No. 816,901. PATENTED APR. 3, 1906.

W. J. DEVERS.

SLATE PICKING MACHINE.

APPLICATION FILED SEPT. 1, 1904.

3 SHEETS—SHEET 1.

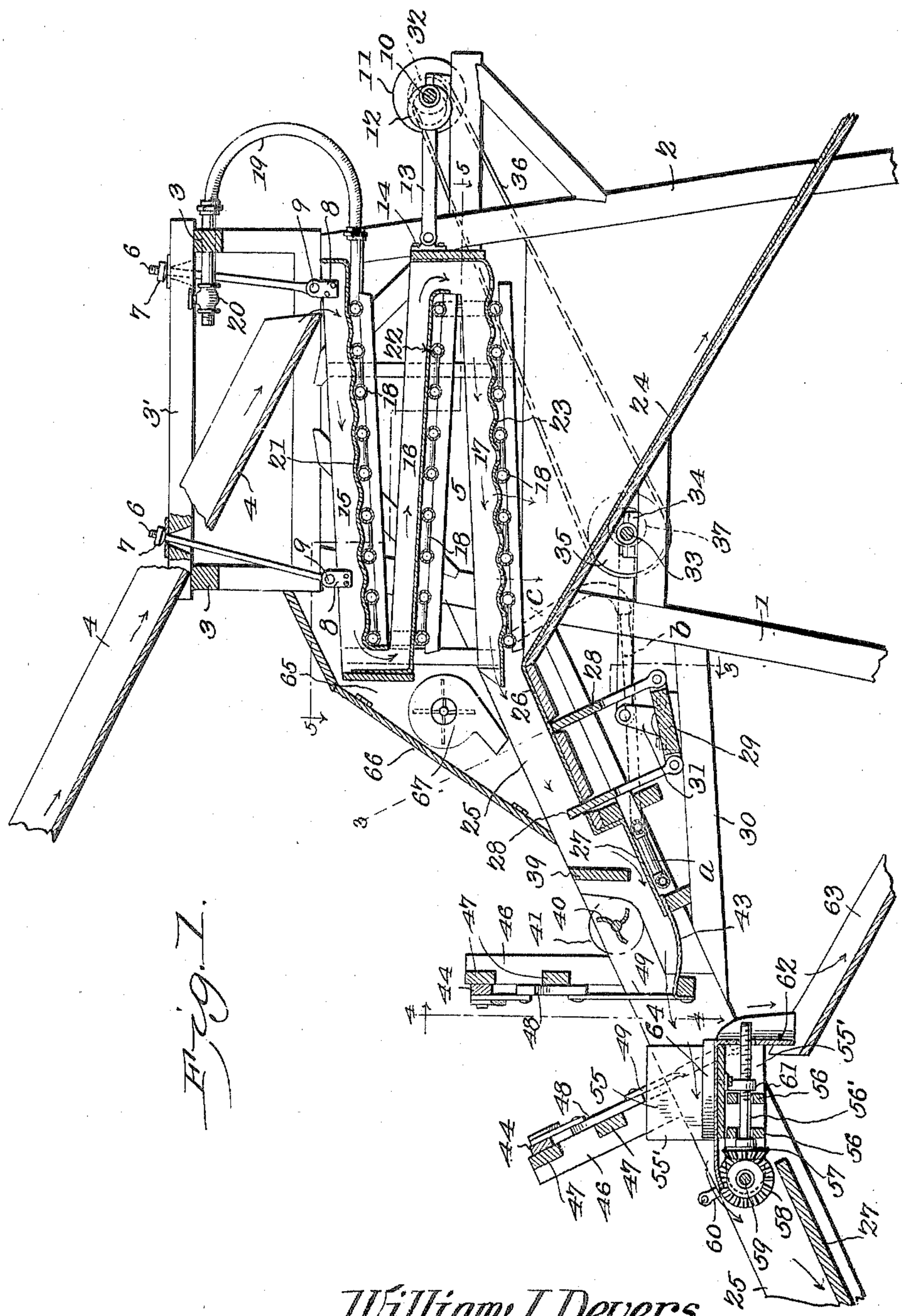


Fig. 1.

Witnesses
E. F. Stewart
H. C. Shepard.

William J. Devers,
Inventor.
by Crowell & Co.,
Attorneys

No. 816,901. PATENTED APR. 3, 1906.

W. J. DEVERS.

SLATE PICKING MACHINE.

APPLICATION FILED SEPT. 1, 1904.

3 SHEETS—SHEET 2.

Fig. 2.

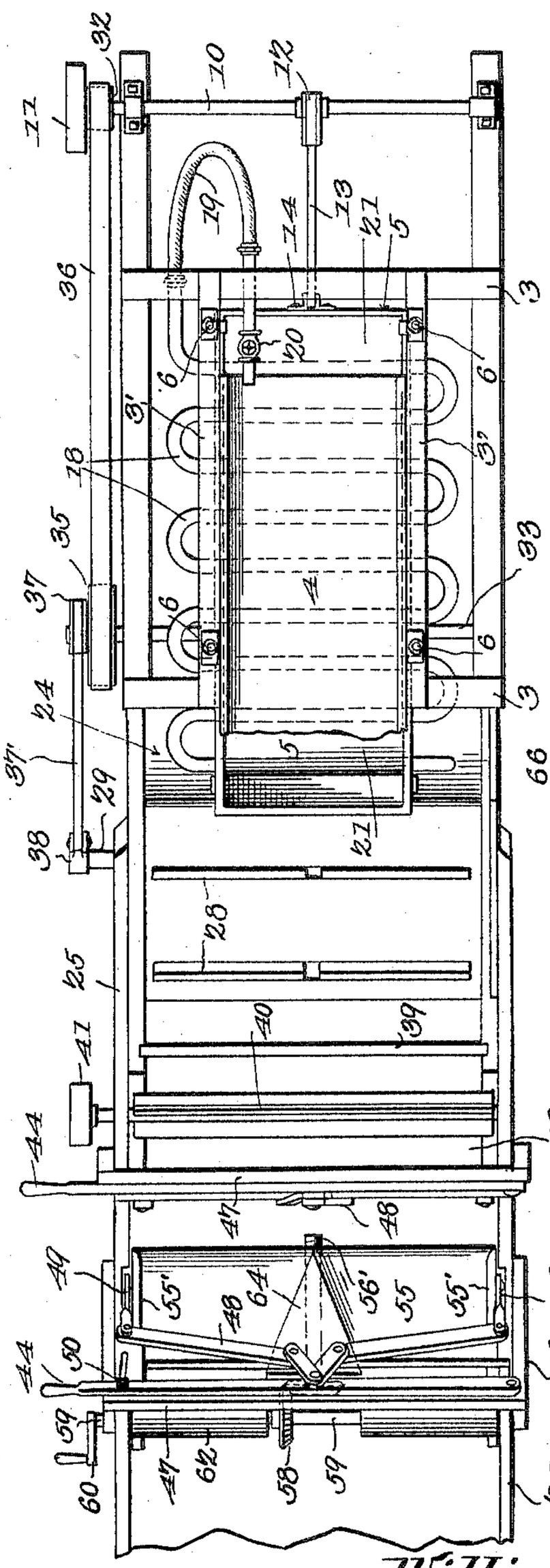
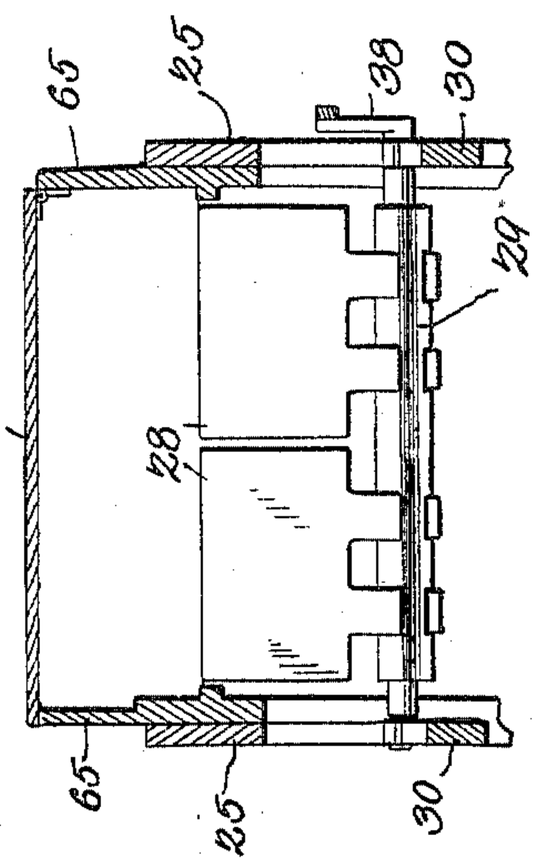


Fig. 3.



Witnesses

E. F. Stewart

H. S. Shepard.

William J. Devers,

Inventor.

by C. A. Snow & Co.

Attorneys

No. 816,901. PATENTED APR. 3, 1906.

W. J. DEVERS.

SLATE PICKING MACHINE.

APPLICATION FILED SEPT. 1, 1904.

3 SHEETS—SHEET 3.

Fig. 4.

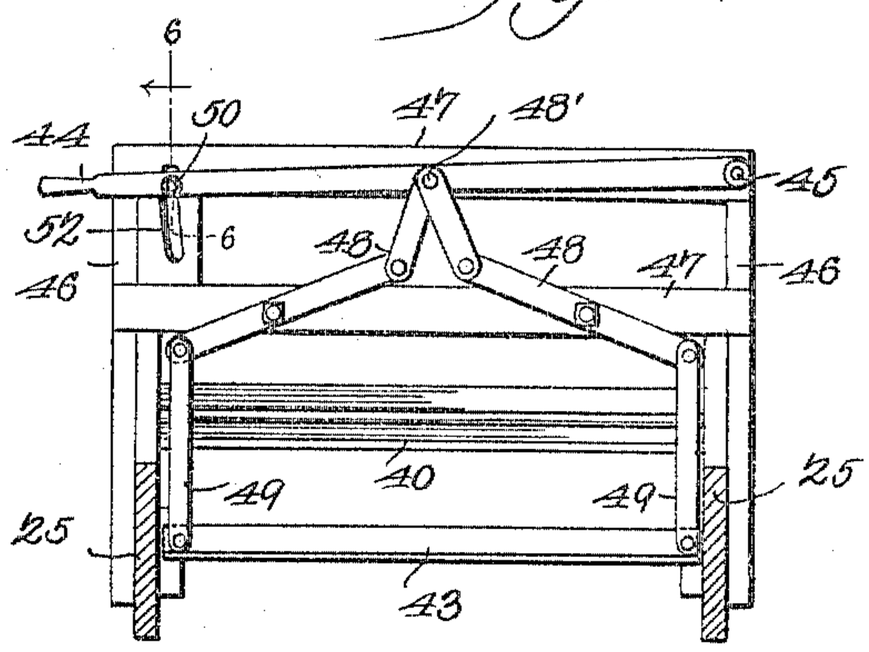
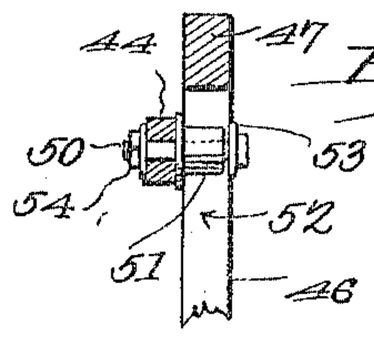


Fig. 6.



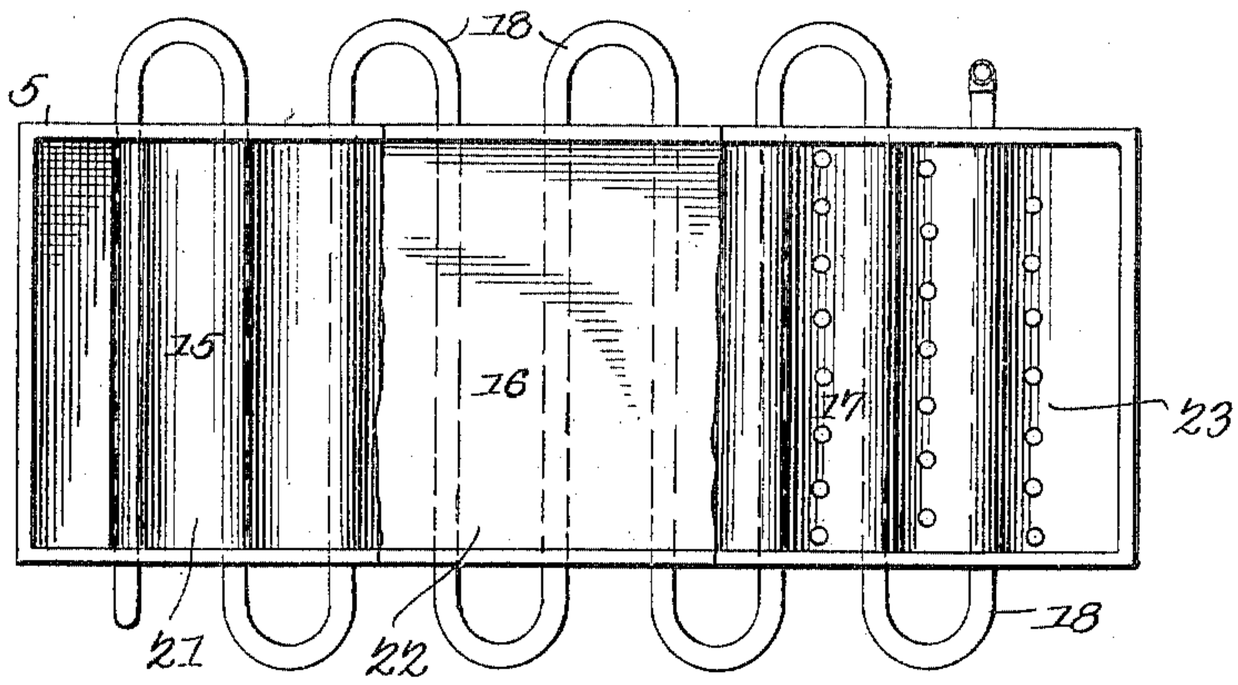


Fig. 5.

Witnesses
E. F. Stewart
H. C. S. Shepard.

William J. Devers,
Inventor.
by Church & Co.
Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM J. DEVERS, OF SCRANTON, PENNSYLVANIA, ASSIGNOR OF TWO-THIRDS TO DWIGHT R. LATHROP AND CHAS. W. TREVERTON, OF SCRANTON, PENNSYLVANIA.

SLATE-PICKING MACHINE.

No. 816,901. Specification of Letters Patent. Patented April 3, 1906.

Application filed September 1, 1904. Serial No. 223,038.

To all whom it may concern:

Be it known that I, WILLIAM J. DEVERS, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented a new and useful Slate-Picking Machine, of which the following is a specification.

This invention relates to machines for separating slate from coal by gravity, and has for its object the prevention of difficulties arising from the treatment of the coal and slate when in a damp or wet condition, such condition retarding the speed of the coal upon the separators, which is ordinarly much greater than that of the slate by reason of its more glassy nature, and thus causing the coal and slate to fall into the same chute. The rust forming upon the metallic operating-surfaces of the separator, owing to dampness, rains, &c., also acts to retard the speed of the coal with the above result. On the other hand, the slate when wet or damp slides as if greased and with a speed at least equal to that of the coal when wet, both consequently falling into the same chute, and thus negativing any separating action on the partof the machine. These difficulties are entirely obviated by my improved apparatus, in which the operating-surfaces thereof are heated by means of steam-pipes or other heating devices of a similar nature, thus completely drying out the coal and slate, and thus greatly diminishing the friction of the former against the operating-surfaces, and consequently increasing its speed thereon. The dried slate, on the other hand, being much heavier than the coal travels at a much less speed and greater friction and on reaching the adjusted open spaces in the machine falls into such spaces, over which the coal by reason of its greater speed passes, thus being separated from the slate and finally reaching its proper chute. It is also proposed to thoroughly agitate and at the same time retard the passage of the material under treatment and also dry the same preparatory to being fed to the gravity separating-chute in order that the most effective separation of the material may be accomplished.

Another object consists in the provision of the machine with a fan adapted to force a blast of air upon the operative surfaces thereof, it being readily understood that the accumulation of dust and culm about said surfaces will also result in retarding the speed of the coal, so that both it and the slate fall into the slate-chute. It is to prevent such that the fan is provided, said fan also acting to increase the speed of the coal upon the surface of the machine, owing to the fact of its greater lightness.

Further improvements consist in the construction of the pickers proper and in the provision of devices for adjusting the inclination of the shoes at the lower end of the machine and for varying the size of the slate-chute entrance.

Still further improvements will be apparent from a consideration of the following detailed description and claims, as shown in the appended drawings, in which—

Figure 1 is a longitudinal sectional view of my improved separator. Fig. 2 is a plan view with the housing removed to disclose the pickers. Fig. 3 is a vertical section on the line 3 3 of Fig. 1. Fig. 4 is a sectional view on the line 4 4 of Fig. 1. Fig. 5 is an enlarged detail sectional view of a combined heater and shaker on the line 5 5 of Fig. 1. Fig. 6 is an enlarged detail sectional view on the line 6 6 of Fig. 4.

Similar characters refer to similar parts throughout the several views.

The framework of the machine consists of the front and rear standards 1 and 2, respectively, united by cross-pieces at top and bottom, the two front and rear standards being likewise connected by cross-pieces, all as clearly shown in Fig. 1. The two front standards and the two rear standards are livewise connected at their upper ends by the upwardly-curved braces 3 3, said braces being joined together by the cross-braces 3′ 3′, the whole being adapted to form a support for the feed-chute 4 and triple shaker and heater 5, hereinafter referred to as the "shaker." The feed-chute 4 is rigidly fastened upon the forward brace 3 and to the cross-pieces 3′ by bolts or any other preferred means, while the shaker 5 is removably supported from the cross-pieces 3′ by bolts 6 passing through said cross-pieces and capable of a rocking movement therein. The upper ends of bolts 6 are threaded and retained upon said cross-pieces by a nut 7, which construction also admits of a slight adjustment of the inclination

of said shaker. At their lower ends said bolts are pivoted within pairs of flanges 8, fastened upon the upper portion of said shaker by means of pins 9. The rocking mechanism for said shaker 5 is as follows: 10 is the main driving-shaft of the machine, having at one end the driving-pulley 11, attached to any suitable source of power. Centrally located upon said shaft 10 is an eccentric 12, the crank 13 of which is pivoted at its outer end to projections 14 on the lower part of the said shaker. The rotation of the shaft 10 will consequently produce a corresponding oscillating or shaking movement of said shaker. Described in detail, said shaker consists of the upper flight 15, inclined toward the front of the machine, the central flight 16 oppositely inclined thereto, and the lower flight 17. Said flights are each heated by a series of steam-coils 18, the steam entering said coils from the flexible pipe 19, fastened at its upper end in the rear curved brace 3 and being attached at that point to any suitable source of supply. A valve 20 is provided also at said point for the regulation of admission of steam or other heating agent.

The upper and central flights 15 and 16 have their operative surfaces consisting of iron plates 21 and 22, respectively, against which the heating-coils 18 closely fit, the upper plate only being corrugated to conform to the outline of the pipes thereon and to provide a greater heating-surface for the passing coal and slate. The heating-coils 18 extend slightly beyond the flights, on each side thereof, and occupy the entire under surface thereof, thus heating every portion of said plates.

The lower flight 17 has for its operative surface the perforated and corrugated iron plate 23, the coal dust or culm passing through said perforations to its chute 24. The plate 23 is corrugated in a manner similar to that of plate 21, and for a similar purpose, it being of course understood, as stated, that any accumulation of dust or culm about the operative surfaces of the machine tends to diminish the speed of the coal and to render it about equal to that of the slate and resulting in the fall of both into the slate-chute. The lower flight 17 is inclined in the same direction as the upper flight 15, said flight 15 emptying into the flight 16 and the flight 16 into the flight 17. The chute 24 is of course inclined in a direction similar to that of the flight 16—that is, toward the rear of the machine.

The several flights are connected together at both sides by bars or other preferred means and have extending vertical walls, as shown, which prevent the escape of the slate and coal in passing therethrough.

Leading downwardly and rearwardly from the discharge end of the lower flight 17 of the shaker is a gravity-chute 25, which has its upper end connected to the main frame and its lower end supported upon the ground. This chute is provided with a stepped bottom and includes an upper stepped section 26 and an adjacent lower stepped section 27, of which the upper stepped section is comparatively short and the lower section is considerably longer and is provided with an opening through which the slate is designed to be discharged from the machine. A pair of vertically-slidable pickers 28 work through transverse slots in the upper bottom portion or stepped section 26 of the chute 25, with their lower ends connected to opposite sides of a rocking cross-head 29, mounted at each end upon a frame-bar 30. This cross-head is actuated from the main shaft 10, which is provided at one end with a pulley 32, there being a counter-shaft 33 mounted at each end in a bar 34, supported upon the main frame in rear and below the shaft 10. One end of the counter-shaft 33 is provided with a pulley 35, and a belt 36 connects the pulley 35 with the pulley 32. An eccentric 37 is provided upon the shaft 33, and a connecting-rod 37′ extends from the eccentric to a crank-arm 38 upon one end of the rocking cross-head 29, whereby the pickers 28 are alternately projected through the bottom section 26 of the gravity-chute, so as to loosen and tend to mechanically separate the slate and coal during its passage across the chute-section 26. Beyond the lower end of the chute-section 26 is an upright baffle 39, carried by the sides of the chute 25 and disposed about midway above the chute-section 27 and in the path of the coal and slate discharging from the chute-section 26, so as to prevent the same from escaping through the open top of the chute and compel the material to pass downwardly and across the section 27, which is formed of metal and heated by a pipe-coil *a*, which is connected to the discharge end of the pipe-coil of the lower flight 17 of the shaker through the medium of a rigid pipe *b* and a flexible pipe *c*, the latter being employed to compensate for the vibrating movement of the shaker or shoe.

Below the baffle 39 and in substantial alinement with and above the lower end of the stepped section 27 of the chute 25 there is a rotary trimmer 40, journaled transversely across the chute and including a plurality of radial plates, one end of the trimmer being provided with a pulley 41, located externally of the chute and connected in any suitable manner (not shown) with the main shaft or the counter-shaft 33 of the machine, so as to impart a rotary movement thereto, and thereby trim the upper surface of the material under treatment. However, if desired, the trimmer may not be driven from an operating portion of the machine, but may be rotated by the passage of the material contacting with the plates of the trimmer.

A metallic flexible shoe 43 is secured to the

lower end of the stepped section 27 and extends the entire distance between the sides of the chute 25, but is entirely free from the latter, so as to be capable of elevation to retard the passage of the material to a greater or less extent, as may be desired. For convenience in flexing, and thereby elevating, the shoe 43 there is a lever 44, disposed transversely above the chute and terminally fulcrumed, as at 45, upon an upstanding frame consisting of standards 46, rising from the sides of the chute 25 and connected by cross-bars 47. Toggle-links 48 are pivotally supported upon the lower cross-bar 47, with the upper links provided with a mutual pivotal connection 48′ with an intermediate portion of the lever 44, there being links 49 hung from the respective toggles and pivotally connected to the free end of the shoe 43, whereby manipulation of the lever 44 will cause an elevation of the chute. The handle end of the lever 44 is provided with a laterally-projected guide-pin 50, working in a slot 52 in the adjacent standard 46 and provided with an antifriction-roller 51, the outer end of the pin 50 being provided with a head 53 to overlap the slot and prevent lateral displacement of the lever. Upon the front of the pin 50 is a nut 54, designed to clamp the lever against the frame and lock the same when the shoe has been adjusted to any desired position.

Below the upper shoe 43 and in the opening in the chute 25 is a lower shoe 55, which is disposed in a substantially horizontal position transversely across the chute and is provided with upstanding terminals 55′, rising above the side walls of the chute, so as to prevent the escape of the material from said sides and also projected below the chute. Upon the under rear side of this shoe are bearings 56 for the rotatable support of the unthreaded portion of a threaded counter-shaft 56′, which is provided at its rear end with a beveled gear 57, engaging a beveled gear 58 upon a shaft 59, journaled across the chute beneath the shoe 55 and provided at one end with a crank 60 for convenience in rotating the adjusting-shaft 59, so as to shift the shoe 55 back and forth, the counter-shaft 56′ working in a threaded bearing 61, hung from the bottom of the shoe. The purpose of this adjustment of the shoe 55 longitudinally of the machine is to vary the size of the discharge-opening between the two shoes, through which the slate is designed to discharge, so as to accommodate the machine to all conditions. The rear end of the shoe overhangs the shaft 59, so as to direct the coal across the same without interference therewith, while the front end is extended downwardly to form a baffle-plate 62, which directs the slate into the chute 63.

In addition to the endwise adjustment of the shoe 55 it is also capable of being tilted upwardly upon the shaft 59 as a pivotal support, and this is accomplished by an elevating device substantially the same as that described for the shoe 43, the same reference characters being applied to both of the elevating devices.

The rear flanged end of the shoe 55 is bifurcated or slotted to accommodate the gear 58, and upon the top of the shoe is a pointed deflector 64 to deflect the material at opposite sides of the gear, and thereby prevent damage thereto.

Much difficulty is encountered by the accumulation of coal-dust from the breakers upon the pickers of separating-machines, and I propose to obviate this difficulty by housing the portion of the chute 25 through which the pickers operate, said housing consisting of side pieces 65, rising from each side of the chute to a top 66, hinged to one of the side pieces and detachably connected to the other side piece in any suitable manner, so as to give convenient access to the pickers whenever desired.

During the operation of the machine the pickers 28 become coated by deposits from the material and in standing over night frequently become rusted, and to overcome this objection I mount a blast-fan 67 within the housing and operate the same from one of the shafts of the machine, the fan being disposed to discharge downwardly and rearwardly against the stepped section 26 of the chute 25, so as to effectually blow off any accumulations upon this portion of the chute and the active upper ends of the pickers 28. In addition to removing accumulations the blast of the fan also operates to increase the speed of the coal, which is lighter than the slate, thereby to impart an initial separation of the material.

The operation of the machine is as follows: The coal and slate are fed into the feed-chute 4 and pass therefrom to the shaker 5, where the heating-coils operate to dry the same. The culm passes through the perforations in the lowermost flight 17 of the shaker and on to the culm-chute 24. Owing to the shaking movement imparted by the eccentric 12 and crank 13, the slate and coal are fed through the three flights of the shaker on to the gravity-chute, down which they pass. It will now be understood that as the material passes through the shaker it is simultaneously agitated, retarded in its passage, and dried by the heating-coils in order that the material may be thoroughly dried preparatory to being fed to the separating-chute. Owing to the greater angle of inclination of this chute and the more glassy nature of the now thoroughly-dried coal, combined with the action of the fan-blast, the coal attains a much greater speed than the slate, which being heavier than the coal slides with increasing friction, and consequently diminishing speed, until reaching shoe 43. which owing

to its raised position acts as an additional stop, the slate then dropping into the slate-chute 63, being thus separated from the coal, which passes over both shoes 43 and 55 in the proper chute (not shown) at the end of the machine. Separation of the coal and slate is of course aided by the action of the picker-fingers 28, which project alternately through the slots and in chute 25, owing to the action of the rock-shaft, as described, and which act to upset and break up the advancing stream of coal and slate.

Modifications within the scope of the appended claims are of course possible, and I therefore do not limit myself to the details shown and described.

Having thus described the invention, what is claimed is—

1. In a separator of the class described, the combination with a frame, of a gravity-chute having one or more separating-openings, a shaking-shoe leading to the chute, a heating-coil for the shoe, a heating-coil for the chute, a flexible pipe connecting the two heating-coils, a supply-pipe mounted upon the frame, and a flexible pipe connecting the supply-pipe with the heating-coil of the shoe.

2. A separator of the class described comprising a gravity-chute having one or more separating-openings, a shaking-shoe leading to the chute and provided with a corrugated bottom, and a heating-coil carried by the shoe with its sections located within the corrugations upon the under side of the shoe.

3. A separator of the class described comprising a gravity-chute having one or more separating-openings, a shaking-shoe leading to the chute and provided with a corrugated bottom having the alternate corrugations perforated, and a heating-coil carried within the imperforate corrugations of the shoe upon the under side thereof.

4. A separator of the class described comprising a gravity-chute having one or more separating-openings, a shaking-shoe leading to the chute and provided with upper and lower corrugated flights with the alternate corrugations of the lower flight perforated, and heating-coils carried by the flights within the corrugations and upon the under sides of the flights, the coils of the lower flight being located in the imperforate corrugations only.

5. A separator of the class described comprising a gravity-chute having one or more separating-openings, a shaking-shoe leading to the chute and provided with upper and lower corrugated flights and an intermediate flat flight, the upper and intermediate flights being imperforate and the lower flight having its alternate corrugations perforated, and heating-coils carried by the under sides of the flights, the coils of the corrugated flights being located within the corrugations thereof and in the imperforate corrugations only of the lower flight.

6. In a separator of the class described, the combination with a frame, of a shaking-shoe mounted thereon and provided with corrugated flights, the lowermost flight having its alternate corrugations perforated, heating-coils carried by the under sides of the flights in the corrugations thereof with the coils of the perforate flight in the imperforate corrugations thereof, a supply-pipe carried by the frame, a flexible pipe connecting the supply-pipe with the coils of the shoe, a chute leading downwardly from the discharge end of the agitating device, heating-coils for the chute, and a flexible pipe connecting the chute-coils with the heating-coils of the agitating device.

7. In a separator, the combination of a gravity-chute having a discharge-opening, a chute-supporting frame rising above the upper end of the chute, swinging links hung from the frame, an agitating device comprising a frame hung from the links and provided with a series of flights with the lowermost flight discharging into the chute, heating-coils upon the under side of the chute and upon the under sides of the flights, a flexible supply-pipe carried by the frame and connected to the heating-coils of the flights, and another flexible pipe connecting the heating-coil of the chute with the lowermost heating-coil of the flights.

8. In a separator, the combination of a gravity-chute having a discharge-opening, an agitating device communicating with the top of the chute, heating means for the agitating device, heating means for the chute, and pickers working through the bottom of the chute between the heating means therefor and the agitating device.

9. In a separator, the combination of a gravity-chute having a discharge-opening, an agitating device in communication with the top of the chute, heating means for the agitating device, heating means for the chute, pickers working through the chute between the heating means thereof and the agitating device, and a blast device located between the agitating device and the pickers and directed toward the latter and the lower end of the chute.

10. In a separator, the combination of a gravity-chute having a discharge-opening, an agitating device in communication with the upper end of the chute, heating means for the agitating device, heating means for a portion of the chute, pickers working through the chute between the heating means thereof and the agitating device, a housing inclosing the chute from the lower limit of the pickers to the discharge end of the agitating device, and a blast device located within the housing and directed toward the pickers and the lower end of the chute.

11. In a separator of the class described, the combination with a gravity-chute having

a discharge-opening, a supporting-frame for and rising above the top of the chute, a swinging agitating device mounted upon the frame above the top of the chute and including connected flights leading to the chute, the lower flight being perforate, a refuse-chute beneath the lowermost flight and leading away from the separating-chute, a supply-chute leading to the uppermost flight, a drive-shaft mounted upon the frame, a connection between the drive-shaft and the agitating device for swinging the same, heating-coils carried by the under sides of the flights, a flexible supply-pipe connected to the heating-coil, a heating-coil for the chute located above the discharge-opening thereof, a flexible pipe connecting the latter coil with the coil of the agitating device, pickers working through the chute between its heating-coil and the agitating device, a housing for the chute extending from the lower limit of the picker to the discharge end of the agitating device, and a blast device located within the housing and directed toward the pickers and the lower end of the separating-chute.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM J. DEVERS.

Witnesses:

RUSSELL DIMMICK,

G. H. MADDOCKS.