

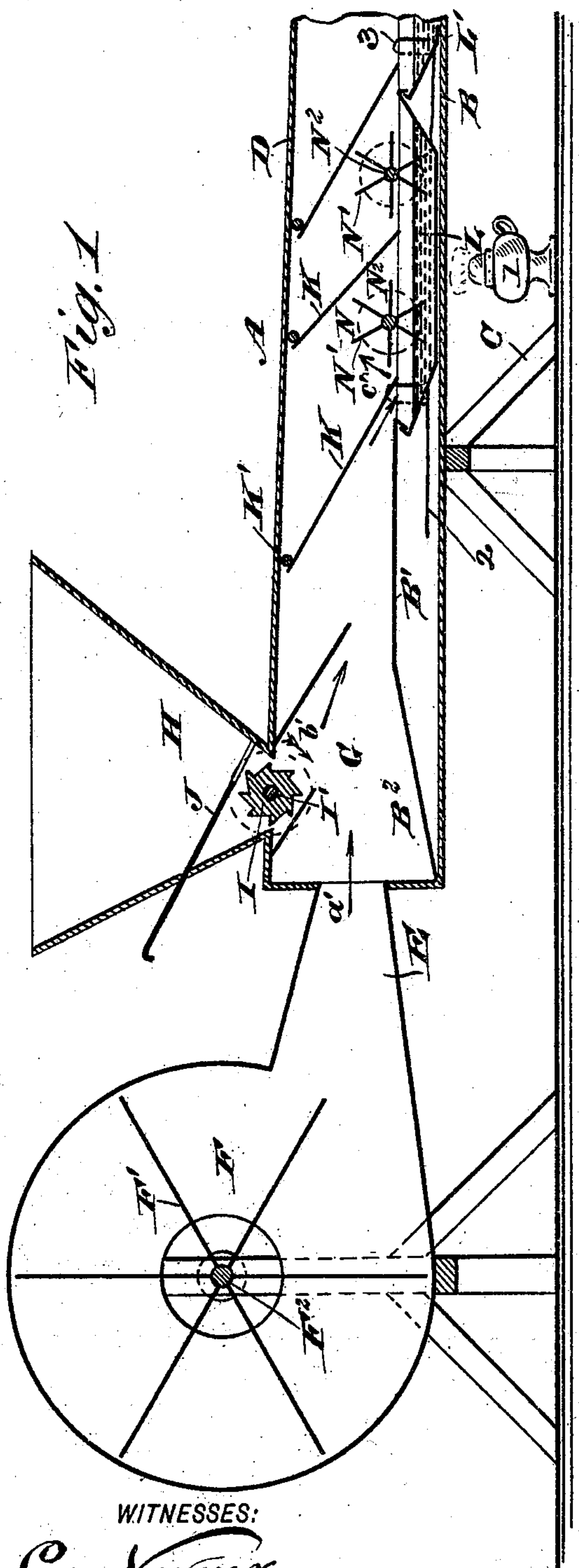
(No Model.)

2 Sheets—Sheet 1

C. F. WILLSIE.  
ORE SEPARATOR.

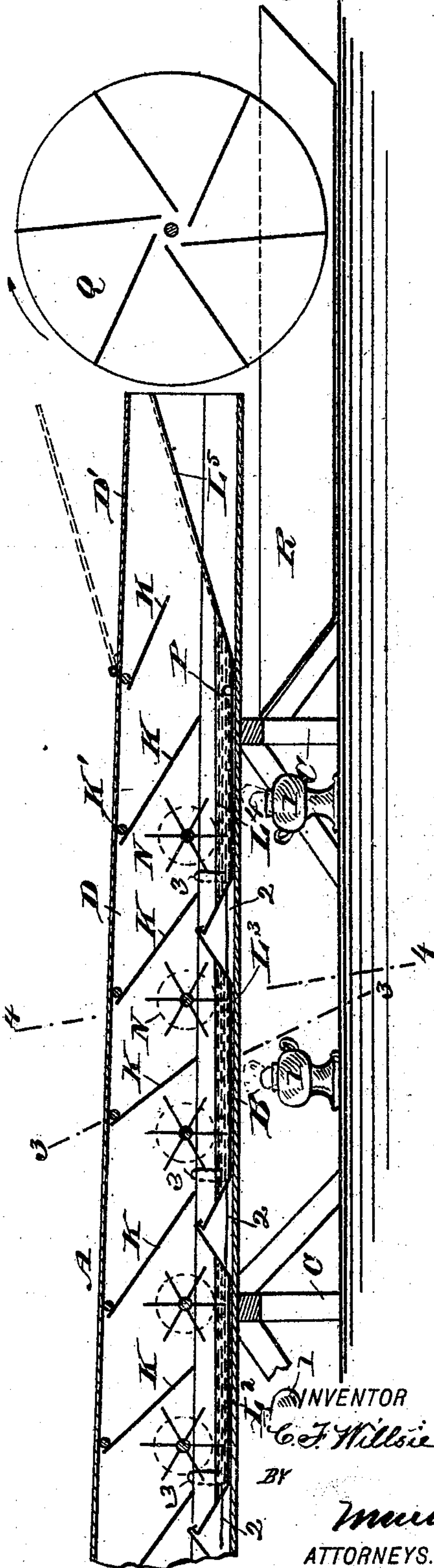
No. 503,023.

Patented Aug. 8, 1893.



**WITNESSES:**

C. Neveu  
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(No Model.)

2 Sheets—Sheet 2.

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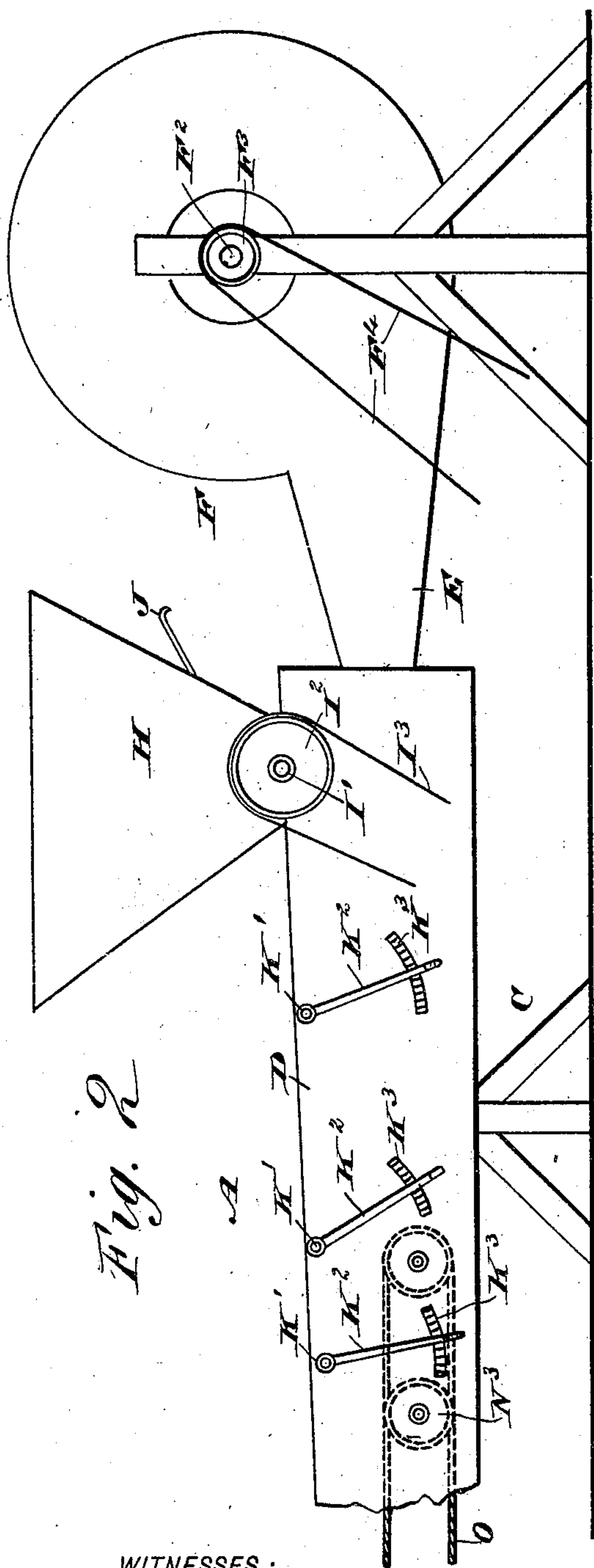


Fig. 2

WITNESSES:  
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Fig. 4

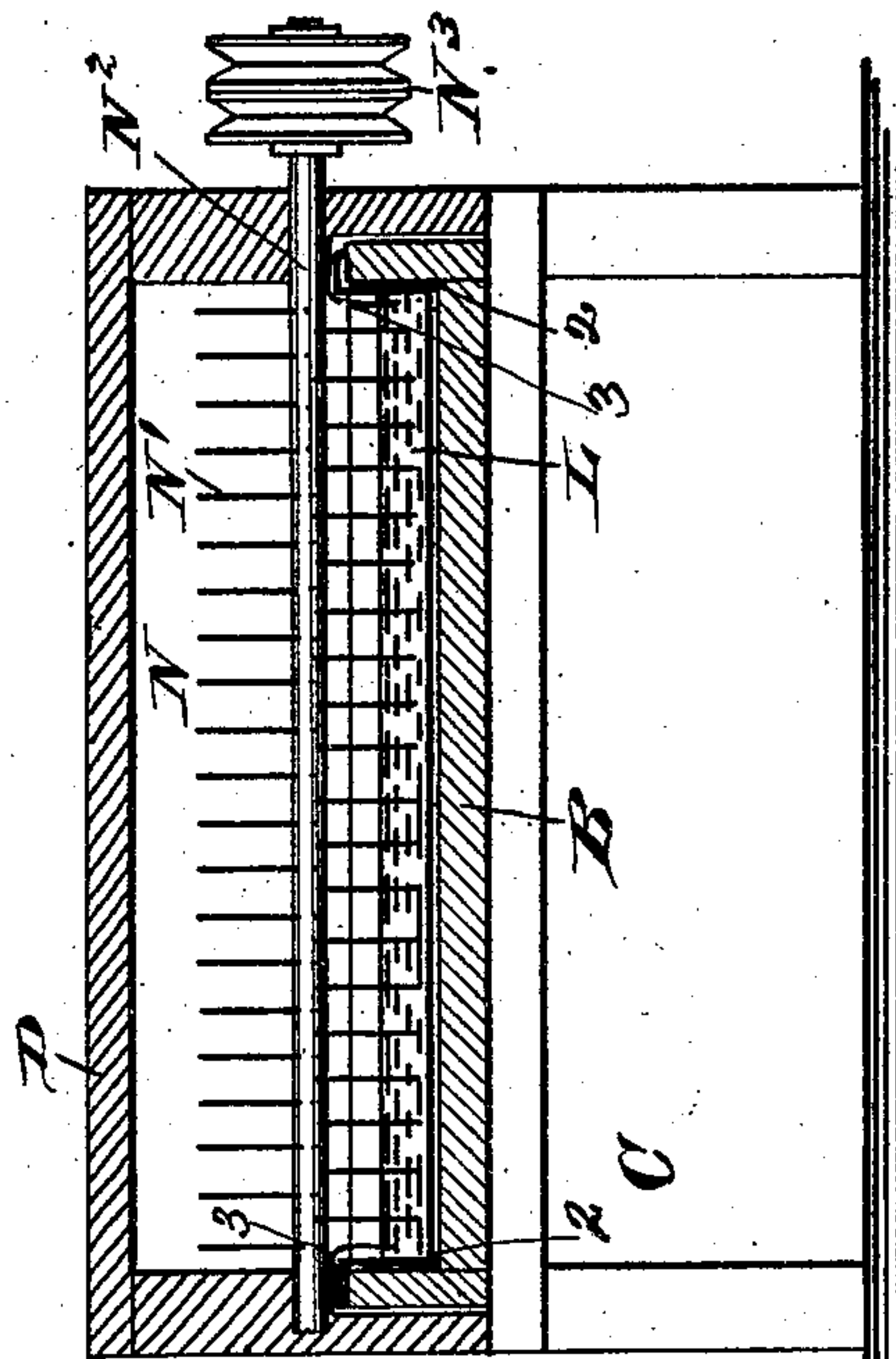
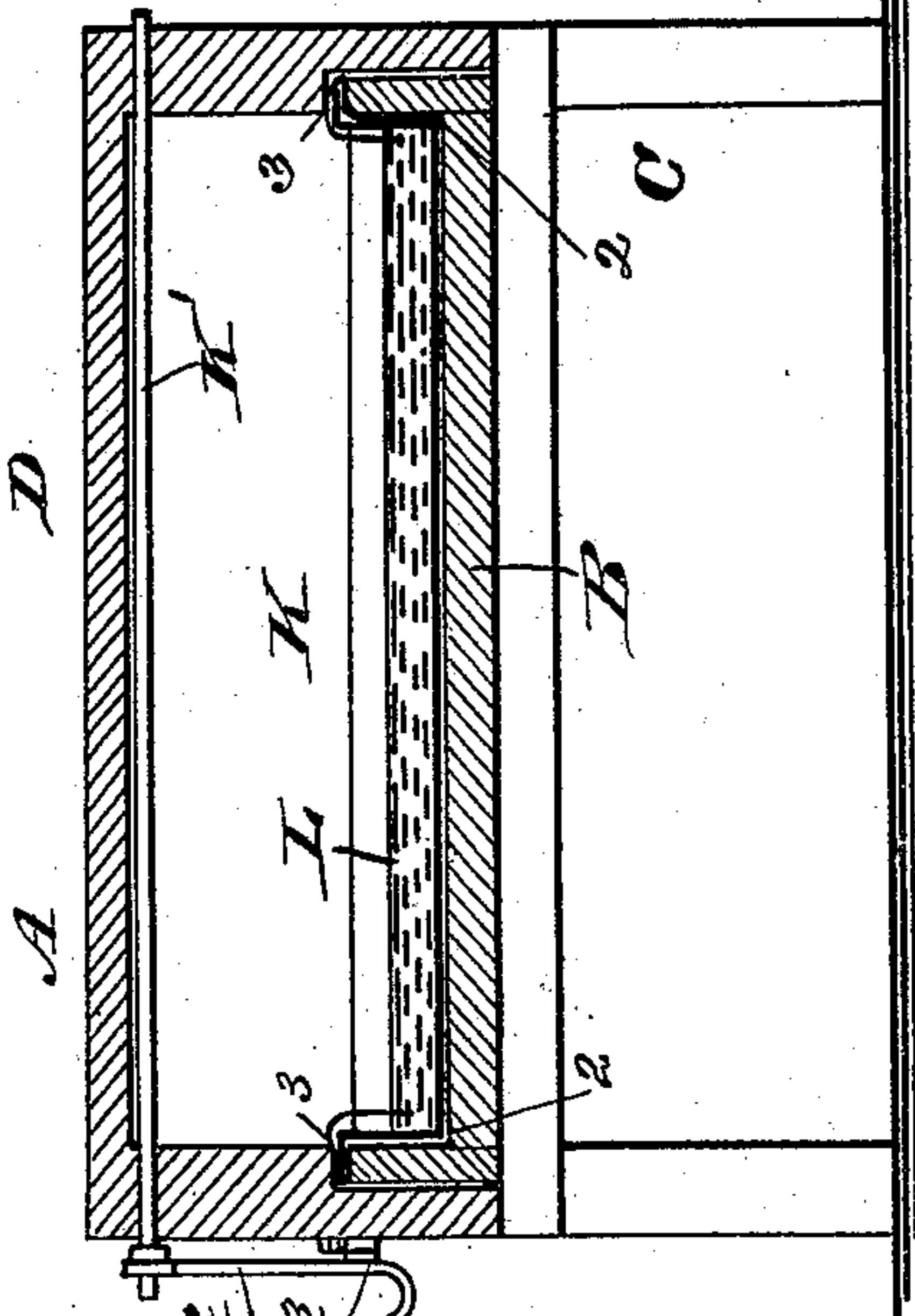


Fig. 3



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# UNITED STATES PATENT OFFICE.

CHARLES F. WILLSIE, OF OGDEN, UTAH TERRITORY.

## ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 503,023, dated August 8, 1893.

Application filed June 13, 1892. Serial No. 436,610. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES F. WILLSIE, of Ogden, in the county of Weber and Territory of Utah, have invented a new and Improved Ore-Separator, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved ore separator which is simple and durable in construction, very effective in operation and more especially designed for dry placer mining, to conveniently, thoroughly and quickly separate the precious metals from the sand without the use of water.

The invention consists of a casing or box connected with a suitable blast, and provided with a series of pans containing quicksilver, and agitators arranged in the said casing and extending into the quicksilver to agitate the same.

The invention also consists of certain parts and details, and combinations of the same, as will be hereinafter described and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar letters and figures of reference indicate corresponding parts in all the views.

Figure 1 is a sectional side elevation of the improvement. Fig. 2 is a rear side elevation of part of the same. Fig. 3 is an enlarged transverse section of the same on the line 3—3 of Fig. 1; and Fig. 4 is a similar view of the same on the line 4—4 of Fig. 1.

The improved ore separator is provided with a box or casing A, preferably made in two parts of which one is in the shape of a trough B, supported on legs C and the other forms a cover D, also supported on the said legs C and covering the top and sides of the trough B, as will be readily understood by reference to Figs. 3 and 4. Into one end of the box or casing A opens the discharge nozzle E of a blower F of any approved construction, to force a blast through the said discharge nozzle E into the box or casing A and through the same for the purpose hereinafter more fully described.

As shown in Figs. 1 and 2, the blower F is provided with the usual fan wheel F' secured on the shaft F<sup>2</sup> carrying on its outer end a pulley F<sup>3</sup> connected by a belt F<sup>4</sup> with suitable

machinery to impart a rotary motion to the said shaft F<sup>2</sup> and consequently to the fan wheel F' so as to force a blast of air through the nozzle E and casing A in the direction of the arrow a'.

In the box or casing A in front of the inlet of the discharge nozzle E is arranged a downwardly and forwardly extending chute G connected at its upper end with a hopper H, set on top of the box or casing A. The sand containing the precious metal is thrown into this hopper H and is fed by a notched wheel I into the spout G from which it passes downward into the path of the blast and over a false bottom B' arranged in the casing A as plainly shown in Fig. 1.

In order to regulate the amount of material passing from the hopper H into the box or casing A, a gate J is provided, held in an inclined position and fitted to slide in the lower part of the hopper H directly above the feed wheel I. By opening or closing the gate J more or less, more or less material is fed into the box A. The toothed feed wheel I is secured on a transversely-extending shaft I' provided at one outer end with a pulley I<sup>2</sup> over which passes a belt I<sup>3</sup> connected with suitable machinery to impart a rotary motion to the said feed wheel in the direction of the arrow b'; see Fig. 1. Part of the false bottom B' extends horizontally and connects with an inclined portion B<sup>2</sup> leading to the front end of the box or casing A below the entrance of the spout E as will be readily understood by reference to Fig. 1.

Above the inner end of the false bottom B' is arranged a deflecting gate K serving to deflect the material into a pan L set in the trough B and containing quicksilver or other amalgamating substance. The upper end of the transversely-extending deflecting gate K is secured on a transversely-extending shaft K' provided on one outer end with a handle K<sup>2</sup> for conveniently setting the deflecting gate K at the desired angle, according to the nature and quantity of the material under treatment. The handle K<sup>2</sup> is adapted to be locked in place in any desired position on a toothed rack K<sup>3</sup>, fastened to the outside of the casing or box A as will be readily understood by reference to Fig. 2.

In the pan L are mounted to revolve agi-



tating wheels N preferably two in number, but a single one will answer, the purpose. Each agitating wheel N is provided with radially-extending agitating arms N' set on a shaft N<sup>2</sup> mounted to turn in suitable bearings in the sides of the cover D of the casing A. On one outer end of this shaft N<sup>2</sup> is secured a pulley N<sup>3</sup> connected by a belt with suitable machinery to impart a rotary motion to the said agitating wheel in the direction of the arrow c'. The lowermost arms N' of each agitating wheel pass into and through the quicksilver contained in the pan L, so as to agitate the quicksilver to cause its particles to take up the precious metals passing with the material into the pan on top of the quicksilver, so that the precious metal is taken up and retained by the amalgam, while the loose sand passes forward by the force of the blast onto the next wheel N to be treated in a like manner.

If two wheels N are used in the same pan L, a second deflecting gate K is arranged between the two wheels, as shown in Fig. 1, the said gate being adjustable and under the control of the operator in the manner described in reference to the first gate K. The ends of the pan L are inclined upwardly and outwardly and the forward end of this pan connects with the corresponding rear end of a second pan L' which again connects at its forward end with a third pan L<sup>2</sup> and in a like manner a series of pans L<sup>3</sup>, L<sup>4</sup> may be connected with each other, as described, each pan being provided with an agitating wheel or wheels and corresponding deflecting gates K so that the material moved forwardly by the blast passes successively into the several pans, comes in contact with the agitated quicksilver which latter takes up all particles of precious metals and retains the same, while the lighter material moves forward until it finally passes into the last pan L<sup>4</sup> of the entire series.

As indicated in Fig. 2, the several agitating wheels in the entire series are connected with each other by belts O at their pulleys N<sup>3</sup>, so that when the first pulley is set in motion all the pulleys are rotated simultaneously and consequently the entire series of agitating wheels N is rotated for the purpose mentioned.

As illustrated in Fig. 1, the last pan L<sup>4</sup> contains but one agitating wheel N and in front of the latter is arranged an amalgamated roller P rotated from the last agitating wheel N and arranged to catch the floured quicksilver. The outer end L<sup>5</sup> of this last pan L<sup>4</sup> extends upwardly a considerable distance as shown in Fig. 1, and this end L<sup>5</sup> is preferably coated with amalgam, to catch the floured quicksilver and return it to the quicksilver contained in the pan L<sup>4</sup>.

At the end of the box or casing A is mounted a revoluble wheel Q, the wings of which are made of amalgam plate for the purpose of catching any quicksilver or flake gold or flour that may escape from the box or casing A. This wheel Q is revolved by the blast escap-

ing from the casing and passes with its lower part into a pan R set on the ground and into which the precious metal is discharged that is caught by the wheel Q. The rear end of the cover D is provided with a hinged top D' adapted to be set at any desired angle so as to regulate the outlet of the material onto the wheel Q.

The operation is as follows: When the several parts are in the position shown in the drawings and motion is given to the blower F, and the several agitating wheels N, the roller P and the wheel Q and the material is fed into the hopper H. Then the material feeds past the revolving feed wheel I into the hopper G and from the latter is forced forward over the false bottom B' by the blast of air coming from the blower F. The material is forced past in contact with the quicksilver held in the first pan L, so that the heavy precious metals are taken up by the agitated quicksilver while the sand and lighter precious metals pass onward to the second pan L' to be treated in a like manner, and again part of the precious metal is separated from the sand taken up and retained by the quicksilver contained in the second pan. The material forced forward by the blast into the next pan is successively treated therein in the manner described, so that when the material finally reaches the last pan most all the precious metal is separated from the sand and retained in the quicksilver of the various pans. Any floured quicksilver carried along by the blast will be taken up by the roller P or the amalgamated plate L<sup>5</sup> and any flake gold or flour that may pass out of the rear end of the box or casing A is caught by the amalgamated plates of the wheel Q and deposited in the pan R. After the process is completed the cover D of the box or casing A is removed so as to permit of conveniently removing the pans L for discharging their amalgam which is treated further to separate the precious metals from the quicksilver.

It will be seen that this machine requires no water whatever for separating the precious metals from the sand or tailings.

Electricity is applied to the plates and pans in order to electrically charge and give life to the quicksilver and keep it from flourishing, also heat, by lamps arranged under the pans or other means to facilitate the separating of the precious metal from the sand. When electricity is used wires 2 connected with a battery or other source of supply, are arranged along the bottom of the casing or box, one at each side, and from these wires branch wires 3 extend up over the edge of the pans down into the quicksilver.

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

1. An ore separator, comprising a casing, a hopper at one end of the casing, a blast fan connected with one end of the said casing, a series of connected pans containing quick-



silver arranged on the bottom of the casing, agitating wheels mounted to revolve in the pans, and a series of hinged gates above the pans, substantially as described.

5 2. An ore separator, comprising a casing, a blast fan connected with one end of the casing, a series of connected pans on the bottom of the casing and containing quicksilver, the last pan having its outer end extended upwardly and outwardly and coated with amalgam, agitating wheels mounted to revolve in the pans, and a series of adjustable gates in the upper part of the casing over the pans, substantially as described.

15 3. An ore separator, comprising a casing, a blast fan connected with one end of the casing, a forwardly inclined discharge chute in the casing, a hopper above the chute, a series of connected pans on the bottom of the casing and containing quicksilver, the last pan having its outer end inclined upwardly and outwardly and coated with amalgam, agitating wheels mounted to revolve in the pans, a series of hinged gates above the pans, and means for adjustably holding the gates, substantially as described.

25 4. An ore-separator, comprising a casing, a blast fan connected with one end of the casing,

ing, a feed hopper discharging into the casing in front of the air blast, a series of connected pans containing quicksilver, the last pan having its outer end extended upwardly and outwardly and coated with amalgam, revolving agitating wheels, adjustable gates above the pans, and a revoluble wheel having amalgamated wings and arranged at the end of the casing, substantially as herein shown and described.

5. An ore separator, comprising a casing having a hinged outer end, a blast fan connected with one end of the casing, a forwardly inclined chute in the casing, a hopper above the chute, a feed wheel in the hopper, a series of connected pans on the bottom of the casing, and containing quicksilver, the last pan having its bottom inclined upwardly and outwardly and coated with amalgam, agitating wheels in the pans, adjustable gates above the pans, an amalgamated roller in the last pan, and a wheel having amalgamated wings arranged at the end of the casing, substantially as shown and described.

CHAS. F. WILLISIE.

Witnesses:

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A. H. MOYES.