

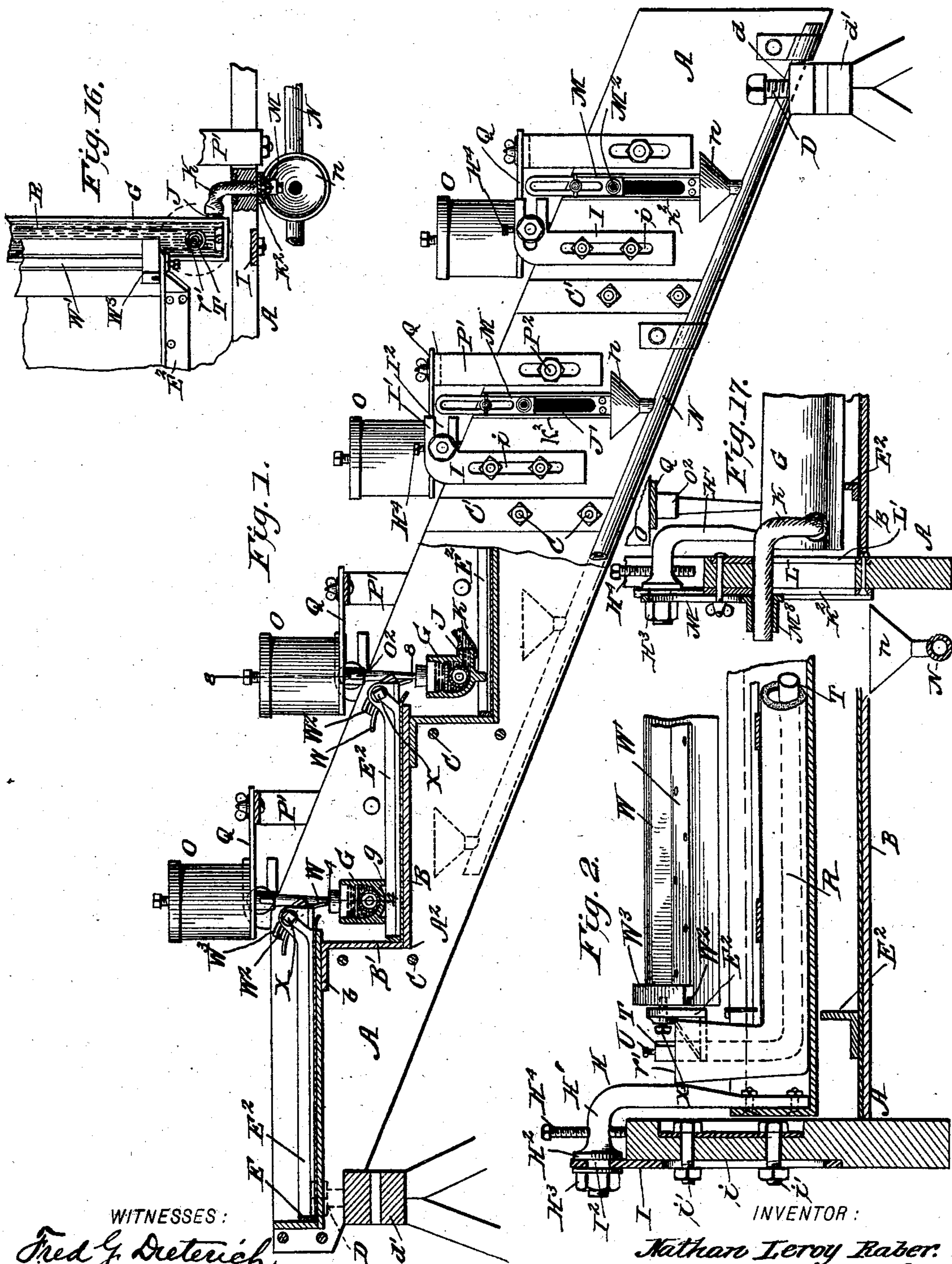
(No Model.)

3 Sheets—Sheet 1.

N. L. RABER.  
AMALGAMATOR.

No. 517,767.

Patented Apr. 3, 1894.



WITNESSES:

*Fred G. Dietrich*  
*P. B. Turpin.*

INVENTOR:

*Nathan Leroy Raber.*  
BY *Munn & Co.*

ATTORNEYS



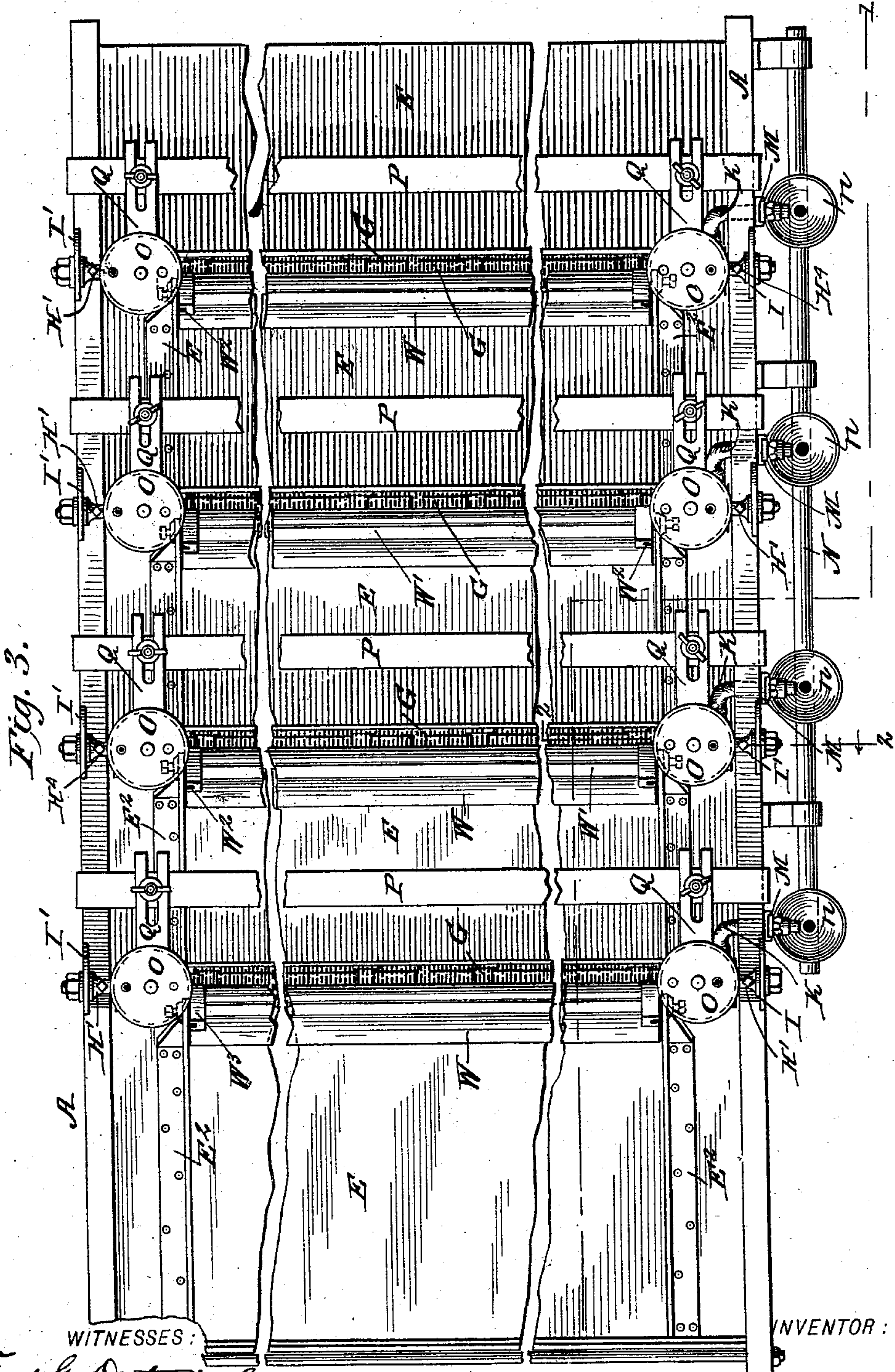
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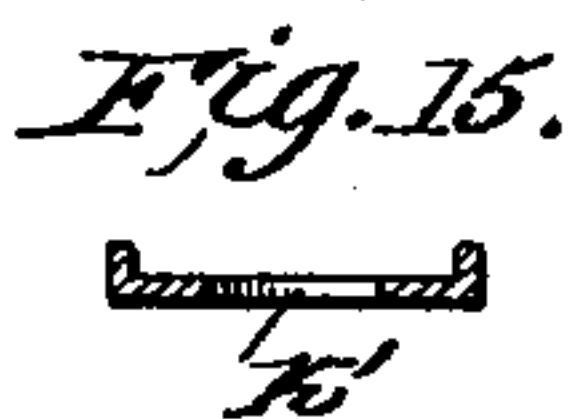
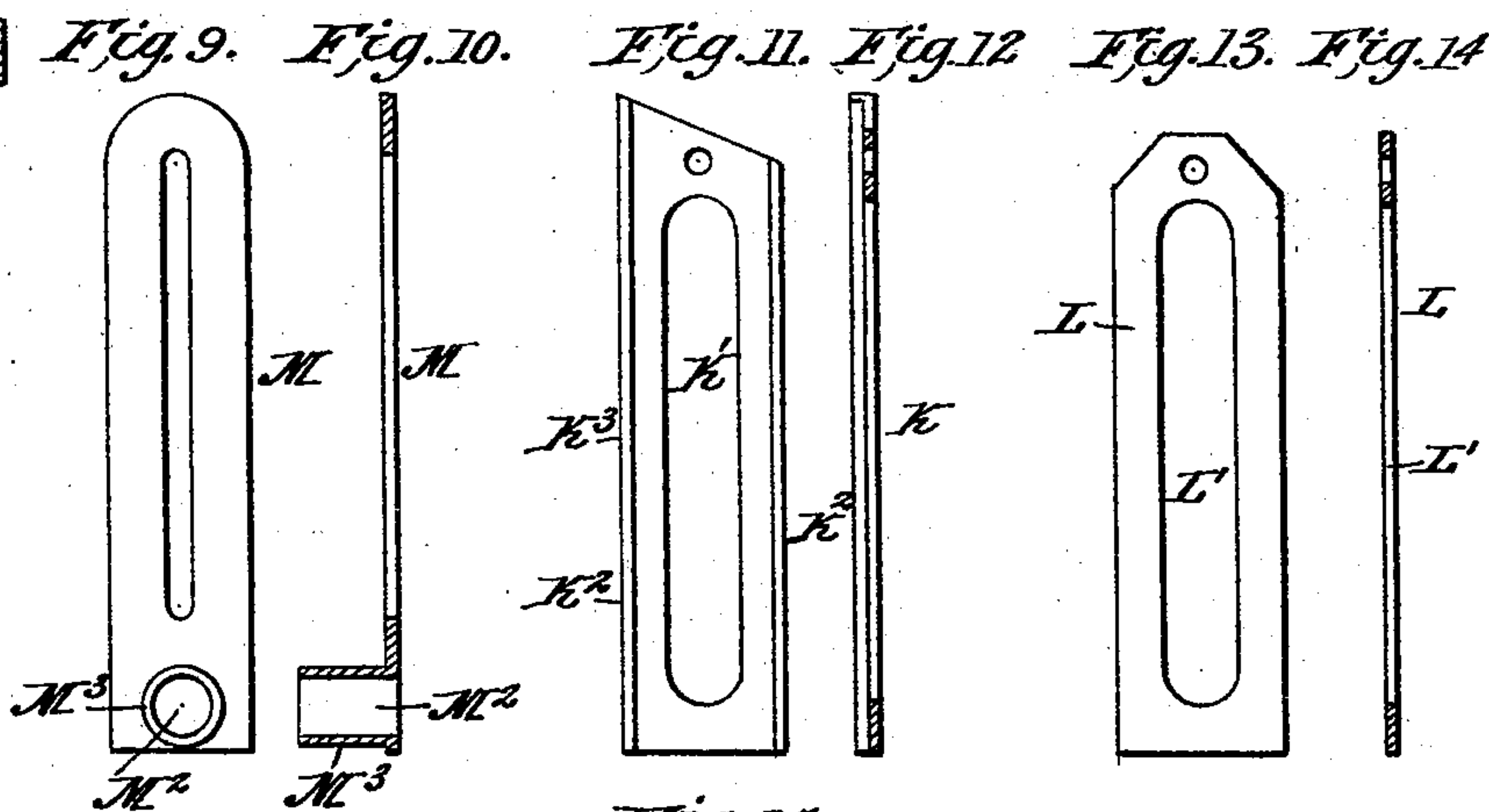
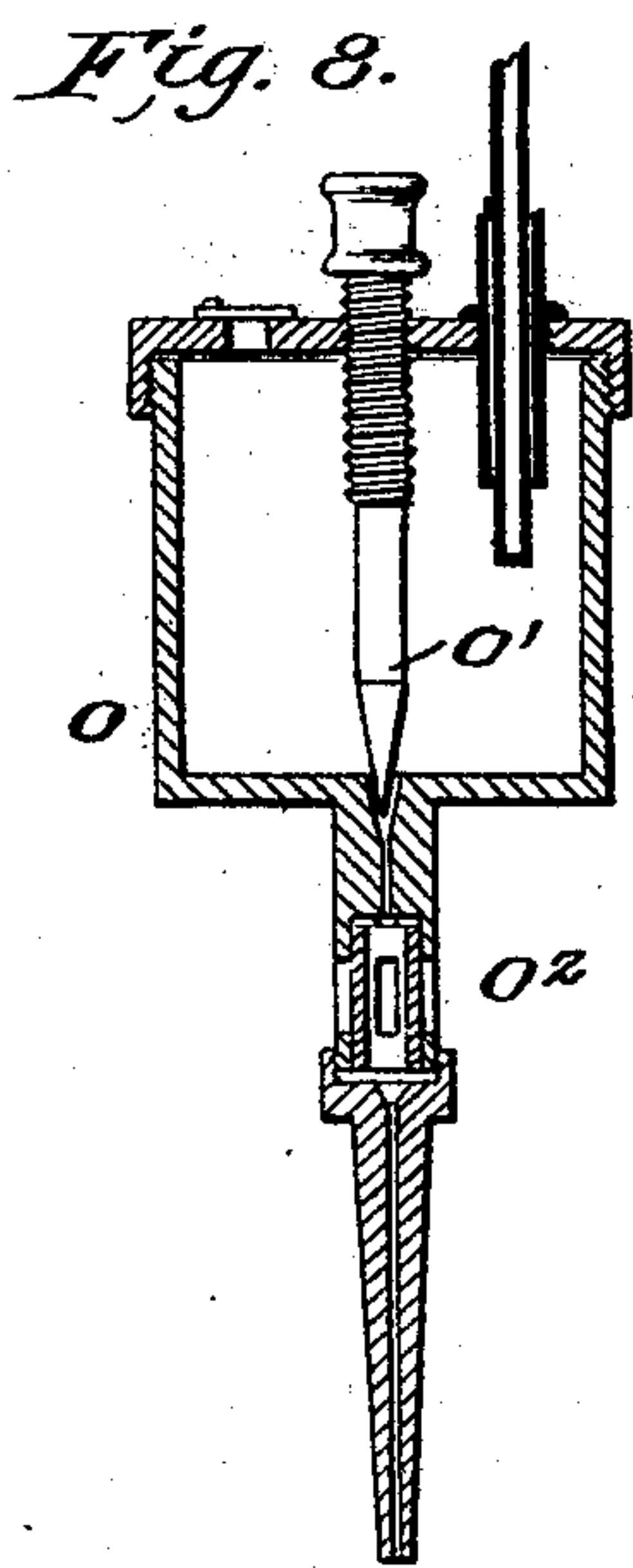
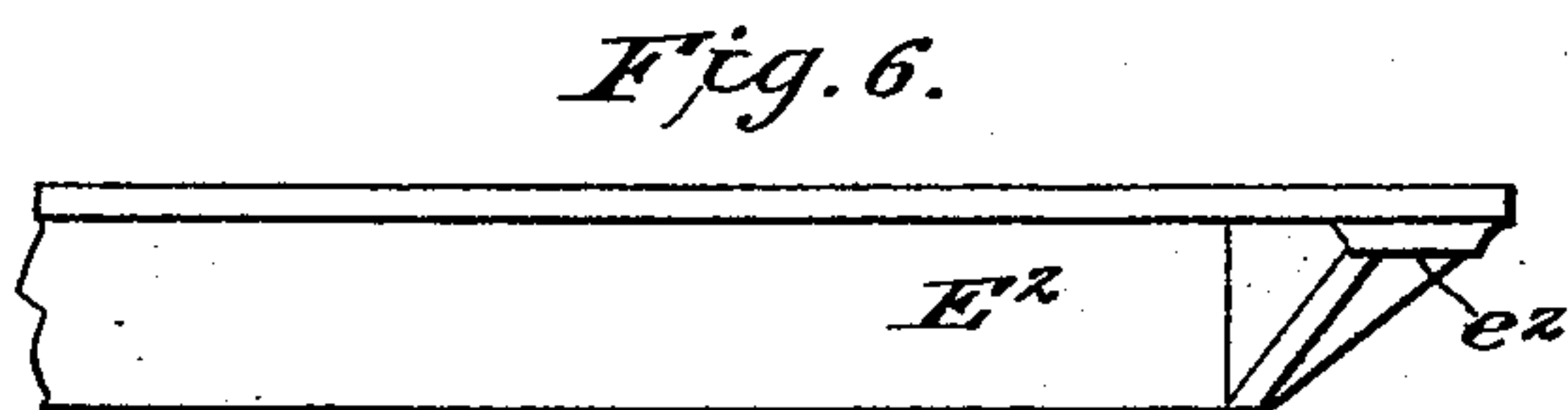
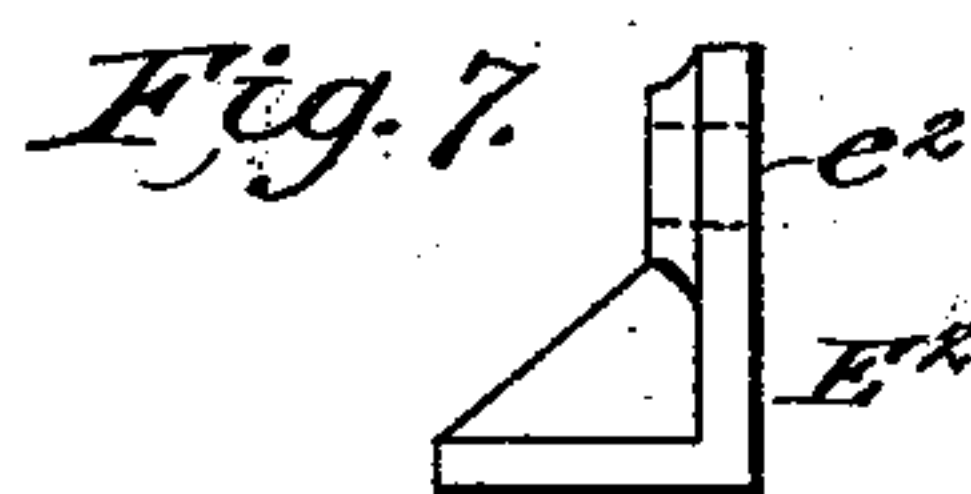
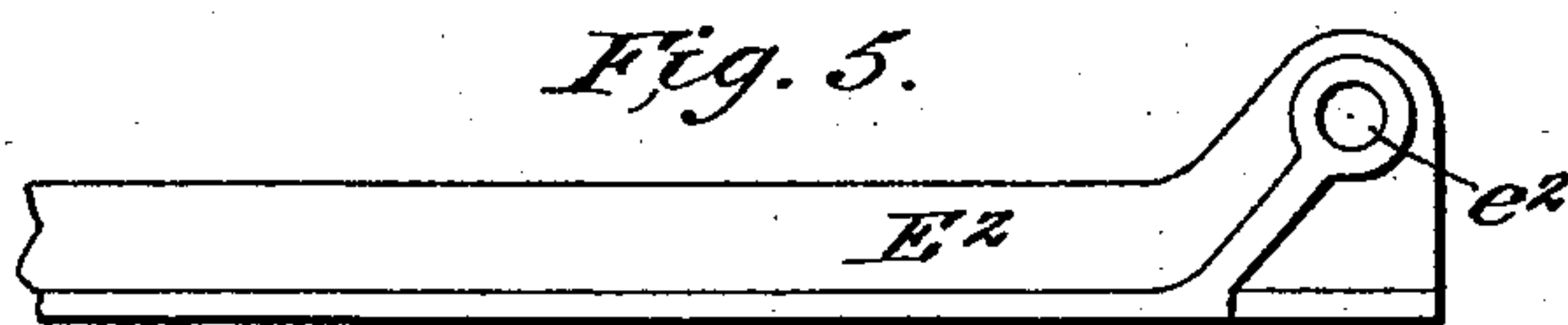
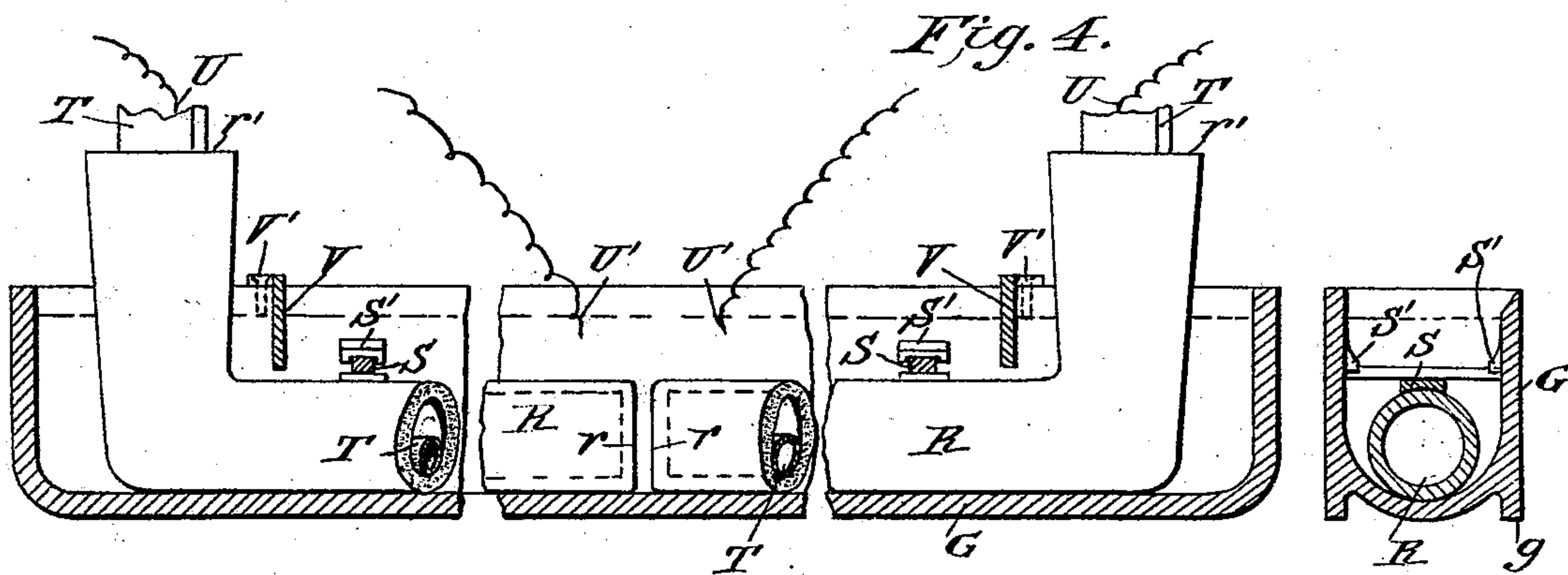
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# UNITED STATES PATENT OFFICE.

NATHAN LEROY RABER, OF CORVALLIS, OREGON.

## AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 517,767, dated April 3, 1894.

Application filed April 8, 1893. Serial No. 469,578. (No model.)

*To all whom it may concern:*

Be it known that I, NATHAN LEROY RABER, of Corvallis, in the county of Benton and State of Oregon, have invented a new and useful Improvement in Amalgamators, of which the following is a specification.

This invention is an improvement in amalgamators and particularly in that class of such machines employing mercury and of which my former Patent No. 497,603, dated May 16, 1893, is an example, and the invention consists in the novel constructions and combinations of parts as will be hereinafter described and claimed.

In the drawings—Figure 1 is a side view, part in section on about line 1—1, Fig. 3, of my improved amalgamator. Fig. 2 is a transverse section on about line 2—2, Fig. 3, drawn through a cup and its accessories. Fig. 3 is a top plan view of the apparatus partly broken away. Fig. 4 is a section on about line 4—4, Fig. 1, through a cup showing the porous jar and the devices for securing the same, also the copper shield. Figs. 5, 6, and 7 are detail views of the side cleats. Fig. 8 is a vertical section on about line 8—8, Fig. 1, of the automatic chemical feeder. Figs. 9 and 10 are detail side and sectional views of the carrier slide for the level controlling tube. Figs. 11, 12 and 15 show the guides for said carrier slide. Figs. 13 and 14 show the inside plate for securing said slide, and Figs. 16 and 17 are detail views.

In carrying out my invention I employ a main frame or box A which is in the nature of a shallow box having vertical sides A' and stepped bottom A<sup>2</sup>. This bottom consists of a series of steps which are preferably made with the treads B and the next upper riser B' integral and of cast, pressed, or rolled iron or steel or other suitable metal the upper edge of each riser being provided with a projecting lip or flange b lapped under the abutting tread of the next upper step and facilitating the connection of the steps as will be readily understood. These steps and the sides A' are properly joined by rabbeting and are firmly bolted or clamped together by the tie bolts C, the heads and nuts of said bolts C bearing against iron washers or battens C' outside the sides A' which serve to stiffen the said sides and brace the box as will be readily

seen. At its four corners the main frame is provided with adjusting screws or bolts D turning in threaded bearings d and resting against base supports d' which may be sills as shown. This permits the frame to be adjusted to any desired inclination, longitudinally and laterally to suit the quality or quantity of the material under treatment. Upon each step is placed a copper plate E held at its upper and side edges by copper cleats E' and copper angle bars E<sup>2</sup> and projecting at its lower edge beyond its supporting step so that each plate overlaps at its lower edge the upper edge of the plate on the next lower step. Beneath the lower projecting edges of the plates E are arranged the mercury cups or troughs G. These cups are suspended above their respective steps preferably by means of hangers H which are connected adjustably with slides I which are in turn adjustably connected with the box or frame by providing their vertical arms with slots i to receive the fastening bolt i' by means of which the slides and the cups supported thereby may be set up or down independently of the adjustments of the main frame. At their upper ends the slides I have horizontal arms I' slotted longitudinally at I<sup>2</sup> and the hangers H have right angled arms H' projecting through said slots, and shouldered at H<sup>2</sup> on one side of the arm I and having clamp nuts H<sup>3</sup> on the opposite side so the hanger can be secured at any point in the slot I<sup>2</sup>. To secure a fine and accurate vertical adjustment of said hangers and troughs I insert a set screw H<sup>4</sup> through the arm H' of the hanger to bear upon the top edge of the sides of the apparatus.

The described constructions provide for both a vertical and horizontal adjustment of the cups and in addition to said adjustment I secure a rocking or swinging adjustment of the cup so I can vary the longitudinal pitch of the same to the horizontal independently of the longitudinal pitch of the main frame. This permits any desired variation in the fall from the edge of the plates to the cup and permits the setting of the cup in any desired relation to the plate and enables me to set the troughs perfectly parallel to the discharge edge of the plates. By the hanger supports the cups are suspended entirely



above the steps and the latter are left entirely unobstructed so that the pulp, &c., discharged thereon may pass freely off and there will be no danger of its becoming clogged.

5 The cups or troughs are of copper and may be silver plated or not as desired but they are always amalgamated. They are preferably of the cross section shown with the rounded bottoms and the vertical sides, the latter being extended down vertically at *g* beyond the  
10 juncture with the curved bottom to increase the stiffening of the trough. The rear edges of the cups are flared to a feather edge to facilitate the free and easy delivery of the sand,  
15 pulp, &c.

To insure that the mercury or amalgam passing off the lower edges of the step plates shall drop cleanly into the trough below and not run back along the under edge of the  
20 plate, I slightly turn down the lower edge of the step plate as shown most clearly in Fig. 1.

Near one end of each cup at the bottom of such cup, I provide a short outlet tube or nipple *J*, to which I connect one end of a rubber  
25 or other flexible hose or pipe *K* whose other end is carried through a vertical slot *J'* in the side of the box and is movable vertically up and down in said slot. On the outside of the box over said slot I secure the guide plate  
30 *K*<sup>3</sup>, Figs. 11, 12 and 15, having a slot *K'* coinciding with slot *J'* and provided with guide ribs *K*<sup>2</sup>, and on the inside of the box I secure a plate *L* having a slot *L'* which also coincides with the slot *J'*. A plate *M* is fitted to  
35 slide upon the plate *K* and between its ribs *K*<sup>2</sup> and may be held in any suitable adjustment by the set screw *M'*. This plate *M* is provided at or near its lower end with an opening *M*<sup>2</sup> to receive the tube *K* and preferably provide a tube *M*<sup>3</sup> projecting from said  
40 opening *M'* to better hold the outer end of tube *K* as shown, the tube *K* being drawn tightly in the tube *M*<sup>3</sup> to cause it to hold in place as desired. The outer end of the outlet  
45 tube can thus be conveniently set up or down as desired and it is evident that the level of the mercury in the troughs will always be controlled by the adjusted level of the outer end of the level controlling tube *K*. These  
50 tubes *K* discharge into funnel shaped receivers *n* on a pipe *N* fixed alongside the box and inclining downward toward its lower end where it discharges into a suitable receptacle.

The described construction enables me to  
55 draw off any or all of the mercury or amalgam contained in any one trough thus enabling me to "clean up" while the machine is running as while the machine is in full operation I can slack the nuts of the trough  
60 hangers and slide any one trough away from the falling stream of pulp, &c., and can clean said trough without stopping or in any way interfering with the flow of pulp through the machine.

65 In quickening the mercury I provide an automatic mercury feeder *O* arranged to discharge continuously and provide a shaft hav-

ing a pin valve *O'* so that the amount fed can be regulated, a "sight feed" being provided  
70 at *O*<sup>2</sup> so the amount of quickening material being fed may be seen at a glance. To support the feeders I provide bars *P* extending horizontally above the box or casing and having at its ends depending legs *P'* slotted longitudinally for the fastening screws *P*<sup>2</sup> so the  
75 bar *P* may be adjusted vertically. The feeders are attached to the bar *P* by means of plates *Q* slotted at one end and secured by screws fitting in said slots to the bar *P* so the plates *Q* may be adjusted upon the bar *P*  
80 and the plates *Q* have their opposite ends provided with openings forming seats for the feeders. Three or more feeders for each trough may be used and they may be arranged  
85 to feed sodium amalgam directly to the cups or troughs. It will be seen that the feeders, by the supporting devices described, may be adjusted back and forth to correspond to the adjustment of the cup or trough.

While as stated the feeders may be arranged  
90 to feed the quickening compound directly to the mercury in the cup it is preferred to employ the intermediate devices which I will now describe.

I provide porous tubes or cells *R* preferably two to each trough closed at their ends  
95 *r* that lie near the center of the troughs and having their other or outer ends *r'* turned up and open. By porous tubes or cells I mean for instance tubes of unglazed porous earthenware such as burnt white clay similar to  
100 an ordinary cell of a storage battery. The porosity of the cells has been indicated at the sectional ends shown in Figs. 2 and 4; but it should be understood that this is more of an  
105 indication than illustration as the pores are so fine that it is practically impossible to illustrate them in the drawings. These cells are fastened at the bottoms of the troughs by  
110 cleats *S* engaging small lugs *S'* on the sides of the trough. In practice the mercury in the cup or trough lies from one half to one inch above the level of the top of the cell or tubes and such cell or tube is filled with a solution  
115 of sodium sulphate in which is inserted a piece of lead *T* forming a conductor and the feeders are arranged to automatically feed the solution of sulphate of sodium to the porous  
120 cells. The wires from a suitable dynamo, cells or other source of electrical power are connected one *U* with the lead and the other  
125 *U'* with the mercury in the cup or trough and under the action of the electric current the liberated sodium passes through the jar or tube and acts on the mercury in the cup or trough purifying and quickening it. In practice I connect the positive pole with the lead  
130 conductor and the negative pole with the mercury.

I am aware that the electrolysis of sodium sulphate has already been used in the art of  
135 amalgamation; but the construction and arrangement of parts such as shown by me are so far as I know new and they enable me to keep



perpetually clean and active the whole surface of the mercury at the point of contact with the thin stream of pulp falling over the edges of my copper plates. By using horizontal cylindrical cells lying along the whole length of the bottom of the cups or troughs and immediately beneath the line of contact of the falling pulp with the overlying mercury I secure a continuous upward discharge of the quickening agent to such point of contact.

To prevent the pulp from accumulating in the cups or troughs around the upturned ends of the porous cells I provide the copper shields V screwed or bolted to lips V' projecting from the walls of the trough. The lower edges of the plates project for a short distance below the surface of the mercury. Above the cups and in rear of the discharge edges of the step plates are arranged the copper gates W against which the material discharged from the plate strikes and which operates to direct such material downward upon the mercury in the trough. In order to adjust or vary the pitch of the gates I form them of a thin copper plate curved transversely to a radius of about three inches (3'') and arranged to present their concave surfaces to the front of the machine. This plate extends across the machine and is braced and strengthened by an angle plate W' riveted to its convex side and extended throughout its length. At its ends the gate is provided with grooves W<sup>2</sup> curved concentrically with the curvature of the gate plate and formed preferably in curved blocks or bars W<sup>3</sup> made fast in any suitable manner to the gate plate at its end. These grooves W<sup>2</sup> receive the points of the screws X which secure the gate and which turn in suitable openings e<sup>2</sup> in the angle bars E<sup>2</sup> by tightening which screws X the gate may be secured in any desired adjustment. This construction permits of a double adjustment of the gate as I can give it a pivotal or swinging adjustment on the set screws as centers and I can also adjust it circumferentially by sliding it along the screws in its curved grooves. Thus the lower edge of the gate can be moved to or from the lower edge of the step plate and it can be set nearer to or farther from the surface of the mercury by which adjustment it is evident I can in operation direct the flow of the pulp to whatever part of the surface of the mercury desired.

The angle bars or cleats E<sup>2</sup> operate to hold the step plates down, act as guides in directing the pulp across the plates confining the pulp so that it shall fall within and clear of the outer ends of the porous cells or tubes, and also serve as supports for the adjustable gates.

In practice the plates and other parts of copper may be silver plated or not as desired. The described machine may be used in place of the battery plates or may be worked below them. The width of the machine and the number of steps may be varied to suit the re-

quirements of the particular quality of material being handled.

The drop may vary from a quarter of an inch to six or seven inches over a series of steps or plates.

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

1. In an amalgamator, the combination of the mercury cup or trough, a tube or cell in said trough and adapted to receive the agents by the electrolysis of which the mercury may be cleaned or purified, and a lead or similar conductor extended longitudinally within said cell, whereby to secure an electrical discharge from end to end within the cell, substantially as set forth.

2. The combination in an amalgamator, of a mercury cup or trough, a tube or cell in said cup, a conductor in said cell, and a sodium compound solution in said cell in contact with the conductor and adapted to be decomposed by the electrical current, substantially as and for the purposes set forth.

3. In an amalgamator substantially as described, the combination of the box or framing hanger supports adjustable vertically upon said box or framing hangers adjustable horizontally upon said supports and the mercury cup or trough carried by said hangers substantially as set forth.

4. In an amalgamator, the combination with the box or casing, the mercury cup or trough and the hanger supports of the hangers connected at one end with the cup or trough and having their opposite ends connected pivotally with their supports whereby the cups or troughs may be given a swinging adjustment substantially as set forth.

5. In an amalgamator the box or framing and the mercury cups in combination with plates secured to the box and vertically adjustable and provided with horizontal arms having slots formed in the direction of their length and the hangers secured to the cups or troughs and having projected arms secured adjustably in the slots of the horizontal arms of the plates substantially as set forth.

6. In an amalgamator the combination with a mercury cup or trough adjustable both vertically and horizontally of a chemical feeder, supported independently of said cup or trough and also adjustable both horizontally and vertically substantially as set forth.

7. In an amalgamator the combination with the box or framing and the mercury cups of a transverse bar extended across said box or framing and having at its ends legs connected with and adjusted vertically upon the box or frame the chemical feeder and a plate supporting said feeder and connected adjustably with the transverse bar substantially as shown and described.

8. In an amalgamator the combination of the mercury cup or trough supports therefor adjustable vertically and horizontally the



chemical feeder and supports therefor adjustable vertically and horizontally substantially as set forth.

9. In an amalgamator the combination of the box or frame, the mercury cup, the plates vertically adjustable upon the box or frame and having the horizontal arms, the hangers connected with the mercury cups and having horizontal arms or portions engaging those of the plates and the set screws turning in the horizontal arms of the hangers substantially as set forth.

10. The combination in an amalgamator of the box or frame, the mercury cup or trough, the level controlling tube connected at one end with the trough, a vertically adjustable plate supporting the other end of the tube and a plate having guides for the said adjustable plate all substantially as set forth.

11. In an amalgamator the combination with the box or frame having sides provided with slots and a stepped bottom having plates which overlap at their lower ends the upper ends of the next lower steps the cleats secured upon said plates and operating to retain between them material being treated the mercury cup, and the level controlling tube connected at one end with the mercury cup and extended at its other end into and adjustable within the slot in the side of the box or frame substantially as set forth.

12. The combination in an amalgamator of a mercury cup or trough, a tube or cell in said trough and adapted to receive the agents by the electrolysis of which the mercury may be cleaned or purified and electrical connections with the contents of said cup and cell substantially as set forth.

13. The combination in an amalgamator of the mercury cup or trough, the tube or cell therein and the lead in said cell all substantially as described and for the purposes set forth.

14. In an amalgamator the combination with a mercury cup or trough of devices whereby the quickening agent may be supplied to the mercury in the cup, below the level of the mercury whereby to secure an even distribution of the quickening agent without interfering with the feed of the material to be treated substantially as set forth.

15. In an amalgamator the combination of the mercury cup and the tube or cell therein having at its outer end an upturned portion

open at its upper end substantially as described and for the purposes set forth.

16. In an amalgamator substantially as described the combination with a mercury cup or trough and a submerged tube or cell therein having an upturned end of a guard plate dipping below the surface of the mercury adjacent to said upturned end whereby to prevent the accumulation of pulp, &c., therearound substantially as set forth.

17. In an amalgamator the combination with the mercury cup or trough, a tube or cell therein and a lead in said tube or cell of wires connected one with the lead and the other with the mercury in the cup or trough substantially as set forth.

18. In an amalgamator the combination with the mercury cup or trough of two tubes or cells submerged therein, closed at their inner adjacent ends and having their outer ends upturned and open substantially as set forth.

19. In an amalgamator substantially as described the combination of the mercury cup or trough devices for feeding the material to be treated and a gate arranged above the cup or trough said gate being curved transversely and adjustable approximately in the arc of its curve substantially as set forth.

20. The combination in an amalgamator of the mercury cup or trough and the gate arranged above the same and having a pivotal and sliding connection with its supports whereby it may be swung or slid to secure its desired relation to the mercury in the cup substantially as set forth.

21. The combination in an amalgamator of the gate provided at its ends with curved grooves, and the set screws entering said grooves whereby the gate may be adjusted pivotally or be slid upon said screws substantially as set forth.

22. The combination of the box or frame, having the stepped bottom the plates thereon the mercury cups on said steps, the cleats upon the step plates and provided with bearings, the curved gates having at their ends curved grooves and the screws turned through the cleats and entering the curved grooves of the gates all substantially as set forth.

NATHAN LEROY RABER.

Witnesses:

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J. R. BRYSON.