Nov. 26, 1935. B. A. TOOTHAKER ET AL 2,022,303

PLACER MINING MACHINE

Filed Sept. 14, 1933 2 Sheets-Sheet 1

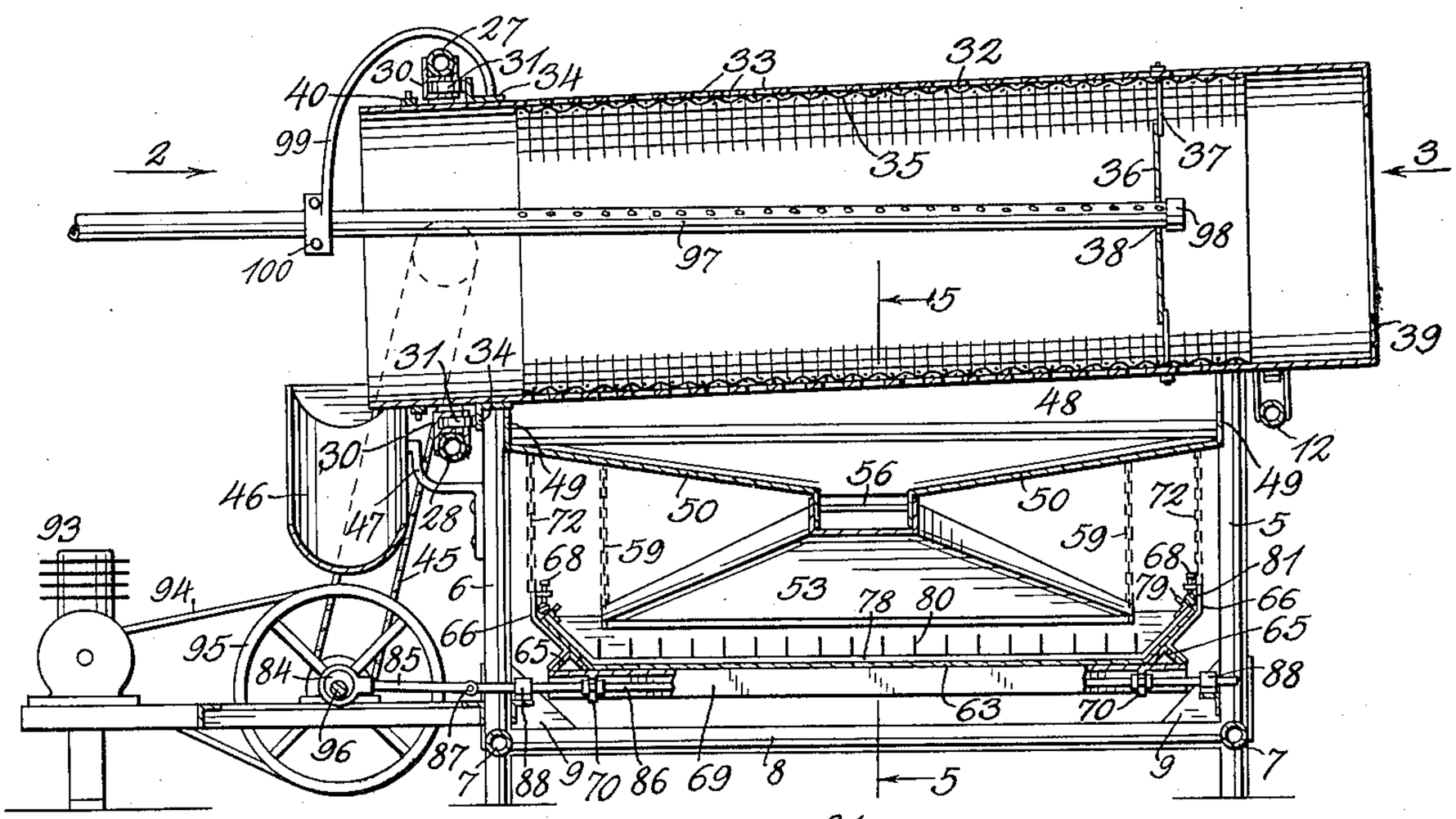

Fig. 1.

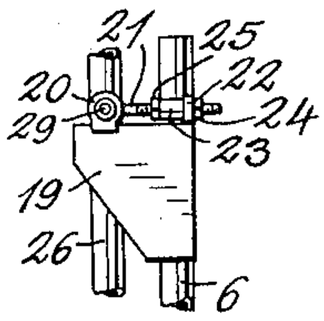

Fig. 4.

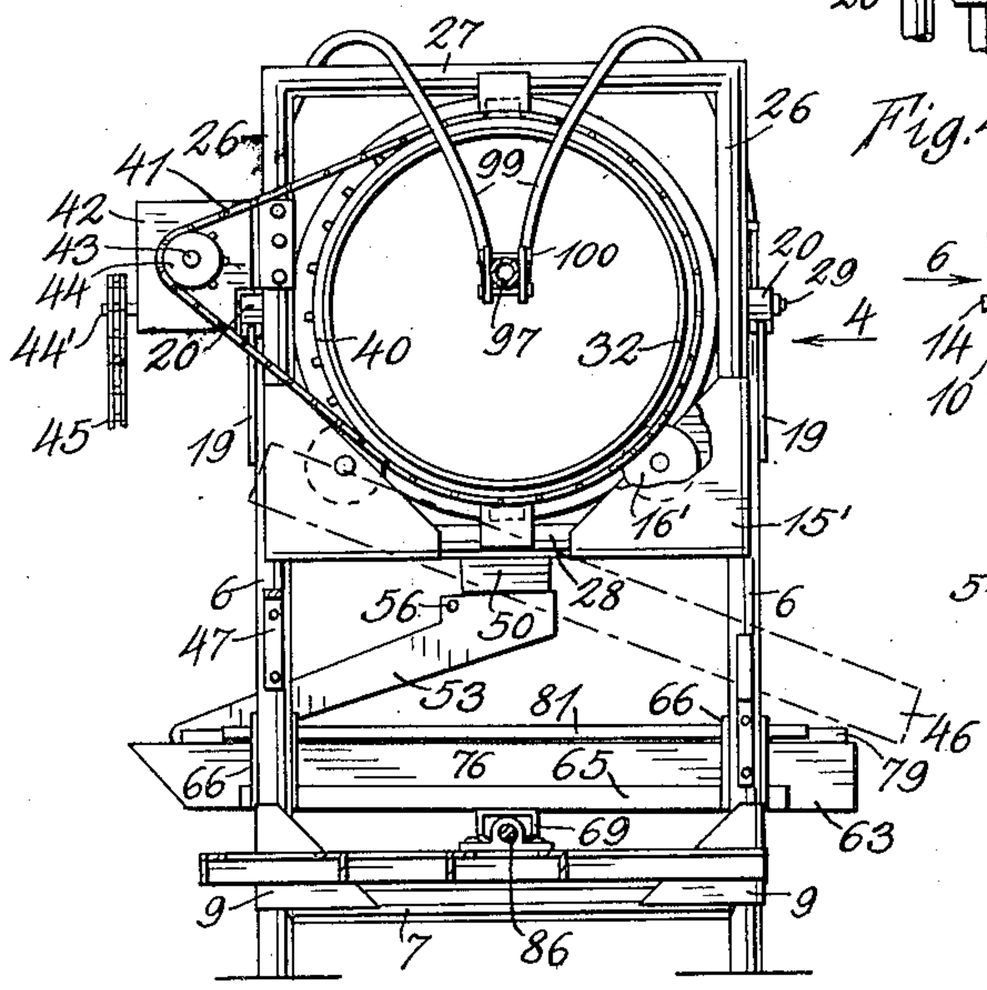

Fig. 2.

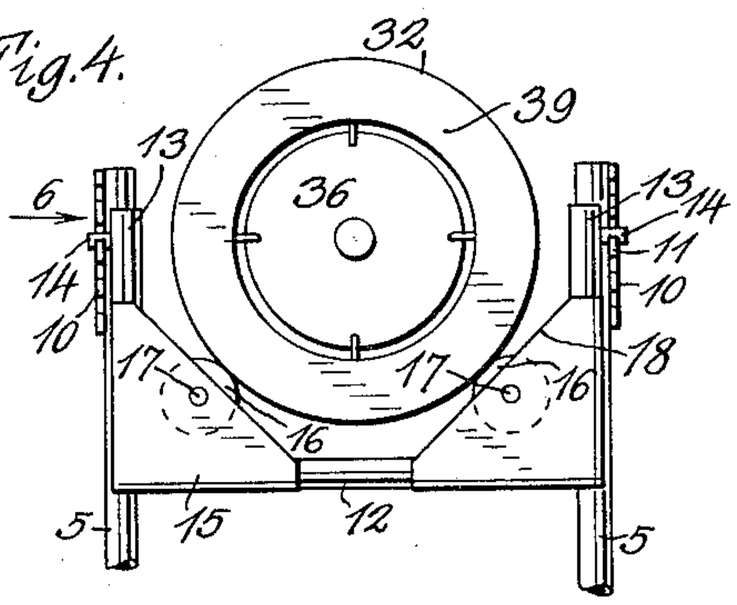

Fig. 3.

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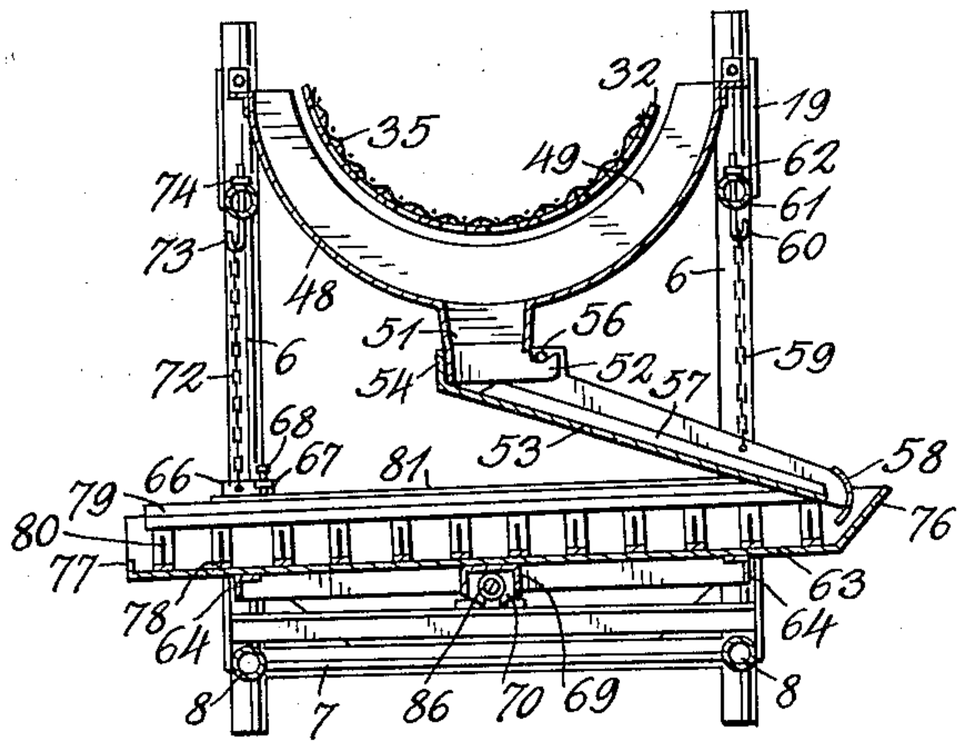

Fig.5.

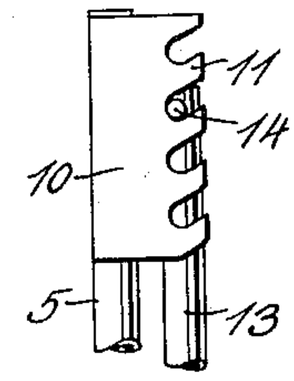

Fig.6.

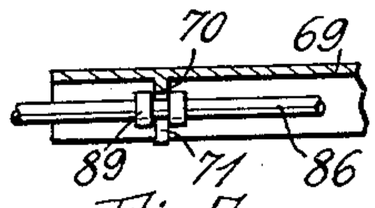

Fig.7.

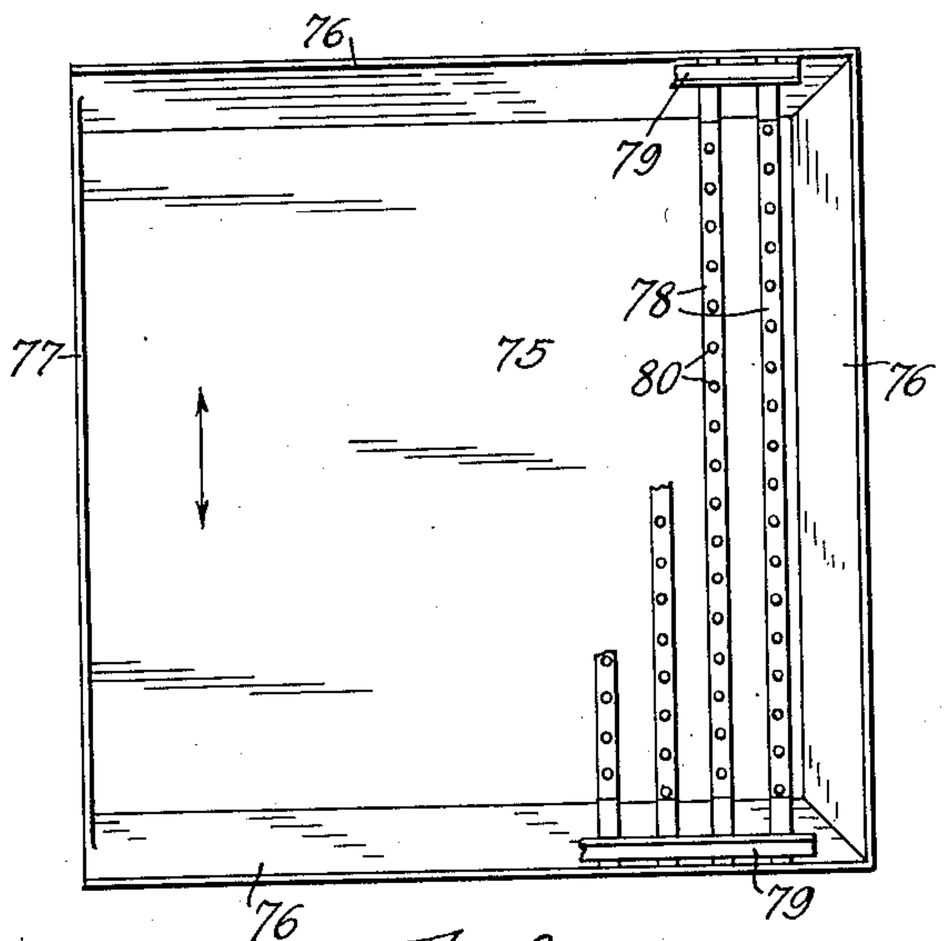

Fig.8.

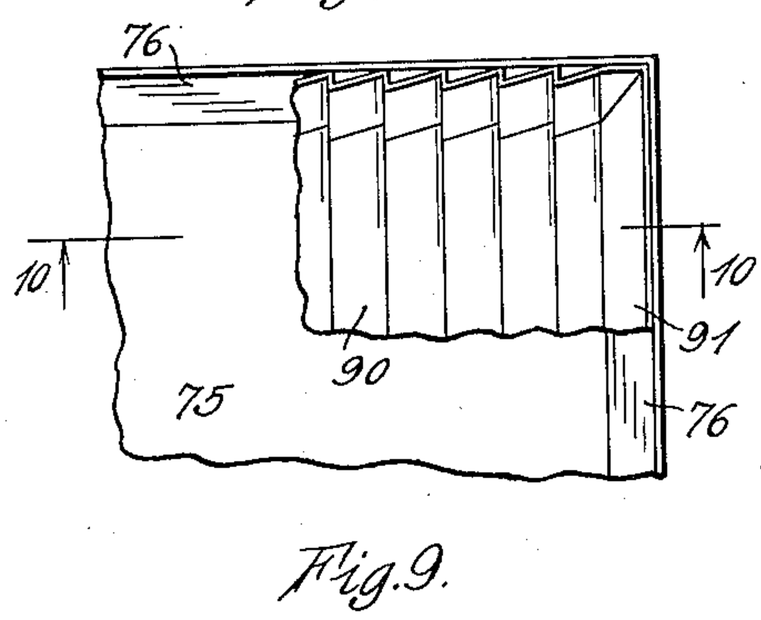

Fig.9.

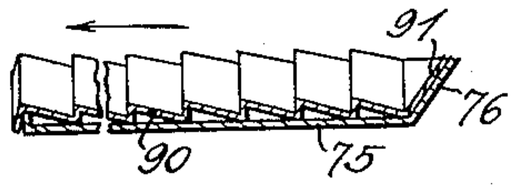

Fig.10.

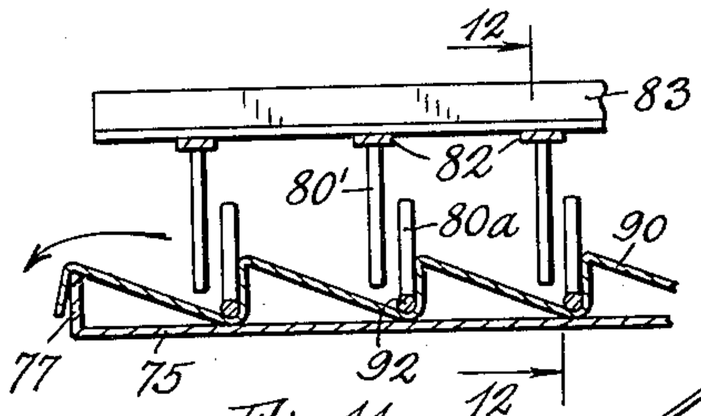

Fig.11.

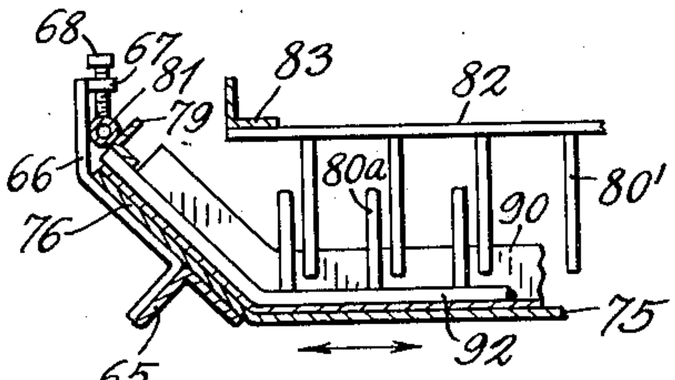

Fig.12.

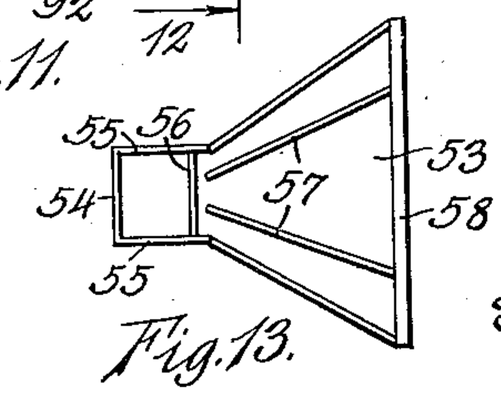

Fig.13.

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2,022,303

PLACER MINING MACHINE

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Application September 14, 1933, Serial No. 689,407

3 Claims. (Cl. 209—485)

This invention relates to improvements in placer mining machines and has reference more particularly to an improved construction of riffle box and to the mounting of the screen.

It is well known that gold occurs in considerable quantity in different parts of the country mixed with sand, gravel or clay, and in order to separate such gold from the gangue with which it is mixed, special type of machinery must be utilized.

Where small operations only are to be carried out, such placer deposits can be treated by means of the ordinary miner's pan or by any one of a large number of different types of machine designed for this purpose.

It is an object of our invention to produce a machine simple and substantial in construction that can be made at a comparatively small cost, and which can be easily taken apart so as to facilitate transportation from one place to another.

Another object of this invention is to provide a machine of the type referred to in which a cylindrical screen is provided that is mounted for rotation about its own axis and which is so mounted on the supporting frame that its inclination with respect to a horizontal plane can be readily adjusted for the purpose of controlling the rate at which material flows through the same.

Another object of this invention is to produce a riffle box having means associated therewith for stirring and agitating the screenings for the purpose of preventing caking and facilitating separation.

The above and other objects that may become apparent as the description proceeds are attained by means of a construction and an arrangement of parts that will now be described in detail and for this purpose reference will be had to the accompanying drawings in which the preferred embodiment of the invention has been illustrated, and in which:

Fig. 1 is a longitudinal vertical section through the machine that forms the subject of this invention;

Fig. 2 is an end view looking in the direction of arrow 2, Fig. 1;

Fig. 3 is an end view of the rotating screen and the frame that supports one end thereof, this view being taken looking in the direction of arrow 3 in Fig. 1;

Fig. 4 is a fragmentary view looking in the direction of arrow 4, Fig. 2 and shows an adjustable bearing support;

Fig. 5 is a section taken on line 5—5, Fig. 1;

Fig. 6 is a view looking in the direction of arrow 6 in Fig. 3;

Fig. 7 is a fragmentary section showing the connection between the reciprocating rod and the riffle pan frame and shows the same to a somewhat enlarged scale;

Fig. 8 is a top plan view of a riffle pan showing a removable frame in place therein;

Fig. 9 is a fragmentary view showing a portion of a riffle pan provided with parallel riffles, located in the smooth riffle pan shown in Fig. 8;

Fig. 10 is a section taken on line 10—10, Fig. 9;

Fig. 11 is a section similar to that shown in Fig. 10, but on a larger scale and showing the agitating fingers that are associated with the pan for the purpose of agitating the material and preventing caking;

Fig. 12 is a section looking in the direction of arrows 12, Fig. 11; and

Fig. 13 is a top plan view of the spout or launder employed for conveying the screenings for the hopper underneath the screen to one side of the riffle pan.

The machine which forms the subject of this invention comprises a framework having four corner posts that have been designated by reference numerals 5 and 6. The two posts designated by reference numeral 6 are located at one end of the frame, while the two designated by reference numeral 5 are located at the opposite end. The two posts of each pair are connected by means of transverse frame member 7 and the two pair are connected by longitudinal frame members 8. Gusset plates 9 are provided at the corners for the purpose of giving rigidity to the framework. The two end posts 5 are provided near their upper ends with plates 10 like those shown more particularly in Fig. 6. These plates are welded to the posts and are each provided with a number of teeth 11. The plates 10 form supports for a supporting frame having a transverse frame member 12, and parallel vertical frame members 13. Each of the members 13 are provided with outwardly extending trunnions 14 that engage in the notches 11 as shown in Figs. 3 and 6. The height of the frame comprising the members 12 and 13 can be adjusted by positioning the trunnions 14 in the notch that gives the desired elevation. Gussett plates 15 are connected at each corner between the frame members 12 and 13 and mounted for rotation between each pair of gusset plates is a roller 16 whose pivot has been designated by reference numeral 17. The outer surface of each roller projects be-

yond the inclined edge 18 of the gusset plates and serves as a support for the rotary screen which will presently be described. The frame members 6 at the other end of the framework are provided near their tops with plates 19 like those shown most clearly in Fig. 4. The upper edges of plates 19 are straight and serve as supports for a bearing 20. This bearing has secured to it a bolt 21 that extends through an opening in a lug 22, which is welded to the corner post 6. A ferrule 23 is secured to the bolt between the bearings and the lug 22 and nuts 24 and 25 serve to adjust the position of the bolt with respect to the lug and to lock it in adjusted position. Supported on the upper horizontal edges of the plates 19 and pivotally connected to the bearings 20 is a frame comprising vertical side members 26, a horizontal top member 27 and a base 28. Gusset plates 15' which correspond to the gusset plates 15 shown in Fig. 3, extend between the lower ends of bars 26 and the transverse bar 28 and serve to give rigidity to the rectangular frame. Pivoted between the gusset plates are rollers 16'. The frame members 26 are each provided with a trunnion 29 that extends through the bearing 20 so that it may be rotated about the axis of the trunnions. Secured to the lower surface of the transverse member 27 and to the upper surface of the transverse member 28, is a housing which has been designated by reference numeral 30. Each of these housings has a roller 31 that is pivoted so as to rotate about an axis that lies in the plane of the frame and parallel with the side members 26. A cylindrical screen comprising a plate 32 that is bent into cylindrical form and provided with a plurality of openings or foraminations 33 is supported by the two sets of rollers 16 and 16'. The screen is provided near its discharge end with an angle iron 34 whose outwardly extending flange projects beyond the rollers 31 and serves as an abutment to hold the screen from longitudinal movement. The inside of the screen is lined with a wire mesh screen 35 that is preferably provided with four meshes to the inch. A plate 36 is located within the screen and held in position therein by means of bolts 37. The plate 36 has a central opening 38 whose function will appear as the description proceeds. The intake end of the screen is provided with an inwardly extending flange 39, the opening in which forms the intake through which material is fed to the screen. The lower end of the screen is provided with a number of outwardly projecting lugs 40 that cooperate with a sprocket chain 41. Attached to the vertical frame member 26 on the left side as shown in Fig. 2, is a gear housing 42. Located within this housing and attached to the shaft 43 is a worm gear which is driven by means of a worm on the shaft 44. The worm and the worm gear have not been illustrated because this is an old and well known speed reduction mechanism and no novelty is claimed for it in this application. The shaft 44 is so positioned that it is axially aligned with the trunnions 29 and therefore when the inclination of the screen is varied the housing 42 will tilt about the axis of the shaft 44 so as to prevent any change in the length of the sprocket chain 45. Whenever shaft 44 is rotated, this will rotate shaft 43 at a slower rate and this will in turn impart rotation to the screen in a manner quite apparent from Fig. 2. The screen is preferably so adjusted that it is higher at the intake end than at the discharge end, as shown in Fig. 1, and this inclination tends to facilitate the movement of material during operation. Supported underneath the discharge end of the screen is launder 46 that serves to receive the gangue and carry it away from the machine. This launder is supported at one end by means of a bracket 47. Located underneath the screen is a hopper 48 which is preferably semi-cylindrical in shape as shown in Fig. 5. The ends of this hopper are provided with inwardly extending flanges 49 and the bottom is downwardly inclined as shown by reference numerals 50 in Fig. 1. At the lowest point of the bottom, a spout or discharge opening 51 is provided. This spout is open at the bottom and is provided with lugs 52 extending outwardly from one side thereof, which lugs serve as a support for one end of the launder 53. Launder 53 is shown in top plan view in Fig. 13 from which it will be seen that it has a rectangular portion comprising the end wall 54 and side walls 55 which are positioned so as to receive the lower end of the spout 51. The bolt or rod 56 extends transversely and parallel with the end wall 54 and this rod engages in the notches in lugs 52, as shown in Fig. 5. The launder 54 is somewhat fan-shaped as shown in Fig. 13 and is provided with upwardly extending partitions 57 that tend to separate the water and screenings that come from the screen and distribute them uniformly over the bottom of the launder. At the end of the launder a curved plate 58 has been provided which serves as a stop for the material and also serves to reverse its direction of flow. The launder is supported by means of chains 59 whose upper ends are connected with bolts 60 adjustably attached to the side bars 61. By turning the nuts 62, the launder can be adjusted so as to equalize the thickness of the material from one side to the other.

Located beneath the discharge end of the launder 53 and in position to receive the pulp as it is discharged therefrom is a riffle pan 63. This pan is supported on a frame which comprises side members 64 that are preferably formed from angle irons. The ends of the frame members 64 are connected by means of angle irons 65 and these in turn are provided with upwardly extending brackets 66, whose upper ends are bent inwardly to form lugs 67 in which are threadedly connected the bolts 68 as shown in Fig. 12. Extending along the bottom of the frame is a channel-shaped member 69 that is provided near each end with a transverse partition 70 having a notch 71 in its under edge. The frame is supported by means of chains 72 whose upper ends are attached to the lower ends of bolts 73 in the manner shown in Fig. 5. By means of the nuts 74 the height of the corners of the frame can be adjusted so as to get the inclination most desirable for the particular operation. Supported on the frame is a pan which will be referred to as the riffle pan. Two specific types of riffle pan have been shown. In Fig. 8 a riffle pan has been illustrated which has a smooth bottom 75 and upwardly and outwardly inclined walls 76 along three sides. The fourth side is provided with an upwardly extending flange 77 that projects upwardly only for a distance of about one inch. In one form and for certain operations, the pan shown in Fig. 8 has attached to it a frame comprising a number of flat bars 78 whose ends are attached to the cross bars 79 as shown in Fig. 8. These bars are provided with upwardly extending fingers 80 and when the frame is in place, the bars 78 lie in close contact with the bottom surface of the pan so as to form riffles in which the

values are caught during operation. In order to secure the frame in the pan, a pipe 81 is provided at each end and located as shown in Fig. 12 and the screws 68 are then turned down into contact with this pipe so as to clamp the pan and the frame in place. For certain operations it is desirable to have another set of fingers 80' that are fastened to a stationary frame and extend downwardly to a point near the bottom of the pan in the manner shown in Fig. 12. This frame consists of a number of parallel bars 82 whose ends are connected to angle irons 83 and these in turn are secured to the supporting framework by any suitable means. When the pan is reciprocated by means of the eccentric 84 and the connecting rod 95, the fingers 80 will move past the fingers 80' and in this way any clay will be kept agitated so as to prevent caking and the separation of the gold or other heavy minerals will be facilitated. In Fig. 1 a rod 86 has been shown as pivotally connected with the connecting rod 85 at 87. This rod is slidably mounted in bearings 88 and therefore whenever the eccentric 84 is rotated, it will reciprocate this rod. The rod 86 is provided with spaced collars 89 which are so located that they will receive between them the partitions 70 and therefore whenever the rod 86 is reciprocated, it will impart a corresponding reciprocation to the channel 69 and to the frame and riffle pan that is attached to the frame. After the machine has been operated for some time it is stopped and the riffle pan is removed and its contents deposited in a suitable receptacle. For the final clean-up, a riffle pan whose bottom is provided with parallel corrugations like those designated by reference numeral 90 in Figs. 9, 10 and 11 is placed in the pan having the smooth bottom and the concentrate from the pan shown in Fig. 8 is placed in the corrugated riffle pan near the upturned edge 91 thereof. A suitable amount of water is now provided and the riffle pan reciprocated in the direction of its length, thereby producing a further separation and concentration. To facilitate the operation, the operator can scrape the concentrate along the pan from one riffle to another with the result that the final concentrates will usually be deposited in the last riffle adjacent the discharge end or in two or three riffles adjacent the discharge end.

In some cases it is preferable to carry on the operations from the very beginning by means of the corrugated riffle pan and when this is to be done, the riffle pan is provided with a frame having transverse bars 92 that correspond to the bars 78 in Fig. 8. Extending upwardly from the bars 92 are fingers 80*a* which will therefore move with the same motion, imparted to the pan. Located above the pan is a frame comprising the frame members 82 and 83, together with the fingers 80'. The fingers 80' and 80*a* serve to keep the material agitated so as to prevent it from caking and so as to facilitate separation.

When the machine is in operation it can be driven by means of an internal combustion engine 93 whose power is transmitted by means of a belt 94 to a grooved pulley 95 secured to the eccentric shaft 96. This shaft is provided with a sprocket wheel that cooperates with the sprocket chain 45 for the purpose of rotating the screen. Material is fed into the opening in flange 39 and as the screen is rotated, the material will gradually travel downwardly towards the discharge end due to the inclination of the screen. Water is conducted to the interior of the screen by means of a pipe 97, whose inner end extends through the opening 38 in plate 36 and is capped as designated by reference numeral 98. The pipe is provided with openings along its lower surface and therefore when water under pressure is supplied to this pipe, this water will be discharged into the screen along the entire length thereof. At the discharge end of the screen the pipe is supported by means of two curved supports 99, one end of each of which terminates adjacent the pipe 97 and is held to this pipe by means of bolts 100. The other ends of the supports 99 extend into the open ends of the corner posts 6 and the pipe 97 is therefore held in a certain position and in such a way as not to interfere with the adjusting of the inclination of the screen. Because the shaft 43 is rotated in bearings carried by the housing 42 and provided with a sprocket 44 the distance from the center of the sprocket to the center of the screen will not vary when the inclination of the screen is adjusted and therefore the chain 41 will always be of the necessary length.

The size of the parts can be made as large or as small as desired and it is even possible to provide one large screen for a number of riffle pans so that the screening operation does not have to be stopped whenever the riffle pan is cleaned and this will increase the capacity.

Special attention is directed to the construction of the riffle pan and to the agitating means provided which means has been shown quite clearly in Figs. 8, 11 and 12. It will be seen from the drawings that fingers 80 and 80*a* extend upwardly from the riffle pan and are moved with the latter and these fingers alone produce a considerable agitating action due to the inertia of the water and its contents. When greater agitation is necessary, the frame comprising members 82 and 83' located above the riffle pan and the downwardly extending fingers carried by this frame produce a still greater agitation which prevents clay from settling and caking and thereby makes continuous operation possible.

The reason why the agitating pin frame is fastened to the riffle pan is to hold the pins stationary with respect thereto. It has been found that where the agitator pins are held stationary with respect to the supporting frame and are therefore movable with respect to the riffle pan, the pulp or other materials in the pan will be held stationary while the pan slides back and forth. When the pins move with the pan, the inertia tends to hold the contents stationary while the pins move and in this way eddies are set up about each pin and this produces an active agitation.

Attention is called to the fact that the material travels over the riffle pan in direction of the arrows in Figs. 10 and 11 as it has been found that the most satisfactory results are obtained in this way. When the material travels against the vertical sides of the riffles, whirls or eddies are set up that prevent the values from settling, but when the material travels in the direction indicated by the arrows, the pulp in the lowest portion of the riffles at the angle between the bottom and the vertical wall remains quiescent with the result that the heavy metals, such as gold, will settle into these places and a more efficient concentration is thereby effected.

Having described the invention what is claimed as new is:

1. A riffle pan and support therefor comprising, a pan supporting frame having its central portion substantially straight and its ends bent

upwardly, each end having an inwardly extending portion provided with openings for the reception of clamping screws, a riffle pan carried by the pan support, the pan having end walls that terminate adjacent the ends of the pan support, and an agitating pin assembly carried by the pan, the pan and pin assembly having portions positioned in the paths of the screws whereby the pan and the pin assembly can be clamped in position on the pan support.

2. A concentrating device comprising, in combination, a framework, a pan support carried by the framework, the pan support comprising a substantially straight center portion and upwardly extending ends, means for reciprocating the support, a pan on the pan support, the bottom of the pan being substantially flat, a plurality of riffle bars on the upper surface of the pan bottom, the riffle bars being substantially parallel and extending in the direction in which the pan support is reciprocated, an agitator pin assembly supported by the riffle pan, and means for clamping the pin assembly to the pan and the pan to the pan support, said last named means being readily releasable whereby the pan and pin assembly may be removed from the support and the pin assembly removed from the pan.

3. A riffle pan and support therefor comprising, a pan supporting frame having its central portion substantially straight and its ends bent upwardly, each end being provided with a clamping device, a riffle pan carried by the pan-support, the pan having end walls that terminate adjacent the end walls of the pan-support and an agitating pin assembly carried by the pan, the pan and the pin assembly having portions positioned to be engaged by the clamping devices whereby the pan and the pin assembly can be clamped in position on the pan-support.

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