Sept. 6, 1938. J. A. SLAUGHTER 2,129,629

MINERAL SEPARATING MACHINE

Filed Dec. 14, 1936 3 Sheets-Sheet 1

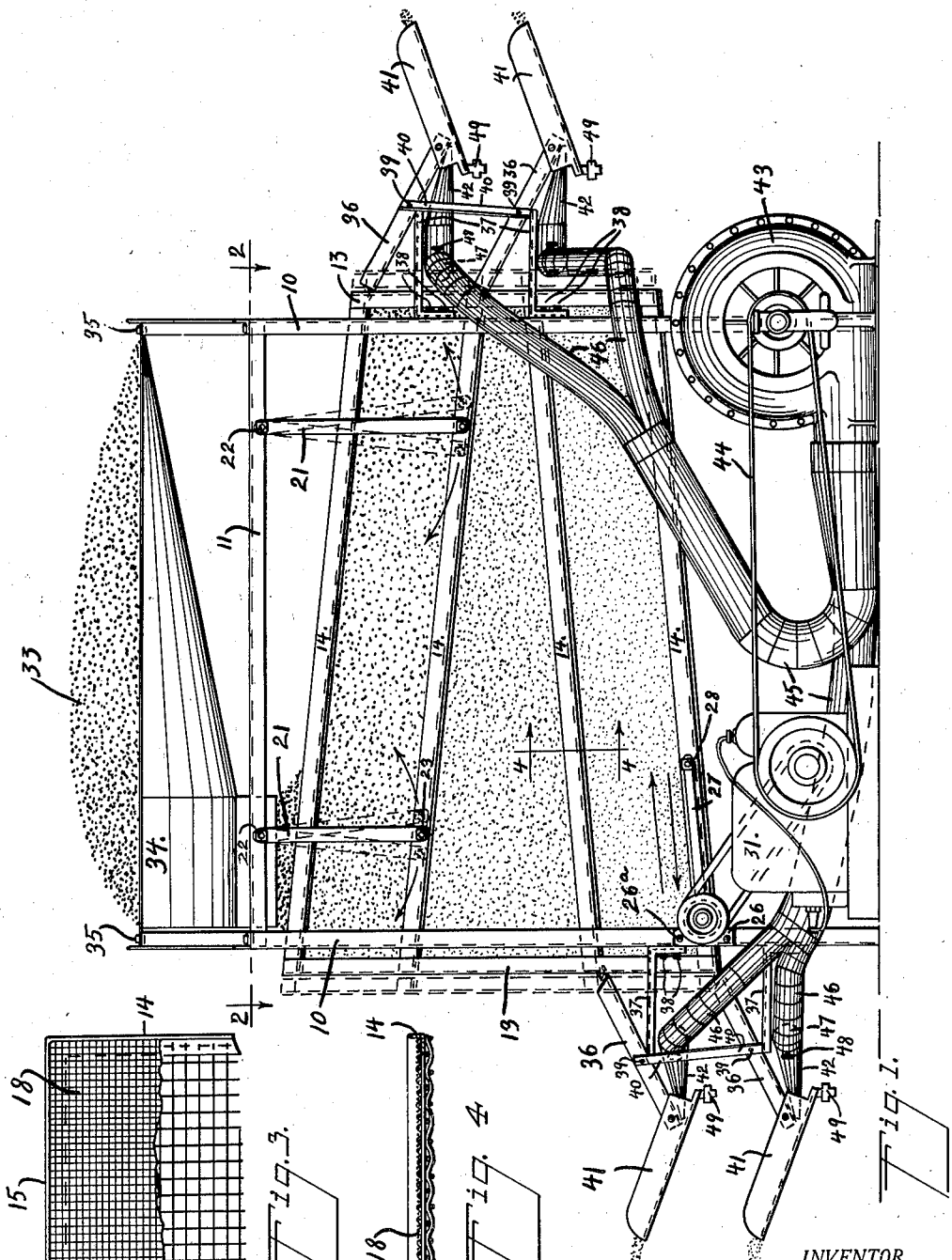


Fig. 3.

Fig. 4.

Fig. 1.

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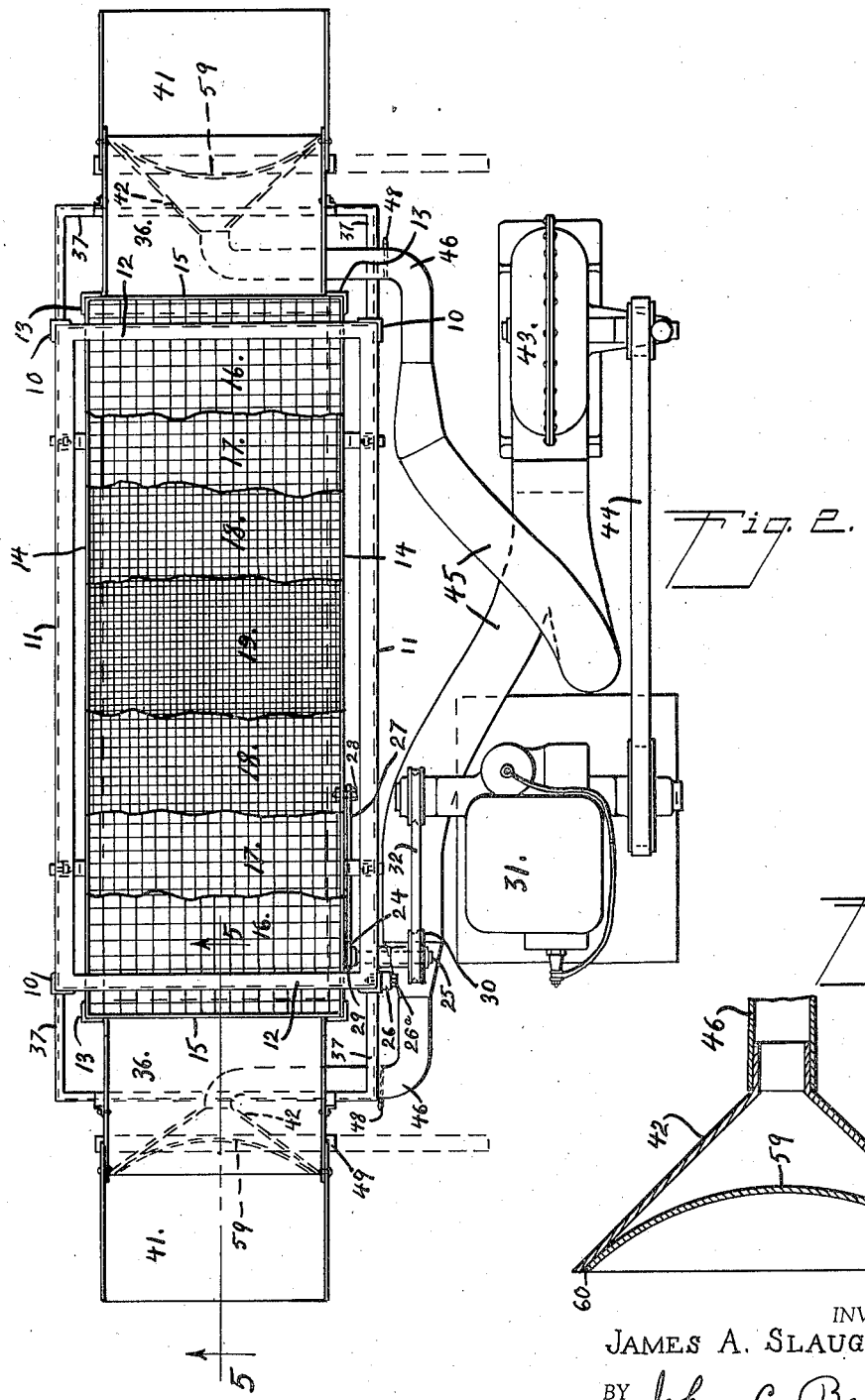


Fig. 2.

Fig. 3.

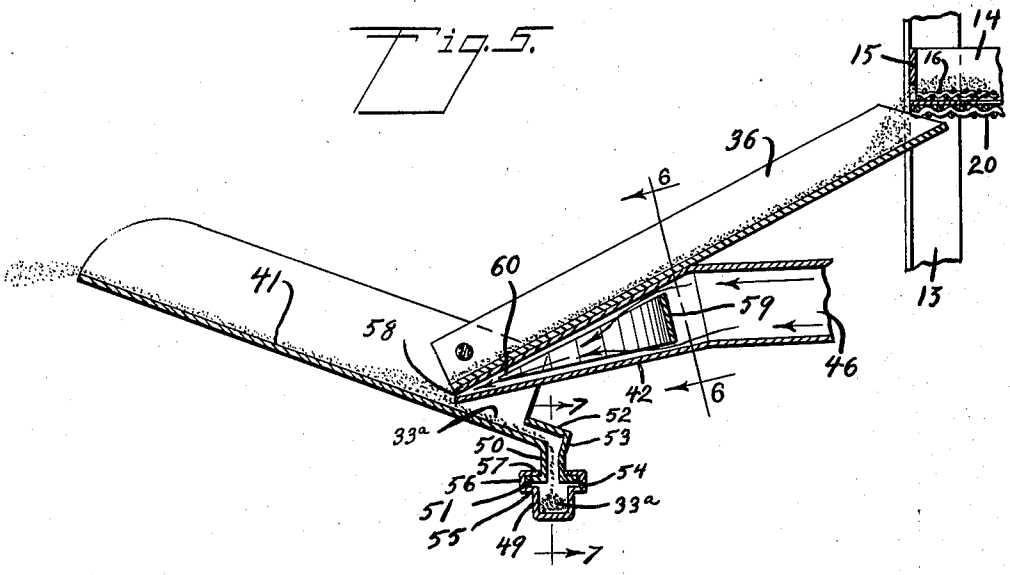
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Fig. 5.



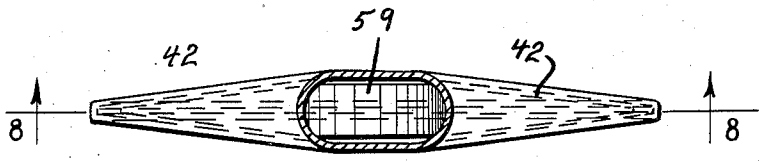


Fig. 6.

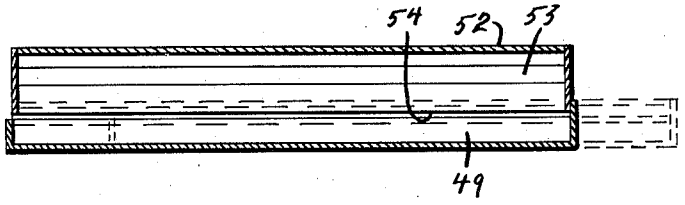


Fig. 7.

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Patented Sept. 6, 1938

2,129,629

UNITED STATES PATENT OFFICE

2,129,629

MINERAL SEPARATING MACHINE

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Application December 14, 1936, Serial No. 115,823

2 Claims. (Cl. 209—34)

This invention relates to mineral separating machines generally and particularly to machines for separating heavy minerals such as gold from sand, gravel and crushed rock.

In a great many localities the amount of gold in gold bearing sand and gravel is too small to justify working same. The cost of separating the gold in such localities is greater than the value of the gold thus secured. Also in many localities where there is sufficient gold in the sand to pay to separate same by means of some method employing water, no water is available.

It is therefore an important object of my invention to provide a mineral separating machine adapted to profitably work sand and gravel having a very small amount of gold mixed with it.

Another object of my invention is to provide a machine of this character wherein gold may be separated from such sand and gravel by means of air under pressure thus making the use of water unnecessary.

Another object of my invention is to provide a machine of this character wherein the mineral bearing sand and gravel is separated into definite classes of limited size before subjecting same to the current of air under pressure.

Another object of my invention is to provide a machine of this character wherein advantage may be taken of the difference in the specific gravity or weight of such minerals as gold and the sand and gravel with which it may be found; air under pressure being used to blow the lighter material away and allow the heavier material such as the gold, to drop or move against the current of air into a suitable receptacle.

Another object is to provide a machine of this character of very low operating cost.

Still another object of the invention is the provision of a machine of this character that is of simple and durable construction which may be manufactured relatively inexpensively.

Numerous other objects and advantages of this invention will be apparent as it is better understood from the following detailed description taken in connection with the accompanying drawings wherein:

Figure 1 is an elevational view of the entire machine showing gold bearing granular material passing therethrough.

Figure 2 is a horizontal section through the machine taken on line 2—2 of Figure 1 in which portions of the respective separating or classifying screens are broken away to show the graduations of the mesh thereof for classifying the material passing through the machine according to size.

Figure 3 is an enlarged partial plan of one of the screens with a portion of the separating screen broken away to show the supporting screen of larger mesh.

Figure 4 is an enlarged vertical section through one of the screens mounted in its frame and resting on its supporting screen taken on line 4—4 of Figure 1.

Figure 5 is an enlarged vertical section through one of the sets of chutes taken on line 5—5 of Figure 2.

Figure 6 is an enlarged cross-section of the air nozzle taken on line 6—6 of Figure 5.

Figure 7 is an enlarged vertical, longitudinal section of the gold receiving receptacle taken on line 7—7 of Figure 5.

Figure 8 is an enlarged horizontal section through the air nozzle taken on line 8—8 of Figure 6.

Referring more particularly to the drawings, which illustrate a preferred embodiment of my invention, the machine comprises a stationary frame of angle irons having upright corner pieces 10 secured at the lower ends to a suitable base. Adjacent the upper ends of said corner pieces 10 are longitudinal and transverse braces 11 and 12 respectively. Within the stationary frame is an oscillatable frame of angle irons comprising vertical corner pieces 13 to which are secured screen frames having longitudinal pieces 14 and transverse pieces 15, said frames being inclined downwardly and serve as braces for the oscillatable frame. Each screen frame has a screen, numbered respectively 16, 17, 18, and 19, the screens being spaced vertically apart and secured in their respective frames by welding or other suitable means. Each screen is supported by a supporting screen 20 of heavy material having a very large mesh, said supporting screens being beneath the supported screen and being welded or otherwise secured to the respective frames.

Screens 16 and 17 are inclined downwardly in one direction and the screens 18 and 19 are inclined downwardly in the opposite direction. The screen 16 has the largest mesh of the separating screens, and the screens 17, 18 and 19 have progressively smaller mesh. Each of the screens 17 to 19 inclusive have a smaller mesh than the screen immediately above it.

The oscillatable frame is suspended in the stationary frame by four oscillatable arms 21, said arms being swingably mounted at their upper ends to the longitudinal members 11 by bolts 22

and at their lower ends to the pieces 14 of the screen 17 by bolts 23.

Means for oscillating the oscillatable frame comprises an eccentric 24 on a drive shaft 25 journaled in a bracket 26 secured to one of the uprights 10 by bolts 26a. A link 27 is operably secured to longitudinal member 14 of screen frame 19 by a bolt 28 and is provided at its opposite end with a band 29 operably received on the eccentric 24. A pulley 30 is secured to the outer end of shaft 25 and is operably connected with a gasoline engine 31 by a belt 32. When shaft 25 is rotated by the gasoline engine the oscillatable frame is rapidly oscillated by the eccentric working through the link 27.

Gold bearing sand or crushed rock 33 is placed in a hopper 34 secured to the upper ends of the corner pieces 10 of the stationary frame by bolts 35. The largest pieces or particles of said sand or crushed rock being somewhat larger than the mesh of screen 16 will remain on said screen upon oscillation of the oscillatable frame. The smaller particles pass through the mesh of screen 16 and drop onto screen 17 which also retains a portion of this dropped material as its mesh is smaller than that of screen 16. Some of the material is also smaller than the mesh of screen 17 and drops therethrough onto screen 18 which retains a portion thereof and drops the remainder onto screen 19 which retains all but the very fine material which drops down and may be collected in a suitable pan not shown.

It is found that substantially all the gold in material of the type passed through the machine will be retained on the screens and that little will be left in the very fine powder like material that finally passes through the lower screen 19.

As the oscillatable frame is oscillated the material retained on the respective screens is shaken to the lower ends thereof and passes into receiving chutes 36, said chutes being secured to the stationary frame by brackets 37, bolts 38 securing the brackets to the uprights 10 and bolts 39 securing the chutes to said brackets. Upwardly extending portions 40 of the brackets hold the respective receiving chutes in vertically spaced relation to each other and add rigidity thereto.

The receiving chutes 36 are outwardly and downwardly inclined and at the lower or free ends thereof each chute 36 is provided with an outwardly and upwardly inclined discharge chute 41, the free ends of chutes 36 being spaced upwardly of the bottom of the chutes 41 to permit air under pressure to be forced through material from the respective screens as it drops from the free ends of chutes 36 into discharge chutes 41 in the form of a curtain.

Air is directed through the curtain of granular material dropped from the chutes 36 by nozzles 42, said nozzles extending the entire width of chutes 36 and being secured to the under sides thereof by solder or welding. The width of the air current discharged by the nozzles is very narrow relative to the length thereof, said air being supplied to the nozzles by a blower 43 through suitable conduits. The blower 43 is driven by engine 31 through a belt 44.

The air is carried from the blower 43 by large conduits or pipes 45 and branch conduits 46 which are connected with the respective nozzles. Dampers 47 are provided in the branch conduits 46 and have knobs 48 extending outwardly of said conduits for adjusting same to control the pressure of the air passing therethrough.

It should be borne in mind that the material deposited in the receiving chutes by the respective screens varies in size and consequently in weight so that it is necessary to adjust the pressure of the air discharged by the respective nozzles in accordance with the size and weight of the material to be separated. Each receiving chute carries a certain definite class of material, graded according to size, and the air pressure used to separate the lighter particles from the heavier particles must be such that proper separation will occur.

As the air passes through the curtain of granular material dropping from the lower end of a receiving chute the lighter particles are blown upwardly in the discharge chute 41 and off the end thereof. The gold 33a, which is much heavier than the particles of sand or crushed rock, (the specific gravity of gold being much greater than that of the sand or crushed rock), drops to the bottom of the discharge chute against the current of air from the nozzle and is collected in a trough or receptacle 49 at the lower end of the discharge chute.

Figure 5 shows in enlarged cross-section the construction of a receiving chute and a discharge chute and the means for attaching the trough 49 to the discharge chute 41. The lower end of the bottom of the discharge chute is turned down at 50 and is provided at its lower end with an outwardly extending horizontal flange 51, said flange extending the entire width of the discharge chute. A piece 52 is provided in spaced parallel relation to the bottom of the discharge chute and is secured to said chute. The piece 52 is turned down at 53 and has a flange 54 at its lower end in substantially the same plane as flange 51, said flange 54 extending outwardly in the opposite direction as that of flange 51.

The trough 49 is closed at the ends and is provided with outwardly extending portions 55 adjacent the open top, said portions 55 being turned upwardly at 56 and inwardly at 57 to provide channels in which are slidably received the flanges 51 and 54. The troughs may therefore be slidably removed to permit emptying thereof.

To provide uniform pressure at the air discharge opening 58 of each nozzle 42 an arcuate baffle 59 is secured within the nozzle. The baffle is preferably secured adjacent the ends 60 although additional points of support may be provided intermediately the ends. The baffle is spaced from the inside surfaces of the nozzle to permit air to pass around and about same as indicated by arrows 61 and serves to equalize the pressure of the air at the discharge opening 58. Spot welding or soldering may be used to fasten the baffle to the inner surfaces of the nozzle although any other suitable means may be employed.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

Having thus described my invention what I claim is:

1. In a mineral separating machine, a stationary frame, an oscillatable frame operatively associated with the stationary frame, a plurality of vertically spaced downwardly inclined screens secured to the oscillatable frame, each of said

screens being of different sized mesh, the upper screen having the largest mesh and each successive lower screen having a smaller mesh than the one immediately above it, means for supporting each screen in substantially a single plane, a receiving chute for each screen adjacent the lower end thereof adapted to receive material from the surface of its respective screen, said chutes being downwardly and outwardly inclined, an outwardly and upwardly inclined discharge chute secured to each receiving chute adjacent the lower end of the latter, the free end of the receiving chute being spaced upwardly of the bottom of the discharge chute, a trough at the lower end of the discharge chute extending the entire width of said chute, said trough being removable from the chute, a nozzle for each receiving chute and secured in operative association therewith, said nozzle being adapted to direct a current of air between the free end of the receiving chute and the bottom of the discharge chute, means for supplying air under pressure to each nozzle, means for individually regulating the pressure of the air supplied to each nozzle, and means for rapidly oscillating the oscillatable frame.

2. In a mineral separating machine, a stationary frame, an oscillatable frame operatively associated with the stationary frame, a plurality of vertically spaced downwardly inclined screens secured in the oscillatable frame, each of said screens being of different sized mesh, the upper screen having the largest mesh with each succeeding screen having a smaller mesh than the one immediately above it, a receiving chute for each screen adjacent the lower end thereof adapted to receive material from the surface of its respective screen, said chutes being downwardly and outwardly inclined, an upwardly and outwardly inclined discharge chute secured adjacent the lower free end of each receiving chute, the free end of the receiving chute being spaced upwardly of the bottom of the discharge chute, a mineral receptacle at the lower end of the discharge chute, a nozzle for each receiving chute in operative association therewith and adapted to direct a current of fluid between the free end of the receiving chute and the bottom of the discharge chute, means for supplying fluid under pressure to each nozzle, means for regulating the pressure of the fluid supplied to each nozzle, and means for oscillating the oscillatable frame.

JAMES A. SLAUGHTER.