No. 891,409. PATENTED JUNE 23, 1908.

H. P. CURTIS.

DRY CONCENTRATOR.

APPLICATION FILED MAY 27, 1907.

2 SHEETS—SHEET 1.

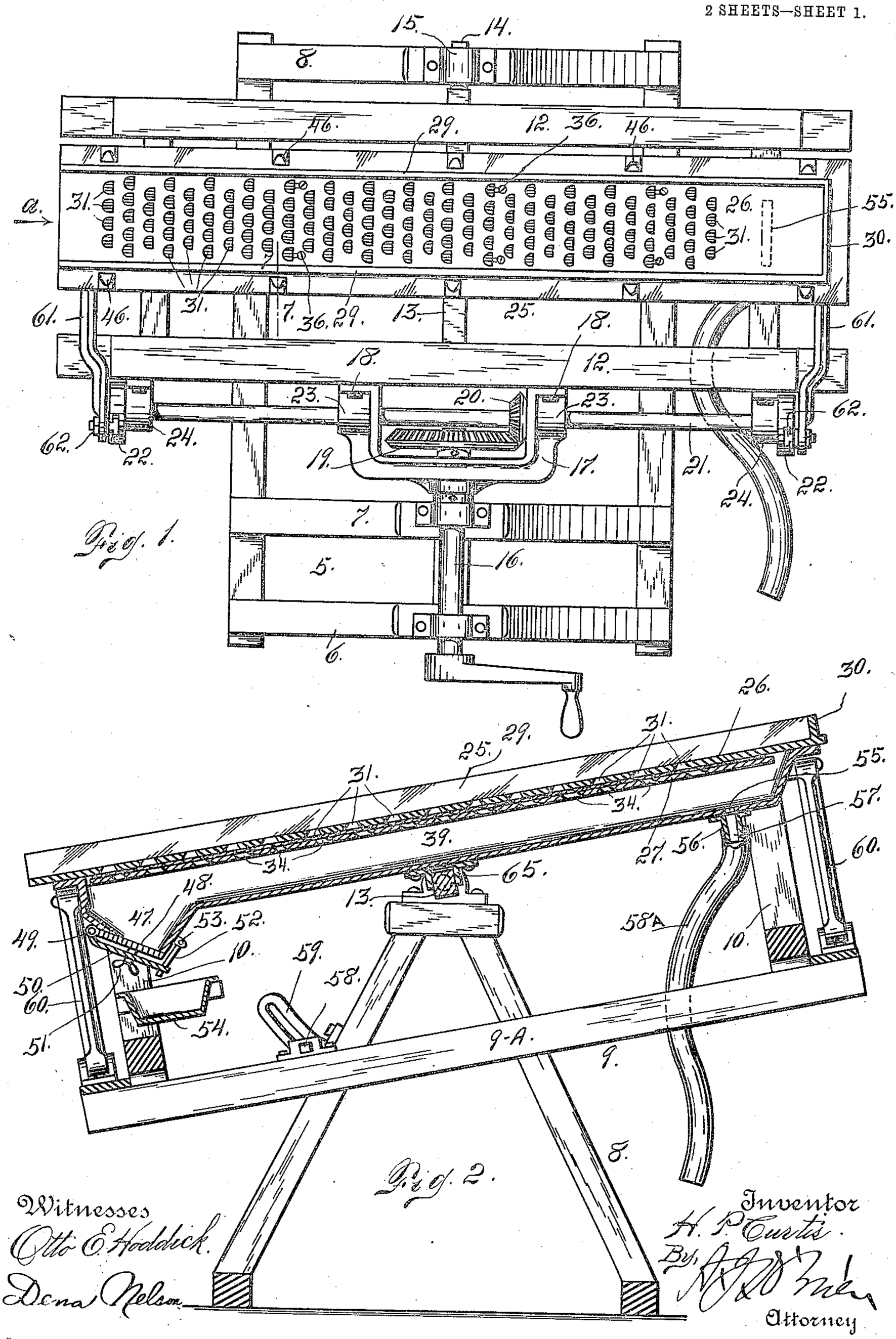

Fig. 1.

Fig. 2.

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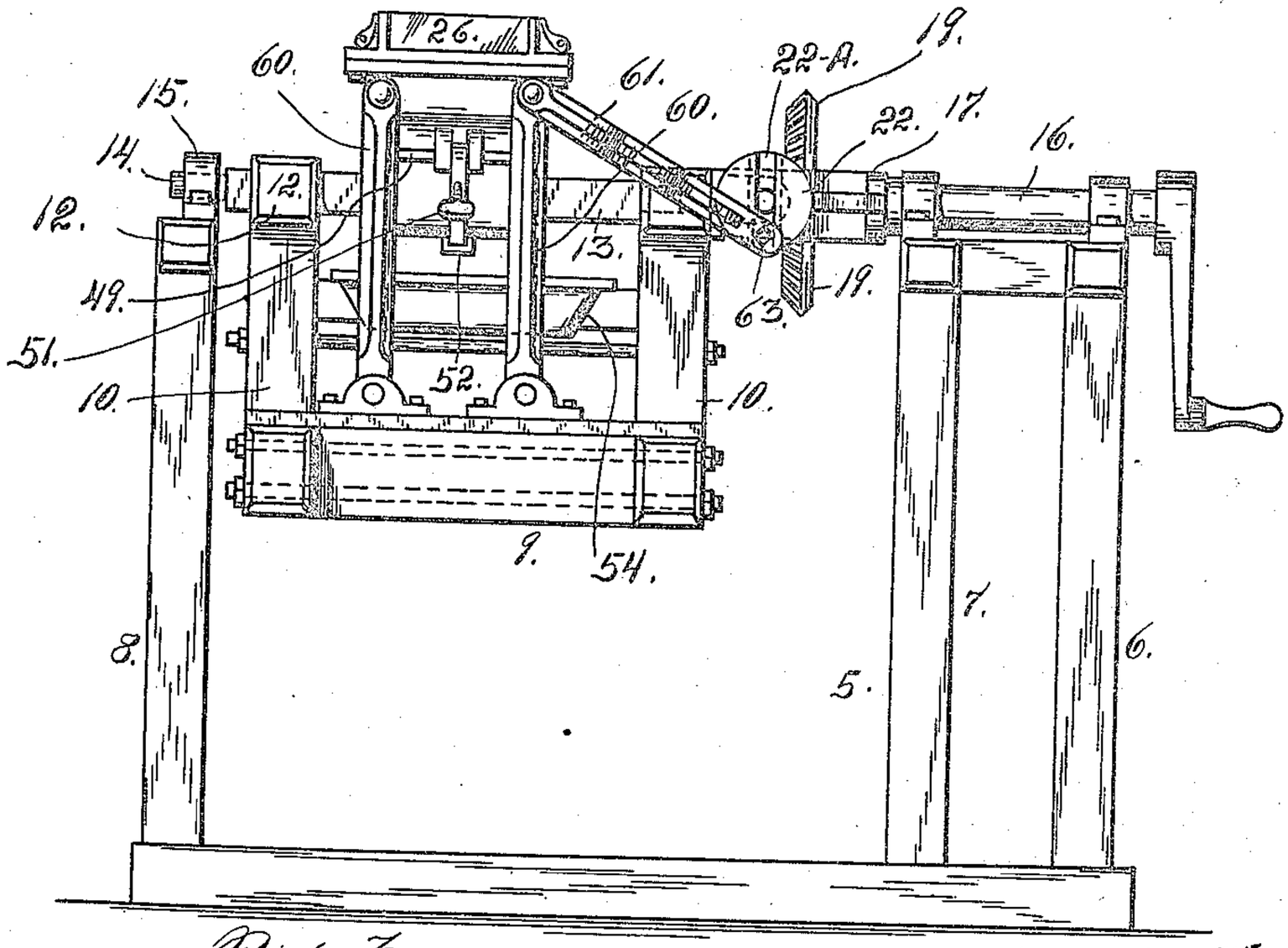

Fig. 3.

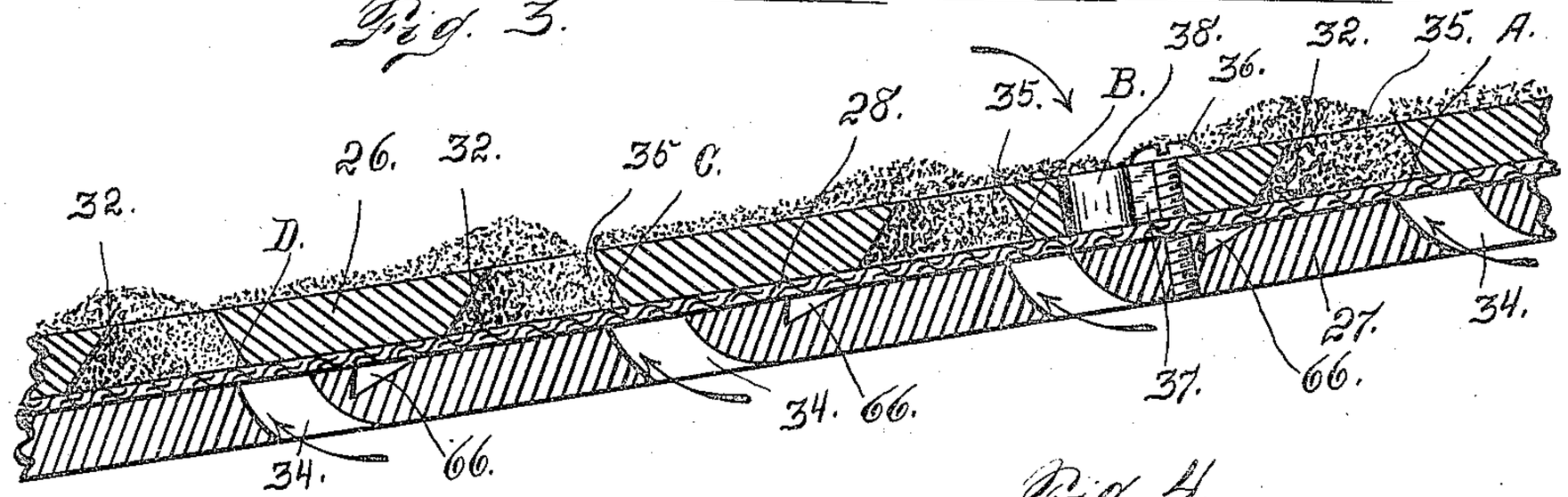

Fig. 4.

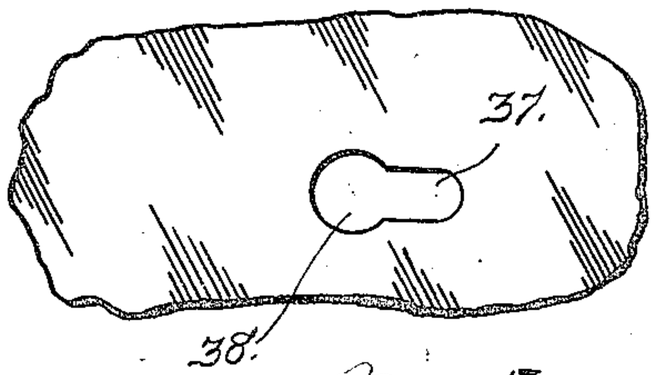

Fig. 5.

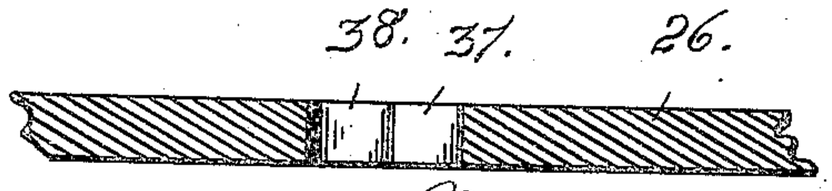

Fig. 6.

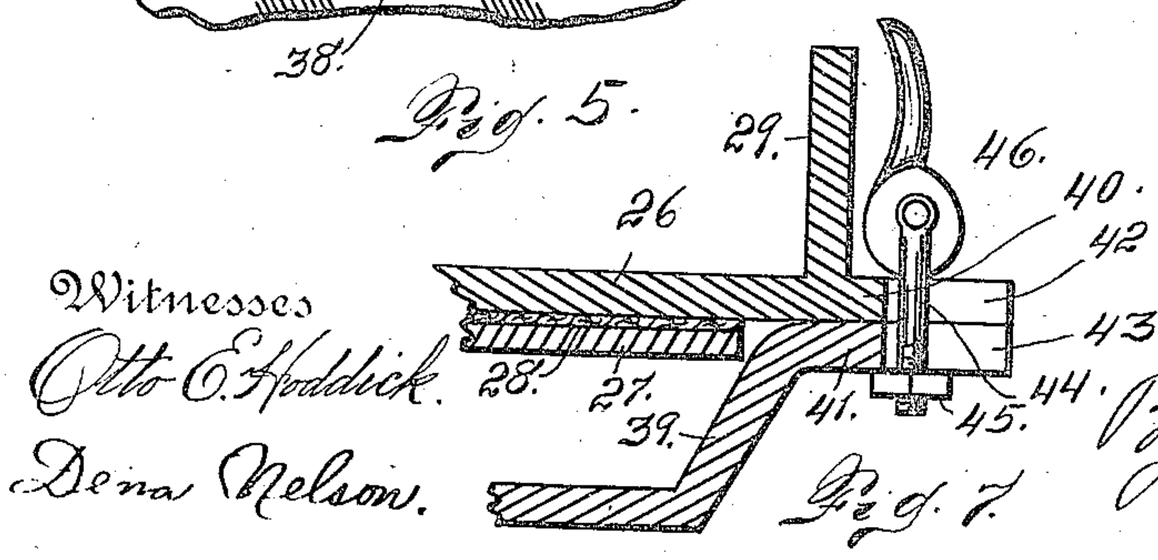

Fig. 7.

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UNITED STATES PATENT OFFICE.

HOMER P. CURTIS, OF DENVER, COLORADO, ASSIGNOR TO THE CURTIS DRY PLACER MACHINE COMPANY, OF DENVER, COLORADO.

DRY CONCENTRATOR.

No. 891,409. Specification of Letters Patent. Patented June 23, 1908.

Application filed May 27, 1907. Serial No. 375,848.

To all whom it may concern:

Be it known that I, HOMER P. CURTIS, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Dry Concentrators; 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in apparatus for separating the precious metal values from the gangue, being more especially intended for use in treating placer material containing free precious metal values.

A distinguishing feature of my improved machine or apparatus is that the material is treated in a dry state thus obviating the necessity for making provision for a water supply which in many placer districts is very difficult to obtain.

My improved apparatus may be operated by hand when in the form of a small machine, both for the purpose of giving it the necessary shaking or vibratory movement, and also for the purpose of supplying the necessary air for the treatment of the material, since a blower operated by hand power will be sufficient for any machine of comparatively small capacity.

In larger machines power of any description may be employed both for the purpose of imparting the oscillating movement and also for supplying the necessary air blast.

My improved machine includes a chute having a bottom composed of two plates with an intervening layer of mesh material preferably wire cloth. These two plates are provided with openings which are partially out of alinement, whereby the spaces between the openings in the lower plate, partially close the openings in the upper plate in the bottom, thus forming pockets or receptacles for the saving of the precious metal values. Below this chute is arranged a tight air box into which the air blast is delivered from a suitable blower, air compressor or other source of supply.

The air blast enters the opening of the lower plate of the chute bottom, and passes up through the mesh material and into the openings of the upper plate entering the same above the closed portions of the opening, whereby the air under pressure supports the lighter material or gangue, and allows the precious metal values to settle in the pockets of the upper plate or the portions of the openings in said plate whose bottoms are closed by the lower plate. The gangue being supported by the air, passes along down the bottom of the chute which is suitably inclined therefor and is finally discharged at its lower end. The pockets in the bottom of the chute are preferably so arranged that the opening for the entrance of the air from below varies. That is to say these pockets are arranged in series, the uppermost pockets of any series having larger spaces for the admission of air while the air spaces for the lower pockets of the series diminish in size, the lowermost pockets of the series having the smaller spaces for the admission of air. The bottom of the chute may have any desired number of these series of pockets.

When the device is in use, the material is fed to the upper extremity thereof and the chute is of sufficient length to catch all of the precious metal values. For instance the uppermost pockets will catch a portion of these values and what escapes from these pockets will be caught in the other pockets as the material continues its downward movement through the chute. It is assumed that the heavier particles will be caught in the uppermost pockets and that the finer values will accumulate in the other pockets. The air blast is introduced at the upper portion of the air box and the precious metal values accumulate in the various pockets as the material works downwardly through the chute, the gangue being lighter is supported by the blast while the precious metal values which are heavier or of greater specific gravity, pass downwardly into the pockets of the upper plate, accumulating therein forward of the upper spaces through which the air enters the said pockets. The forward walls of the openings in the upper plate are undercut or downwardly inclined thus forming protected receptacles or pockets for the precious metal values.

An oscillatory or vibratory movement is imparted to the chute, whereby the separation of the precious metal values from the gangue is facilitated.

Having briefly outlined my improved con-

struction, the general manner of its operation and the function it is intended to perform, I will proceed to describe the same in detail reference being had to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a top plan view of my improved machine. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is an end elevation of the machine looking in the direction of arrow A in Fig. 1. Fig. 4 is an enlarged fragmentary section of the bottom of the concentrating chute. Fig. 5 is a top view of a portion of the chute bottom, illustrating an opening for a screw whereby the two plates of the chute bottom are connected. Fig. 6 is a sectional view of the same. Fig. 7 is a fragmentary detail sectional view of a portion of the concentrating chute. This section is taken on the line 7—7 Fig. 1, the parts, however, being shown on a larger scale.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a suitable stationary frame provided with upright members 6, 7 and 8 upon which the concentrating apparatus is adjustably hung whereby any desired inclination of the concentrating chute or dry sluice may be obtained. This concentrating apparatus consists of a rectangular bottom frame 9 provided with uprights 10 and longitudinal top beams 12, forming a rigid frame work which is trunnioned on the upright members 6, 7 and 8. This frame is provided with a centrally located transversely disposed upper bar 13 which is rigidly connected at one extremity with one of the frame bars 12, while its outer extremity is formed into a journal or trunnion 14 engaging a box 15 at the top of the upright 8. At the opposite side from the trunnion 14, the frame work of the concentrator is trunnioned on an operating shaft 16 which is journaled in a gear case 17 secured to one of the frame bars 12 by fastening devices 18. Upon the shaft 16 is made fast a beveled gear 19 which meshes with a pinion 20 fast on a shaft 21 whose outer extremities are provided with crank wheels 22. The shaft 21 is journaled in the gear case at 23 while its outer extremities are journaled in boxes 24 mounted on one of the frame bars 12.

Between the upper frame bars 12 but raised considerably above the same, is the concentrating chute or dry sluice 25 provided with a bottom composed of an upper plate 26, a lower plate 27 and an interposed or intervening layer of mesh material 28. The upper plate is provided with upwardly projecting side members 29 and a top end member 30, these members being of sufficient height to give the chute or sluice the desired or necessary capacity. The upper plate 26 is provided with openings 31 whose forward portions 32 constitute pockets closed at the bottom by the bottom plate 27 which is also provided with passages designated 34 which communicate with the rear portions 35 of the openings 31 of the upper plate. The interposed layer of mesh material preferably wire cloth, while of sufficient fineness to support the material within the upper portions 35 of the upper plate, at the same time are sufficiently open for the passage of the necessary air blast for the treatment of the material.

As heretofore explained it is preferred that the openings 31 of the upper plate and the corresponding passages 34 of the lower plate be arranged in series. It may be assumed that one of these series is illustrated in Fig. 4 where the air space A communicating with the uppermost opening 31, is widest, while the air space B next below is somewhat narrower; while the air spaces C and D lower down diminish in width.

The two plates 26 and 27 and the intervening layer 28 of mesh material, may be connected in any suitable manner. It is highly desirable, however, if not absolutely necessary, that these members be connected in such a manner that they will be readily detachable for cleaning up purposes. As illustrated in the drawings these three members 26, 28 and 27 are connected by screws 36 which pass through slots 37 formed in the plate 26, the said screws being threaded in openings formed in the bottom plate 27. The forward extremities of the slots 37 are enlarged as shown at 38, to permit the heads of the screws to pass through. Hence when it is desired to disconnect the plates 26 and 27, it is only necessary to loosen the screws 36, and slide the plate 26 rearwardly until the heads of the screws register with the enlarged opening 38, in which event the bottom plate 27 will fall downwardly into the air box 39 below.

The plate 26 is provided with side flanges 40 while the air box has engaging corresponding flanges 41. These two sets of flanges are slotted as shown at 42 and 43 to receive bolts 44 whose lower extremities are threaded to receive nuts 45. To the upper extremities of these bolts are pivoted cam levers 46 which when thrown to the upright position shown in Fig. 7, lock the plate 26 and the air box tightly together. After, however, the screws 36 connecting the members of the chute or dry sluice as heretofore explained, are disconnected by loosening the screws 36, and allowing the plate 33 to drop downwardly into the air box, the plate 26 may be detached from the air box by throwing the cam levers 46 to the proper position or moving them toward the right referring to Fig. 7. This movement of the cam lever will loosen the bolts 44 and allow them to be removed from the slots of the flange members of the air box and plate.

The plate 26 will then be entirely free and may be shaken to cause any remaining values within the pockets to drop into the air box. The layer 28 of mesh material will also be cleaned. This material may then be moved downwardly into the lower part 47 of the air box which is provided with a door 48 hinged at 49. This door is locked in place by means of a hinged member 50 in which is threaded a bolt 51 its inner extremity bearing against the door 48. The extremity of the member 50 remote from the hinge passes through a U-shaped clip 52 hinged to the air box at 53. When this member 50 is in engagement with the loop 53, it is evident that the hinged door 48 may be held tightly in place. However, when it is desired to remove the concentrates or values from the air box, the screw 51 is loosened sufficiently to allow the clip 52 to be disconnected from the member 50 when the said member together with the door 48 are free to swing upon the hinge pin 49, allowing the contents of the air box to drop into a receptacle 54.

The rear extremity of the air box is provided with an elongated port 55 below which is located a nipple 56 having an opening 57. To this nipple is attached a suitable conduit 58[A] which may be connected with any suitable source of air supply, for delivering the necessary air blast to the box 39.

The concentrating frame work, trunnioned on the uprights 6, 7 and 8 as heretofore explained, is longitudinally tiltable by loosening a bolt 58 fast on one of the lower side bars 9[A] of the frame 9, and passing through a slotted bracket 59 fast on one of the standards 8. By loosening this bolt or a number of bolts (not shown) in case it is necessary to employ more than one, the entire frame work 9 upon which the concentrating chute or dry sluice is mounted, may be turned longitudinally on its trunnions to give any desired inclination to the chute, after which the said frame work is rigidly locked in place upon the standards. Hence this frame work 9 has no other movement. The concentrating chute, however, together with the air box 39, is mounted at each end upon a pair of links 60, whereby the said apparatus is free to oscillate transversely, and for this purpose pitmen 61 are connected at their outer extremities with the crank wheels 22 as shown at 62, the said connection being of such a nature that the length of stroke may be varied as desired, and for this purpose the crank wheels are provided with dove-tailed grooves 22[A] in which is slidably mounted a suitable device 63 for connecting each pitman with its corresponding crank wheel.

Now when the apparatus is in use, the material to be treated after being properly screened in any suitable manner, is discharged into the concentrating chute or dry sluice, the latter being simultaneously operated by imparting a transverse oscillation thereto through the instrumentality of the shaft 16, the gears 19 and 20, the shaft 21, the crank wheels 22 and the pitmen 61. At the same time a suitable air blast is introduced to the air box 39 through the port 55. This air under pressure passes up through the openings 34 of the bottom plate 33 of the chute, and thence through the mesh covered air spaces A, B and C into the various openings 31 of the upper plate of the said chute in the rear of the pockets 32.

The gangue or lighter material being supported by the air blast, passes downwardly over the pockets, being eventually discharged from the lower end of the chute, while the precious metal values, which are too heavy to be removed by the air blast, move downwardly and occupy the pockets 32, forward of the screened air spaces, as heretofore explained. The action of the air together with the lateral oscillation imparted to the concentrating apparatus, serves to produce the desired separation of the values from the gangue as heretofore outlined.

After the apparatus has been operated a sufficient length of time to require cleaning up, the oscillatory movement of the concentrating apparatus is stopped as well as the delivery of the air to the air box. The screws 36 are then loosened, and the cam levers 46 actuated to release the chute from the air box. The upper plate is then moved rearwardly sufficiently to bring the heads of the screws 36 into alinement with the portions 38 of the slots 37, which allows the bottom plate 33 to drop into the air box together with the mesh member 28, allowing the contents of the pockets 32 to drop into said box. These concentrates may then be removed from the lower extremity of the box as heretofore explained.

To the bottom of the air box is applied a transversely located channel bar 65 adapted to straddle the stationary bar 13, and form an additional support for the air box and chute, to prevent the tendency of the said mechanism to swing downwardly which would interfere with the proper working of the supporting end links 60. The connection between the channel bar 65 and the stationary bar 13, is such as to allow the oscillatory structure to move in an arc whose center is the lower pivots of the links, without disconnecting the said parts 65 and 13. Hence when the oscillatory structure is in the central position, there will be a narrow space between the top of the bar 13 and the bottom of the channel bar 65 (see Fig. 2).

It is preferred to have recesses 66 formed in the lower plate 33 of the concentrating chute, between the pockets 32 of the upper plate and the passages 34 of the lower plate, to receive any fine precious metal values which may follow the mesh material 28 for-

wardly between the upper and lower plates. Without this provision in case the metal values are very fine, they might after having once been caught, enter an opening 34 and be carried upwardly with the gangue especially if the opening 34 was one of the foremost openings of the chute.

It must be understood that I do not limit the invention to a chute having air spaces A, B, C etc., of varying width, though under some circumstances this form of construction is preferred for the reason that the greater air volume entering one pocket, may be sufficient to carry very light flake gold upwardly out of the pocket, and if so the lesser air volume of the forward pocket, would allow the same to settle in the pocket.

Having thus described my invention, what I claim is:

1. A dry concentrating chute or sluice whose bottom is provided with a series of pockets whose rear portions are open at the bottom to permit the introduction of an air blast from below, the rear portions of the pockets being also open to permit the escape of the air, substantially as described.

2. A concentrating chute or sluice whose bottom is composed of two plates having openings, and an interposed layer of mesh material, the plates being arranged so that the forward portions of the openings of the upper plate are covered at the bottom to form pockets, the openings in the rear of these pockets being exposed at the bottom to allow an air blast to pass through the mesh material into the said pockets for the purpose set forth.

3. A chute for dry concentration having a bottom provided with pockets whose bottoms have mesh covered rear portions for the admission of air under pressure, the forward portions of the pockets being closed and their rear portions open for the escape of the air, in combination with means for introducing air to the said pockets, and means for imparting a transverse oscillation to the chute for the purpose set forth.

4. In dry concentrating apparatus, the combination of a sluice having a bottom provided with pockets whose rear portions are open to permit the introduction of an air blast, the rear portions of the pockets being also open to permit the escape of the air.

5. A chute for dry concentration, comprising upper and lower plates and an interposed layer of mesh material, the said plate having openings, the forward portions of the openings of the upper plate being closed at the bottom by the lower plate to form pockets while the rear portions of these pockets are exposed at the bottom to permit the passage of air entering the openings of the lower plate, the two plates and the interposed mesh layer being readily detachable for the purpose set forth.

6. In a dry concentrator, the combination with a suitable stationary frame work, of an auxiliary frame work trunnioned on the stationary frame work, means for adjusting the inclination of the trunnioned frame work, and a concentrating chute mounted on the trunnioned frame work to permit the oscillatory movement, the said chute having pockets whose forward portions are closed at the bottom and whose rear portions are open at the bottom, and means for introducing air under pressure from below to the pockets, substantially as described.

7. In apparatus of the class described, the combination with a suitable stationary frame work, of an auxiliary frame work trunnioned thereon, means for adjusting the trunnioned frame work to regulate its inclination, a concentrating chute provided with pockets whose rear portions are open at the bottom for the admission of air under pressure, the said pockets being also open at the top to permit the escape of the air, the said chute being mounted on the trunnioned frame work to permit a transverse oscillation, substantially as described.

8. In dry concentrating apparatus, the combination with a suitable stationary frame work, of an auxiliary frame work trunnioned thereon, a concentrating chute provided with pockets whose rear portions are open from below for the admission of air under pressure, and whose forward portions are closed at the bottom, a closed air box located underneath said chute, means for introducing air under pressure to said box, and means for imparting a transverse oscillation to the concentrating chute, substantially as described.

9. In a dry concentrator, the combination with a suitable stationary frame work, of an auxiliary frame work trunnioned thereon, means for locking the trunnioned frame work in the desired position of adjustment, a concentrating chute provided with an air box underneath and having pockets whose rear portions are open at the bottom for the admission of air from the said box, the said chute and air box being suitably connected and mounted to permit an oscillatory movement in a transverse direction, substantially as described.

10. A chute for dry concentration having its bottom provided with a series of pockets having portions in the rear open for the admission of air under pressure, the air spaces of the various pockets varying in width for the purpose set forth.

11. A chute for dry concentration having its bottom provided with pockets, a plate connected with the said bottom and having passages for the admission of air under pressure to the said pockets, the said plate being provided with recesses located intermediate the pockets in the bottom of the chute and the air passages in the lower plate.

12. In a dry concentrator, the combination of a dry sluice provided with pockets whose forward portions are closed at the bottom and whose rear portions are open at the bottom, means for introducing air under pressure to the said pockets from below, and means for imparting a vibratory motion to the chute, substantially as described.

13. A machine of the class described, having a chute or sluice whose bottom is provided with a series of pockets whose forward portions are closed at the bottom, and whose rear portions are mesh covered and open at the bottom to permit the introduction of an air blast from below, the rear portions of the pockets being also open to permit the escape of the air.

14. A concentrating chute or sluice whose bottom is provided with a series of pockets whose rear portions are open to permit the introduction of an air blast, the rear portions of the pockets being open to permit the escape of the air, the forward portions of the pockets being closed.

15. A dry concentrating chute or sluice whose bottom is provided with pockets whose forward portions are closed and whose rear portions are open to permit the introduction of an air blast, the rear portions of the pockets being also open to permit the escape of the air.

16. A concentrating chute or sluice having pockets whose rear portions are open at the bottom for the introduction of an air blast and at the top for the escape of the air.

17. A concentrating chute or sluice having pockets, and means for introducing air under pressure to the rear portions of the pockets which are open at the top for the escape of the air.

In testimony whereof I affix my signature in presence of two witnesses.

HOMER P. CURTIS.

Witnesses:
DENA NELSON,
A. J. O'BRIEN.