

No. 750,366.

PATENTED JAN. 26, 1904.

E. M. JAHRAUS.
PNEUMATIC DRY ORE SEPARATOR.

APPLICATION FILED OCT. 15, 1902.

NO MODEL.

4 SHEETS—SHEET 1.

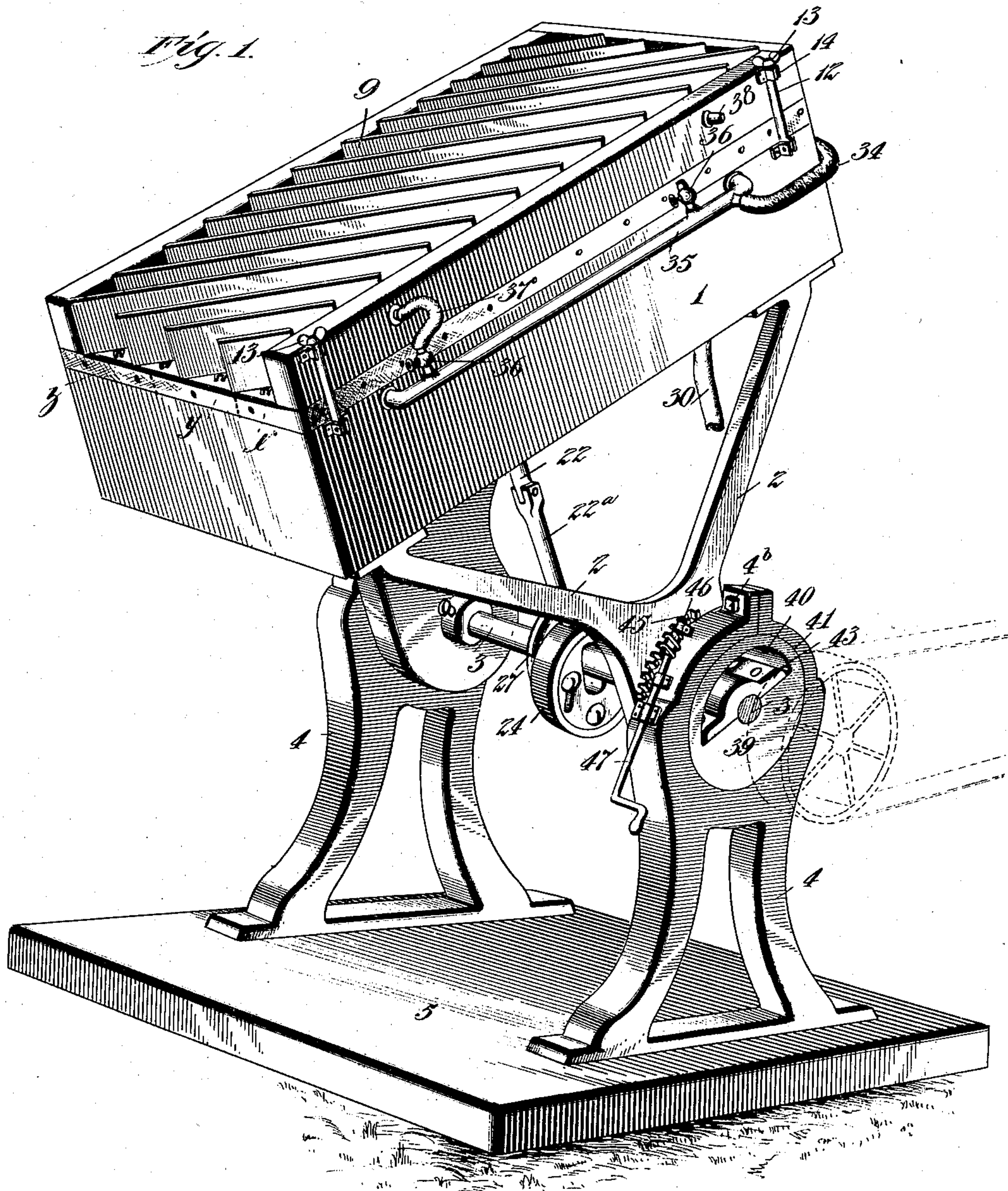
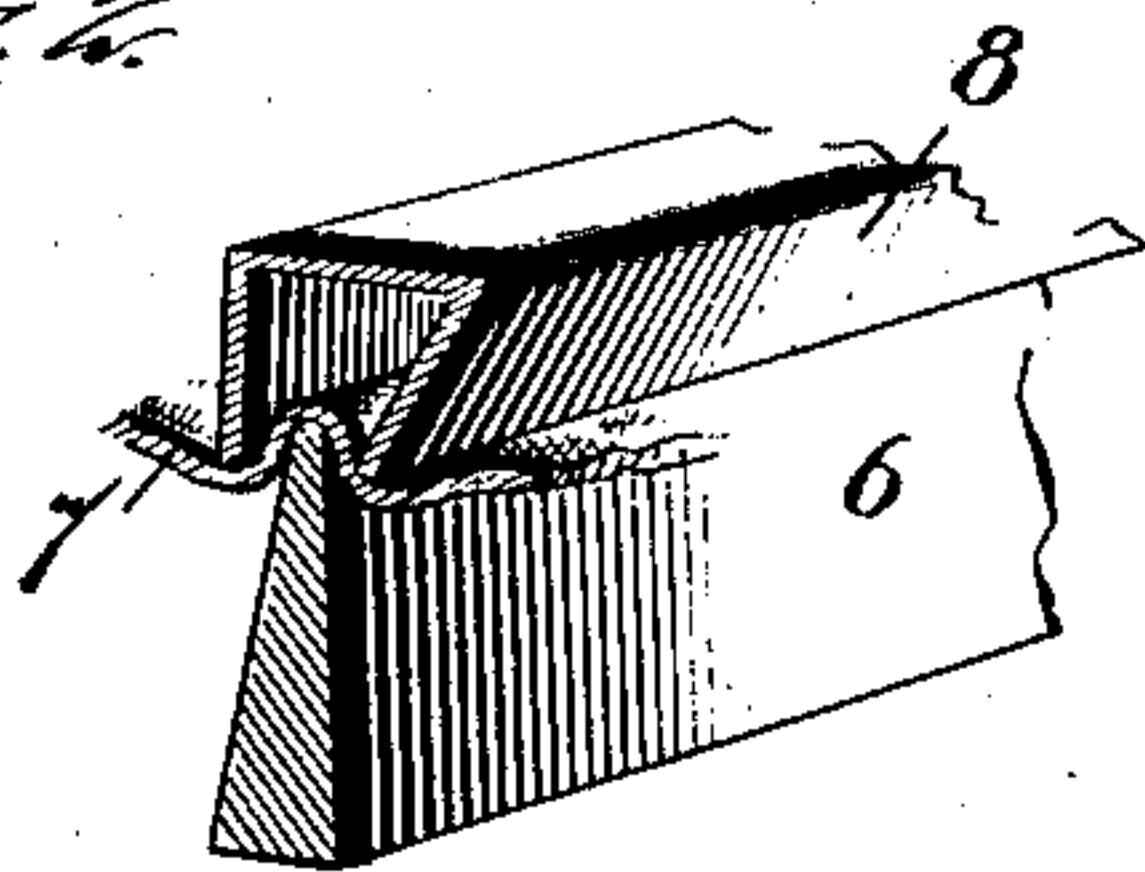


Fig. 2.



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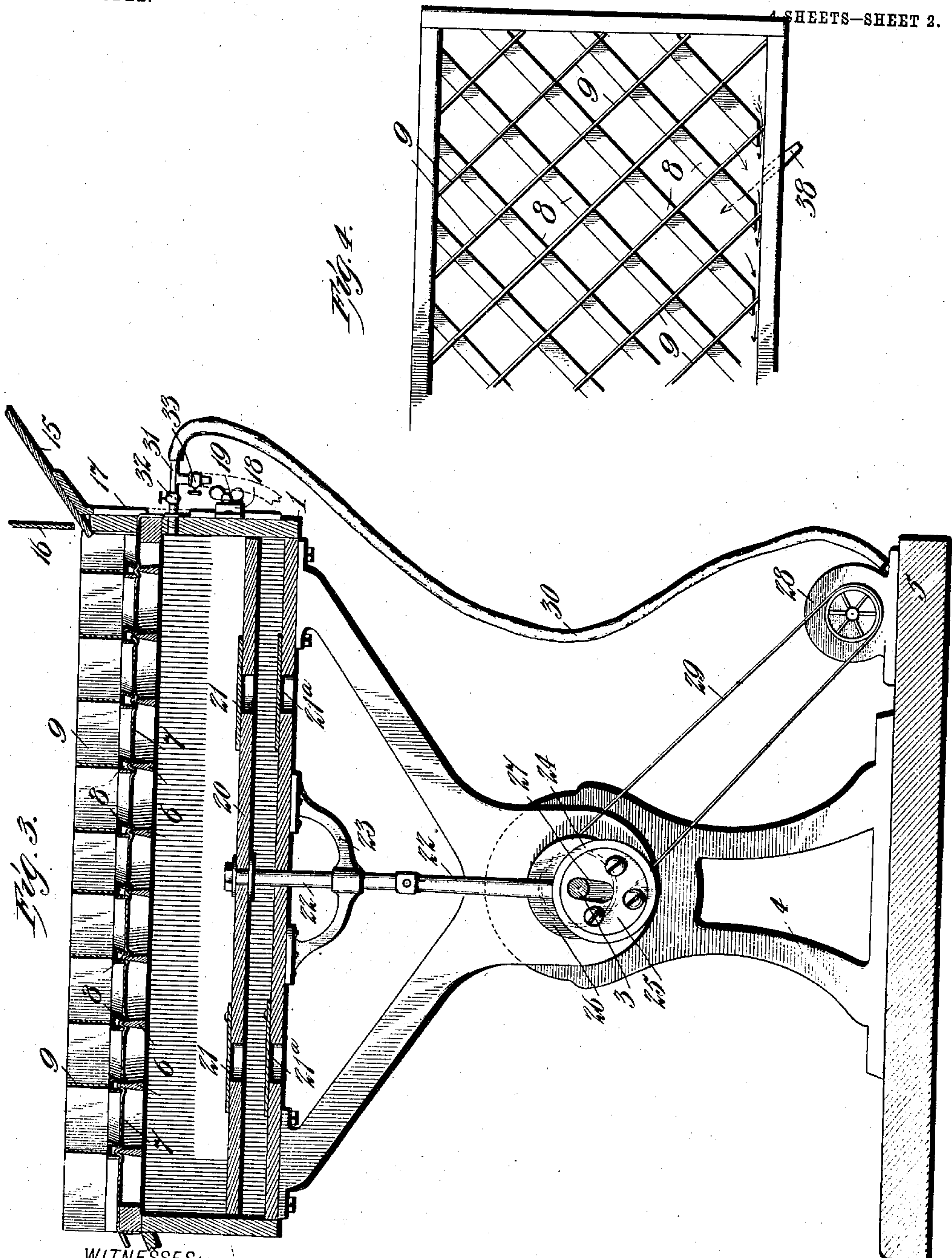
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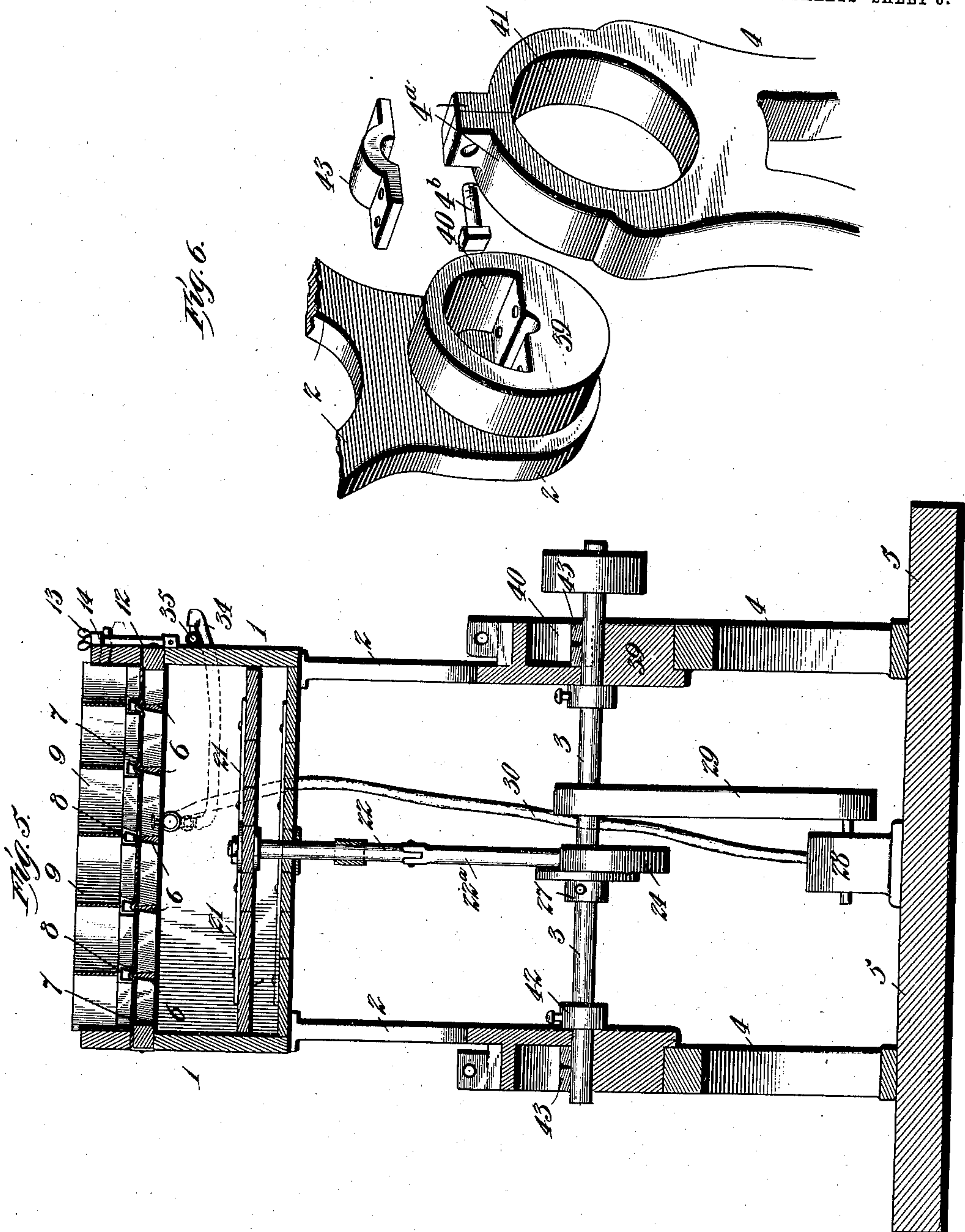
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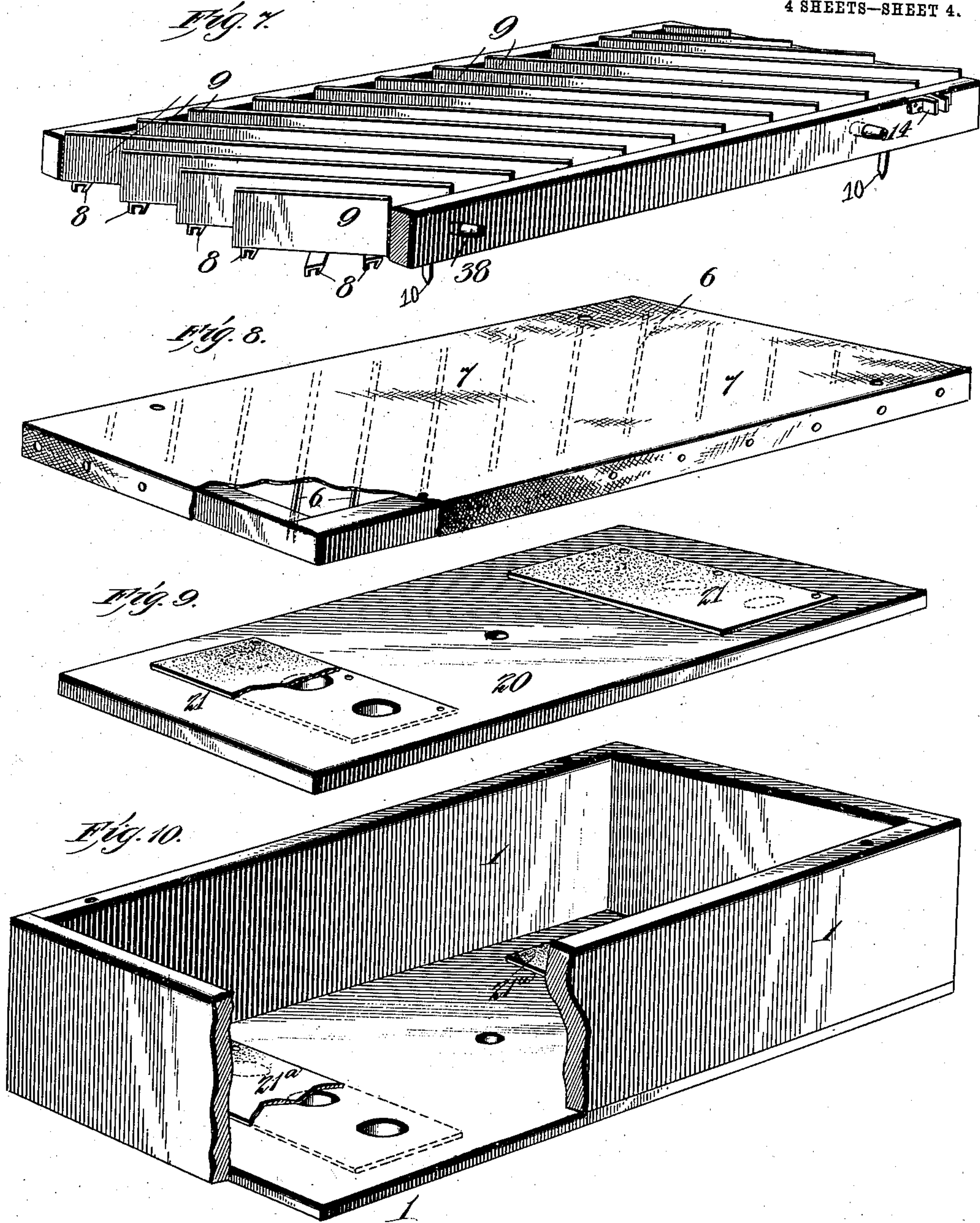
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UNITED STATES PATENT OFFICE.

EDWIN M. JAHRAUS, OF DAYTON, OHIO.

PNEUMATIC DRY ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 750,366, dated January 26, 1904.

Application filed October 15, 1902. Serial No. 127,404. (No model.)

To all whom it may concern:

Be it known that I, EDWIN M. JAHRAUS, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have made certain new and useful Improvements in Pneumatic Dry Ore-Separators, of which the following is a specification.

My invention is an improvement in the class of dry concentrators and separators in which the prime agent for effecting separation of the ore proper from the gangue or refuse matter is duly strong blast or currents of air forced up through a loose-mesh or permeable ore-bed.

I have devised several new and important features of construction, arrangement, and combination of parts, as hereinafter described, and illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of the apparatus as a whole. Fig. 2 is a detail perspective view of a portion of the grating, the permeable ore-bed or cloth screen, and one of the riffle-bars. Fig. 3 is a longitudinal vertical section of the apparatus. Fig. 4 is a plan view of a portion of the so-called "skimmer" and the riffles. Fig. 5 is a transverse vertical section of the apparatus. Fig. 6 is a perspective view illustrating one of the bearings for the adjustable ore-box and its attachments. Fig. 7 is a perspective view of the skimmer. Fig. 8 is a perspective view of the permeable top or screen of the pneumatic ore-box. Fig. 9 is a perspective view of the air-piston detached from the air-box. Fig. 10 is a perspective view of the air-box proper.

Referring in the first instance to Figs. 1, 3, and 5, 1 indicates the main portion of the apparatus, which consists of a pneumatic box having depending arms 2, which are supported and pivoted upon the horizontal axle or shaft 3. The rotatable bearing for the box 1, whereby it is adapted to be rotated, and thereby shifted as may be required to vary its inclination, is provided by uprights or vertical standards 4, which are suitably secured to a base 5. The top of the box 1 is formed by a grating 6, (see Figs. 2 and 8,) having a cloth or fabric

7 laid thereon and secured thereto, the same being porous or permeable to air. As shown in Figs. 2 and 5, said grating is composed of a series of diagonal metal bars, which are beveled or narrowed at their upper edges, upon which the fabric 7 rests. Upon the ore-bed thus formed I arrange a series of riffle-bars 8, which are peculiarly constructed—that is to say, the bars are preferably constructed of sheet metal and made hollow, the lower side being open and the two edges of the bar resting upon the fabric 7 on opposite sides of the beveled edges of the grating-bars 6. The diagonal arrangement of the riffles is therefore identical with that of the grating, as shown. As shown in Figs. 2 and 3, the riffles 8 are pressed upon the fabric 7 so that the same is held pressed tightly upon the bars 6 and stretched taut. It will be further noted that the upper side of the riffle-bars is inclined at an acute angle to the top, or, in other words, inclined toward the beveled top edges of the grating-bars. This is for the purpose of forming a sort of pocket in which the ore or valuable portion of the mineral may collect and be protected from the air-blast to such an extent that it will not be in danger of being carried over the riffles. The lower or right-hand ends of the riffles 8 terminate short of the side bar of the frame to which they are attached, and thus the valuable portion of the ore moving along down the inner inclined sides of the riffles and reaching such ends will find a free passage down alongside the right-hand bar, and thus escape at the point *x* indicated in Fig. 1, while the middlings will escape at *y* and the tailings or gangue at *z*. Above the riffles is arranged the portion of the apparatus termed the "skimmer." This consists of a series of diagonal bars 9, which are, in effect, thin narrow strips of sheet or plate metal arranged at right angles to the riffles 8. In other words, the skimmer-bars lie upon and cross the riffles at right angles. The skimmer and riffle-frame have dowels 10, (see Fig. 7,) which are adapted to enter holes in the frame of the cloth screen, and the frame of the latter may be in turn provided with dowels adapted to enter sockets in

the sides of the air-box 1. By these means the several parts are held in due relation to each other. For the purpose of securing them, yet permitting convenient detachment when required, I provide the means illustrated in Figs. 1 and 5, the same consisting of bolts 12, which are pivoted to the sides of the air-box 1 and threaded at their upper ends to adapt them to receive a wing-nut 13. When the said bolts are swung up, as shown, they pass between lugs 14, secured to the sides of the skimmer and riffle-frame, and the nuts 13 being screwed down the several parts are locked firmly together. It is obvious that by turning the nuts 13 reversely the bolts 12 may be swung down.

In practice the ore-box is set at a considerable downward inclination, as shown in Fig. 1, the degree varying with the kind or nature of the mineral which is to be treated. The ore is fed onto the ore-bed at the upper end, and for this purpose it may be allowed to pass over a chute 15, (see Fig. 3,) which is provided with a gate 16 and is adapted to be adjusted higher or lower for regulating the feed by means of a pendent bar 17, which is slidable in a keeper 18 and may be clamped in any required adjustment by a wing-screw 19.

A piston 20, (see Figs. 3, 5, and 9,) consisting of a rectangular plate having air-openings closed by flexible flap-valves 21, is arranged in the air-box 1 and adapted to slide vertically therein. The bottom of the air-box is provided, like the piston, with air-openings covered by flexible valves 21^a. A shaft 22 is connected with the center of the piston 20 and passes through the center of the bottom of the air-box and also through a guide-bracket 23, which is attached to the air-box, as shown in Fig. 3. The rod 22 has an extension 22^a, which is jointed to and provided at its lower end with a ring 24, which surrounds an eccentric 25. The latter is secured to a concentric collar 26, (see Fig. 3,) which is fast on the axis or shaft 3, and therefore rotates with it. The eccentric 25 is, however, adjusted with relation to the shaft for the purpose of increasing or lessening the throw of the piston-rod and piston, and to permit its due adjustment it is necessarily provided with a slot 27, through which the shaft passes. Screws serve to secure the eccentric adjustably to the aforesaid collar. It is apparent that when the shaft 3 is rotated the piston 20 will be reciprocated within the air-box 1 and that as the piston rises air will be drawn into the space beneath it and pass the valves 21^a and that as the piston descends such air will be forced up, passing the valves 21 of the piston. By this means air is forced through the permeable ore-bed 7 in a succession of quick puffs or blasts, by which the mineral is acted upon in such manner as to first induce a stratification of the lighter with the heavier particles and to force

the lighter portion over the riffles 8, while the precious metal, owing to its gravity, remains upon the fabric or bed 7 and owing to the inclination of the ore-bed moves toward the riffles and is by them caused to travel laterally toward their lower ends, where it finds escape, as before stated. I thus effect rapid stratification and separation of the sand or other refuse matter from the valuable portion of the ore without any loss of the latter. It will be seen that in this operation the skimmers or skimmer-bars 9 perform an important function in that they hinder the lighter or refuse portion of the mineral from passing directly downwardly or in the same direction with the heavier portion. In other words, they cause the middlings and gangue to travel laterally in a direction at right angles to that of the mineral proper.

With some kinds and conditions of ore it is requisite to provide an additional means for supplying air to the air-box 1 in the space between the piston and the permeable ore-bed 7, and for this purpose I employ the following means: A blower 28 (see Figs. 3 and 5) is arranged upon the bed or base 5, and a driving-belt 29 runs from a pulley keyed on the shaft 3. A flexible tube 30 extends from the blower to a nozzle 31, (see Fig. 3,) which passes through the upper end of the air-box and is provided with a stop-cock 32. The said nozzle 31 is provided with a lateral nozzle 33, to which another flexible tube, 34, (see Figs. 1 and 5,) is attached. The said tube 34 connects with a rigid pipe 35, that extends along the side of the air-box 7 and is provided with nozzles entering the latter. When the blower is operated, it supplies an increased volume of air upon which the piston acts as it ascends and forces it through the ore-bed 7 with the effect of producing a more rapid and forcible lifting, stratification, and separation of the valuable and refuse portions of the ore. It is also sometimes advantageous or requisite to provide an additional blast above the permeable ore-bed for the purpose of aiding the lateral travel of the refuse matter or gangue. I therefore provide the pipe 35 with nozzles 36, to which flexible pipes 37 (see Figs. 3 and 4) are applied and connect with nozzles 38, passing through the side of the skimmer-frame and arranged diagonally—that is to say, in the same direction as the skimmer-bars 9. The nozzles 36 are provided with stop-cocks, so that a supplemental blast through any one or more of the nozzles 38 may be directed at will upon the lighter or refuse portions of the ore which tend to accumulate over or upon the riffles 8 in the spaces between the skimmer-bars 9. It will be apparent that the blast so delivered will be a constant one. I propose to employ any number of these additional nozzles and air-blasts that conditions

may require. The air fed through tube 34 may be cut off and then the discharge from cocks 38 will be intermittent.

As shown in Figs. 1, 5, and 6, the lower ends of the arms 2, which are attached to and support the air-box 1, are provided with circular bosses 39, which are provided in their upper portion with a semicircular recess 40. These bosses fit in the circular openings 41, provided in the upper ends of the uprights 4, the latter being bifurcated and provided with jaws 4^a, which may be adjusted by screw-bolts 4^b to clamp the bosses tightly. The shaft 3 (see Fig. 5) is provided with collars 42, which are secured thereon by clamp-screws at points adjacent to the inner sides of the bosses 39, and thereby the shaft is held in due position. As shown, the latter has its bearings in the said bosses, a cap 43 (see Fig. 6) being applied within the recess 40 to complete the bearing. It is apparent that the air-box 1 and its attachments may be adjusted upon the centers provided by the bosses 39 to give it any required pitch. It is important, however, that such adjustment may be effected easily and quickly even when the apparatus is in operation, and in devising means for this purpose I have sought to also adapt them for locking the air-box at any angle to which it may be adjusted. I have adopted a construction and arrangement of parts shown in Fig. 1, where one of the arms 2 is provided with a toothed arc 45 or, in other words, a series of laterally-projecting teeth arranged in the arc of a circle and concentric with the shaft 3 or with the center on which the air-box is adapted to rotate. A worm 46, attached to a crank-shaft 47, is held in bearings on the adjacent upright 4 and adapted to engage the toothed arc 45. Hence by rotating the crank 47 the air-box 7 and its attachments may be adjusted in either direction for changing its pitch, and when so adjusted it will be held locked by means of the same parts 45 and 46. It will be understood that when the desired adjustment has been thus made the screws are rotated to approximate the jaws 4^a, and thus clamp the bosses 39 tightly for holding the separator proper fixed firmly in position until adjustment shall be again required. These described means for pivoting, adjusting, and locking the air-box, ore-bed, and their attachments constitute an important feature of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with suitable supports and a horizontal axis, of an ore-separator box having pendent arms which are journaled on such axis, an eccentric on such axis, a jointed piston-rod connected with the said eccentric, an air-piston arranged in the box and recip-

rocated through the medium of the piston-rod, a toothed arc formed on the side of one of the pendent arms, a hand worm-shaft journaled on one of the fixed supports, its worm engaging the toothed arc, as shown and described.

2. The combination with vertical standards, or supports, of a dry ore-separator having pendent portions provided with circular bosses adapted to fit and rotate in bearings in said uprights, a rotatable shaft passing through the center of said bosses, an eccentric mounted on the said shaft, a piston adapted to reciprocate in the air-box of the separator, and a jointed piston-rod connecting the same, substantially as shown and described.

3. The combination with uprights having circular openings, of a dry ore-separator having pendent arms provided with circular bosses adapted to fit and rotate in said openings, a crank-shaft passing through the center of said bosses, an air-piston arranged in the air-box of the separator and means connecting the piston with the crank-shaft, and means for adjusting the pitch of the separator and locking it in any adjustment, the same consisting of a toothed arc arranged upon the pendent portions of the separator, and a worm and shaft having bearings upon one of the uprights, substantially as shown and described.

4. In a dry ore-separator, the combination of the air-box having pendent portions or arms with fixed uprights having circular openings adapted to receive bosses as described, the said bosses being recessed in their upper portion, the shaft passing through the center of the bosses and secured by caps arranged in said recesses, an eccentric mounted on the shaft, a piston-rod connected therewith, and a piston arranged in the air-box of the separator, substantially as shown and described.

5. The combination with uprights and a separator proper having pendent portions having bearings in the uprights, a rotatable shaft passing through the center of the bearings, clamp-collars applied to said shaft and arranged in contact with said pendent portions of the separator, an eccentric mounted on the shaft, a jointed piston-rod connected therewith and a piston adapted to reciprocate in the air-box of the separator, substantially as shown and described.

6. In an ore-separator, the combination with the air-box having a rigid grating composed of parallel bars arranged diagonally, and a fabric stretched over said bars, of a superposed frame having riffles constructed of metal and arranged directly over and at the same inclination as the grating-bars, and provided on their under sides with a longitudinal channel, said riffles being applied directly over and straddling the bars, and their side edges resting upon the screen cloth and pressing the same down slightly below the plane of the

grating-bars, and means for applying pressure upon the riffles, whereby slack in the cloth is taken up and the same held taut between the bars, as shown and described.

- 5 7. In a dry ore-separator, the combination with the air-box, a permeable screen, riffles applied thereto, and diagonal strips or plates constituting the skimmer, and arranged above the riffles and screen as described, of nozzles

arranged horizontally in the sides of the box 10 and between the skimmer-plates and pointed in a direction parallel to such plates, and an air-forcing apparatus connected with said nozzles, as described.

EDWIN M. JAHRAUS.

Witnesses:

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AMOS W. HART.