

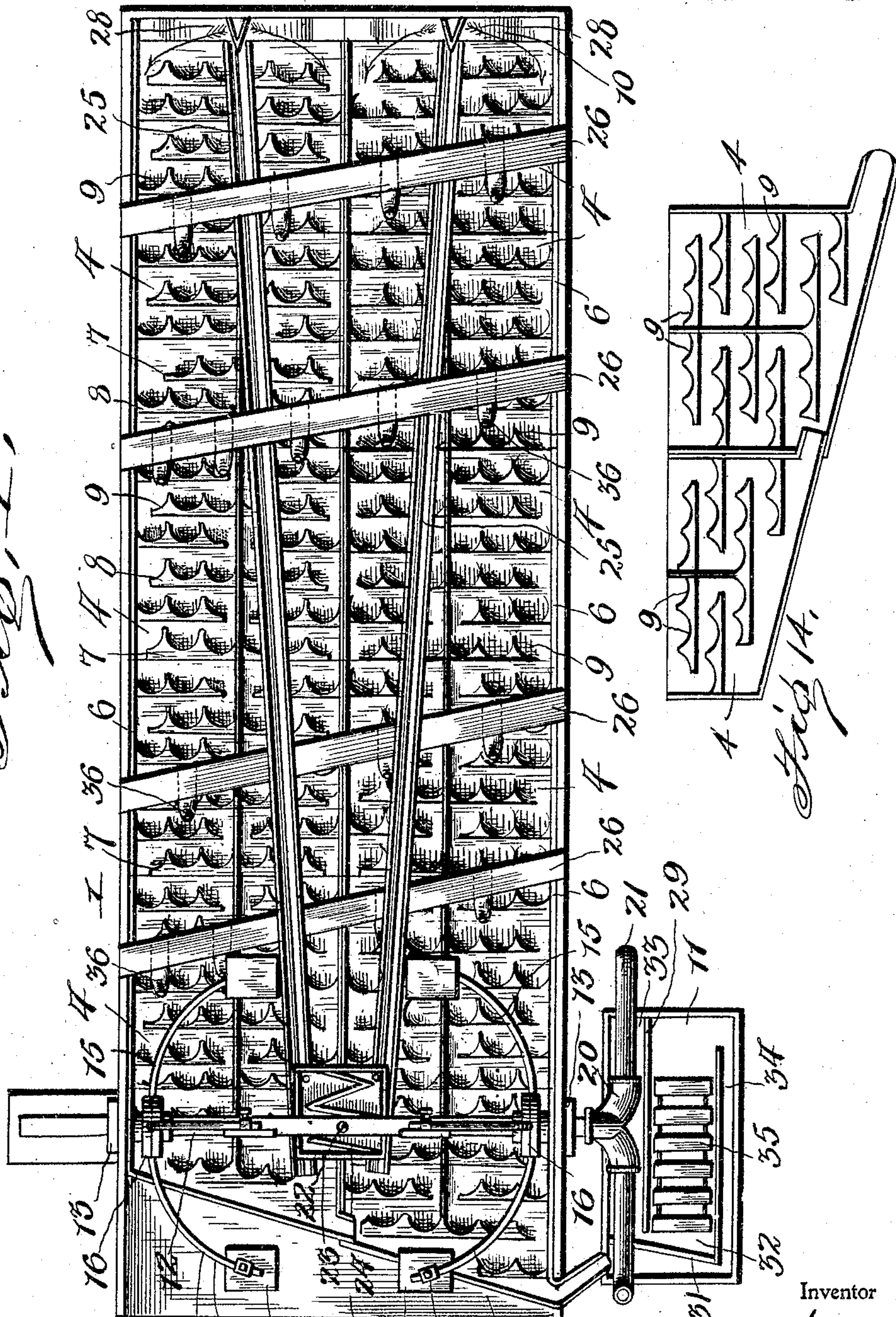
No. 785,565.

PATENTED MAR. 21, 1905.

P. McENTEE.
AMALGAMATOR.

APPLICATION FILED JAN. 13, 1904.

3 SHEETS—SHEET 1.



Witnesses

Jas A. Koehl.

[Signature]

By

Patrick McEntee,

[Signature]

Attorney

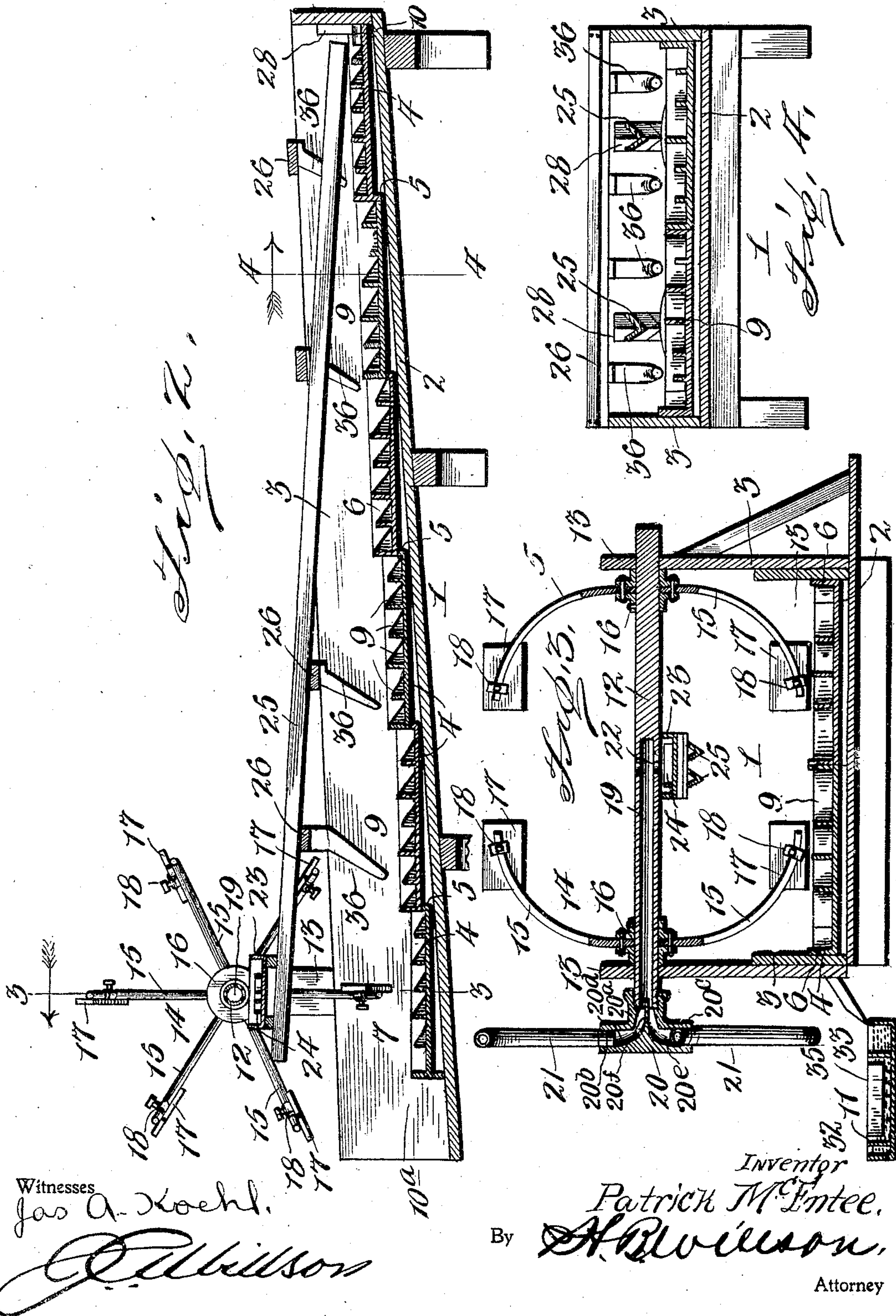
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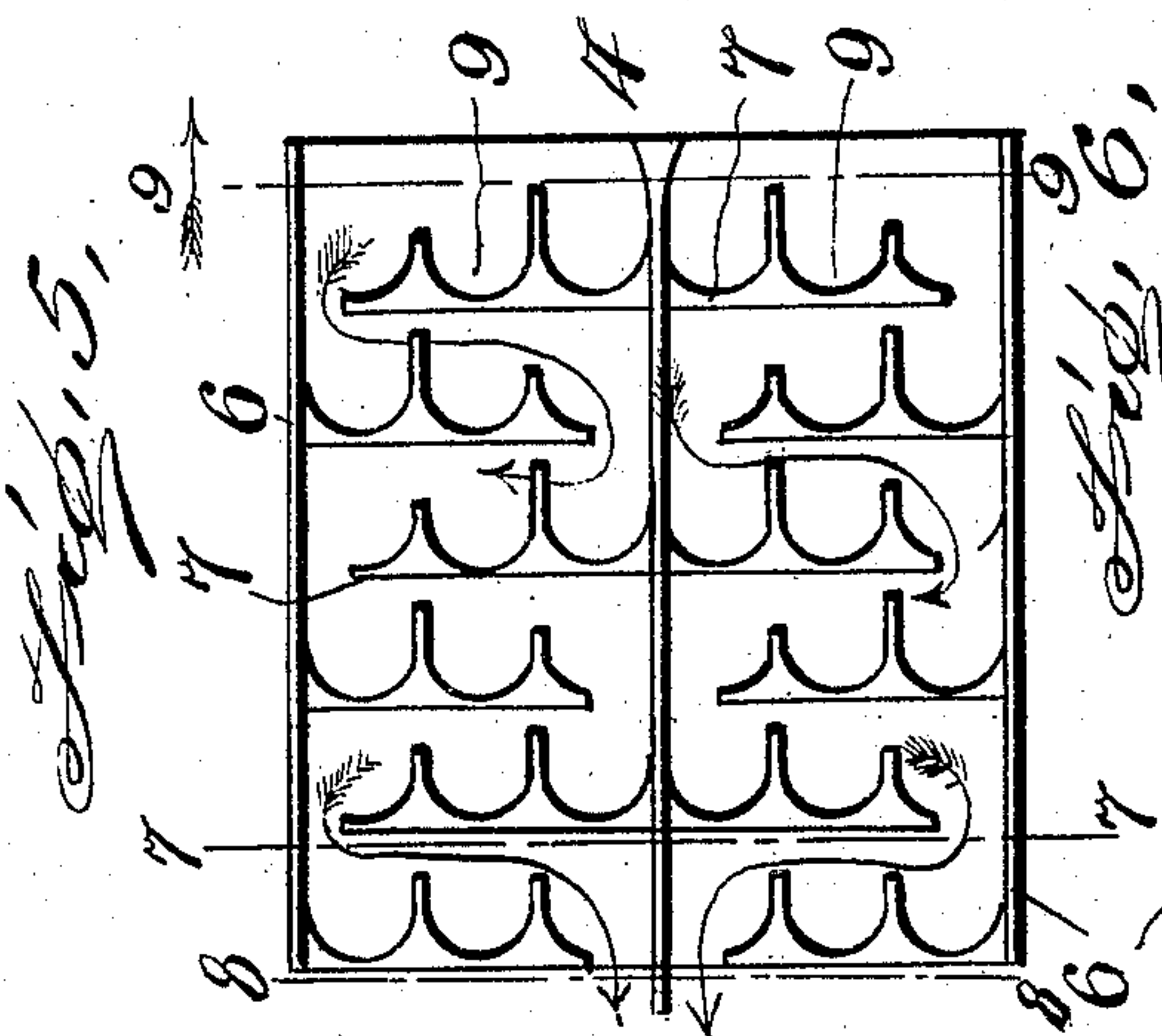
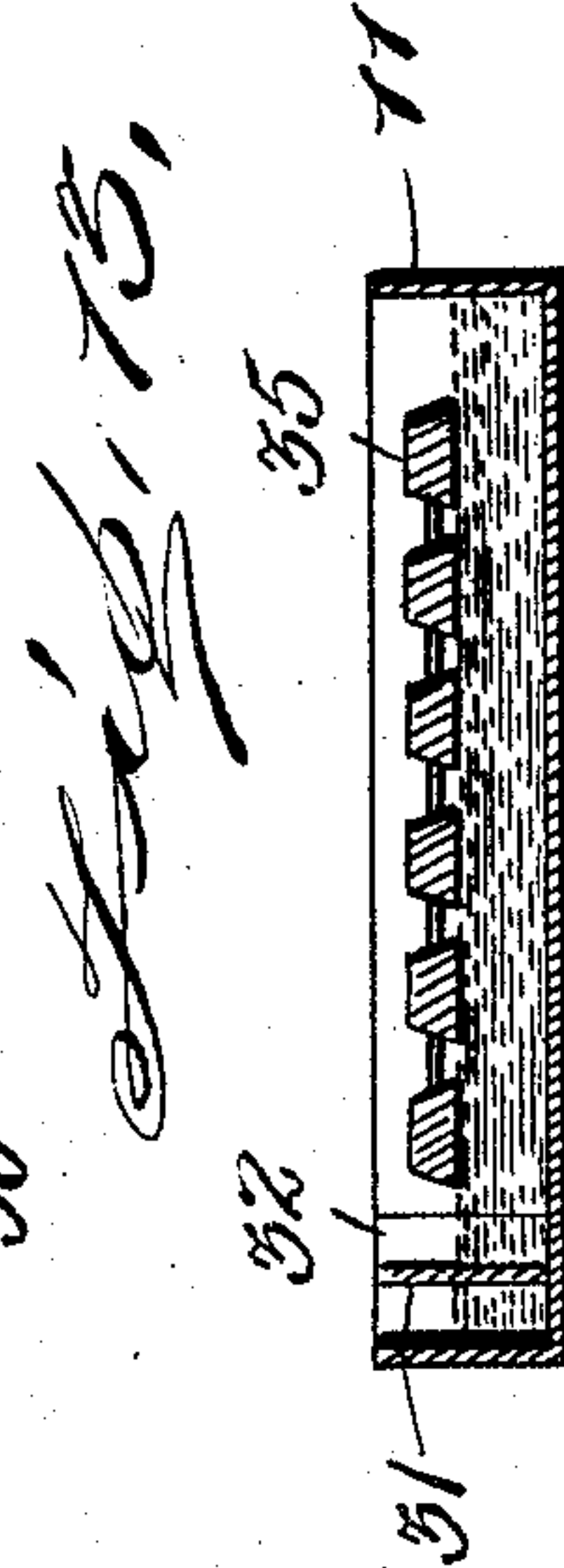
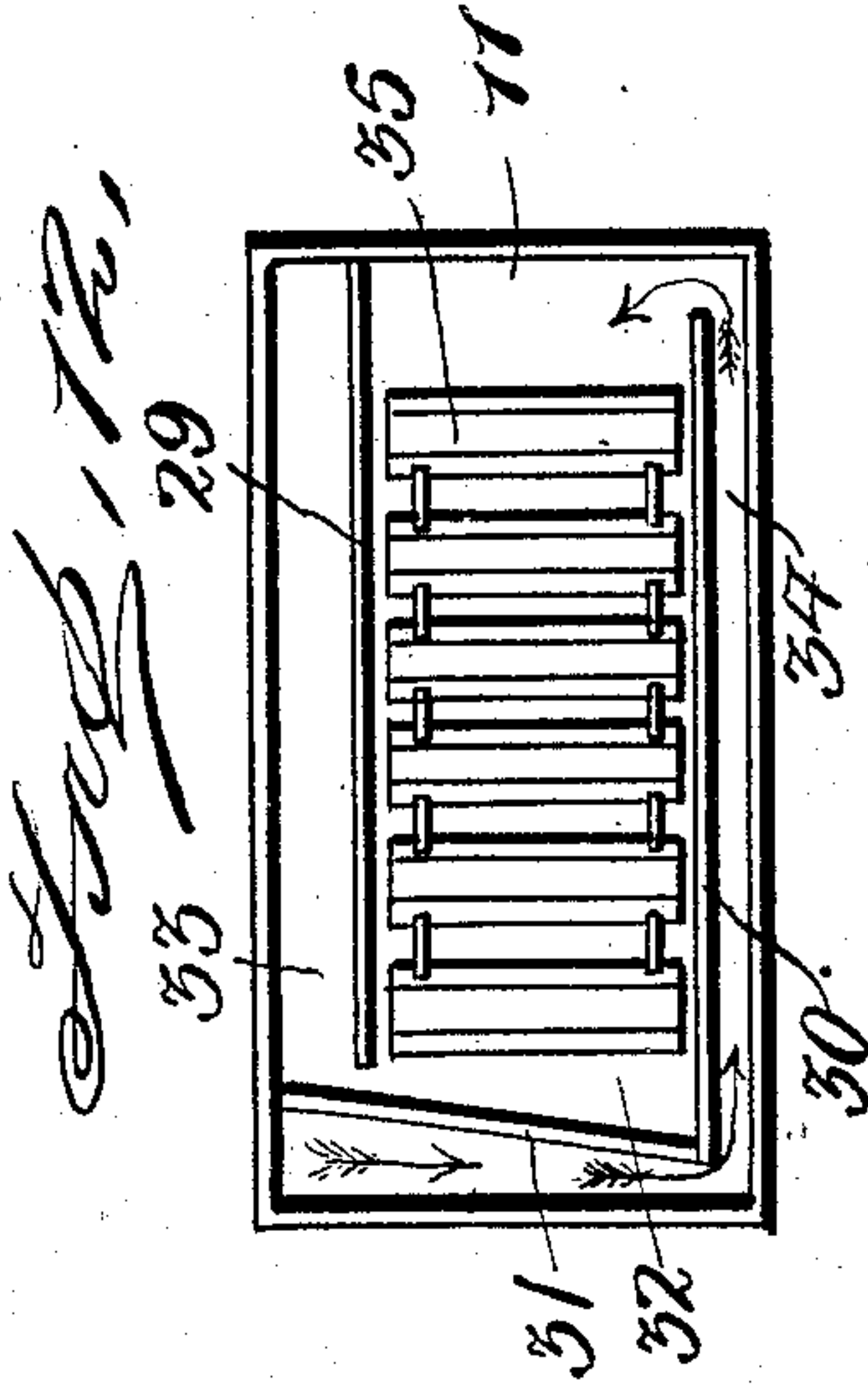
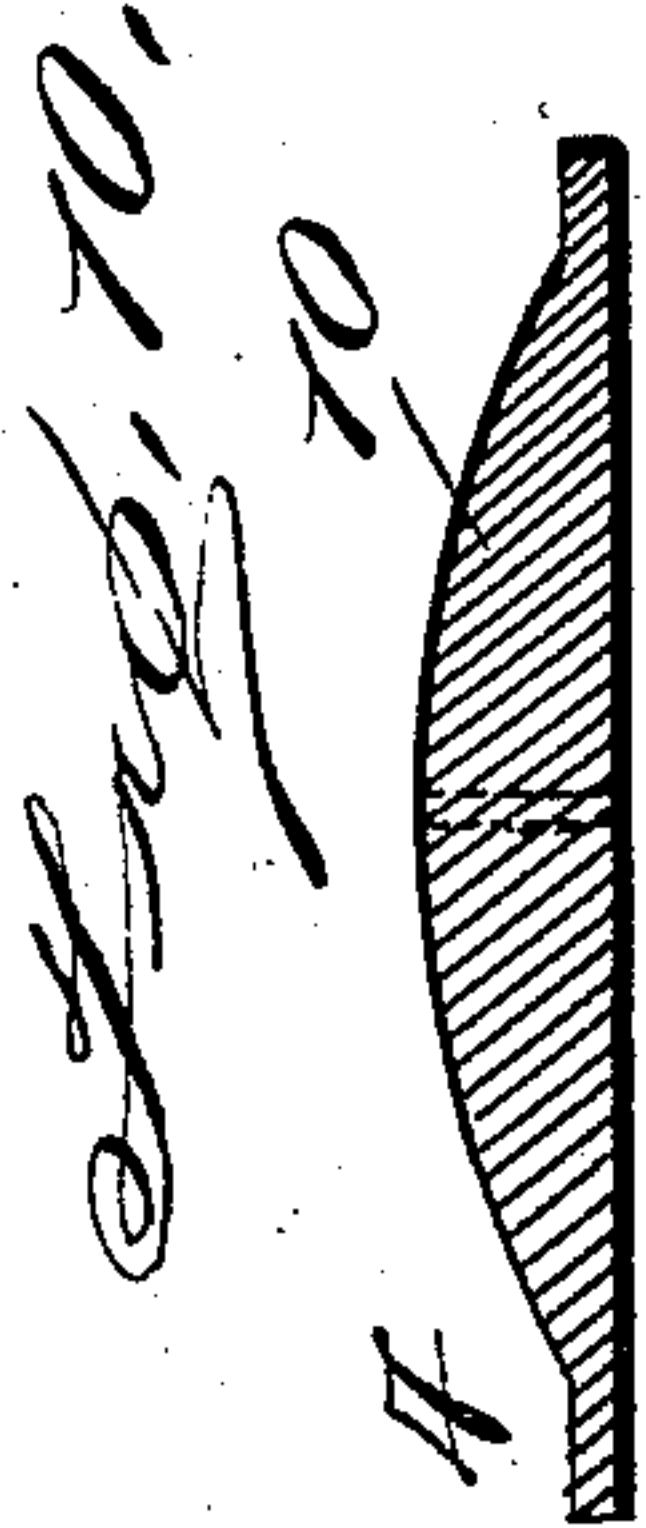
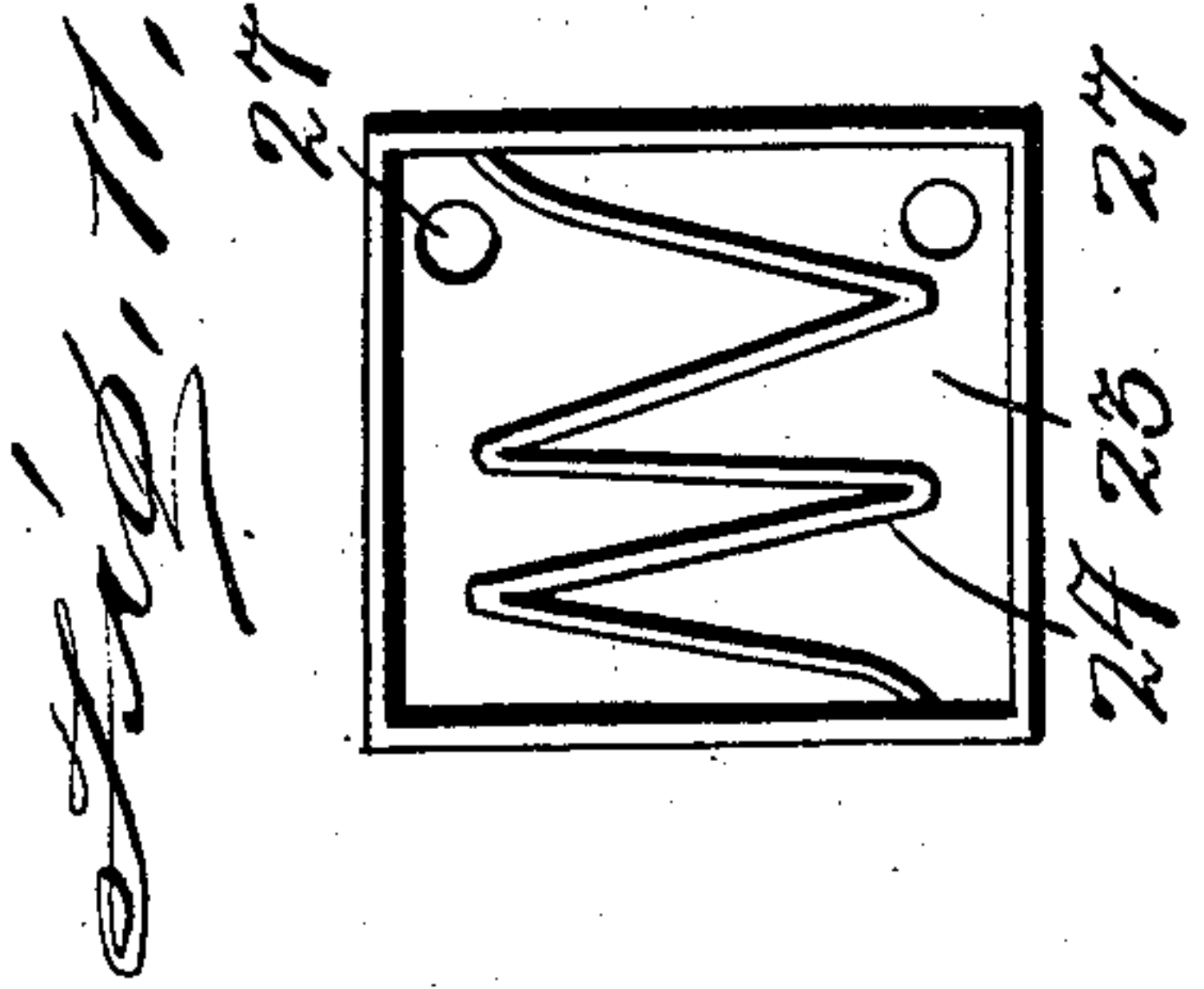
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3 SHEETS—SHEET 3.



Witnesses

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UNITED STATES PATENT OFFICE.

PATRICK McENTEE, OF SPOKANE, WASHINGTON.

AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 785,565, dated March 21, 1905.

Application filed January 13, 1904. Serial No. 188,874.

To all whom it may concern:

Be it known that I, PATRICK McENTEE, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented certain new and useful Improvements in Amalgamators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to amalgamators of the sluice-box type for treating gold-bearing sand, stamp-mill pulp, and other material to save the precious metals contained therein.

One object of my invention is to provide for a continuous circuitous circulation of mercury down the sluice along with the water and the gold-bearing material, thereby giving the mercury ample opportunity to amalgamate the free gold.

Another object of my invention is to provide means, operated by the force of the stream of material passing down the sluice, for elevating the mercury as it is discharged from the lower end of the sluice to a point above the upper or inlet end to permit it to again pass down the sluice.

A further object of my invention is to provide means for preventing any loss of amalgam and for permitting it to be removed while the apparatus is in use.

A further object of my invention is to provide means for agitating the mixture of water and gold-bearing material as it passes down the sluice in order to force the "float" or "flour" gold into contact with the mercury in the riffles upon bottom of the sluice.

A still further object of my invention is to provide an apparatus of this character which will be simple in construction, efficient and durable in use, and very easy and inexpensive to operate.

With these and other objects in view the invention consists of certain novel features of construction, combination, and arrangement of parts, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1

is a top plan view of my improved amalgamating apparatus. Fig. 2 is a vertical longitudinal sectional view through the same. Figs. 3 and 4 are vertical transverse sectional views taken, respectively, on the lines 3 3 and 4 4 of Fig. 2. Fig. 5 is an enlarged detail view of one of the amalgamator-plates. Fig. 6 is a longitudinal section through the same. Figs. 7, 8, and 9 are transverse sections taken, respectively, on the lines 7 7, 8 8, and 9 9 of Fig. 5. Fig. 10 is a similar view through the upper end of one of the amalgamator-plates at the head or upper end of the sluice. Fig. 11 is an enlarged detail view of the device for dividing the mercury between the two return conductors or troughs after it has been elevated from the collecting-tank by the elevator or pump. Fig. 12 is an enlarged plan view of the mercury tank or receptacle. Fig. 13 is a vertical sectional view through the same. Fig. 14 is a detail view of the lower end of the sluice way or box.

In the embodiment of my invention illustrated in the drawings the numeral 1 denotes a sluice way or box comprising a bottom 2, suitably supported in an inclined position and provided with sides 3 to confine the water, sand, pulp, slime, or other material passing down the sluice. Upon the upper side of the bottom 2 are metal amalgamator-plates 4, which are arranged in longitudinal rows or series (two being shown in the drawings) and have their end edges bent and overlapping, as at 5, to form the stepped surface clearly shown in Fig. 2. The side edges of said plates are bent up at right angles, as at 6, and the upper sides of said plates are provided with transverse riffles 7 and 8, which form pockets 9, adapted to contain mercury and which are arranged in a staggered relation, as seen in Fig. 5, to cause the mercury as it runs down the sluice to take a zigzag or circuitous course, as indicated by the arrows in said Fig. 5. The upper ends of the plates at the head or upper end of the sluice are shaped in cross-section, as shown in Fig. 10, to provide a divide or shed for the mercury as it is discharged into the sluice, as hereinafter described. The lower ends of the plates at the lower or discharge end of

the sluice are cut away diagonally and bent up at right angles to provide a deflector 10^a, which serves to direct the mercury and amalgam into a settling and supply tank 11, but
 5 which permits the remainder of the mixture to pass over it and to discharge out of the end of the sluice.

In order to maintain a constant flow of mercury down the sluice, the mercury discharged from the lower end of the sluice into the tank is again discharged into the sluice at the upper end of the latter. This may be done in any desired manner; but I preferably provide a combined elevator and agitator actuated by the force of the current of
 15 mixture passing down the sluice for lifting the mercury from the tank to a point above the upper end of sluice, and I then discharge the same onto the sluice, as shown in Fig. 2.

The said elevator may be of any suitable construction; but, as illustrated, it comprises a transversely-disposed horizontal shaft 12, mounted in bearings in standards 13, secured to the sides 3 adjacent to their lower ends.

Said shaft is rotated by one or more under-shot wheels 14, each consisting of a series of radially-disposed curved arms or spokes 15, having their inner ends clamped between clamping members 16, secured upon said
 25 shaft adjacent to one of its ends and having rectangular paddles 17, adjustably secured to their outer ends. Said paddles rotate in the stream or current of water, sand, pulp, &c., passing down the sluice, and they may
 35 be adjusted at any desired angle by means of clamps 18, which connect them to the ends of the arms 15 in order to vary the speed of rotation of the shaft, and hence of the elevator. It will be observed that the

paddles 17 not only receive motion from the stream or current passing down the sluice, and thereby communicate motion to the wheel, but also operate as temporary checks or retarders, whereby the current at that
 45 point is agitated and a backlash produced which promotes the amalgamating action. A portion of said shaft from its center to one of its ends is hollow or tubular, as at 19, and upon its open outer end is secured the branch

50 20^a of a T-coupling 20, in the other two branches 20^b and 20^c of which are secured curved or semicircular scoop-arms 21, formed of pipe-sections, the outer ends of which are open and adapted to be moved through the
 55 mercury in the tank 11 when the shaft is rotated. These curved pipes 21 form an S-shaped elevator-wheel, and their open ends scoop up the mercury as they are rotated through the same in the tank 11. The
 60 branches 20^b and 20^c of the T-coupling 20 (see Fig. 3) have passages 20^d and 20^e, which curve inwardly from the ends of the pipes 21 to the bore of the shaft and are separated up to their point of intersection with said

65 bore by an interposed web or deflector 20^f,

which prevents the mercury taken up by one pipe 21 from flowing out through the opposed pipe 21. This action is promoted by the weight of the mercury itself and the head thereon or force of flow which it attains in
 70 passing inward through the elevated pipe 21, whereby it is caused to pass quickly through the communicating passage in the T-coupling to the bore of shaft 12 without liability of discharging through the other
 75 passage in said coupling, and it is discharged from the said shaft through one or more openings 22, formed in its center into a tray 23, provided with a zigzag partition 24, which divides the mercury, causing one-half of the
 80 amount discharged to fall upon each side of the partition. Said tray is supported beneath the center of the shaft by V-shaped return troughs or conductors 25, which are in turn supported by transverse bars 26,
 85 connecting the sides 3 of the sluice. Said troughs 25 are divergently disposed and are inclined downwardly from the lower to the upper end of the sluice. Their adjacent upper ends are disposed directly beneath open-
 90 ings 27, formed in the bottom of the tray 23, through which openings the mercury passes and then falls into said troughs, which conduct it to the head or upper end of the sluice. The lower discharge end of each of the troughs
 95 is disposed above the center of the upper end of the upper end plate of each of the rows of amalgamator-plates 4, and a V-shaped divider 28 is provided to divide the stream of mercury passing down said trough before
 100 it is discharged upon the divide or shed 10 of said uppermost plates. Said divider causes one half of the mercury passing down each trough to flow down the opposite sides of the divide 10, thus distributing the mercury
 105 evenly over the entire sluice.

In order to prevent the amalgam which passes off from the discharge end of the sluice into the collecting-tank 11 from being again transferred into the sluice by the ele-
 110 vator and also to permit it to be removed from the tank while the apparatus is in use, I provide said tank with two longitudinal partitions 29 and 30 adjacent to its sides and a transverse partition 31 adjacent to one
 115 of its ends. These partitions separate the tank into a large central chamber 32, a narrow chamber 33 in communication at one end with the central chamber, and a narrow chamber or passage 34, into which the mer-
 120 cury and amalgam discharges and which conducts it to the opposite end of the central chamber. In said large central chamber is an open-work float or skimming device 35, which is adapted to check the amalgam and
 125 prevent it passing into the narrow chamber 33, from which the elevator-wheel takes its supply of mercury.

In order to thoroughly agitate the mixture as it passes down the sluice, I provide a series
 130

of agitators 36 upon each of the cross-bars 26, which latter are preferably disposed diagonally, as shown in Fig. 1. Said agitators are transversely-curved angularly-disposed plates depending from the under side of the said bars 26, and their object is to force the floating gold into contact with the mercury in the pockets upon the bottom of the sluice. It will be readily understood that as the water flows past these agitators it will be converted into numerous little eddies, which tend to force the gold into contact with the mercury. Owing to the curve in the agitators and their incline in the direction of the flow of water, a space will be formed immediately behind them as the water passes to either side, and into these spaces the water will be drawn and will thus force the free gold into contact with the mercury. By the use of these agitators in connection with the paddles 17 of the power-wheel a retardation in the flow of the current is caused, whereby an effective agitating action is set up to promote the action of the agitating devices 36, more thoroughly to bring the free gold into contact with the mercury and facilitate the amalgamating operation.

The operation of my invention will be readily understood from the foregoing description, taken in connection with the accompanying drawings, and the following brief explanation. After the pockets 9, formed by the riffles upon the bottom of the sluice, and the tank 11 have been filled with mercury and after the blades or paddles 17 of the power-wheels have been adjusted at the proper angle to give the elevator the necessary lifting power the gold-bearing sand, stamp-mill pulp, or other material to be worked is discharged with water into the head or upper end of the sluice in any suitable manner. As the mixture flows down the sluice by gravity the force of the current will rotate the undershot wheels and thence the elevator-wheel, which latter will lift mercury from the tank and discharge it into the return-troughs, which in turn will discharge it into the upper end of the sluice, and thus a continuous circulation of the mercury will be produced. Owing to the riffles upon the amalgamator-plates, the mercury will take a zigzag course as it flows down the sluice, and it will produce an undercurrent of water and material which will tend to draw the finer particles of gold down into contact with it. As previously explained, the overhanging agitators also produce currents of water, which will help to force the fine particles of gold into contact with the mercury.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various 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 my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An amalgamator comprising a sluice having amalgamating-plates, means for feeding material to be treated, together with water and mercury, to the sluice, a collector into which the sluice discharges, said collector having means for separating the water and tailings from the amalgam, and the free mercury from the latter, and means to return the recovered mercury to the sluice for reuse therein.

2. In an amalgamator, the combination of a sluice, amalgamating-plates arranged in rows upon said sluice, each of said plates being provided with transverse riffles arranged in staggered relation, and said plates having at their upper end sheds and at their lower end an inclined divider for separating the amalgam and free mercury from the tailings, a conductor for conveying said amalgam and mercury from the sluice, means for supplying mercury at the upper end of the sluice to traverse the same with the water and material to be treated, a collector at the lower end of the sluice receiving the amalgam from said conductor, said collector being provided with means for separating the free mercury from the amalgam, means for returning the free mercury from the collector to the upper end of the sluice, and dividers coacting with said sheds to properly divide the mercury between the rows of amalgamator-plates, substantially as described.

3. In an amalgamator, the combination with a sluice, of means for supplying mercury to traverse the sluice together with the water and material to be treated, means for separating the water and tailings from the amalgamated and free mercury, a collector for receiving the amalgamated and free mercury and separating the same, said collector comprising a chamber having an inlet for the mercury, a receiving-space for the free mercury, and an interposed passage communicating with said inlet and receiving-space, a floating retarder in said passage adapted to allow the free mercury to pass to its receiving-space but to prevent the amalgamated mercury from passing thereto, and means for collecting the free mercury from said receiving-space and returning the same to the upper end of the sluice to be employed again, substantially as described.

4. In an amalgamator, the combination of an inclined sluice, reversely-inclined troughs leading from the lower to the upper end of the sluice, said troughs adapted to supply mercury to different portions of the sluice to traverse the sluice-course with the material

to be treated, means for recovering the mercury at the lower end of the sluice, a hollow shaft having a discharge-opening located to discharge into the receiving end of the troughs,
5 a gatherer operated by said shaft to take up and convey the recovered mercury thereto, a power-wheel connected to said shaft and adapted to be operated by the flowing current of material, and a divider for separating
10 the mercury discharged from the shaft and

supplying the same in proper proportions to the troughs, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

PATRICK McENTEE.

Witnesses:

L. C. SNYDER,
J. ELMER WEST.