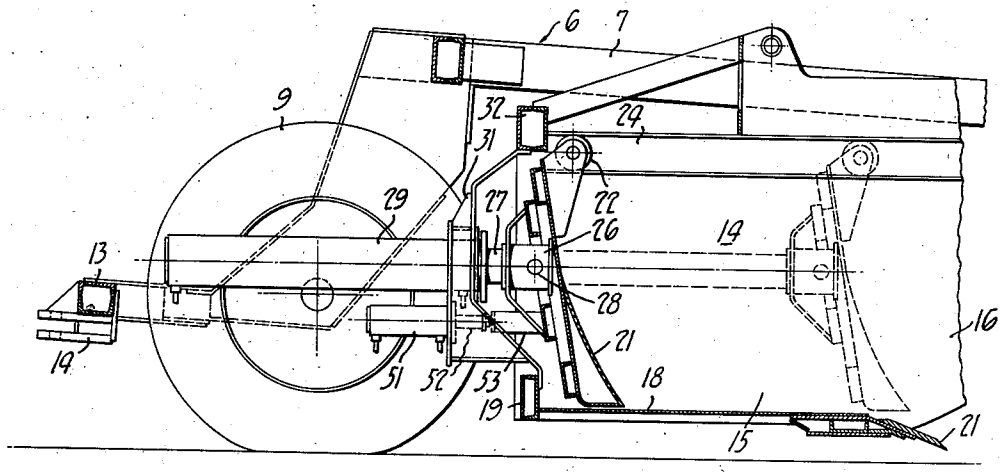
July 11, 1944. E. W. AUSTIN 2,353,120

EARTH MOVER

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FIG. 1.



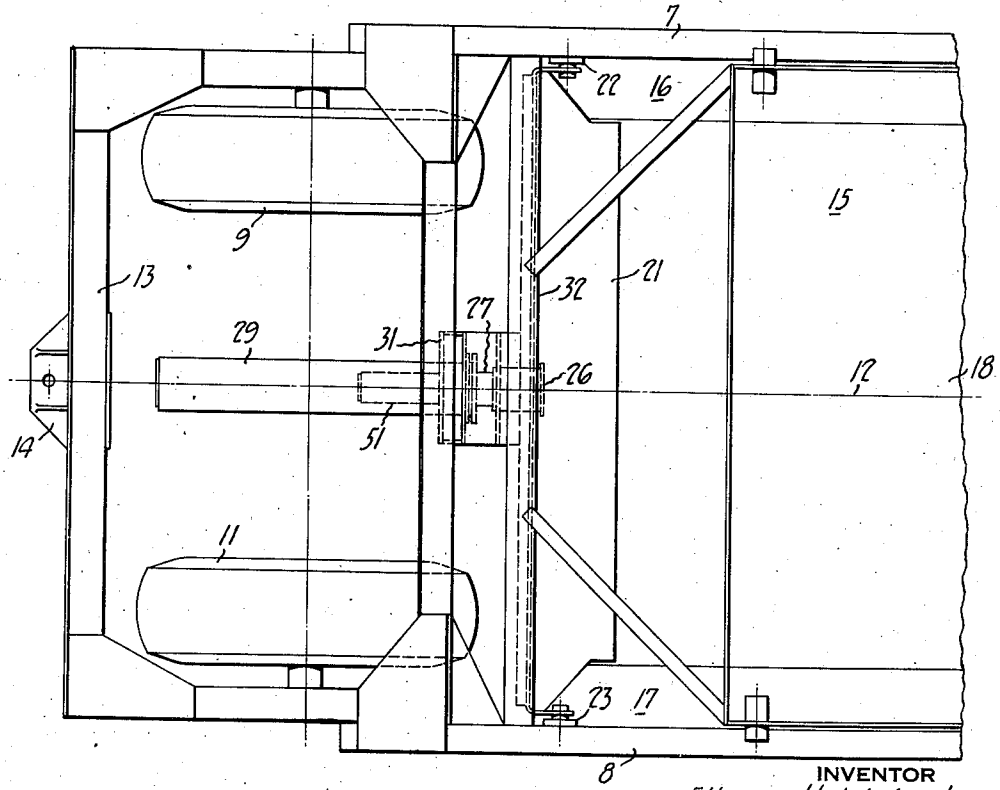


FIG. 2.

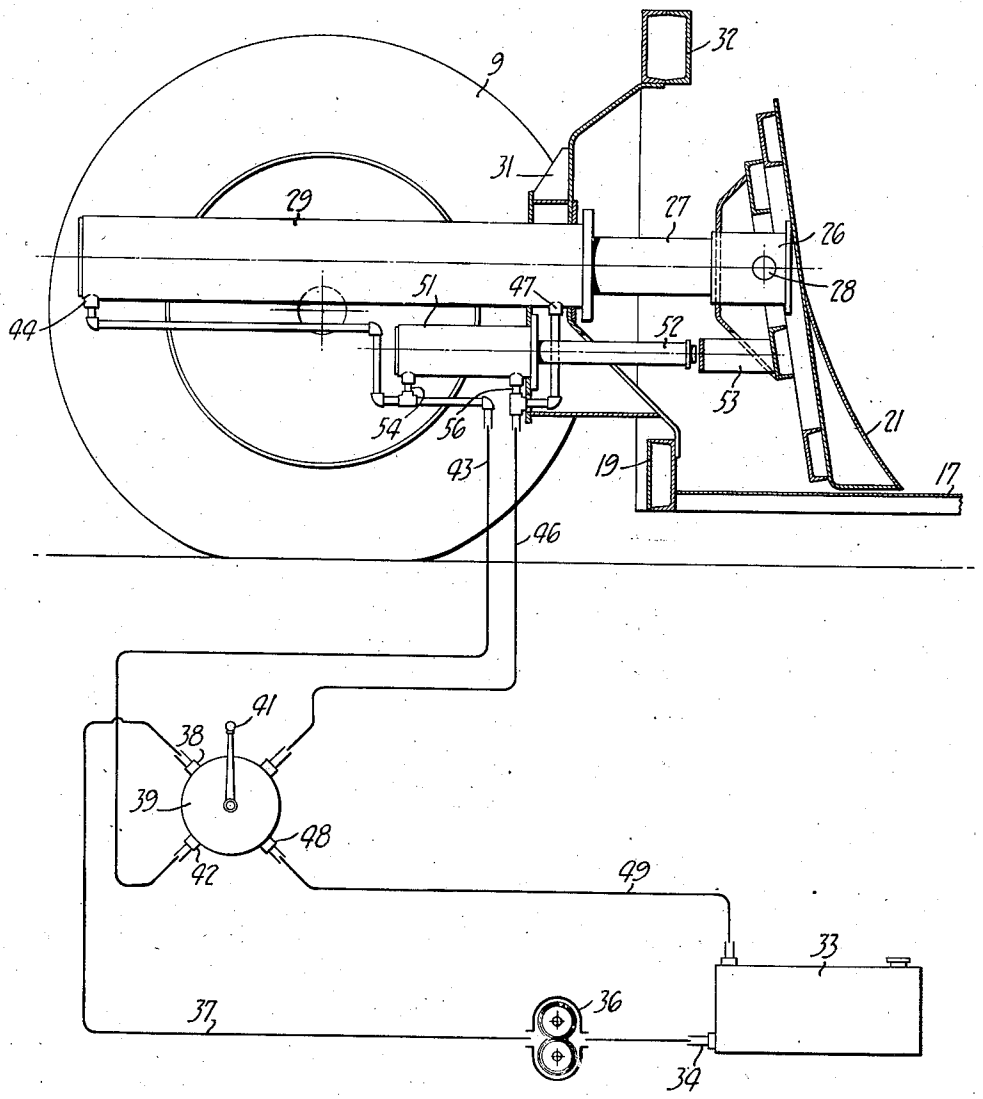
INVENTOR
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EARTH MOVER

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FIG. 3.



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UNITED STATES PATENT OFFICE

2,353,120

EARTH MOVER

Ellsworth W. Austin, Cedar Rapids, Iowa, assignor to La Plant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa, a corporation of Delaware

Application September 15, 1941, Serial No. 410,826

9 Claims. (Cl. 37—126)

My invention relates to means intended to be utilized in gathering, conveying and discharging material such as earth especially designed to be propelled by a separate draft vehicle or by included power. Devices of this general character are disclosed in my patents for "Earth mover," Nos. 2,204,033 and 2,203,713. This application is a continuation in part of my application entitled "Earth mover," Serial No. 172,094, filed November 1, 1937, and since issued as Patent No. 2,273,010.

It is in general an object of my invention to provide an improved earth mover.

Another object of my invention is to provide an earth mover having a very large earth capacity, yet one in which the earth is positively discharged.

Another object of my invention is to provide an earth mover in which very heavy loads can readily be started from rest, yet discharged reasonably quickly.

The foregoing and other objects are attained in the embodiment of the invention illustrated in the drawings, in which—

Fig. 1 is a cross-section on a vertical longitudinal central plane through the rear portion of an earth mover constructed in accordance with my invention, portions of the figure being broken away to reduce its size and some portions being shown in elevation.

Fig. 2 is a plan of the structure illustrated in Fig. 1.

Fig. 3 is a view similar to Fig. 1, the parts being displaced from their rearmost positions and parts of the showing being omitted and parts being diagrammatic to illustrate the hydraulic connections.

In its preferred form my earth mover comprises a main bowl through which an earth barrier is movable from a rearward position toward a forward position, there being provided means for so moving the barrier, the means preferably being hydraulic, and there also being provided a booster means for initially starting and partially propelling the barrier away from its rearmost position, such booster means likewise preferably being hydraulic.

While the earth mover of my invention is in its entirety illustrated in the above-identified Patent No. 2,273,010, it may be generally described as including a forward structure, not illustrated, which is designed to be attached to and propelled by a suitable draft implement such as a tractor. There is a main frame structure 6, which extends rearwardly and has side rails 7 and 8 adjacent their rear portions formed to support a pair of rear ground-engaging wheels 9 and 11, respectively, arranged symmetrically on opposite sides of the center line 12 of the structure. The frame rails 7 and 8 are joined behind the rear wheels by a rear crosstie 13 upon which is mounted a connector 14 for the reception of a fastening to another vehicle such as a trailing earth mover or a propelling tractor.

Suitably mounted on and suspended from the main frame 6 is a main earth containing bowl 15 including a pair of side plates 16 and 17 which merge into a generally planar, horizontal bottom plate 18. The bottom plate extends from the rearward portion of the machine whereat it is reinforced by a crossbeam 19 to a transverse cutting edge 21 at the leading portion of the bottom 18. Acting together the side plates 16 and 17 and the bottom plate 18 are designed to receive and support excavated earth.

Preferably the forward portion of the bowl so defined is closed by a front apron, not illustrated herein, and is likewise closed by an earth barrier or pusher or rear end gate 21ª which in effect is a movable, generally vertically extending, transverse wall having at appropriate locations rollers 22 and 23 designed to operate in guides or rails 24 disposed at the top of the side walls 16 and 17, respectively. The pusher 21ª is fabricated of suitable plates and structural shapes all of which are designed to reinforce the central portion of the pusher to receive in a socket 26 the forward end of a piston rod 27 fastened in place by a removable pin 28.

The piston rod forms part of a main actuating mechanism such as a hydraulically expansible chamber and extends into a hydraulic cylinder 29 disposed centrally and rearwardly of the pusher being primarily mounted in a supporting frame 31 secured to the crossbeam 19 and to a comparable crossbeam 32. Within the cylinder 28 is a double acting piston (not shown) connected to the piston rod 27.

In order to actuate the piston rod 27 so that the pusher 21 will similarly be moved between its rearmost position, as shown in full lines in Fig. 1, and its forward position, as shown in broken lines in that figure, a suitable hydraulic circuit under operator control is provided.

A tank 33 of hydraulic fluid such as oil is provided in a suitable location and is connected by an intake conduit 34 to a hydraulic pressure pump 36 of any suitable kind, which preferably is driven from a suitable source of power such as a tractor engine. From the pump 36 a pipe

37 extends to a port 38 in a valve casing within which is a valve (not shown) suitably rotated by an operating handle 41. At one position of the valve fluid under pressure from the port 38 is conducted immediately to a port 42 which is connected by a pipe 43 to an apertured boss 44 at the rearward end of the cylinder 29 so as to subject the rearward face of the piston therein to the pressure of the fluid. Simultaneously, the valve within the casing 39 preferably interconnects a pipe 46 leading from an apertured boss 47 at the forward end of the cylinder back through the valve casing and through a port 48 to a return pipe 49 extending to the tank 33. Thus, simultaneously with the supply of pressure fluid to the rearward end of the cylinder 29 fluid is released from the forward end thereof. The difference in pressure causes the expulsion of the piston rod 27 from the cylinder and the advancing movement of the pusher 21a.

A reversal of operation of the valve handle 41 causes the pressure fluid from pipe 37 to be conducted through the pipe 46 to the forward portion of the cylinder 29 while simultaneously fluid is released from the rearward part of the cylinder through the pipe 43 to and through the pipe 49 back to the tank 33. In this fashion the pusher 21a is returned. It can be hydraulically advanced and retracted or held in any selected location.

Usually the pusher is subjected to its greatest load when first leaving its rearward position as illustrated in Fig. 1. If the hydraulic cylinder 29 is made sufficiently large in diameter to start the load with alacrity, then its volume is so large as to require a relatively slow forward movement of the pusher. As an alternative, there can be used a greatly oversized pump which works at an extreme load in the beginning portion of the pusher ejecting movement and then works to handle an exceedingly large volume for the remaining part of the time as the load decreases during discharge.

To overcome this difficulty, that is, to provide adequate power for starting the load, yet to keep the hydraulic cylinder 29 relatively small in diameter and volume so that a relatively rapid final ejecting movement will be produced, and so that a standard capacity pump can be used, I have in accordance with my invention provided a place on the mounting frame 31 for a second booster cylinder 51 which is preferably disposed with its axis in the same plane as and parallel to the axis of the cylinder 29 centrally of the transverse dimension of the earth mover. Within the cylinder is provided a piston (not shown) preferably of the double acting variety, and which is fast on a piston rod 52 extending forwardly. In one position, preferably the rearmost position of the pusher 21a, the piston rod is adapted to abut or substantially to abut a pressure strap 53 supplied on the rearward side of the pusher 21a. The booster cylinder 51 is provided with a pipe connection 54 joining the pipe 43 and is likewise provided with a pipe connection 56 joining the pipe 46.

With this arrangement of the parts when they are in their rearmost position, when the pipe 43 is subjected to a high hydraulic pressure not only is the cylinder 29 likewise subjected thereto, but also the rearward portion of the cylinder 51 is also so subjected, and the plunger or piston rod 52 augments the piston rod 27 in exerting a forward force on the pusher 21a. Thus, the piston rods 27 and 52 travel in unison and assist in starting the heavily loaded pusher until such time as the piston within the cylinder 51 reaches the end of its stroke. Obviously, the piston rod 52 can then travel no farther, but the piston rod 27 continues the stroke at a relatively rapid rate since it is no longer necessary for the pump 36 to supply the starting or booster cylinder with oil. Hence, the initial part of the discharge is made under great power, but the final portion is made at a relatively high speed.

After the pusher has accomplished its purpose and is to be returned, the valve controller 41 is reversed and pressure at the rearward ends of cylinders 29 and 51 is relieved, while it is imposed upon the forward ends of those cylinders. This is effective to drive the piston rod 52 to its innermost position within the cylinder 51 while the piston rod 27 follows suit. Usually the piston rod 52 arrives at its rearmost position considerably in advance of the time that the piston rod 27 arrives at its rearmost position, although this depends somewhat upon the flow characteristics of the piping involved. While the initial return movement of the pusher 21a may somewhat be slowed because of the necessity of supplying both cylinders with oil, still the final return movement is relatively rapid, and since all of this return is under substantially no load, the pump can readily supply the oil at a rapid rate. After they have arrived at their rearmost position, as shown in Fig. 1, the parts are ready to repeat the operation.

I claim:

1. An earth mover comprising a main bowl, an earth barrier movable in said main bowl throughout a predetermined range, hydraulic means for moving said barrier throughout said range, and means for supplementing said hydraulic means throughout part only of said range.

2. An earth mover comprising an earth containing bowl, means forming a movable earth sustaining end wall for said bowl, hydraulic means for moving said wall between a rearward position and a forward position, and additional hydraulic means for moving said wall away from said rearward position and only part way toward said forward position.

3. An earth mover comprising a bowl, an earth barrier movable in said bowl throughout a predetermined range, means for so moving said barrier, and additional means for moving said barrier throughout part only of said range.

4. An earth mover comprising a bowl, a pusher movable in said bowl throughout a predetermined range, hydraulic means for so moving said pusher, additional hydraulic means for moving said pusher through part only of said range, and means for concurrently regulating hydraulic flow to and from said hydraulic means and said additional hydraulic means.

5. An earth mover comprising a bowl, a pusher movable in said bowl, guides for said pusher on the sides of said bowl, means acting centrally between said guides to move said pusher throughout a predetermined range, and additional means acting centrally between said guides to assist in moving said pusher through part only of said range.

6. An earth mover comprising a bowl, a pusher movable in said bowl, a hydraulic mechanism located centrally of said pusher for advancing said pusher into said bowl for a predetermined distance, and an additional hydraulic mechanism located centrally of said pusher in a trans-

verse direction for advancing said pusher for part only of said predetermined distance.

7. An earth mover comprising a frame, a pusher mounted to move with respect to said frame, a hydraulic mechanism having a predetermined stroke for so moving said pusher, a second hydraulic mechanism having a different stroke for so moving said pusher, a hydraulic circuit, means for connecting said hydraulic mechanisms in said circuit in parallel, and a common controller for said hydraulic mechanisms.

8. An earth mover comprising: a frame; a bowl carried by said frame; a pusher mounted within said bowl for movement over a predetermined path therein; a first hydraulic member associated with said pusher for moving said pusher through said predetermined path; and a second hydraulic member associated with said pusher for supplementing the action of said first hydraulic member in moving said pusher over a portion only of said predetermined path.

9. An earth mover comprising: a frame; a bowl carried by said frame and provided with a rear end wall; a pusher mounted within said bowl for movement therein over a predetermined distance; a first hydraulic member carried by said wall and arranged to move said pusher through said predetermined distance; and a second hydraulic member carried by said wall and arranged to supplement said first hydraulic member in moving said pusher over a portion only of said predetermined distance.

ELLSWORTH W. AUSTIN.