Dec. 7, 1937. F. P. LAWLER 2,101,400

EARTH MOVING MACHINE

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FIG. 1

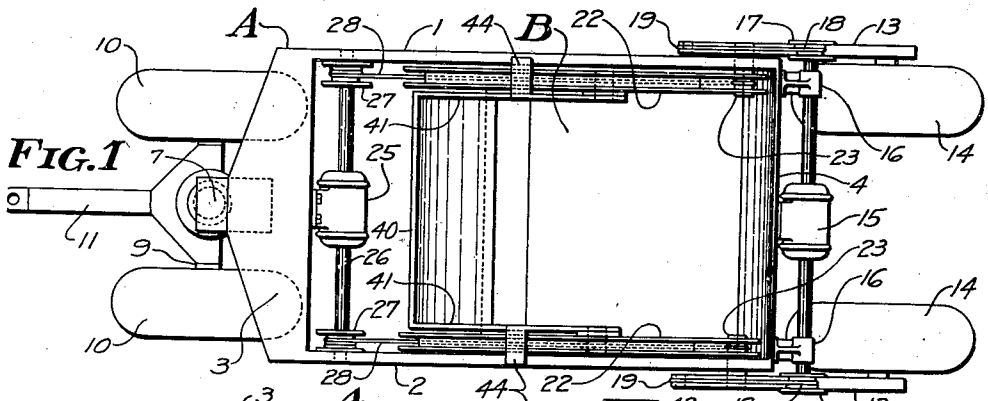


FIG. 2

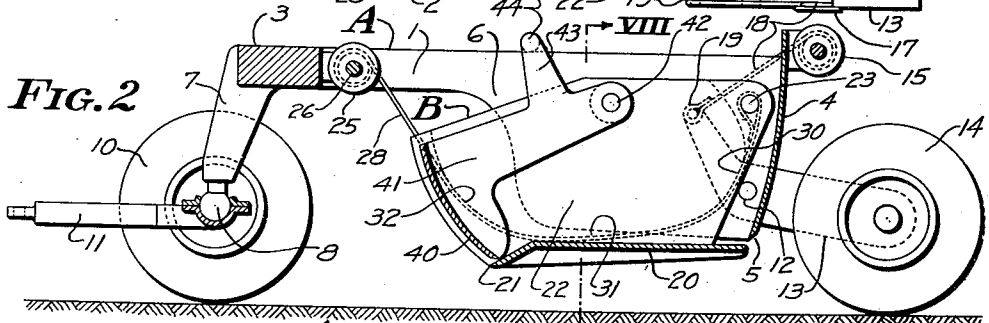


FIG. 3

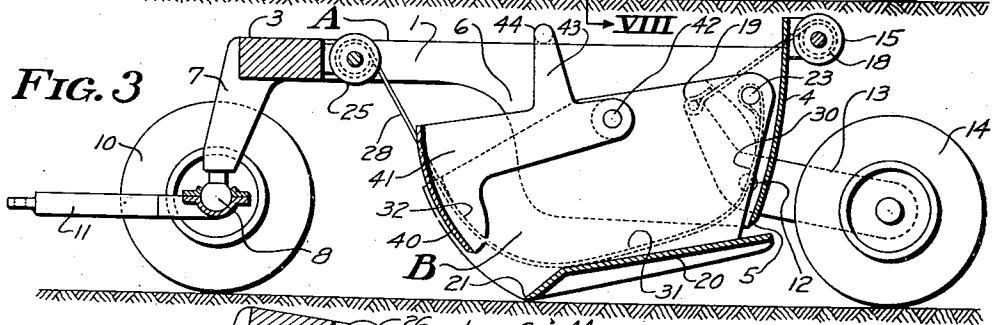
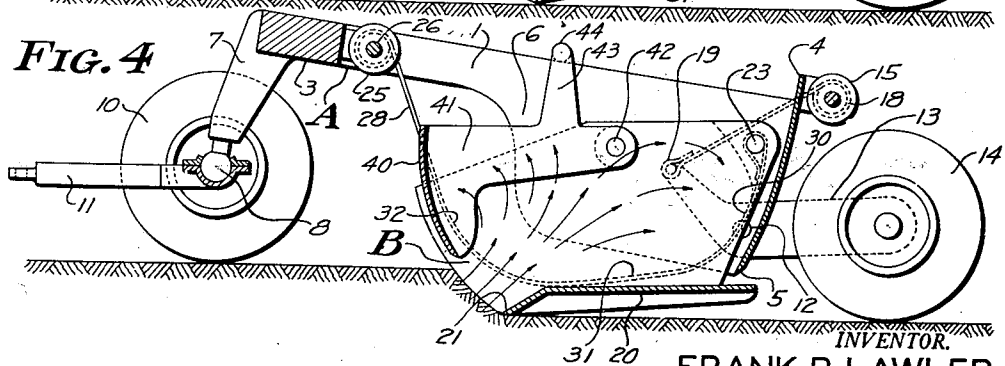


FIG. 4



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FIG. 5

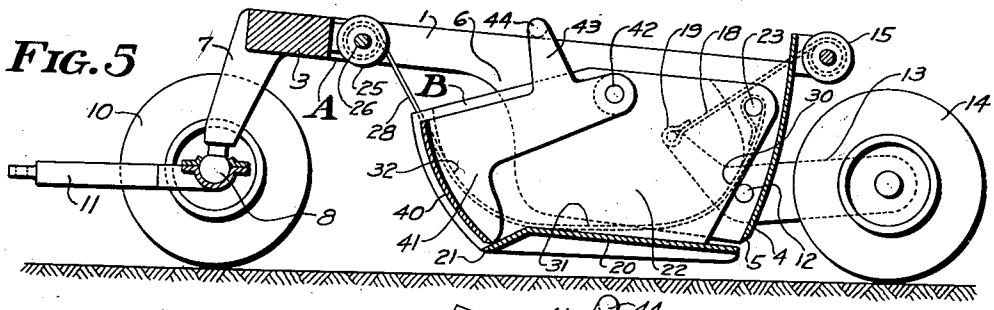


FIG. 6

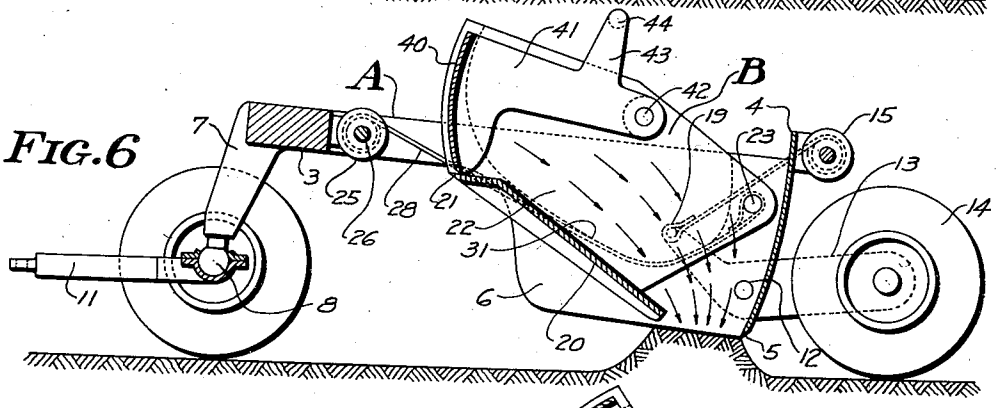


FIG. 7

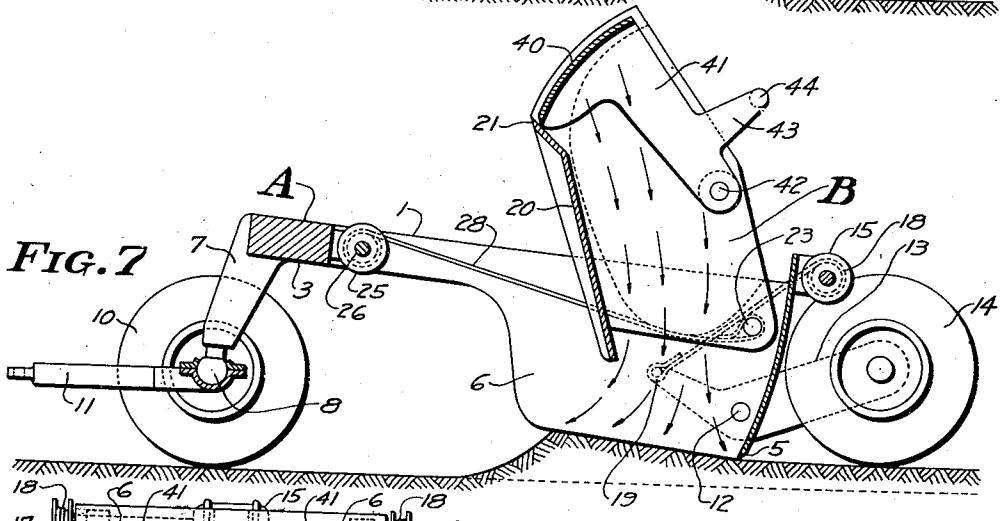
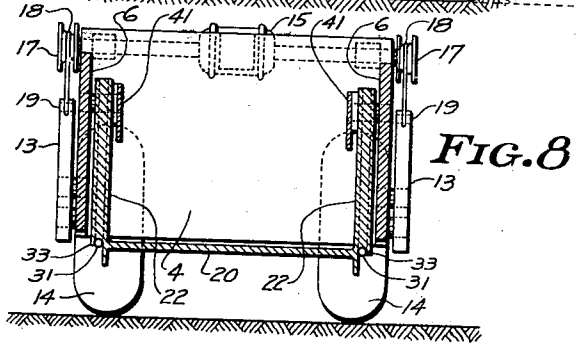


FIG. 8



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UNITED STATES PATENT OFFICE

2,101,400

EARTH MOVING MACHINE

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Application January 4, 1937, Serial No. 118,946

4 Claims. (Cl. 37—128)

This invention relates to earth moving machines of the general wheeled type adapted to be drawn by a power unit such as a tractor or the like, said earth moving machine being capable of loading, discharging and spreading the transported material to any desired depth.

The object of the present invention is to generally improve and simplify the construction and operation of machines of the character described; to provide a machine which is not limited as to its capacity by structural or mechanical considerations, and which therefore can be constructed of a size and capacity which will utilize the full ability of the draft unit with full efficiency; to provide means for regulating the depth of the spread which is both simple and positive in action, and which will permit any depth of spread from a fraction of an inch to a pile dump; to provide a machine which is simple to construct and which requires only two controls, both of which can be operated by cables, hydraulic rams, electric motors, or any other suitable means; to provide a scraper blade so controlled that the angle which the blade makes with the cut can be changed during operation so as to provide a wide range of cutting angles independently of the depth of the cut, in order that the cutting angle presented to the material will give the maximum efficiency in cutting and loading according to the type of material being handled; to provide a machine in which the material handled passes through in one direction only—that is, it loads in one direction and discharges in the same direction.

The machine is shown by way of illustration in the accompanying drawings in which

Fig. 1 is a plan view of the machine;

Fig. 2 is a side elevation in section showing the machine in load transporting position;

Fig. 3 is a similar section showing the scraper blade while it is being lowered and just before it touches the ground surface;

Fig. 4 is a similar section showing the scraper blade in digging or cutting position;

Fig. 5 is a similar section showing the load as it is being raised after the bucket has been filled;

Fig. 6 is a similar section showing the machine starting to discharge and spread the load;

Fig. 7 is a similar section showing the machine in final discharging position; and

Fig. 8 is a cross section taken on line VIII—VIII, Fig. 2.

Referring to the drawings in detail, particularly Figs. 1 and 2, A represents the main frame of the machine, said frame forming a support for a bucket generally indicated at B. The main frame consists of two horizontally disposed side members 1 and 2 connected at the front ends by cross-bar 3 and at their rear by cross-plate 4 which terminates at its lower edge in a spreader blade 5. The cross-plate 4 forms a part of the main frame as it is permanently attached thereto, and this plate is further attached to the main frame by side wings or plates 6—6 which function to stiffen the frame and to form a part thereof as will be hereinafter described. Attached to the cross-bar 3 at its center is a column 7 having as its base a ball and socket arrangement 8 or a suitable form of universal joint to provide a universal support for a front axle 9 having front wheels 10. The front axle is provided with a draw-bar 11 and this is coupled to a tractor in any suitable manner not shown.

Pivotally attached to the side plates 6, forming a part of the main frame at the point 12, are a pair of lever arms 13. These arms carry at their rear ends stub axles on which are journaled rear wheels 14, said wheels forming a support for the rear end of the main frame, and the front wheels 10 a support for the front end of the main frame.

Means are provided for swinging the lever arms 13 about the stub axles on the rear wheels as a pivot so as to make it possible to raise and lower the rear end of the main frame. This means comprises an electric motor or the like such as shown at 15. This motor drives a shaft extending crosswise of the rear end of the main frame, said shaft being supported in bearings 16 or the like. At each end of the shaft is secured a drum 17, and secured thereto, and adapted to be wound thereabout, is a cable 18, one for each drum. The opposite ends of the cables are secured to the front ends of the lever arms as at 19. Hence when the drums 17 are rotated in one direction, the rear end of the main frame will be raised and, conversely, when the drums are rotated in an opposite direction, the rear end of the main frame will be lowered.

The bucket B, previously referred to, consists of a bottom plate 20, the forward end of which terminates in a scraper or cutting blade 21. The bucket further comprises a pair of side plates 22 which are pivotally attached at their upper and rear ends, as at 23, to the main frame. The bucket, plainly speaking, is U-shaped in cross section, as it consists of a bottom plate 20 and a pair of side plates 22 disposed substantially at right angles thereto.

Means are provided for tilting the bucket about its pivots 23, for instance, from the po-

sition shown in Fig. 2 or 5 to the positions shown in Fig. 6 or 7. The means employed comprises an electric motor **25** disposed at the forward end of the frame, a shaft **26**, drums **27** secured thereon, and a cable **28** secured to each drum. The opposite ends of the cables are secured to the bucket at the points **23**. They then extend downwardly as indicated by the curved line **30**, then forwardly as indicated at **31**, and finally upwardly on the curved line **32** to the drums; curved channel members **33** or the like being secured to each side of the bucket to receive and retain the cables in any position of the bucket. The electric motors **15** and **25** are supplied with current from the tractor, and switches or any other suitable mechanism not here disclosed are provided for their operation and control.

The dirt, gravel or other material scooped up by the blade **21** when it is lowered to digging position, for instance, as shown in Fig. 4, is retained by the bottom section **20**, the sides **22** and by the cross-plate **4**, said last named plate functioning not only as the support for the spreader blade **5**, but also as a rear gate for the bucket while material is being transported.

A front gate is also employed. This gate consists of a curved plate **40** extending crosswise of the bucket. To this plate is secured a pair of side arms **41** which are pivoted as at **42** to the sides of the bucket. An upwardly extending arm **43** is formed on each side arm, and these upwardly extending arms terminate in rollers or pins **44** which normally rest on the upper surface of the main frame. Their function will hereinafter be described.

In actual operation, when it is desired to lower the blade **21** to digging position, it is only necessary to actuate the motor **25** and pay out on the cables actuated thereby so that the bucket will swing downwardly on its pivot **23**, first to the position shown in Fig. 3 and then further downwardly as shown in Fig. 4 to any position desired, depending on the depth of cut that will be made. When the bucket is thus lowered or swung downwardly on its pivot **23**, the front gate will remain in its uppermost position, due to the engagement of the rollers **44** with relation to the upper surface of the main frame. Thus the front gate is automatically opened when the bucket is lowered. If it is desired to further lower the bucket, and particularly if it is desired to decrease the angle of the blade **21** with relation to the cut to be made, motor **15** is also actuated, that is, it is rotated in a direction which will permit the cables actuated thereby to pay out. This will cause the forward ends of the arms **13** to move downwardly about the rear axle stubs as a pivot and thereby causes the rear end of the main frame to be lowered, and as it is lowered the angle between the blade **21** and the cut becomes less and less. In other words, a scraper blade has been provided which is so controlled that the angle which the blade makes with relation to the cut can be increased or decreased, independently of the depth of the cut, while the machine is in operation. This is important, as it permits any material to be cut with a blade angle which will give maximum cutting efficiency and therefore load to a greater heighth and a greater distance back into the bucket, thereby adding to the capacity of the bucket as a direct result of the increased cutting efficiency. It should here be pointed out that similar machines in use today have a blade slope characteristic in which the angle that the blade makes with relation to the cut is fixed for any depth of cut and increases or becomes more blunt or obtuse as the depth of the cut increases. The adjustable angle of cutting in the present machine accounts for its greater digging and loading efficiency.

After the bucket is filled, motor **25** is actuated to raise the front end of the bucket, bringing it from the digging position shown in Fig. 4, up toward and against the front gate, so that the front end of the bucket is closed and in a carrying position as shown in Fig. 5. Then if it is desired to increase the ground clearance of the machine, motor **15** is actuated to raise the rear of the bucket to the desired height, for instance as shown in Fig. 2. When the bucket assumes a carrying position the load may be transported to wherever it is to be dumped, and when it is ready to be dumped, it is only necessary to actuate motor **25** to continue raising the bucket on its pivots **23** to any desired position, for instance, the position shown in Fig. 6. In this position the load will begin to discharge as the rear portion of the bottom section **20** will move away from the plate or rear gate **4**, thus leaving an opening from which the dirt or other material can freely discharge. While discharging, the rear end of the frame may be lowered so that the material may be spread as shown in Fig. 7, and when it is desired to completely empty the bucket, it is accomplished by raising the bucket substantially to the position shown in Fig. 7.

In the operation of the machine, it will be noticed that there are only two control members employed, to-wit, motors **15** and **25**. Motor **15** functions to raise and lower the rear end of the frame, and thereby first controls the position of the spreader blade **5**, and secondly partially controls the angle of the blade and the depth of the cut. The motor **25** actuates the bucket, and either lowers it to digging position or raises it to any one of the dumping or spreading positions, and, in addition thereto, cooperates with the motor **15** to regulate the depth of the cut and the angle of the blade. The control and operation of the machine is thus easily taken care of, and while electric motors are here shown and specified, hydraulic, pneumatic or other control means may easily be applied. Due to the construction here shown, the machine is not limited as to capacity by structural or mechanical considerations. For this reason, it can be made of a size to handle practically any capacity desired, thereby making it possible to utilize the full ability of the tractor or other machine employed.

Another important feature is the fact that during both loading and discharging, the material is moved in the same direction. This is an advantage because when sticky materials such as clay or the like are loaded into the bucket they jet over the cutting blade in lumps or clots arranged in a more or less rolling position. In the present machine the material enters in one direction and discharges in the same direction in which it is loaded. For this reason, maximum discharge efficiency results because the rolling arrangement which the material assumed during the loading is not disturbed.

While this and other features of the present invention have been more or less specifically described and illustrated, I wish it understood that various changes may be resorted to within the scope of the appended claims, and that the materials and finish of the several parts employed may

be such as the experience of the manufacturer or other conditions may dictate.

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

1. In an earth moving machine of the character described, a main frame, front wheels supporting the front end of the frame, an adjustable frame pivotally attached to the main frame adjacent the rear end thereof, rear wheels journaled at the rear end of the adjustable frame and supporting said frame, means connected with the adjustable frame for swinging said frame about the axis of the rear wheels to raise or lower the rear end of the main frame, a bucket carried by the main frame, said bucket comprising a bottom section and a pair of side sections, a scraper blade attached to the front end of the bottom section and extending crosswise thereof, a pivotal support between the rear upper ends of the sides of the bucket and the main frame, means for swinging the bucket about the pivotal support, a plate secured to the main frame rearwardly of the bucket and forming a rear gate for the bucket, a spreader blade carried by said plate, and a front gate pivotally attached to the bucket.

2. In an earth moving machine of the character described, a main frame, front wheels supporting the front end of the frame, an adjustable frame pivotally attached to the main frame adjacent the rear end thereof, rear wheels journaled at the rear end of the adjustable frame and supporting said frame, means connected with the adjustable frame for swinging said frame about the axis of the rear wheels to raise or lower the rear end of the main frame, a bucket carried by the main frame, said bucket comprising a bottom section and a pair of side sections, a scraper blade attached to the front end of the bottom section and extending crosswise thereof, a pivotal support between the rear upper ends of the sides of the bucket and the main frame, means for swinging the bucket about the pivotal support, a plate secured to the main frame rearwardly of the bucket and forming a rear gate for the bucket, a spreader blade carried by said plate, a front gate pivotally attached to the bucket, said gate adapted to be raised with the bucket and lowered with the bucket to a predetermined position, and means for retaining the front gate against lowering movement when the bucket is lowered below the predetermined position.

3. In an earth moving machine of the character described, a main frame, front wheels supporting the front end of the frame, a pair of lever arms pivoted intermediate their ends, adjacent the rear end of the main frame, said arms presenting front and rear ends; rear wheels supporting the rear ends of the lever arms and the rear end of the main frame; means connected with the front ends of the lever arms to swing said arms about the axis of the rear wheels, to raise or lower the rear end of the main frame; a bucket carried by the main frame, said bucket comprising a bottom section and a pair of side sections, a scraper blade attached to the front end of the bottom section and extending crosswise thereof; a pivotal support between the rear upper ends of the sides of the bucket and the main frame; means for swinging the bucket about the pivotal support; a plate secured to the main frame rearwardly of the bucket and forming a rear gate for the bucket; a spreader blade carried by said plate; and a front gate pivotally attached to the bucket.

4. In an earth moving machine of the character described, a main frame, front wheels supporting the front end of the frame, an adjustable frame pivotally attached to the main frame adjacent the rear end thereof, rear wheels journaled at the rear end of the adjustable frame and supporting said frame, means connected with the adjustable frame for swinging said frame about the axis of the rear wheels to raise or lower the rear end of the main frame, a bucket carried by the main frame, said bucket comprising a bottom section and a pair of side sections, a scraper blade attached to the front end of the bottom section and extending crosswise thereof, a pivotal support between the rear upper ends of the sides of the bucket and the main frame, means for swinging the bucket about the pivotal support, said means comprising a pair of flanges one on each side of the bucket, said flanges having a shape substantially conforming to the cross-sectional shape of the bucket; a pair of cables passing under each flange, said cables being attached at one end at a point adjacent the pivot of the bucket, and having their other ends connected with a raising and lowering mechanism; a plate secured to the main frame rearwardly of the bucket and forming a rear gate for the bucket, a spreader blade carried by said plate; and a front gate pivotally attached to the bucket.

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