected thereto, as at 22, a U-shaped fastening-bail 23, that is provided at its opposite extremities with the hooks 24, adapted to detachably engage with the keepers 25, fitted in one side of the flume 1. The

fastening means described fasten one end of the trough 21 to the flume, and therefore serve to clamp the trough properly in position below the discharging end of the box 3.

The combined separating and feed trough 21 may be of any desired length according to the number of amalgamating devices that are designed to be fed thereby; but whatever may be its length the said trough is extended at one end beyond the side of the flume opposite to which the other end of the trough is fastened, and in its projected portion at one side of the flume 1 the said trough 21 is provided with a bottom discharge-pocket 26. The bottom discharge-pocket 26 of the trough 21 communicates with a side discharge slot or opening 27, from which leads a side-inclosed side discharge-chute 28, projected from one side of the trough 21. A cut-off gate 29 is mounted to slide within the chute 28, outside of the opening 27, and is designed to cover and uncover said opening to regulate or cut off the flow therethrough.

Fitted within the bottom of the trough 21, directly over the bottom discharge-pocket 26 therein, is a separating-screen 30. The separating-screen 30 may be of any desired mesh and is of the same area as the bottom discharge-pocket 26, over which it is arranged, so that the flow which finds its way into said pocket must necessarily first pass through the screen 30. The sand and gold readily pass through the screen 30 and into and out of the pocket 26; but all clay and coarser particles, such as gravel and the like, are separated from the fine sand and gold by the screen and remain on the latter, so that the accumulations thereof can be readily removed from time to time; but in the event of the trough being made longer to feed more than one amalgamating device it will be obvious that the flow through the trough 21 will carry the accumulations of clay and coarse particles off of the separating-screen out to the end of the trough.

The sand and gold, together with the water, which of course flows the same, pass into the closed end of the inclined amalgamating-box 31. The inclined amalgamating-box is set at any desired pitch or inclination as may be required for the work and is provided with a lower open end 32, through which the tailings discharge, and at its upper closed end the said amalgamating-box is provided with a side supporting-bracket 33. The side supporting-bracket 33 is preferably triangular in shape and is projected beyond the upper end and one side of the box 31 to receive for support thereon the extended portion of the combined separating and feed trough 21, and at its outer end or apex the said bracket 33 is provided with an engaging eye 34, that is adapted to detachably engage with a pin 35, projected from one side of the trough 21, to provide a firm connection between the trough and the box 31. The box 31 extends at a downward inclination from one side of the



trough 21, and the chute 28, projected from one side of the said trough, overhangs the upper closed end of the box 31 in order to discharge the flow of sand and gold into the box 31, in which the gold is collected by means of the amalgamating devices to be described.

The amalgamating-box 31 is provided at its inner lower side edges with the opposite slide-grooves 36, that are adapted to receive the opposite side edges of a bottom pan 37, that is adapted to be slid in and out of position within the bottom of the box 31, and when arranged in position within the box 31 the said pan 37 is adjusted with one end resting directly against the closed end of the box 31 directly under the chute 28.

The removable bottom pan 37 is adapted to removably accommodate therein the lower set of amalgamated riffle-plates 38. The lower set of riffle-plates 38 are preferably made of copper coated with quicksilver to provide for the amalgamation of gold which is carried by the sand flowed around the said riffle-plates. The said riffle-plates are L-shaped and are arranged sufficiently close together so that the lower horizontal portions of the said L-shaped plates which rest flat on the bottom of the pan 37 will meet each other to form a continuous amalgamated bed portion, over which the sand and gold are carried by the flow of water. The vertically-disposed portions of the L-shaped lower riffle-plates 38 are necessarily spaced apart to form pockets therebetween and are arranged parallel with each other. The said vertically-disposed portions of the L-shaped plates 38 are provided at their upper edges with the right-angularly-disposed flanges 39, that are disposed away from the flow, or, in other words, in the same direction as the flow. The entire set of lower riffle-plates 38 are removably and temporarily secured together in the relative positions referred to by means of opposite parallel holder-strips 40, that are provided in their inner side edges with a parallel series of transversely-disposed grooves 41, that receive the opposite ends of the vertically-disposed portions of the plates 38, and when arranged within the pan 37 the said holder-strips are held tightly on the ends of the riffle-plates 38 to maintain the same relatively positioned.

When the lower set of riffle-plates are removed from the pan 37 for the purpose of recovering the amalgamated gold from the said plates, the holder-strips are preferably retained in position on the ends of the riffle-plates by means of the inverted-U-shaped retaining-bars 42, arranged transversely between and above the strips 40 and detachably embracing the outer sides of the same.

The lower set of riffle-plates 38 are adapted to have removably arranged thereover and therebetween the upper set of vertically-disposed riffle-plates 43. The upper set of riffle-plates 43 may be made of wood or any other suitable material, but are preferably made of the same material as and wider than

the lower riffle-plates, and are also coated with quicksilver to provide for the collection of gold by amalgamation. The upper set of vertically-disposed riffle-plates 43 are maintained in their relative grouped positions—that is, in a parallel series—by means of opposite parallel holder-strips 40<sup>a</sup>, similar to the strips 40 for the lower riffle-plates, and which holder-strips are also provided in their inner side edges with transversely-disposed grooves 41<sup>a</sup> to receive the ends of the plates 43, and the said holder-strips 40<sup>a</sup> are removably and temporarily retained properly in position by means of the inverted-U-shaped retaining-bars 42<sup>a</sup>, similar to the bars 42, and also embracing the outer sides of the strips 40<sup>a</sup>.

The upper set of parallel vertically-disposed riffle-plates 43 project below the lower edges of the holder-strips 40<sup>a</sup> therefor, so as to extend centrally into the spaces or pockets between the vertically-disposed portions of the lower L-shaped riffle-plates 38, and at their lower edges the said upper riffle-plates 43 are provided with the right-angularly-disposed flanges 44, that are located below the flanges 39 of the plates 38 and are disposed in a reverse direction thereto—that is, in a direction opposed to or toward the flow of water and sand through the box 31. The said upper riffle-plates 43 may also be provided at their upper edges with the strengthening flanges or beads 45; but by reason of the disposition of the lower edges of the upper riffle-plates 43 within the pockets or spaces between the lower riffle-plates it will be obvious that a circuitous circulation is provided for the flow of sand and water, so that the same will be compelled to come in contact with every part or exposed portion of the lower riffle-plates and also the portions of the upper riffle-plates that project in between the lower riffle-plates. The position of this double set of riffle-plates provides means for keeping the sand in constant agitation, thus giving the advantage of all the exposed surfaces of the riffle-plates for amalgamation, and, furthermore, it will be noted that the disposition and arrangement of the reversely-disposed flanges 39 and 44 provide for such an agitation of the sand as to absolutely prevent a clogging or settling of the sand in the riffles.

While the reversely-disposed flanges 39 and 44 are not absolutely necessary when a greater flow of water and sand is desired, still it will be obvious that the same perform very important functions in connection with the thorough agitation of the sand, and at this point it is be noted that when arranged within the box 31 the upper set of riffle-plates are held properly positioned by means of suitable stop-plates 46, secured to one end of the holder-strips 40, for the lower set of riffle-plates, and said plates therefore serve to maintain the upper and lower riffle-plates relatively positioned, so that the sand may freely flow in between the riffle-plates and out at the lower open end of the amalgamating-box.



The amalgamating-box 31 is provided with a removable bottom board 47, that is adapted to be removed, so that the bottom opening 48, uncovered thereby, may receive therein a flat-top heating-tank 49, that is provided with suitable pipe connections 50 to provide for the circulation of steam or hot water therein. When placed in position at the bottom of the box 31, the flat top of the tank 49 rests directly against the bottom of the pan 37 to provide for maintaining the quicksilver on the riffle-plates sufficiently warm and active for amalgamating purposes.

From the above it is thought that the construction, operation, and many advantages of the herein-described separating and amalgamating apparatus will be apparent without further description, and it will be understood that changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In an apparatus of the class described, a flume provided with a bottom discharge-opening, a grill or grating removably fitted in said bottom discharge-opening, a discharge-box arranged against the bottom of the flume directly under the bottom discharge-opening therein and provided with an open top, an inclined bottom, and a gate-controlled discharge-opening at one end of said inclined bottom, securing-bars arranged transversely under said discharge-box and projecting at their extremities beyond the sides of said box, exteriorly-arranged securing-rods provided at their upper ends with hooks detachably engaging over the upper side edges of the flume, said rods being bolted at their lower extremities to the extremities of said transversely-arranged securing-bars, and a suitably-arranged amalgamating device, substantially as set forth.

2. In an apparatus of the class described, the combination of a flume provided with a bottom discharge-opening, a discharge-box detachably fastened to the bottom of the flume below said bottom discharge-opening and provided with an end gate-controlled discharge-opening, a combined separating and feed trough arranged under the flume at right angles thereto and detachably secured to the flume so as to bear under the discharging end of said discharge-box, said trough being provided beyond one side of the flume with a screened bottom discharge-pocket and a side discharge-opening leading from the pocket below the screen therein, and an amalgamating device arranged under and beyond the side discharge-opening of the trough and supporting one end of the latter, substantially as set forth.

3. In an apparatus of the class described,

the combination of a flume provided with a bottom discharge-opening, a discharge-box detachably fastened to the bottom of the flume under said bottom discharge-opening, a trough arranged below the flume at right angles thereto and bearing under the discharging end of the discharge-box, said trough being provided at one side beyond the flume with a discharge-opening, a fastening-bail pivotally connected to one end of the trough and provided with hooks adapted to engage with keepers at one side of the flume, and an amalgamating-box, supporting amalgamating devices, and provided at one end with a triangularly-shaped offstanding supporting-bracket disposed under said trough and provided at its outer end or apex with an eye engaging a pin at one side of the trough, substantially as set forth.

4. In an apparatus of the class described, an amalgamating-box, a bottom pan slidably fitted within the box, a lower set of amalgamated riffle-plates arranged in said box, said lower riffle-plates being L-shaped in cross-section and having their lower horizontal portions contiguously meeting each other and resting flat on the bottom of the pan, and an upper set of parallel riffle-plates supported above the lower plates and projected at their lower edges into the spaces or pockets between said lower plates, substantially as set forth.

5. In an apparatus of the class described, an amalgamating-box, a lower set of closely-arranged L-shaped riffle-plates mounted within said box, the straight vertically-disposed portions of said L-shaped plates being provided at their upper edges with right-angularly-disposed flanges, and an upper set of parallel vertically-disposed riffle-plates projected at their lower edges into the spaces or pockets between the lower riffle-plates, said upper riffle-plates being wider than the lower riffle-plates and provided at their lower edges with right-angularly-disposed flanges located below and disposed in a reverse direction to the flanges of said lower riffle-plates, substantially as set forth.

6. In an apparatus of the class described, an amalgamating-box, a bottom pan removably fitted within said box, upper and lower sets of alternating amalgamated riffle-plates, the lower of which are arranged directly in said pan, opposite parallel holder-strips provided in their inner side edges with transverse grooves which loosely receive the ends of each set of riffle-plates respectively, and inverted-U-shaped retaining-bars arranged transversely between and above the holder-strips and adapted to detachably embrace the outer sides of said strips, substantially as set forth.

7. In an apparatus of the class described, an amalgamating-box provided with a removable bottom board to cover and uncover a bottom opening, a metallic pan arranged to



rest on the bottom of said box and support-  
ing amalgamating devices, and a flat-top heat-  
ing-tank adapted to be detachably fitted in  
said bottom opening of the box so that its  
5 flat top will rest directly against the bottom  
of the pan therein, substantially as set forth.  
In testimony that I claim the foregoing as

my own I have hereto affixed my signature in  
the presence of two witnesses.

LUCIUS S. PIERCE.

Witnesses:

E. H. LINDSEY,  
H. W. GOODRICH.