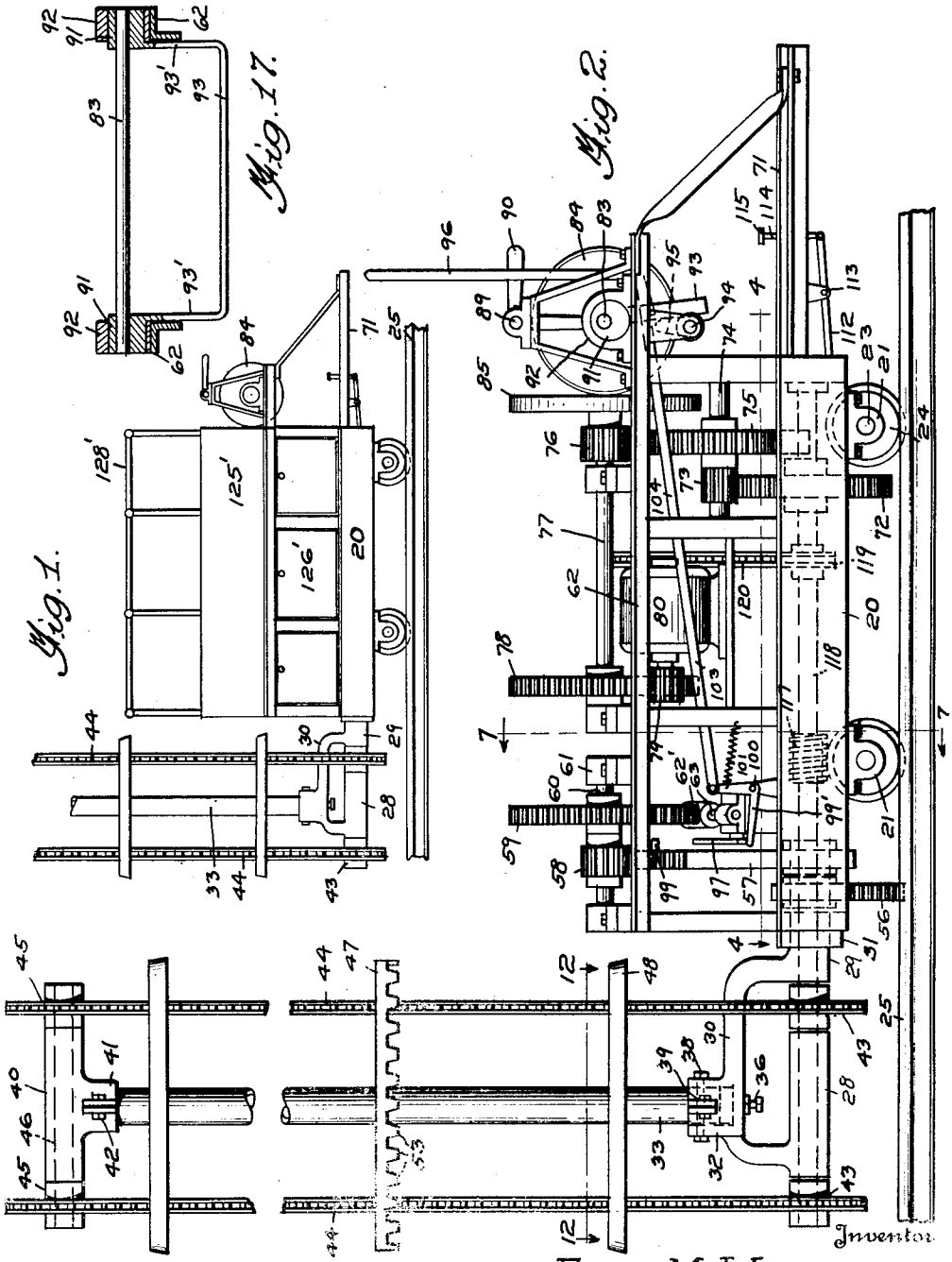
July 3, 1928. 1,675,871

F. M. WEVER

ACID PHOSPHATE HOT DEN EXCAVATOR

Filed Sept. 30, 1926 6 Sheets-Sheet 1



Inventor

FRANK M. WEVER,

By

Attorney

July 3, 1928. 1,675,871

F. M. WEVER

ACID PHOSPHATE HOT DEN EXCAVATOR

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Fig. 3.

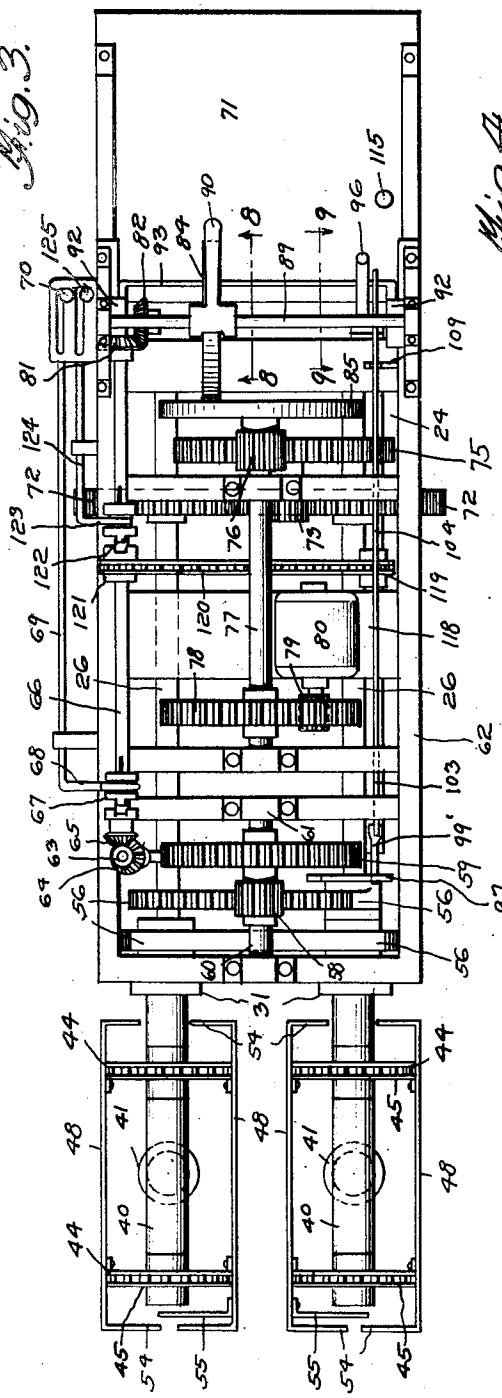
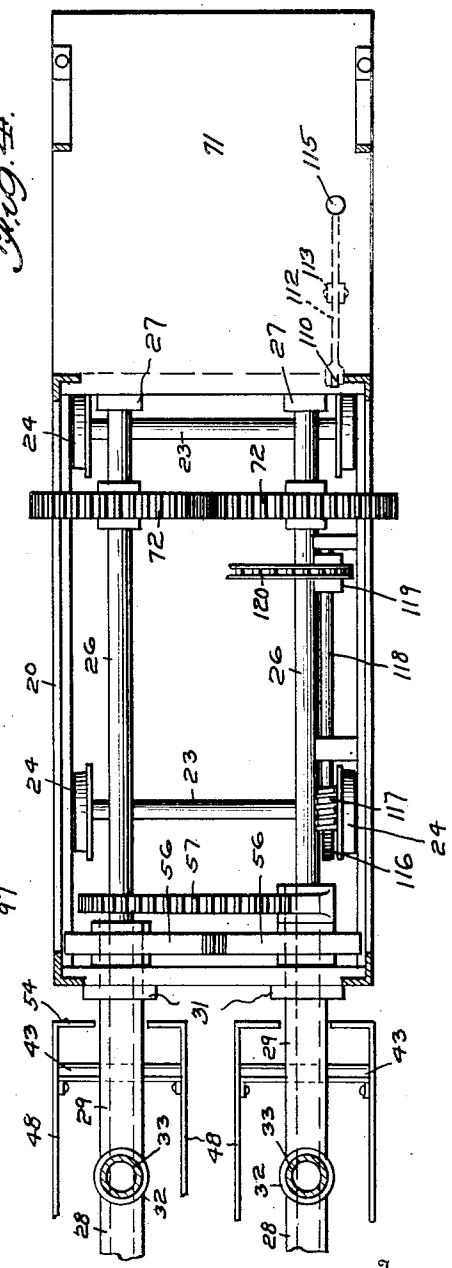


Fig. 4.



Inventor

FRANK M. WEVER,

By

Attorney

July 3, 1928. 1,675,871

F. M. WEVER

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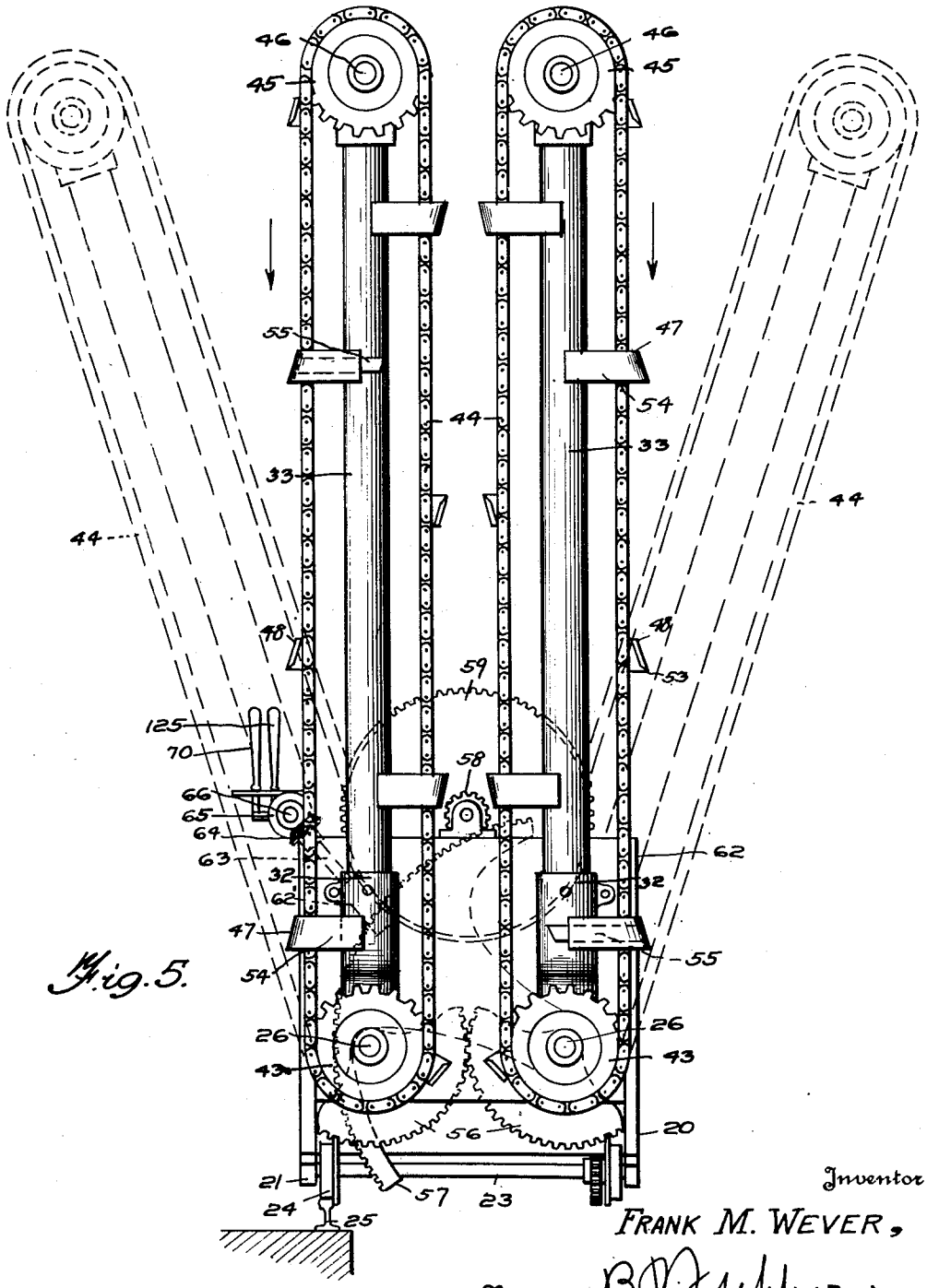


Fig. 5.

Inventor

FRANK M. WEVER,

By

Attorney

July 3, 1928. 1,675,871

F. M. WEVER

ACID PHOSPHATE HOT DEN EXCAVATOR

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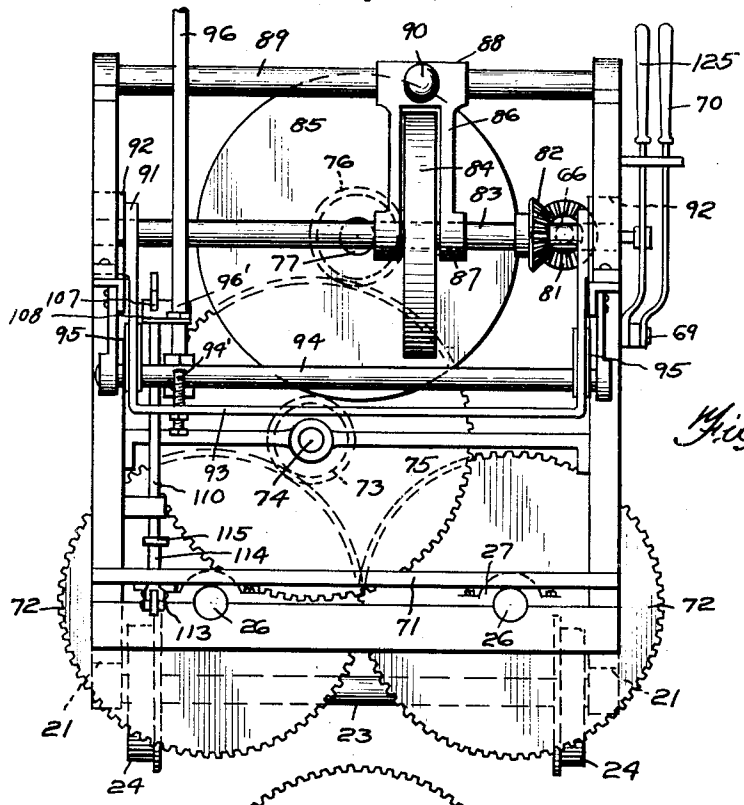


Fig. 6.

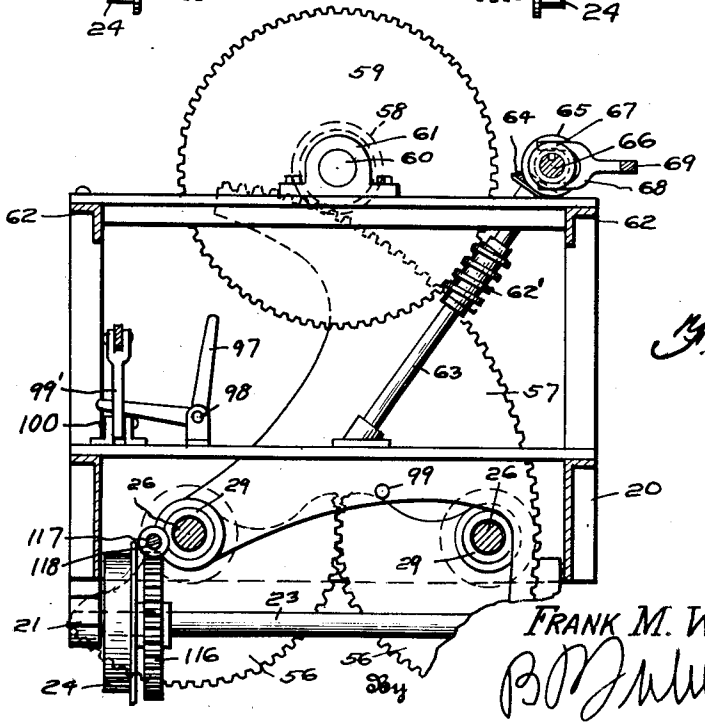


Fig. 7.

Inventor

FRANK M. WEVER,

By

Attorney

July 3, 1928. 1,675,871

F. M. WEVER

ACID PHOSPHATE HOT DEN EXCAVATOR

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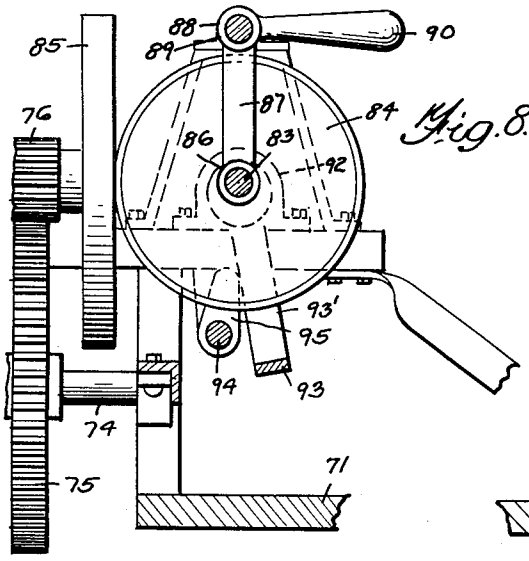


Fig. 8.

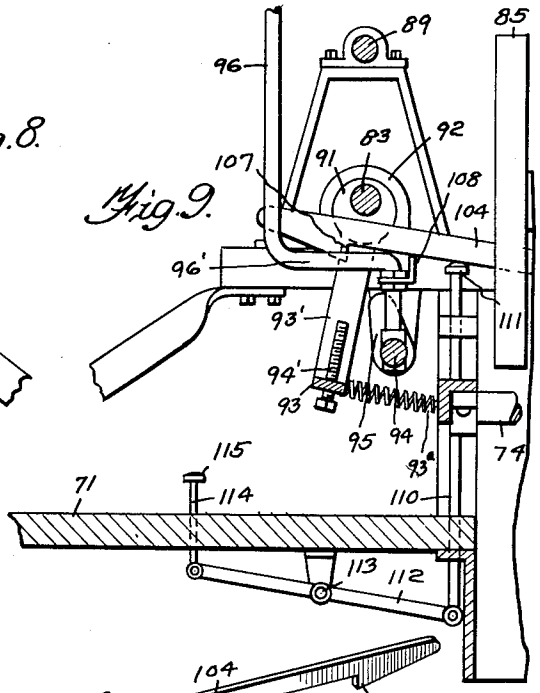


Fig. 9.

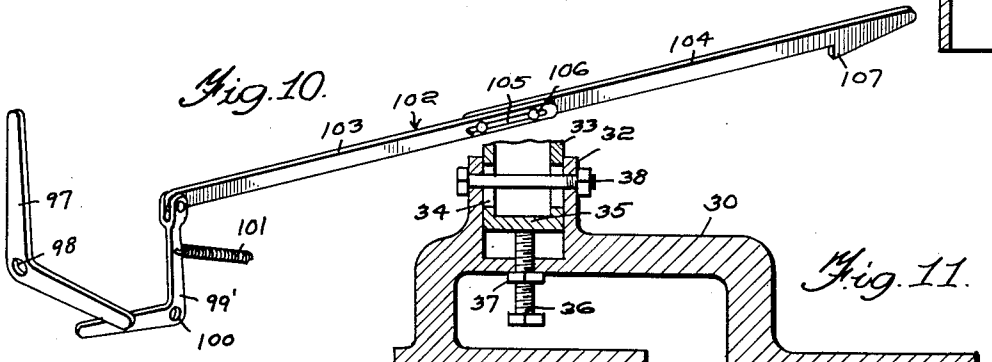


Fig. 10.

Fig. 11.

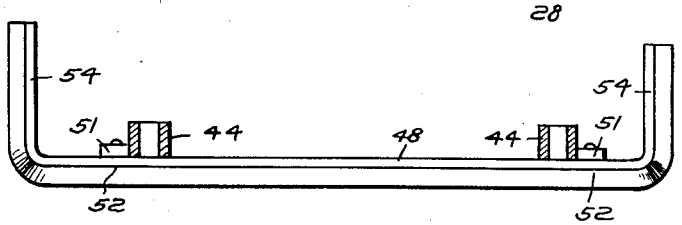


Fig. 12.

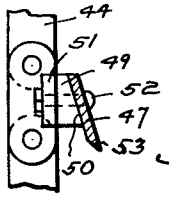


Fig. 13.

Inventor

FRANK M. WEVER,

By

Attorney

July 3, 1928. 1,675,871

F. M. WEVER

ACID PHOSPHATE HOT DEN EXCAVATOR

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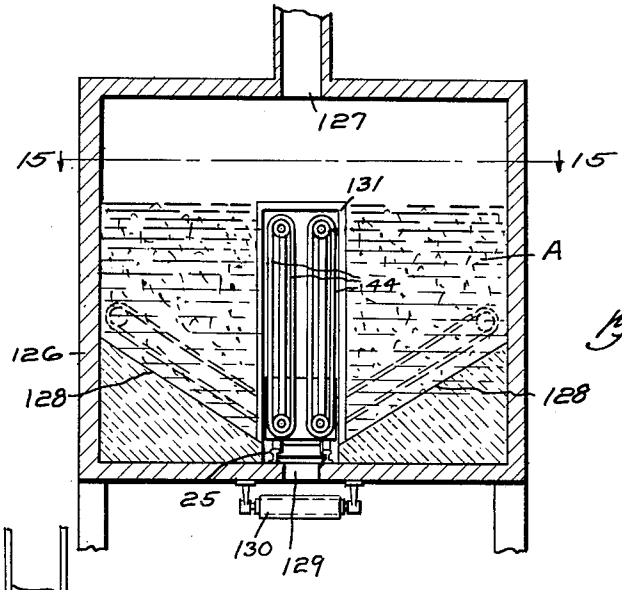


Fig. 14.

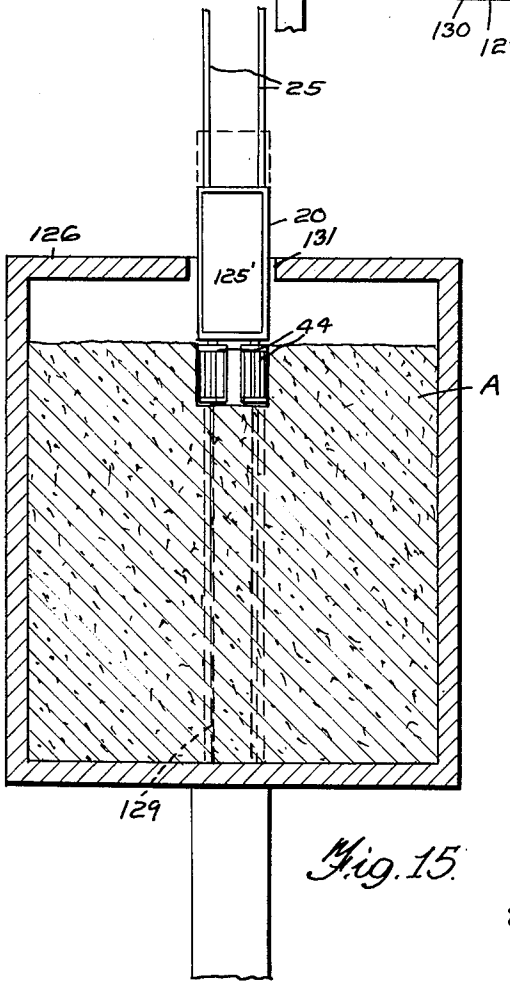


Fig. 15.

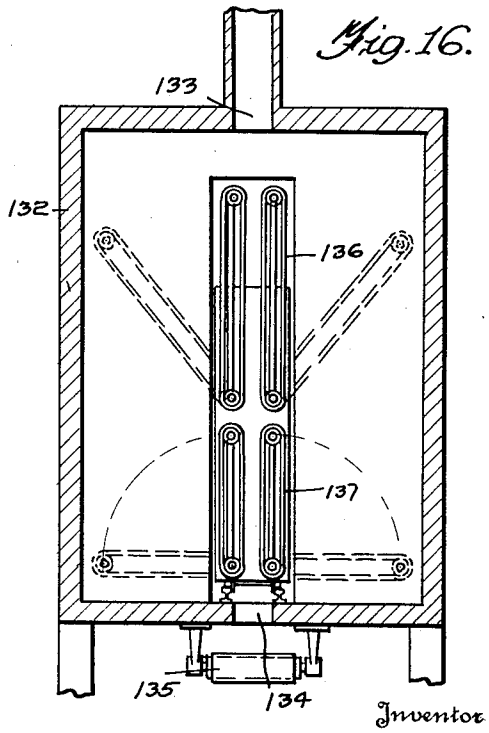


Fig. 16.

Inventor

FRANK M. WEVER,

By

Attorney

Patented July 3, 1928. 1,675,871

UNITED STATES PATENT OFFICE.

FRANK M. WEVER, OF ANDERSON, SOUTH CAROLINA.

ACID-PHOSPHATE HOT-DEN EXCAVATOR.

Application filed September 30, 1926. Serial No. 138,774.

My invention relates to apparatus for cutting and removing the contents of acid phosphate dens.

An important object of the invention is to provide apparatus of the above mentioned character, which is adapted for use in connection with the ordinary type of acid phosphate den, without altering the construction of the same.

A further object of the invention is to provide a machine of the above mentioned character which is adjustable during its operation, whereby the cutting means thereof may remove substantially all of the fresh acid phosphate from within the den.

A further object of the invention is to provide a machine of the above mentioned character, which is reliable in operation and will effect a great saving in time and labor over the old method of removing the fresh acid phosphate by means of hand labor.

A further object of the invention is to provide a machine of the above mentioned character, which is simple and easy to operate and may be completely controlled in its operation by a single operator.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this specification, and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a side elevation of apparatus embodying my invention, parts broken away,

Figure 2 is a similar view, with the hood or cover removed,

Figure 3 is a plan view of the same, with the hood or cover removed,

Figure 4 is a horizontal section taken on line 4—4 of Figure 2,

Figure 5 is an elevation of the forward end of the apparatus,

Figure 6 is an elevation of the rear end of the same,

Figure 7 is a transverse section taken on line 7—7 of Figure 2,

Figure 8 is a detailed section taken on line 8—8 of Figure 3, looking in the direction of the arrows,

Figure 9 is a similar view taken on line 9—9 of Figure 3, looking in the direction of the arrows,

Figure 10 is a perspective view of elements included in trip means for automatically releasing the friction drive,

Figure 11 is a central vertical longitudinal section through one of the pivot-yokes,

Figure 12 is a horizontal section taken on line 12—12 of Figure 2,

Figure 13 is a side elevation of one cutter blade,

Figure 14 is a partly diagrammatic view through an acid phosphate den, illustrating the operation of the apparatus therein,

Figure 15 is a partly diagrammatic view taken on line 15—15 of Figure 14,

Figure 16 is a partly diagrammatic view of a modified form of the apparatus embodying my invention, showing the same operating within the acid phosphate den, which is shown in vertical section, and,

Figure 17 is a side elevation of a bearing yoke.

In the drawings, wherein for the purpose of illustration, are shown preferred embodiments of my invention, attention being called first to Figures 1 to 13, inclusive, the machine is shown as embodying a rectangular carriage 20, having bearings 21, for receiving transverse axles 23, carrying flanged wheels 24, for traveling upon track rails 25, to be hereinafter referred to.

Extending longitudinaly of the carriage 20 are drive shafts 26, having their rear ends journaled in bearings 27, suitably mounted upon the carriage 20. The drive shafts 26 have their forward ends journaled within forward and rear sleeves 28 and 29, rigidly secured to the lower ends of pivot-yokes 30, Figs. 2 and 11. The rear sleeves 29 are pivoted within bearings 31, suitably carried by the forward end of the carriage 20. It should be stated at this point that the drive shafts rotate independently of the swinging movement of the pivot-yokes 30.

The pivot-yokes 30 are provided at their tops with sockets 32, receiving the lower ends of preferably tubular uprights or supports 33, which are provided near such lower ends with elongated slots 34, Figure 11. The lower ends of these uprights are preferably closed by bottoms 35, which are adapted to be engaged by adjusting bolts 36, having screw-threaded engagement with the pivot-yokes 30 and adapted to be held in the adjusted positions by lock nuts 37 or the like. Passing through the slots 34 and

openings in the sockets 32 are bolts 38, the function of which is to prevent the uprights or supports from turning upon their longitudinal axes. The sockets 32 are split and, therefore, contractable and are adapted to be drawn together for clamping engagement with the uprights or supports 33, by means of bolts 39, Figure 2.

The numeral 40 designates T-shaped tubular heads, having depending sockets 41, for the reception of the upper ends of the supports or uprights 33, and these sockets are preferably split so that they may be clamped to the supports 33 by bolts 42 or the like. The heads 40 extend longitudinally of the carriage 20 and are parallel with the longitudinal axes of the same.

As above stated, the forward ends of the drive shafts 26 are journaled within the sleeves 28 and 29, and lower pairs of sprocket wheels 43 are rigidly mounted upon the drive shafts 26. These sprocket wheels are engaged by pairs of sprocket chains 44, extending upwardly for engagement with upper pairs of sprocket wheels 45, which are rigidly mounted upon shafts 46, journaled within the tubular heads or bearings 40, as shown.

These sprocket chains are included in the cutting or excavating mechanism, and for this purpose they are equipped with alternately arranged cutter blades 47 and 48, which are equi-distantly spaced, as shown. As more clearly shown in Figure 13, spacing blocks 49, having inclined faces 50 are arranged between the cutter blade and the adjacent apertured ears or extensions 51 carried by the sprocket chain links and these parts are held together by bolts 52 or the like. This is the preferred construction in order that the blade may be inclined outwardly in a downwardly direction. Of course, the invention is in no sense restricted to the precise manner of attaching the cutter blades to the sprocket chains. The alternate cutter blades 47 are preferably serrated for providing teeth 53, while the alternate blades 48 preferably have straight cutting edges. However, the alternate blades 48 have their ends extended in the form of transverse blades or extensions 54. The purpose of these transverse blades or extensions 54 is to provide means for cutting into the fresh acid phosphate, as the machine is being fed into the den, prior to the cutting action which occurs, when the cutting mechanism is laterally adjusted. The numeral 55 designates an auxiliary cutter blade, which is associated with each endless cutting or excavating device. This auxiliary cutting blade is preferably rigidly attached to one of the cutter blades 48 in a transverse plane forwardly of the transverse cutter blades 54. The auxiliary blade is longer than the transverse cutter blades 54, and is adapted to span the vertical space occurring between the inner ends of the transverse cutter blades 54. These inner ends are purposely spaced a sufficient distance, so that there will be no liability of these ends striking or locking with each other, due to slack in the endless chains. It, therefore, follows that as the machine is being fed into the den, that thin vertical strips of the fresh acid phosphate are left, due to the spacing of the transverse blades 54, and the function of the auxiliary cutter blade 55 is to cut out this remaining partition, or strip.

Means are provided to swing the cutting or excavating devices laterally upon the drive shafts 26, as pivots, and such means includes segmental gears 56, which are rigidly mounted upon the rear sleeves 29 of the pivot-yokes 30. As clearly shown in Figure 7, these segmental gears are in permanent mesh, and hence the pivot-yokes are simultaneously turned in opposite direction.

Rigidly mounted upon the rear sleeve 29 of one pivot-yoke 30, namely the pivot-yoke 30 to the left, Figure 7, is a segmental gear 57, engaging a pinion or gear 58, which rotates with a larger worm wheel 59. This gear and worm wheel are rigidly mounted upon a longitudinal shaft 60, journaled in bearings 61, suitably mounted upon the frame 62, mounted upon the carriage 20. The worm wheel 59 is driven by a worm 62′, formed upon a diagonally arranged shaft 63. This shaft is provided at its upper end with a beveled gear 64, see Figures 3 and 7, and this beveled gear is engaged by a beveled gear 65, as shown. The beveled gear 65 is rotatable upon a longitudinal line shaft 66, mounted upon the frame 62 and is adapted to be locked to the shaft 66, for rotation therewith, by means of a clutch device, embodying a sliding clutch head 67, shifted by a fork 68, connected with a rearwardly extending rod 69. This rod is moved by means of a lever 70 arranged near the rear end of the machine, and in convenient reach of the operator, standing upon a platform 71. It is thus seen that means are provided to swing the cutting or excavating devices laterally from each other, and while the means shown and described has proven satisfactory, yet the invention is in no sense restricted to the precise shifting means and driving means therefor, as changes may be resorted to as may be found advantageous.

The drive shafts 26 are adapted to be rotated in opposite directions, in unison, and for this purpose they are provided near their rear ends with large gears or pinions 72, Figures 4 and 6. The gears or pinions 72 are in constant mesh, and one gear 72, preferably the gear 72 to the left, Figure 6, is engaged by a smaller gear 73. This gear 73 is rigidly mounted upon a shaft 74, suit-

ably supported by the frame 62 and a larger gear 75 is also rigidly mounted upon the shaft 74. This larger gear engages a smaller gear 76, rigidly mounted upon a main drive shaft 77, which is suitably mounted upon the frame 62, and extends longitudinally thereof. If desired, a clutch device may be employed to lock and unlock the gear 76 to and from the shaft 77, for controlling the rotation of the gear 75. The main drive shaft 77 is driven by a large gear 78, rigidly secured to its forward end and this large gear engages a smaller gear 79, driven by an electric motor 80 or other suitable source of power. The motor is, of course, suitably mounted upon the carriage 20.

Referring to Figure 3, it will be seen that the line shaft 66 is provided at its rear end with a beveled gear 81, rigidly secured thereto, and this beveled gear engages a beveled gear 82, which is rigidly mounted upon a transverse counter shaft 83, see particularly Figures 3 and 6. The counter shaft receives its rotation from a friction disk 84, which is splined thereon, to move longitudinally thereof and turn therewith. This friction disk is adapted for co-action with a forward friction disk 85, arranged at a right angle thereto, and rigidly mounted upon the main drive shaft 77. Means are provided for shifting the friction disk 84 longitudinally of its counter shaft 83, comprising a yoke 86, which straddles this disk and has apertured ends 87, slidable upon the counter shaft 83. The yoke embodies a head 88, slidable upon an upper transverse guide rod 89, suitably attached to the frame 62, and the yoke is shafted by means of a handle 90, rigidly attached to the head 88.

As more clearly shown in Figures 3, 6, 8, 9 and 11, the ends of the counter shaft 83 are eccentrically journaled within bearings 91, which are cylindrical and are in turn concentrically journaled within stationary bearings 92, suitably mounted upon the frame 62. The bearings 91 are free to turn in the stationary bearings 92 and are rigidly connected by means of a U-shaped member or yoke 93, so that they turn together. It will be seen that when the yoke 93 is shifted toward the rear end of the machine, that the counter shaft 83 will be shifted forwardly, and hence the friction disk 84 will be brought into firmer engagement with the co-acting friction disk 85.

Manually operated means is provided to shift the yoke 93 rearwardly, the same comprising a transverse rock shaft 94, suitably mounted upon the frame 62 and this rock shaft carries upstanding radial cams 95, rigidly secured thereto, arranged to engage the arms 93′ of the yoke. A spring 93ª serves to shift the yoke 93 forwardly, when released. The rock shaft is turned by means of an upstanding lever 96, arranged at the rear of the machine, in convenient reach of the operator upon the platform 71. The rearward swinging movement of the lever 96 is limited by an adjustable stop bolt 94′, carried by the yoke 93, and arranged to engage the horizontal portion 96′ of this lever. When the lever 96 is shifted to the rearmost position, the cams 95 will be substantially horizontal, and hence will retain the disks in driving frictional engagement.

Adjustable automatic means is provided to break the driving frictional engagement between the disks 84 and 85, when the cutting devices have been swung outwardly to a desired limit. This means comprises a transverse bell-crank lever 97, pivoted at 98, Figure 7, and having its upstanding arm disposed in the path of travel of a pin 99, carried by the segmental gear 57. The bell-crank lever 97 is arranged at a right angle to a longitudinally extending bell-crank lever 99′, pivoted at 100, and the horizontal arm of the last-named bell-crank lever is arranged beneath and in the path of travel of the horizontal arm of the bell-crank lever 97 to be engaged and shifted thereby. The bell-crank lever 99′ is swung rearwardly and normally retained in the rear position by means of a retractile coil spring 101. The bell-crank lever 99′ has its upper end pivotally connected with a longitudinal reach rod or bar 102, preferably formed in sections 103 and 104, which are longitudinally adjustably connected. For this purpose, the section 103 is provided with a longitudinal slot 105, for receiving adjustably clamping bolts 106, carried by the section 104. The section 104 is provided at its rear end with a depending tooth or shoulder 107, arranged rearwardly of and in the path of travel of an element or bracket 108, rigidly attached to the lever 96. The rear end of the reach rod 102 is adapted to rest upon the bracket 108 and this reach rod also operates within a slotted guide 109, secured to the frame, in advance of the lever 96, and this permits of the reach rod moving longitudinally and also having its rear end raised and lowered. The rear end of the reach rod is adapted to be manually operated so that its tooth 107 may disengage the bracket 108, by means of a vertical push rod 110 having a head 111 engaging beneath the rear end of the reach rod. The push rod is adapted to be shifted upwardly by a lever 112, arranged beneath the platform 71, and pivoted at 113, as shown. The lever 112 is turned by means of a vertical rod 114, extending through and above the platform 71, and equipped with a head 115. From the foregoing description it will be seen that when the cutting devices have been swung outwardly to the desired limit, that the pin 99 will turn the bell-crank lever 97, which will turn the bell-crank lever 99′,

and effect a forward longitudinal movement of the reach rod 102 and when this reach rod is moved rearwardly sufficiently its tooth 107 will engage the bracket 108, and shift the lever 96 forwardly. In the event that the operator should be urging this lever rearwardly, the same will be positively shifted forwardly against his action, and hence the driving frictional engagement between the disks will be broken and the outward movement of the cutting devices stopped. It is obvious that the time at which this outward movement will be stopped will depend upon the distance between the tooth 107 and the bracket 108, which may be regulated by adjusting the length of the reach rod 103, and hence the automatic means for stopping the outward swinging movement of the cutting devices is adjustable. The movement of the disk 84 toward and away from the disk 85 is slight, and hence the beveled gears 81 and 82 ordinarily remain in mesh and there is sufficient play between the teeth of the beveled gears to permit of this adjustment. A friction drive may be substituted for these beveled gears, if desired.

Means are provided whereby the machine may be fed or driven longitudinally by the motor 80, and for this purpose, the forward axle 23 is equipped with a worm wheel 116, rigidly secured thereto, and engaging a worm 117, rigidly mounted upon a shaft 118, extending longitudinally of the carriage 20, near one side thereof, and suitably mounted thereon. The shaft 118 is driven by a sprocket wheel 119, see Figure 3, engaged by a sprocket chain 120, extending transversely of the machine and engaging a sprocket wheel 121, rotatable upon a shaft 66, and adapted to be locked to this shaft for rotation thereby by means of a clutch device including a clutch head 122, slidable upon the shaft 66. This clutch is shifted by means of a fork 123, moved by a rod or link 124, extending rearwardly for connection with a lever 125, arranged near the rear end of the machine, in convenient reach of the operator.

As clearly shown in Figure 1, the operating parts of the machine, excepting the cutting devices, are preferably enclosed within a hood or cover 125′, suitably mounted upon the carriage 20. This hood or cover may be equipped with swinging doors 126′, so that access may be had to the driving parts without entirely removing the cover. The top of the hood or cover serves as a platform upon which the operator may stand, particularly when he wishes to remove or knock down portions, of the fresh acid phosphate which the machine may have skipped. The hood or cover is preferably provided with a railing 128′, for the protection of the operator.

Attention is now called to Figures 14 and 15. In these figures, the numeral 126 designates an acid phosphate den, having an opening 127 at its top through which the material may be fed into the den. The den may have inclined bottoms 128, converging downwardly toward a longitudinal outlet opening or slot 129. Arranged beneath the outlet opening or slot 129 is an endless conveyor 130 for removing the fresh acid phosphate as it is cut and fed through the slot 129. The den 126 is provided in one end with a door opening 131, which may be closed by an iron door or the like. The track rails 25 extend into the den through the opening 131, and are not secured to the floor of the den, but are secured to each other by transverse metal cross ties or the like, arranged at suitable intervals. The machine which has been described, travels on these track rails and enters the den through the opening 131. As the machine is fed or driven through the opening 131, the transverse blades or extensions 54 first engage the fresh acid phosphate, indicated at A. This fresh acid phosphate ordinarily extends upwardly to an elevation at about the top of the door opening. The transverse blades cut into this fresh acid phosphate and provide a suitable passage for the entrance of the cutting devices. The cut acid phosphate falls to the bottom of the den and discharges through the opening or slot 129. As above stated, the space occurring between the inner ends of the transverse blades 54, produces a thin sheet or column of uncut fresh acid phosphate, which, however, is cut by the auxiliary blades 55, and discharges from the den, as is obvious. After the machine has been advanced sufficiently so that the blades 47 and 48 clear the end wall of the den, the two cutting devices are gradually swung outwardly, so that the blades 47 and 48 act upon the material. This outward swinging movement of the cutting devices is effected through the medium of the friction drive and associated elements which is actuated by the operator pulling the lever 96 rearwardly whereby the friction disks are brought into driving frictional engagement. At this time, the cams 108 engaging the arms 93′ of the yoke 93 are substantially horizontal and hence the yoke is held in the rear position and the frictional drive is maintained. When the cutting devices have swung outwardly to the desired limited movement, as explained, the reach rod 103 is automatically shifted forwardly, whereby the tooth 107 engages the bracket 108, shifting the lever 96 and its rock shaft forwardly, whereby the cams 95 will release the yoke 103 and the yoke will be returned to the forward position by means of the spring 93ª and the friction drive broken. The bolt 94′ is arranged in the path of travel of the hori-

zontal portion of the lever 96, and limits the rearward swinging movement of the lever so that the cams 95 can not be swung rearwardly beyond the horizontal position, which would prevent their automatic release. While the cutting devices are being swung outwardly, as explained, the endless chains carrying the cutting elements or blades are constantly driven in the direction of their arrows, as clearly shown in Figure 5. The cutter elements or blades, therefore, cut the fresh acid phosphate and aid in feeding the same toward the discharge opening or slot. After the first section of the den has been substantially completely emptied of the fresh acid phosphate the cutting devices are again swung inwardly to the vertical position, which may be accomplished by shifting the friction disk 84 to the opposite side of the center of the friction disk 85. After this is done, the machine is again gradually fed or advanced into the fresh acid phosphate until the forward transverse cutters or blades 54 have again provided a space or cavity of substantially the length of the cutter blades 47 and 48, at which time the longitudinal travel of the machine is stopped and the cutting devices are again gradually swung outwardly, while they are being constantly driven, as explained. The machine is not restricted to this mode of operation, as I have found that the machine may be first advanced for the entire length of the den, thereby cutting a passage through the entire length of the fresh acid phosphate, for the travel of the machine, and subsequently to this, the machine may be made to travel back and forth throughout the entire length of the den, and the cutting devices gradually swung outwardly, thereby cutting successive layers from the fresh acid phosphate throughout the entire length of the mass.

In Figure 16, I have shown a diagrammatically or modified form of the invention. In this figure, the numeral 132 designates a tall den, having a top inlet 133, and the usual slot 134, in its bottom with the usual conveyor 135. The bottom of this den may be horizontal. The machine which I contemplate using in this type of tall den will embody two superposed pairs of cutting devices, designated as a whole by the numerals 136 and 137. These cutting devices will be identical with the cutting devices hereinbefore described, and will be actuated by the substantial same means but will be arranged in superposed relation. The lower cutting device 137 may be swung downwardly to a substantially horizontal position while the upper cutting device may be swung downwardly to outer inclined positions. The remaining sections of fresh acid phosphate which are not cut by the machine, may be broken or cut by the operator by means of a pick or the like.

Prior to the filling of the den, the slot in the bottom is covered by temporary means, such as boards, and this prevents the plastic material discharging through the slot, before it has hardened. Prior to the entrance of the cutting devices into the den, a suitable number of these boards are removed by a pick or the like. Any suitable form of removable support may be employed.

It is to be understood that the forms of my invention, herewith shown and described, are to be taken as preferred examples of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:—

1. A machine for cutting acid phosphate in a den or the like comprising, a carriage, a pair of normally upstanding supports pivotally mounted upon the carriage to be swung outwardly toward the horizontal, endless cutting devices mounted upon the supports, gears connected with the supports and in mesh to cause the supports to swing simultaneously in opposite directions, an operating element connected with one of the supports to turn the same and having a trip pin, driving means to move the operating element, and means automatically actuated by the trip pin to render the driving means inoperative with respect to turning said operating element when the operating element has turned to a selected position.

2. A machine for cutting acid phosphate in a den or the like, a pair of pivoted endless cutting devices, gears connected with the devices to turn them and in mesh, an operating element connected with one cutting device to swing the same upon its pivot, driving means for the operating element including a pair of co-acting friction disks, manually operated shifting means for bringing one disk into driving frictional engagement with the other disk, a pin carried by the operating element, and means automatically actuated by the pin to operate the manually operated means to break the driving frictional engagement between said disks.

3. A machine for cutting acid phosphate in a den or the like, a pair of pivoted endless cutting devices, gears connected with the devices to turn with them and in mesh, an operating element connected with one cutting device to swing the same, a driving friction disk, a driven friction disk, a shaft carrying the driven friction disk, pivoted bearings having eccentric openings to receive the ends of the shaft, a yoke connecting the pivoted bearings, a rock shaft having cams to engage

the yoke and swing the same in one direction, a manually operated lever to turn the rock shaft in one direction, a pin secured to the operating element, automatic means actuated by the pin to turn the rock shaft in a reverse dircetion, and driving means between the driven disk and the operating element.

4. A machine for cutting acid phosphate in a den or the like having an outlet slot in its bottom comprising a track arranged near and extending longitudinally of said slot, a carriage to travel upon the track, an upstanding endless cutting device having its lower end pivotally mounted upon the carriage at an elevation beneath the elevation of the top of the acid phosphate within said den, the pivotal connection being such that the upper end of the endless cutting device is adapted to be swung in a substantially vertical plane outwardly and transversely of said carriage, said endless cutting device being adapted to have cutting action with the acid phosphate throughout the major portion of the length of the outer run of the endless cutting device, and means to drive the endless cutting device in a direction so that the lower end of said outer run travels inwardly toward said slot and the cutting device will also serve to feed the cut acid phosphate to the slot.

5. A machine for cutting acid phosphate in a den having a door opening in its side wall and an outlet slot in its bottom, and a track arranged near and extending longitudinally of said slot comprising, a carriage to travel upon the track, upstanding endless cutting devices having their lower ends pivotally mounted upon the carriage at an elevation beneath the elevation of the top of the acid phosphate within said den, the pivotal connections being such that the lower ends of the endless cutting devices are permanently retained near the outlet slot while their upper ends are adapted to be swung transversely and outwardly of said carriage, said endless cutting devices being adapted to have cutting action with the acid phosphate throughout the major portion of the length of the outer runs of the endless cutting devices, means to swing the endless cutting devices in a substantially vertical plane upon their pivots, and means to drive the endless cutting devices in directions so that the lower ends of the outer runs travel inwardly toward said slot and the cutting devices will also serve to feed the cut acid phosphate to the slot.

6. A machine for cutting acid phosphate within a den which has a door in its side wall and an outlet slot in its bottom, and a track passing through the door and extending longitudinally of the outlet slot, comprising a carriage to travel upon the track and to enter the den through said door, a pair of supports which are substantially vertically arranged in the starting position and having their lower ends pivotally mounted upon the carriage in a manner to permit the upper ends of said supports being swung generally vertically transversely of the carriage and outwardly beyond the same, endless carriers mounted upon said support, cutters positioned upon the sides of the endless carriers and attached thereto, cutters positioned at the forward edges of the endless carriers and secured thereto, the arrangement being such that said cutters are adapted to cut the acid phosphate throughout the major portion of the length of the runs of the endless carriage, means to swing the upper ends of the supports outwardly with relation to the carriage, and means to drive the endless carriers so that the lower ends of their outer runs travel toward the longitudinal slot whereby the cutters also serve to feed the cut acid phosphate to said slot.

7. A machine for cutting acid phosphate within a den which has a door in its side wall and an outlet slot in its bottom, and a track passing through the door and extending longitudinally of the outlet slot, comprising a carriage to travel upon the track and to enter the den through said opening, a pair of endless cutting devices which are generally vertically arranged in the starting position and have their lower ends pivotally mounted upon the carriage at an elevation beneath the elevation of the top of the acid phosphate within said den, the pivotal connection being such that the lower ends of the endless cutting devices are retained near the outlet slot while their upper ends are adapted to be shifted transversely of the carriage and outwardly beyond the same, said endless cutting devices embodying cutting means arranged at the sides and forward edges of the same, the arrangement being such that the cutting devices will cut the acid phosphate throughout the major portion of the lengths of the runs of said endless cutting devices, means to swing the endless cutting devices outwardly, and means to drive the endless cutting devices so that the lower ends of their outer runs will travel inwardly toward said slot and feed the cut acid phosphate to the same.

8. A machine for cutting acid phosphate within a den which has an entrance door and an outlet slot in its bottom, and a track passing through the door and extending longitudinally of said slot, comprising a carriage to travel upon the track, a pair of endless cutting devices having their inner ends pivotally mounted upon the carriage so that they are arranged near the outlet slot and their outer ends adapted to be swung transversely of the carriage, said endless cutting devices embodying cutting means extending about the sides and forward edges

of the same, the arrangement being such that the cutting devices will cut the acid phosphate throughout the major portion of the lengths of the runs of said endless cutting devices, friction clutch means to swing the endless cutting devices outwardly, and means to drive the endless cutting devices so that the lower ends of their outer runs will travel inwardly toward said slot and feed the cut acid phosphate to the same.

9. In a machine for cutting acid phosphate within a den, a carriage, a pair of substantially horizontal shafts mounted upon the carriage and extending longitudinally thereof, a pair of upstanding supports having their lower ends pivotally mounted upon said shafts, gears connected with the lower ends of these supports and in engagement to cause the supports to swing in opposite directions, means to swing one support, endless cutting devices mounted upon the support, driving elements mounted upon the longitudinal shafts and engaging the endless cutting devices, gears connecting said shafts so that they rotate in opposite directions, and means for driving one shaft.

10. In a machine for cutting acid phosphate within a den, a carriage, a pair of substantially horizontal shafts mounted upon the carriage and extending longitudinally thereof, supports provided at their inner ends with sleeves pivotally mounted upon the shafts, gears mounted upon said sleeves and engaging each other to cause the supports to swing in unison, means to turn one sleeve embodying a friction clutch, automatic means to render the friction clutch inactive when the supports are shifted outwardly to a predetermined limit, endless cutting devices mounted upon said supports, driving elements mounted on said shafts and engaging the endless cutting devices, gearing connecting said shafts so that they rotate in unison, and means to drive one shaft.

In testimony whereof I affix my signature.

FRANK M. WEVER.