J. WAGNER.

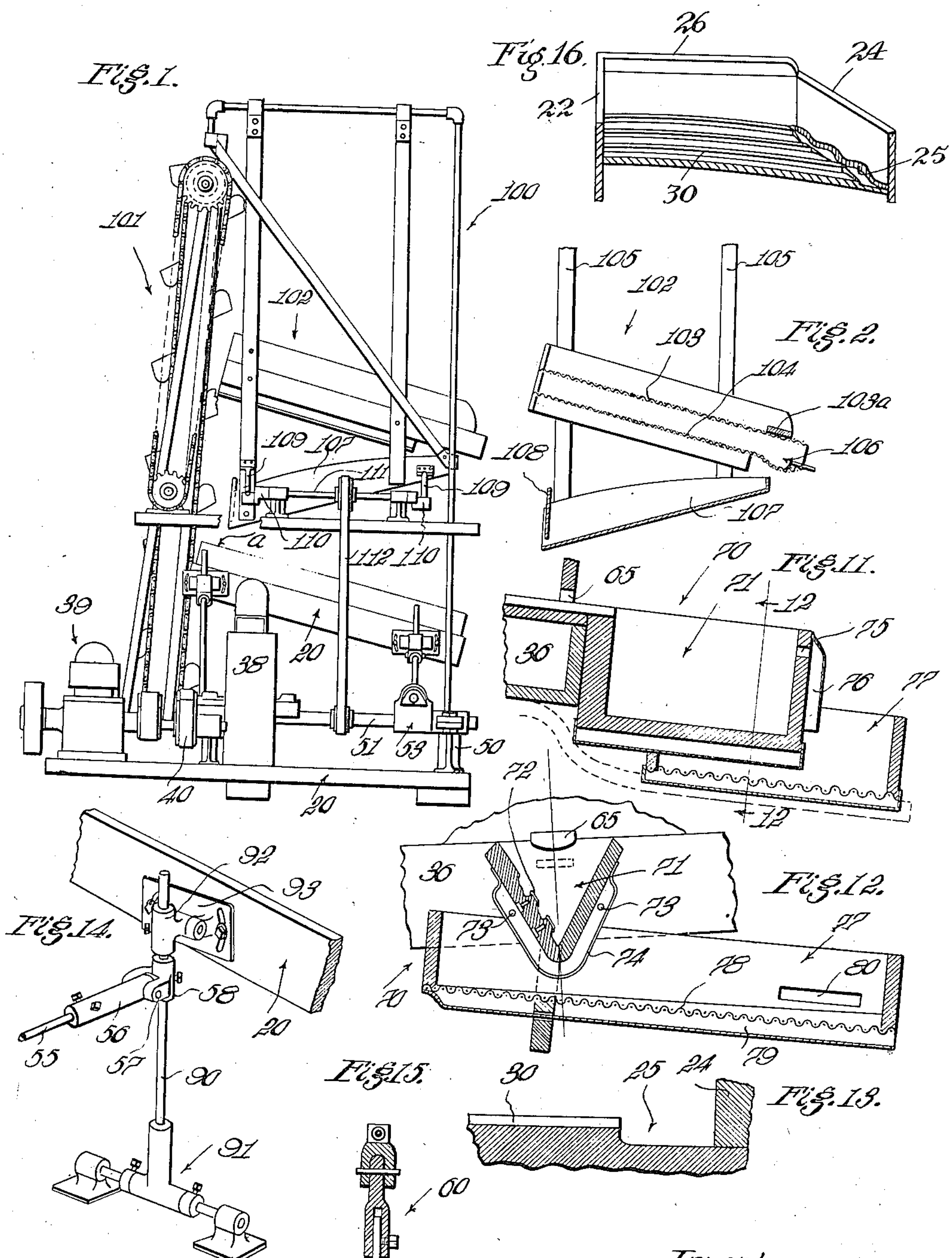
DRY CONCENTRATOR.

APPLICATION FILED MAR. 19, 1912.

1,045,478.

Patented Nov. 26, 1912.

2 SHEETS—SHEET 1.



Witnesses.
Elwood H. Barkelew.
B. McCurdie

Inventor,
Jacob Wagner,
by James T. Barkelew
his Attorney.

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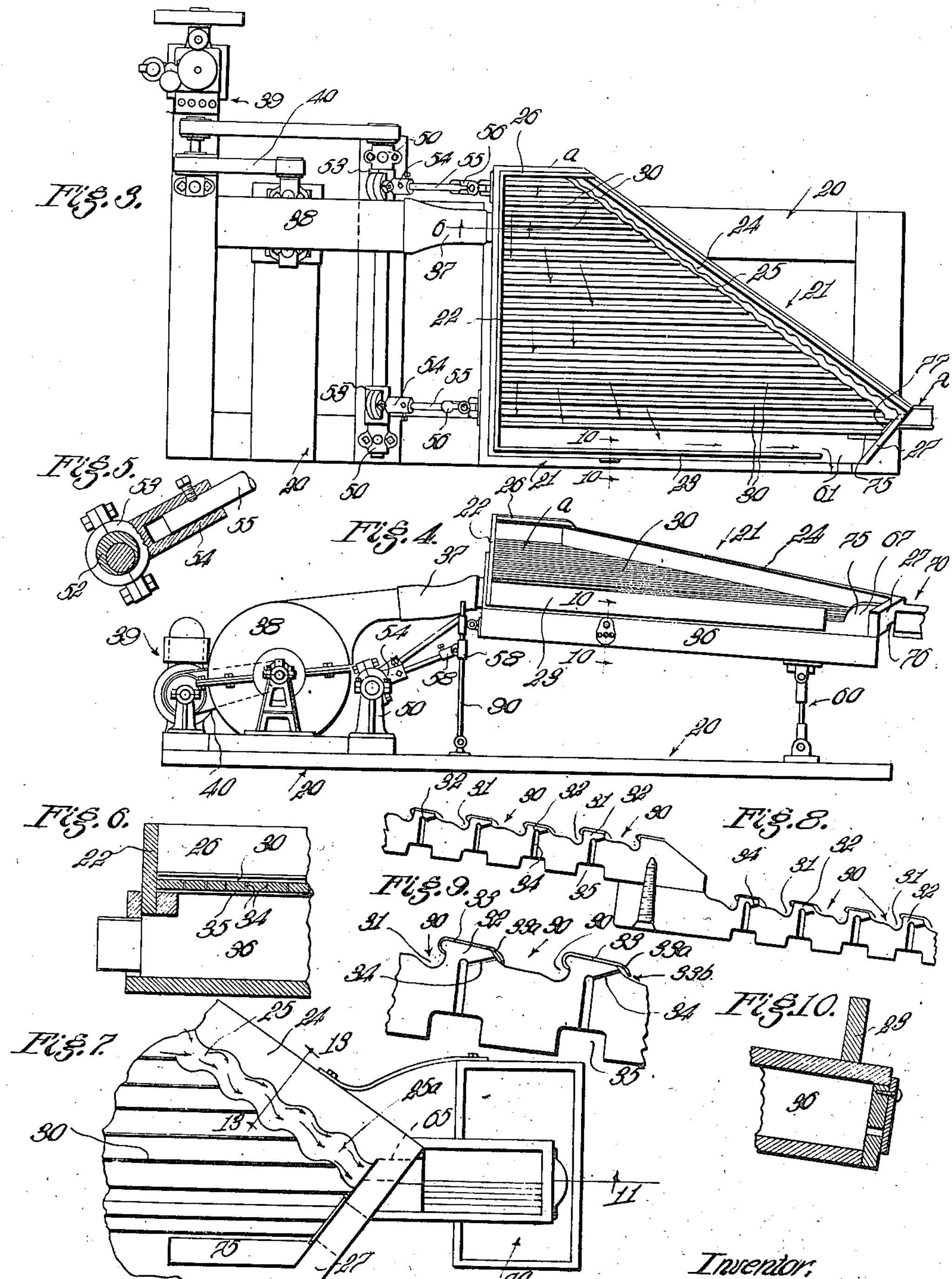

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UNITED STATES PATENT OFFICE.

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DRY CONCENTRATOR.

1,045,478. Specification of Letters Patent. Patented Nov. 26, 1912.

Application filed March 19, 1912. Serial No. 684,795.

To all whom it may concern:

Be it known that I, JACOB WAGNER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Dry Concentrators, of which the following is a specification.

This invention relates to a dry concentrator particularly adapted for gold, platinum, silver and like heavy metals; and it consists mainly in a novel combination of parts to utilize gravitational influence for the separation of fine gold or other valuable metal particles from the accompanying sand or ore, quartz or the like and for forming a dry and high concentrate from which the metals may be easily separated.

Heretofore, so far as I am aware, the devices used for dry concentrating have only been able to separate a concentrate of, say, gold and fine black sand from a larger body of sand and ore; and there has always been some difficulty in separating the gold from the fine black sand as a final operation.

The prime object of this invention is to provide a device which will separate the gold from such black sand or from any similar heavy fine particles and to form a higher concentrate than has heretofore been possible.

It is also an object to provide a simple machine of large capacity and of small size and weight, and one which may be easily operated to produce efficient results.

It will be seen that I accomplish these objects by a mechanism entirely new and original.

Broadly considered, my present invention resides directly in a table mechanism on which the ore is concentrated; from which the concentrate is taken and the wastes are passed off. In combination with this table mechanism I utilize a system of other machinery for operating the table mechanism and for handling the material to and from it; and, although these extraneous machines enter into the general combination of my concentrator, my particular invention resides more specifically in the table mechanism itself. The table mechanism is the nucleus around which the whole concentrator is built. My table mechanism generally comprises a table which is tilted diagonally, or tilted in two directions, longitudinally and transversely. The surface of the table is provided with peculiarly shaped grooves which act to catch the heavier particles of valuable metal, these grooves extending longitudinally of the table and connecting with a diagonal sinuous groove at one end thereof. The table is vibrated parallel to the grooves which originally catch the metallic values and diagonally to the sinuous groove into which the longitudinal surface grooves discharge; and the result of this arrangement is that the concentrate discharged into the sinuous groove is shaken diagonally transversely of the groove while it passes down the same, thus arranging the material with the heavier values at the bottom and the lighter refuse materials at the top. This diagonal sinuous groove discharges into a suitable pocket which catches the majority of the values and allows the waste materials to pass off. Provision is made for returning to the concentrator table any materials which may still hold some values after passing through the pocket, so that none of the values can be lost. This action of the longitudinal and sinuous diagonal groove is the fundamental feature of operation of my invention. The precise mechanism by which this operation is preferably obtained will be more fully set forth in the following specification.

The bulk of the material fed to the machine, the waste materials, passes down the table transversely of the grooves (in the line of greatest inclination) and is discharged from the table along its lower longitudinal edge. The inclination of the table is such that the lighter waste materials will easily pass over the grooves and be discharged from the table; but the respective inclinations of the table are adjustable to different kinds and characters of materials to be handled. All of these features will be more particularly described in the following specification and are illustrated in the accompanying drawings, in which—

Figure 1 is an end elevation of my complete mechanism. Fig. 2 is a vertical section illustrating a portion of the screen apparatus which delivers material to the table mechanism. Fig. 3 is a plan view of the table mechanism and its directly connected operating mechanism, omitting the material handling machinery. Fig. 4 is a front elevation of the portion shown in Fig. 3. Fig. 5 is a sectional detail illustrating a portion

of the table operating or vibrating mechanism. Fig. 6 is a sectional detail taken on line 6 of Fig. 3. Fig. 7 is a partial plan view of the lower end of the table. Fig. 8 is an enlarged cross section of the table surface members, showing the grooves therein. Fig. 9 is a further enlarged detail of the section shown in Fig. 8. Fig. 10 is a detail section taken on lines 10—10 of Figs. 3 and 4. Fig. 11 is a section taken as indicated by line 11 of Fig. 7. Fig. 12 is a section taken on line 12—12 of Fig. 11. Fig. 13 is an enlarged section taken on line 13—13 of Fig. 7. Fig. 14 is a perspective view illustrating the method of support and of vibrating the table mechanism.

In the drawings 20 designates a suitable base frame of any desired material and proportions and adapted to carry the supports for table 21 and the mechanism for vibrating the table and for providing an air pressure. Table 20 is of the configuration shown in Figs. 3 and 4 and is supported on oscillating supports so as to be inclined approximately as illustrated and so as to be capable of vibration from right to left in Fig. 3. Table 21 is provided with two walls 22 and 23 placed at right angles to each other and forming transverse and longitudinal edges of the table. The table is preferably so supported that the angle of inclination of transverse wall 22 is greater than that of longitudinal wall 23. In other words, the table is preferably tilted to a greater angle transversely than longitudinally. Opposite walls 22 and 23 is placed a diagonal wall 24 which has just inside its inner face a sinuous groove 25 which extends parallel to the wall and also diagonally of the table. Groove 25 is preferably wider at its lower than at its upper end. At the upper corner of the table is a short wall 26 at right angles to transverse wall 22 and at the lower corner of the table is a wall 27 arranged at about the angle shown with diagonal wall 24. Within these walls the surface of the table is made up as is illustrated in Figs. 3, 4, 8 and 9. The surface is formed in a plurality of sections secured together as is particularly shown in Fig. 8, and each section is provided with a plurality of longitudinally extending grooves 30 leading from transverse wall 22 to diagonal sinuous groove 25. It will be seen that these grooves are tipped at a slight angle longitudinally, while transversely they are tipped to a somewhat greater angle. The grooves are not necessarily exactly straight; the surface members of the table may be bowed up in their centers so that the inclination of the grooves at their upper ends (to the left in Figs. 3 and 4) is less than at their lower ends. This shown exaggeratedly in Fig. 4. Each groove is formed in the upper surface of the table top members and is provided with a secondary groove 31 at its lower edge, the effect being to deepen the main groove along this lower edge. The grooves are spaced apart by portions 32 and over each of these portions is placed a strip of metal 33 of the cross sectional configuration shown in Figs. 8 and 9. These strips 33 engage grooves 31 and also the upper edges of main grooves 30, having lips 33^a which project over the upper edges of the main grooves and forming deflectors against which a current of air coming through apertures 34 may impinge. The slot 33^b through which air passes into the groove 30 is very narrow; the lip 33^a almost touches the bottom of the groove 30. This construction causes a thin stream of air to flow as indicated in Fig. 9, passing over and not into the secondary groove 31 which catches and holds the values. Apertures 34 lead from longitudinal grooves 35 in the lower surface of the table top and connect with a wind box 36 constructed below the table top. This wind box 36 is supplied with air under appropriate pressure through a connection 37 with a suitable fan 38. This fan is driven from an engine or other prime mover 39 through the medium of a belt or other connection 40. Engine 39 is shown as mounted on frame 20, but it may be arranged in any convenient manner. And at this point I would state that one of the prime advantages of my construction is the requirement of comparatively little power for its operation. The air under pressure required is small and the power required for vibrating the table is also small compared with the amount of material which may be handled per day on the table.

Mounted in bearings 50 on frame 20 is an eccentric shaft 51 carrying a pair of eccentrics 52 engaged by suitable eccentric straps 53. These eccentric straps 53 each carry sockets 54 in which connecting rods 55 are adjustably engaged. See Figs. 5 and 14. Connecting rods 55 connect with similar sockets 56 at their other ends and sockets 56 are pivotally mounted at 57 on members 58. Members 58 are adjustably mounted on upright supporting rods 90 adjustably pivoted at 91 below and adjustably engaged by a sleeve 92 above. Sleeve 92 is pivotally mounted on a bracket 93 which in turn is adjustably secured to table 20. The whole arrangement is such that the height of either or both corners of the table may be changed to adjust its inclination in either direction. And by adjusting the inclinations of rods 55 the horizontal vibration of the table may be lengthened or shortened as desired.

The finely divided ore containing the gold or other metal is fed on to the table at the point *a* by a suitable mechanism, hereinafter described. The table is vibrated longitudinally of grooves 30 and

the heavier metals at once begin to settle toward the bottom and to be caught in the grooves. The lighter materials follow the general direction indicated by the arrows and finally come against lower longitudinal wall 23 whence they move along the wall as indicated and out through opening 61. The heavier metals settle in the grooves 30 and tend to move longitudinally down the grooves toward diagonal sinuous groove 25. But the materials in the grooves are constantly agitated by means of the air currents flowing out through apertures 34 and the lighter of these materials are consequently thrown into the main body of lighter materials traveling transversely down the table and over the grooves. This action continues and the lighter materials are thrown out of the grooves until the material in the grooves discharges into diagonal groove 25. By this time most of the lighter materials have been removed and have traveled transversely down the table, leaving only the higher concentrates in the grooves to discharge into diagonal groove 25. The discharge into the diagonal groove takes place as is indicated in Fig. 7 diagonally across groove 25 and against a concavity of the opposite wall of the sinuous groove; and the vibrations being in the directions indicated by the double-headed arrow in Fig. 7, the materials in the groove 25 are thrown diagonally against the opposite walls and are thus forced to take up the zig-zag course down the groove as is indicated by the arrows. In taking this zig-zag course the materials and the metallic particles roll over and thus the heavier metallic particles are given ample opportunity to settle to the bottom, while the lighter materials place themselves on top of the slowly moving stream down groove 25. The sinuosity of groove 25 retards the movement of the material down the groove and gives ample opportunity for the arrangement of the materials and the metallic particles described. As the materials reach the lower end of the groove, they reach a point where the groove is widened, as at 25^a, and then discharge through an aperture 65 through end wall 27 and into a small gold saving device 70. Gold saving device 70 is best illustrated in Figs. 7, 11 and 12. It consists mainly of a V-shaped gold saving pocket 71 having suitable riffles 72 on one of its sides, through which riffles air is injected into the material in the pocket in the same manner as air is injected through the riffles on the table surface. Air is supplied to the riffles through apertures 73 leading from the wind box 36 into a space inclosed by a suitable casing 74. The apertures to the riffles connect with the space within the casing 74 in just the same manner as hereinbefore described for the air apertures in the table surface. At the lower end of the pocket 71 there is an outlet 75 through which the lighter materials pass into a vertical shield 76 and thence into a tray 77 having a screen bottom 78. The heavier materials will pass through this screen bottom 78 into a sheet metal tray 79 and will be discharged at the lower end of the tray; while the lighter materials will arrange themselves above the screen 78 and pass out through opening 80. The heavier materials passing from the tray 79 may contain a few stray gold or other metallic particles; and this material is again placed on the concentrating table so that all of the values may be extracted. The major portion of the values sinks in the pocket 71 and is caught in the bottom thereof, from whence it may be removed after a day's run.

The mechanism for handing the material to the table will now be described. I have shown a suitable framework 100, preferably made so that it may be disassembled for transportation, for supporting an elevator mechanism 101 and a screen mechanism 102. The elevator mechanism 101 is preferably of the bucket type and elevates the materials to a point above the upper end of the screen device. The screening mechanism is composed of two screens 103 and 104 preferably hung on suitable supports 105 which allow of their oscillating vibration. Screen 103 is preferably coarser than screen 104 and the coarse materials are thereby passed off into the discharge. A board 103^a at the lower end of the screen will suffice to catch any large heavy particles which may contain values. The screen 104 has a pocket 106 at its lower end for the purpose of catching heavier particles which are so large as to otherwise pass off into the discharge. The material passing through screen 104 runs into a chute 107 also mounted on supports 105 so that it may be oscillatingly vibrated. Vibration of the chute causes the uniform passage of materials down it under adjustable gate 108 on to the table at the position designated *a*. The vibration of the chute and of the screen is accomplished through the medium of connecting rods 109 attached to cranks 110 on shaft 111. Shaft 111 is rotatably connected by a belt or other mechanism 112 to shaft 51.

From the foregoing it will be seen that I have provided a general combination in which dry gold and other metallic ores may be handled in minimum time with a minimum expenditure of energy to obtain a very high concentrate therefrom. The fundamental feature and principle of the operation of my device is contained in the action of the grooves as above described; and it is this feature which I particularly wish to secure in the following claims.

Having described my invention, I claim:

1. In a device of the class described, a

table surface tilted longitudinally and transversely having a series of longitudinally extending parallel grooves, and having a sinuous discharge groove extending diagonally across the table into and diagonally across which the longitudinal grooves discharge, there being a concavity in the sinuous groove wall opposite the discharge of each longitudinal groove.

2. In a device of the class described, a table surface tilted longitudinally and transversely having a series of longitudinally extending grooves deeper along their edges which are lower on the table surface than along their edges uppermost on the table surface, and means to supply air under pressure to the grooves along their upper shallower edges only.

3. In a device of the class described, a table having surface grooves deeper along one edge than the other, and means to supply air pressure to the bottom of the grooves along their shallow edges only.

4. In a device of the class described, a table having surface grooves deeper on one edge than the other, members overhanging both edges of the grooves, and means to supply a current of air to the bottom of the groove at its shallow edge and so directed upwardly that it impinges on the overhanging member at that edge.

5. In a device of the class described, a table having surface grooves deeper on one edge than the other and having a supplemental deeper groove at its lower edge, members overhanging both edges of the grooves, and means to supply a current of air to the bottom of the groove at its shallow edge and so directed upwardly that it impinges on the overhanging member at that edge.

6. In a device of the class described, a table having surface grooves deeper on one edge than the other and having a supplemental deeper groove at its lower edge, members overhanging both edges of the grooves, and means to supply a current of air to the bottom of the groove at its shallow edge and so directed upwardly that it impinges on the overhanging member at that edge, the overhanging member being arranged so as to direct a thin stream of air along the bottom of the groove.

7. In a device of the class described, a table having surface grooves deeper on one edge than the other and having a supplemental deeper groove at its lower edge, a ridge on the bottom of the groove at the edge of the supplemental groove, members overhanging both edges of the grooves, and means to supply a current of air to the bottom of the groove at its shallow edge and so directed upwardly that it impinges on the overhanging member at that edge.

8. In a device of the class described, a table surface tilted longitudinally and transversely having a series of longitudinally extending grooves deeper along their edges lower on the table surface than along their edges uppermost on the table surface, means to supply air under pressure to the grooves along their shallower edges, the table surface also having a sinuous discharge groove extending diagonally across the table into and across which the longitudinal grooves discharge, there being a concavity in the sinuous groove wall opposite the discharge of each longitudinal groove.

9. In a device of the class described, a table surface tilted longitudinally and transversely having a series of longitudinally extending grooves deeper along their edges lower on the table surface than along their edges uppermost on the table surface, members overhanging both edges of the grooves, means to supply air under pressure to the grooves along their shallower edges, the table surface also having a sinuous discharge groove extending diagonally across the table into and across which the longitudinal grooves discharge, there being a concavity in the sinuous groove wall opposite the discharge of each longitudinal groove.

In witness that I claim the foregoing I have hereunto subscribed my name this 9th day of March, 1912.

JACOB WAGNER.

Witnesses:
ELWOOD H. BARKELEW,
MAX FACTOR.