

June 29, 1926.

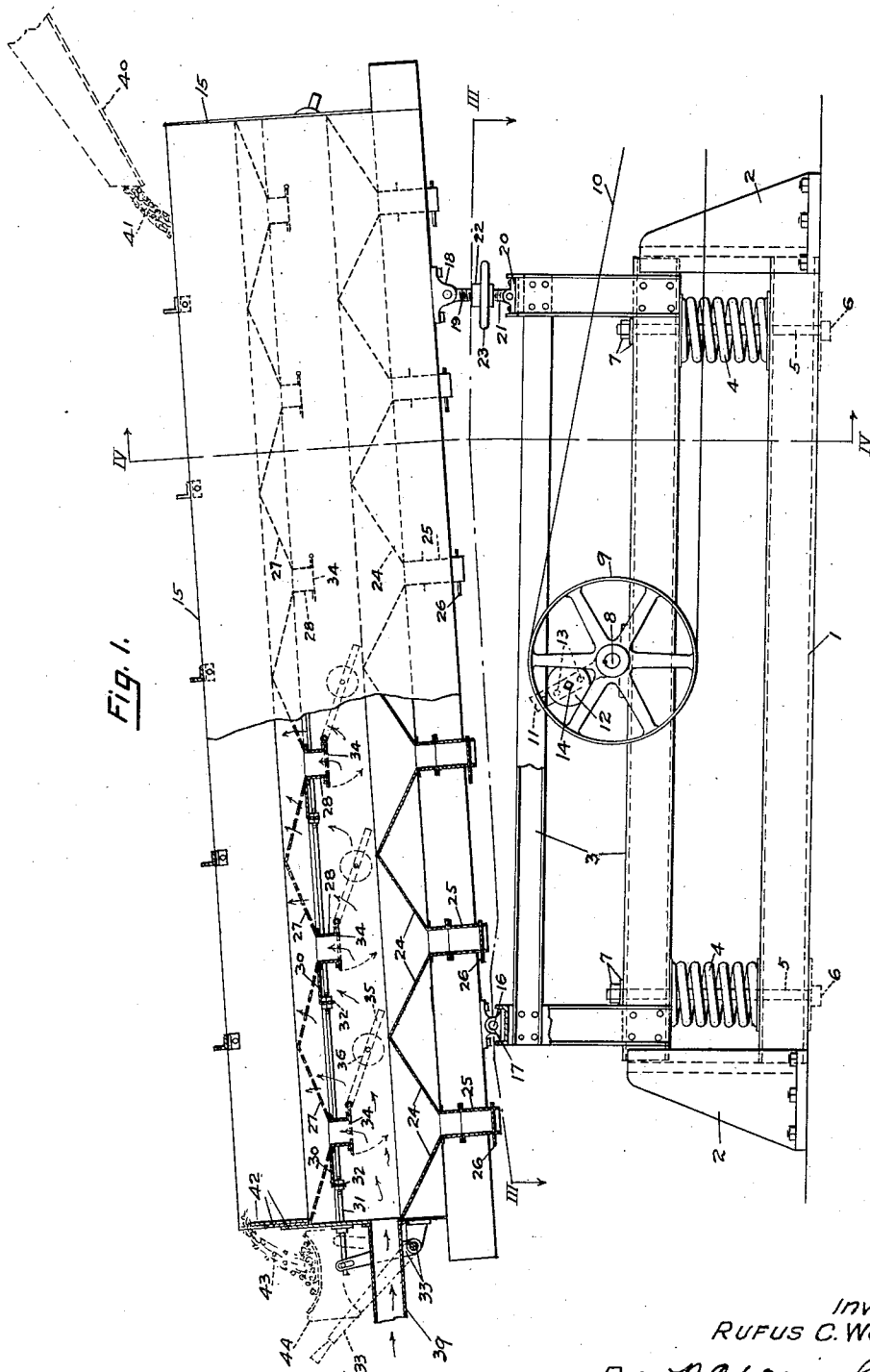
R. C. WOOD

1,590,339

DEVICE FOR SEPARATING METALS FROM DRY MATERIAL

Filed May 23, 1925

3 Sheets-Sheet 1



Inventor,
RUFUS C. WOOD.

By *McDonough,*
Attorney.

June 29, 1926.

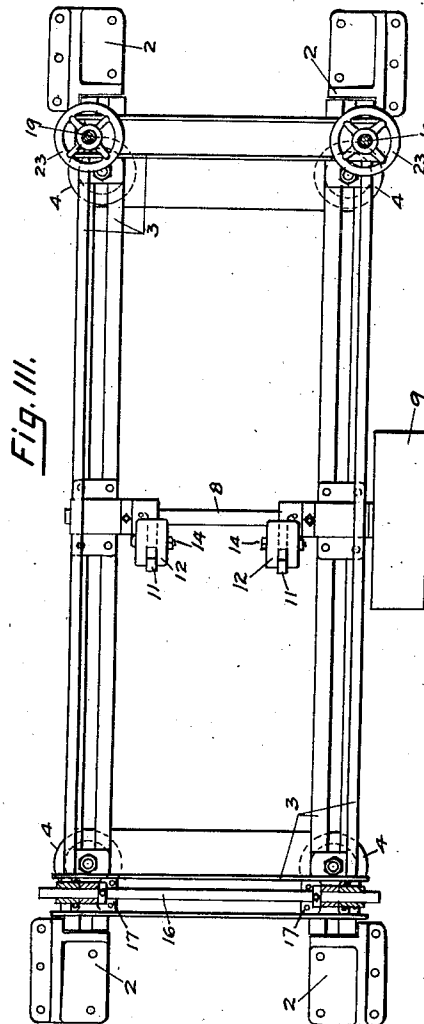
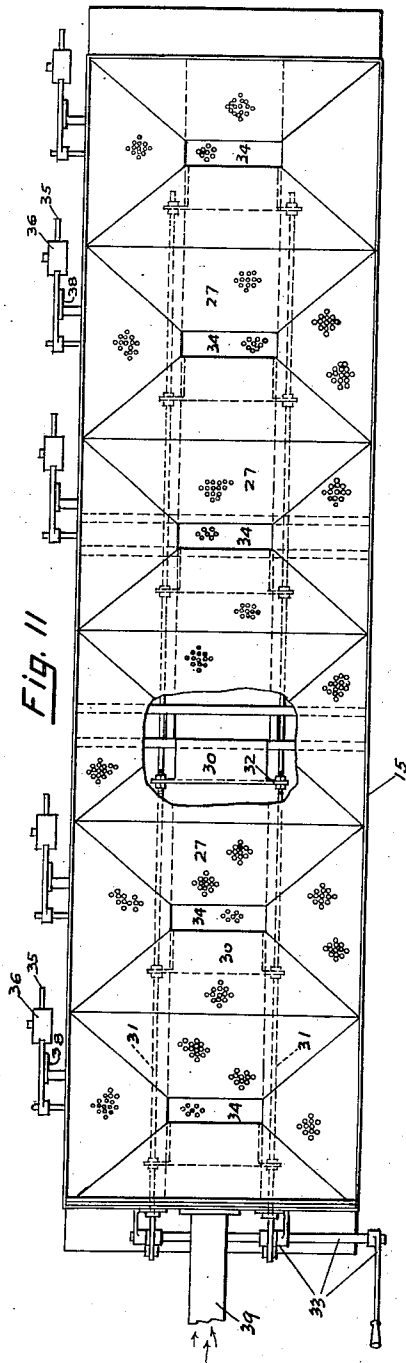
R. C. WOOD

1,590,339

DEVICE FOR SEPARATING METALS FROM DRY MATERIAL

Filed May 23, 1925

3 Sheets-Sheet 2



Inventor,
RUFUS C. WOOD.
By *R. C. Wright*
Attorney.

June 29, 1926.

1,590,339

R. C. WOOD

DEVICE FOR SEPARATING METALS FROM DRY MATERIAL

Filed May 23, 1925

3 Sheets-Sheet 3

Fig. IV.

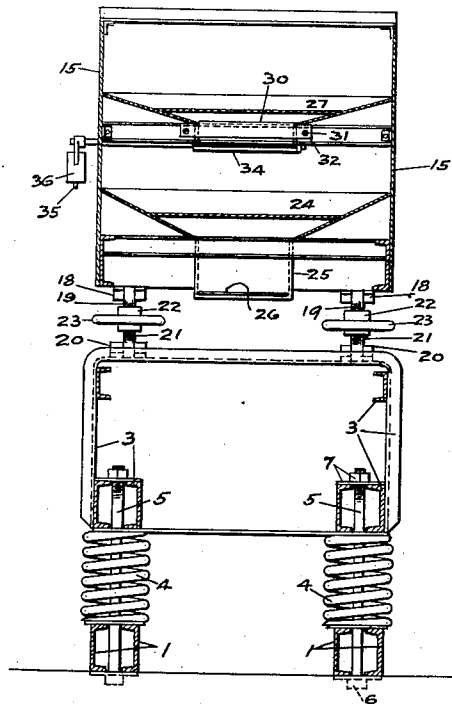
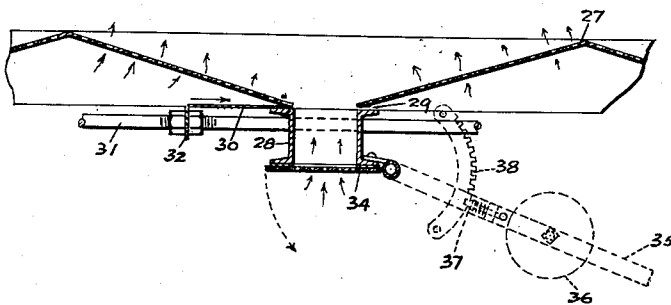


Fig. V.



Inventor:
RUFUS C. WOOD.
By *R. C. Wright.*
Attorney.

UNITED STATES PATENT OFFICE.

RUFUS C. WOOD, OF PORTLAND, OREGON.

DEVICE FOR SEPARATING METALS FROM DRY MATERIAL.

Application filed May 23, 1925. Serial No. 32,406.

My invention relates to devices for separating precious or valuable metals from quartz, sand, gravel, rock and other substances while in a dry state.

5 The object of my invention is to provide an apparatus of this kind wherein the valuable metals are separated from surrounding substances in a dry state by stratifying the material by gravity, while under a gentle
10 flowing movement, and collecting the metal product toward and into chutes from which such product may be released into suitable receptacles. The container has an inclined position and is given a vertical movement by
15 mechanism connected therewith. Mechanism is also provided to force blasts of air through the material body to remove dust and fine particles from the same while it is
20 being agitated. These objects, as well as other advantages, I attain by the construction, combination and arrangement of parts illustrated in the accompanying drawings which form a part hereof.

25 Fig. I is a side elevation of the apparatus in operative position, with parts of ore box in section.

Fig. II is a plan view of the rectangular ore receiving box.

30 Fig. III is a plan view of the box supporting frame, guides, and mechanism for imparting a vertical movement to the box, on the line III—III in Fig. I.

Fig. IV is a sectional view of the apparatus on the line IV—IV in Fig. I.

35 Fig. V is an enlarged sectional view of a collecting hopper, chute and covers, part of the operating mechanism being in dotted lines.

40 Like characters refer to like parts in all views.

A bed plate 1 is provided. At each end of the plate pairs of vertical guides 2 are rigidly secured. A rectangular frame 3 is slidably positioned in the guides. The frame
45 3 rests upon pairs of buffer coil springs 4 positioned near the opposing ends of the frame. Bolts 5 extend through the springs. The lower ends of the bolts are secured to the plate 1 by heads 6. The bolts also extend through the lower part of the frame 3
50 and have impact means 7 upon their upper ends. A shaft 8 is rotatably mounted centrally in the frame 3. Upon the shaft a pulley 9 is keyed. Power from a suitable
55 source is transmitted to the pulley by the

belt 10. Upon the shaft 8 arms 11 are radially secured in rigid position. Weights 12 are slidably mounted on the arms. The arms have a series of openings 13, the weights a central opening. A pin or bolt 14 extends
60 through the opening in the weights and an opposing opening in the arms to position the weights at a desired distance from the shaft. Above the frame 3 a rectangular ore receiving box 15 is positioned. Its forward
65 end is supported upon a rod 16 which extends through bearings 17 in the frame 3, positioned near the ends of the rod. The rear end of the box 15 has a pair of brackets 18 with dependent screws 19 pivoted near
70 their upper ends in the brackets. The frame 3 has a pair of brackets 20 with upright screws 21 pivoted near their lower ends in these brackets. The opposing screws in each bracket extend into a threaded sleeve 22
75 which has a hand wheel 23. The box is supported near its rear end upon the screw or jack mechanism just described, and by means of which the rear part of the box may be
80 raised or lowered to tilt it forwardly upon a desired incline. Along the lower interior of the box is arranged a series of hoppers 24 which converge to chutes 25 extending
85 therefrom through the bottom of the box, the chutes having slidable gates 26 near their lower ends to allow dumping of contents at desired times. At a convenient
90 height above the hoppers 24 a second series of hoppers 27 is arranged in the box. These hoppers are of a perforated material or wire fabric adapted to allow the passage of air through them. The hoppers 27 converge to
95 chutes 28, a small space 29 being left between the lower end of the hoppers and upper ends of the chutes to admit a slidable gate 30 to cover the lower end of the hoppers 27. Longitudinally through the box 15
100 a pair of slidable rods 31 are positioned alongside the chutes 28 and gates 30, the gates having angled arms 32 attached to the rods 31. Lever mechanism 33 is arranged before the front end of the box and connected with the rods 31 to allow the rods to be moved horizontally to open or close the
105 hopper gates 30 simultaneously. Hinged gates 34, or perforated material, are positioned on the lower ends of the chutes 28. A gate operating arm 35 is secured at one end to each gate. The arm has a weight 36 arranged thereon to retain the arm in low-
110

ered position. The arm also has a dog 37 arranged to engage a quadrant ratchet 38, positioned alongside the arm, to retain the arm at a desired elevation and the gate 34 at a desired open position. A tube 39 extends from a source of compressed air supply to the forward end of the box 15 and opens into the box between the hoppers 24 and 27, to allow air under pressure to be forced below the hoppers 27, through the same, the gates 30 and material contained in said hoppers. The course of the air currents upwardly is indicated by appropriately positioned arrows. A chute 40 extends from a convenient apparatus for screening out coarse material, to a position above the rear hopper 27, and the material thus prepared to a convenient fineness is shown discharging at 41 from the chute 40 into the hopper 27. At the forward end of the box a spillway 42, of three gates, is arranged to allow tailings 43 to pass over them into a chute 44 and to descend through the same to a convenient dump of tailing waste. The gates are arranged to allow the spillway to be set at a proper height to control the depth of material in its passage through the box.

The operation will now be described. It is intended that all gathered material shall be screened first, of all large and coarse substances. When it is of a desired consistency for treatment it is discharged through the chute 40 into the rearmost hopper 27. The box 15 has been tilted to an incline which will allow the falling material to pass forward, filling the hoppers 27 in its progress. While the material is thus passing, the wheel 9 is operated. This causes the radially placed weight 12, on its downward course to impart a centrifugal lever movement to the frame 3, forcing the buffer springs 4 downward and lowering the box 15 a short distance vertically. As the weight ascends, its pressure is released and the springs elevate the frame and box to prior raised position. The frame is prevented from rising any higher by the impact means 7 on the ends of the bolts 5. The mechanism just described imparts a vibrating movement to the material in the box, causing its heavier, metallic content to descend into the lowest stratum and into the chutes 27. The material of lighter nature is collected above in strata of different weights and all of this is shifted downwardly by the vibration toward the lower end of the box until it passes over the spillway as tailings. While the mechanism is causing this vibratory movement, air under pressure, is forced through the hoppers 27 and gates 34. This blast of air tends to blow all dust and fine particles of waste out of the material body and upwardly out of the box 15. The vibration and air blasting agitate and aid the material in the box to flow by gravity on its course toward

the lower end. The air blast removes particles which will not stratify, and prevents packing of the material. It also tends to produce a gentle gravity flow of the material over the upper hoppers. The air blast and vibration cause this gravity flow of the dry material and obviates the necessity of a longitudinal movement of any kind in the box to force a flow of same. The incline tilt of the box is set to control the time of flow of material in relation to its vibration and air cleaning. In practice the apparatus will be adapted for different kinds of metals to be extracted from dry sand, gravel, etc. In doing this the preliminary coarse screening will be used to classify the material to be operated upon by selectively of fineness for each apparatus through which it is to pass. It is intended that any metals of value, precious or otherwise may be separated by the apparatus. Gold, for example, in ordinary dry sand, gravel, etc., does not commonly appear in particles exceeding in diameter one-half inch, hence coarse screening would be limited to half-inch material body. In practice, a flow of metal bearing material of say twelve inches depth in the box will stratify as indicated, but this should be governed by the character of the material being handled in each instance.

It is obvious that in the flow of material as described the rearmost hopper 27 will accumulate the least amount of valuable metal in its chute and the other hoppers greater quantities in succession toward the last, which will get the largest amount. The operator, by observation and practice, will soon determine when the lowest chute 28 is filled sufficiently for discharge and the others in sequence. When he desires to discharge such accumulation, he first operates the lever mechanism 33, which closes all gates 30. The treatment of the dry material above continues at the same time. When he has closed the gates 30, he immediately passes alongside, opens the desired gates 34 and the contents of the chutes, being separated from material above by the closed gates 30, falls into the hoppers 24 and chutes 25. He then closes the gates 34 and opens the gates 30. Thereafter he opens the gates 26 which allows the concentrates in the chutes 25 to be dropped into a suitable receptacle and to be removed from the apparatus. The gates 26 are then closed and the same method pursued while the apparatus is being operated.

It is well known that there exist large quantities of dry sand, gravel, quartz and other material containing free gold and other valuable metals in small particles. Also that such metal bearing material is situated where water is most expensive to get or not obtainable at all. The material not being of high yield per ton, a method

must be provided for separating the metal at a low cost and effectively. My apparatus affords such method and is new and useful. It will operate on great quantities of low yield material in a day's run, and, having a constant feed capacity, it will handle the produce of a steam shovel working steadily to dump the original material into the coarse screens.

10 I claim:

1. In an apparatus for separating valuable metals from waste material while in a dry state, the following illustrated elements in combination; a rectangular box adapted to be tilted, a longitudinal series of hoppers of perforated material in the upper part of the box, a series of vertical chutes aligned with the lower hopper discharge openings, a series of gates arranged to open and close the hopper discharge openings, and a series of perforated hinged gates arranged to open and close the lower chute discharge openings.

2. In an apparatus for separating valuable metals from waste material while in a dry state, the following illustrated elements in combination; a rectangular box adapted to be tilted, a longitudinal series of hoppers of perforated material in the upper part of the box, a series of vertical chutes aligned with the lower hopper discharge openings, a series of gates arranged to open and close the hopper discharge openings, a series of perforated hinged gates arranged to open and close the lower chute discharge openings, and a series of spillway gates positioned at the lower end of the box, arranged and adapted to control the flow of material over the hoppers and spillway gates so as to retain the material substantially at a predetermined depth of flow.

3. In an apparatus for separating valuable metals from waste material while in a dry state, the following illustrated elements in combination; a rectangular box adapted to be tilted, a longitudinal series of hoppers of perforated material in the upper part of the box, a series of vertical chutes aligned with the lower hopper discharge openings, a series of gates arranged to open and close the hopper discharge openings, a series of perforated hinged gates arranged to open and close the lower chute discharge openings, mechanism arranged to open and close said hopper gates simultaneously, and mechanism for opening and closing said chute gates.

4. In an apparatus for separating valuable metals from waste material while in a dry state, the following illustrated elements in combination; a rectangular box adapted to be tilted, a longitudinal series of hoppers of perforated material in the upper part of the box, a series of vertical chutes aligned with the lower hopper discharge openings,

a series of gates arranged to open and close the hopper discharge openings, a series of perforated hinged gates arranged to open and close the lower chute discharge openings, and a tube extending from a convenient supply source of compressed air into the box and adapted to transmit the air upwardly through the meshes of the said hoppers and the chute gates.

5. In an apparatus for separating valuable metals from waste material while in a dry state, the following illustrated elements in combination; a rectangular box adapted to be tilted, a longitudinal series of hoppers of perforated material in the upper part of the box, a series of vertical chutes aligned with the lower hopper discharge openings, a series of gates arranged to open and close the hopper discharge openings, a series of perforated hinged gates arranged to open and close the lower chute discharge openings, and a series of hoppers with chutes extending therefrom through the bottom of the box, the chutes having gates near their lower ends, said hoppers and chutes being positioned at a convenient distance below and in alignment respectively with the first described hoppers and chutes.

6. In an apparatus for separating valuable metals from waste material while in a dry state, the following illustrated elements in combination; a rectangular box adapted to be tilted, a longitudinal series of hoppers of perforated material in the upper part of the box, a series of vertical chutes aligned with the lower hopper discharge openings, a series of gates arranged to open and close the hopper discharge openings, a series of perforated hinged gates arranged to open and close the lower chute discharge openings, a series of hoppers with chutes extending therefrom through the bottom of the box, the chutes having gates near their lower ends, said hoppers and chutes being positioned at a convenient distance below and in alignment respectively with the first described hoppers and chutes, and a tube extending from a convenient supply source of compressed air into the box and adapted to transmit air into the space between the two series of hoppers, thence upwardly through the meshes of the upper hoppers and their chute gates.

7. In an apparatus for separating valuable metals from waste material while in a dry state, the following illustrated elements in combination; vertical guides, a vertically slidable frame positioned in the guides, buffer springs supporting the frame, impact means to prevent the springs from raising the frame beyond a convenient height, mechanism adapted to depress the frame upon the springs and release it to the upward tension of the springs, a rectangular box pivoted near its lower forward end upon

one end of said frame, and mechanism positioned upon the opposing end of the frame, adapted to tilt the box longitudinally at a predetermined incline, the frame and described mechanism being adapted so to move the box as to cause dry contents therein to be vibrated so that the same will flow gently down the inclined course by gravity and at the same time arrange themselves in strata of different weights.

8. In an apparatus for separating valuable metals from waste material while in a dry state, the following illustrated elements in combination; vertical guides, a vertically slidable frame positioned in the guides, buffer springs supporting the frame, impact means to prevent the springs from raising the frame beyond a convenient height, mechanism adapted to depress the frame upon the springs and release it to the upward tension of the springs, a rectangular box pivoted near its lower forward end upon one end of said frame, mechanism positioned upon the opposing end of the frame, adapted to tilt the box longitudinally at a predetermined incline, a series of perforated hoppers longitudinally positioned in the box, having discharging chutes from the hoppers, with perforated gates on their lower ends, and means to allow compressed air to be transmitted below the hoppers and their chute gates, thence upwardly through the same, the apparatus being adapted to allow vibration of dry material resting upon the hoppers, the material to flow gently over the hopper downward by gravity along the box, also to allow dust and fine particles to be blasted upward from the material by the air currents and the material to arrange itself in strata of different weights over the hoppers, the heaviest descending into the chutes

for discharge, the lighter passing out of the box at its spillway end.

9. In an apparatus for separating valuable metals from waste material while in a dry state, the following illustrated elements in combination; vertical guides, a vertically slidable frame positioned in the guides, buffer springs supporting the frame, impact means to prevent the springs from raising the frame beyond a convenient height, mechanism adapted to depress the frame upon the springs and release it to the upward tension of the springs, a rectangular box pivoted near its lower forward end upon one end of said frame, mechanism positioned upon the opposing end of the frame, adapted to tilt the box longitudinally at a predetermined incline, a series of perforated hoppers longitudinally positioned in the box, having discharging chutes from the hoppers, with perforated gates on their ends, means to allow compressed air to be transmitted below the hoppers and their chute gates, thence upwardly through the same, the apparatus being adapted to allow vibration of dry material resting upon the hoppers, the material to flow gently over the hoppers downward by gravity along the box, also to have dust and fine particles to be blasted upward from the material by the air currents and the material to arrange itself in strata of different weights over the hoppers, the heaviest descending into the chutes for discharge, the lighter passing out of the box at its spillway end, and a series of spillway gates positioned at the lower end of the box, adapted to control the flow of material over the hoppers and spillway gates so as to retain the material substantially at a predetermined depth of flow.

RUFUS C. WOOD.