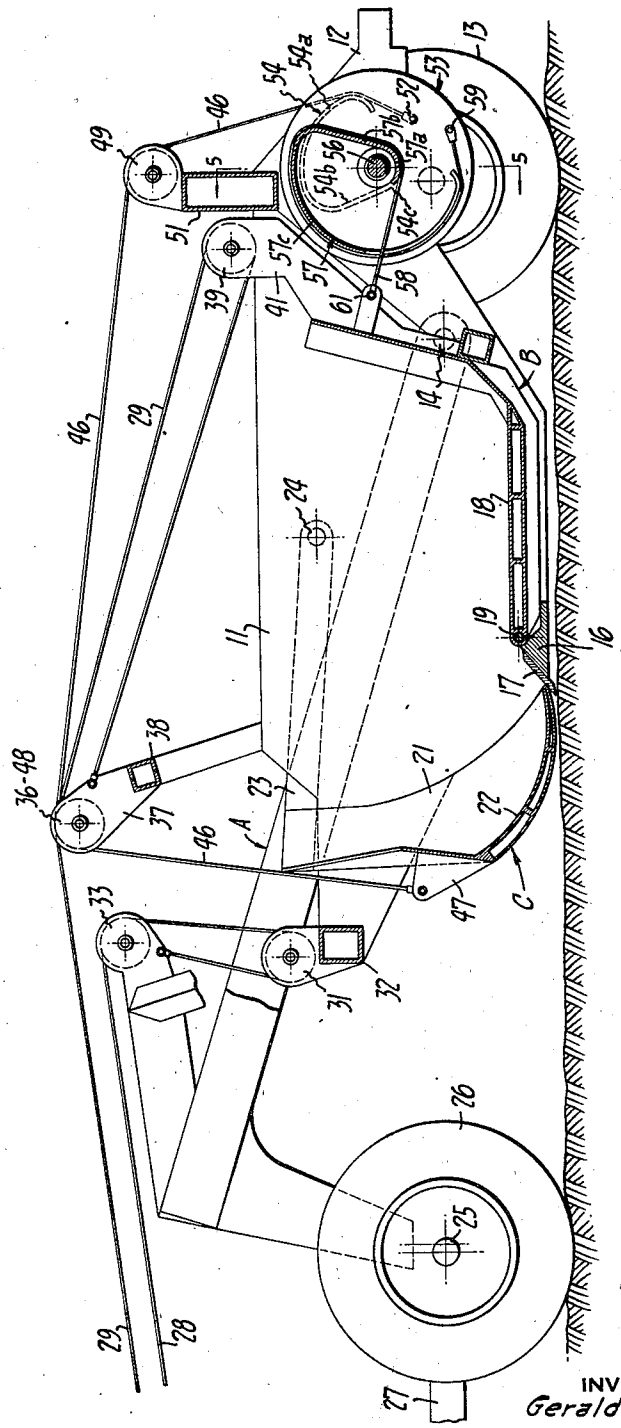
Aug. 4, 1942. G. I. CLARK 2,291,950

EARTH MOVING EQUIPMENT

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FIG. 1



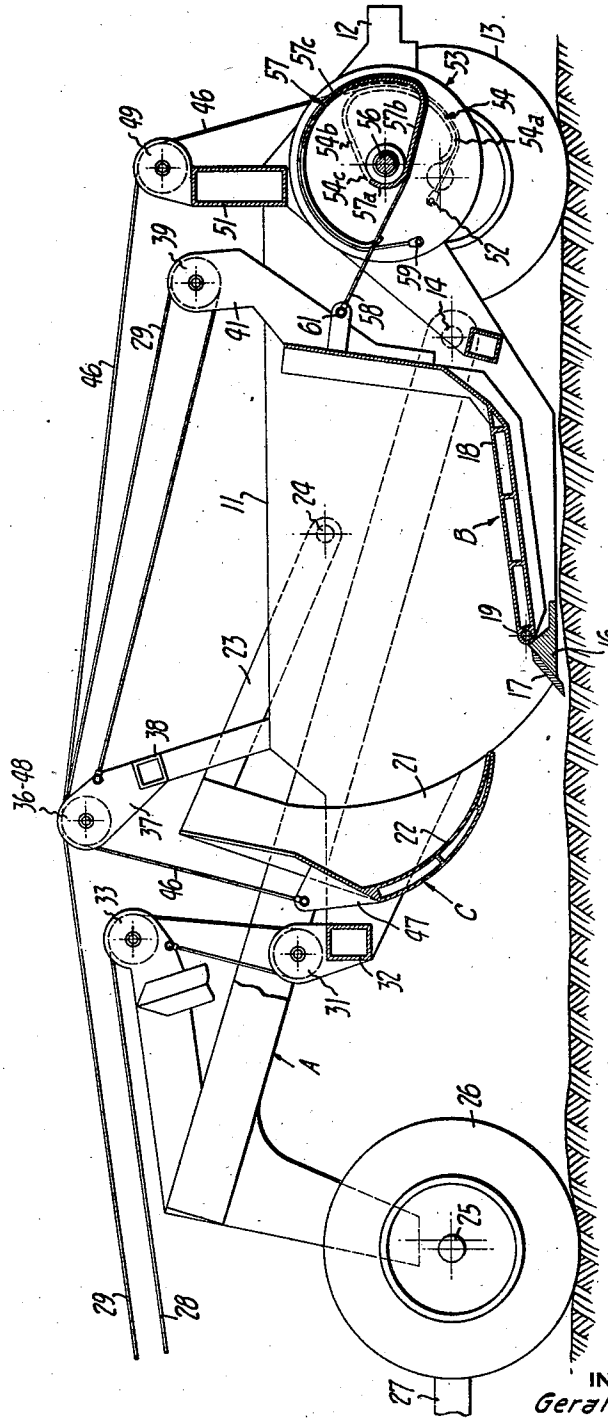
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EARTH MOVING EQUIPMENT

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FIG-2-



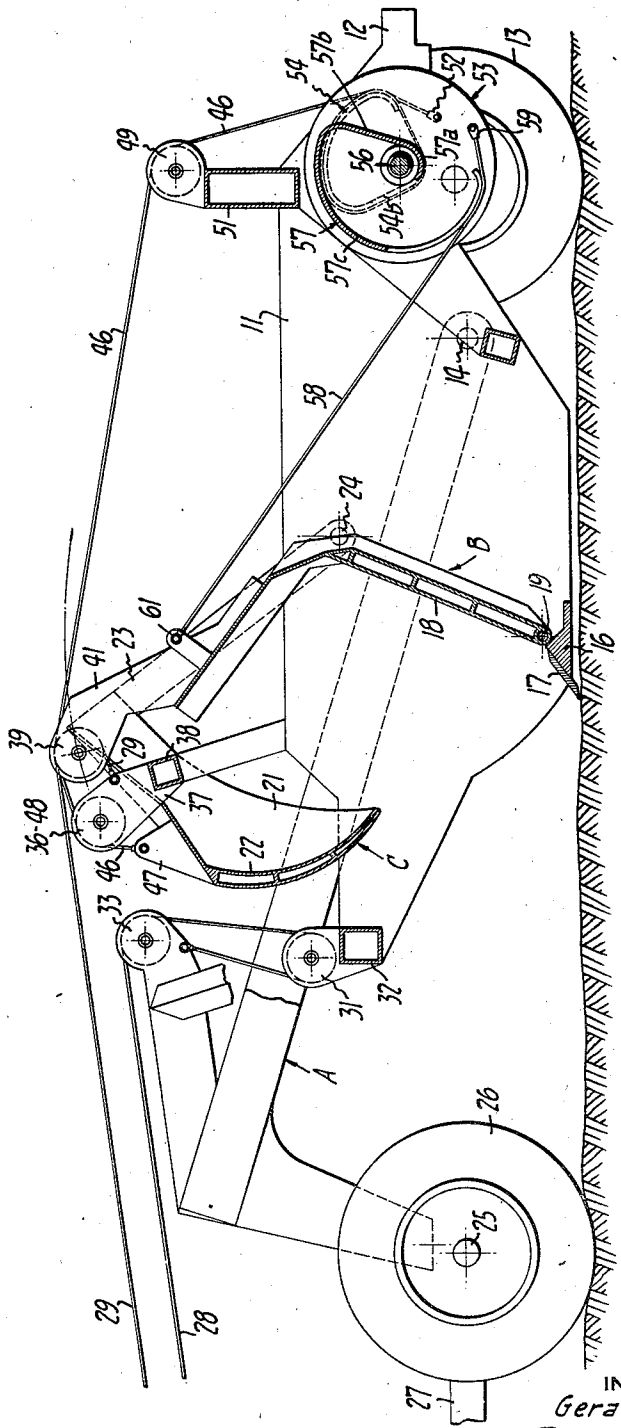
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EARTH MOVING EQUIPMENT

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FIG. 3



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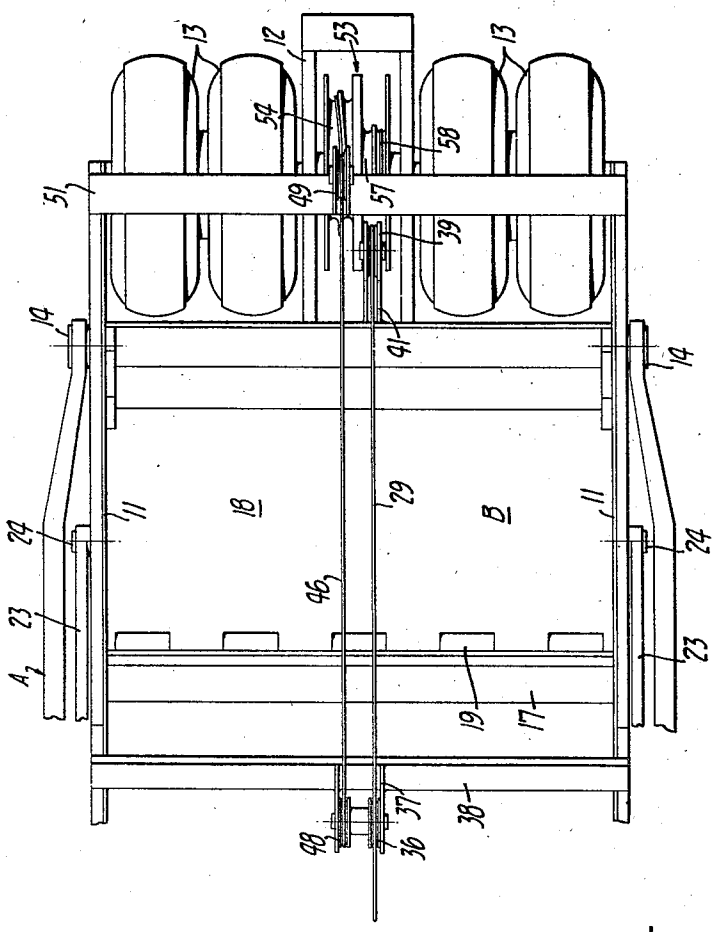


FIG. 4.

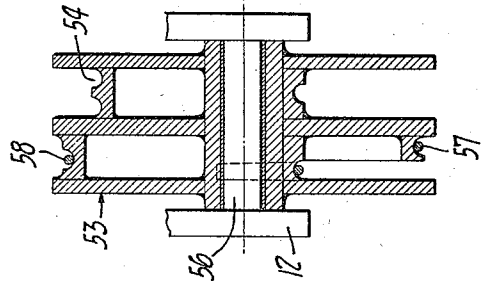


FIG. 5.

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UNITED STATES PATENT OFFICE

2,291,950

EARTH MOVING EQUIPMENT

Gerald I. Clark, Mountain View, Calif., assignor to Wooldridge Manufacturing Company, Sunnyvale, Calif., a corporation of Nevada

Application February 12, 1940, Serial No. 318,394

4 Claims. (Cl. 37—126)

This invention relates generally to earth removing equipment of the type utilizing an earth cutting or scraping blade, together with a bowl or like structure for receiving and carrying a load to a point of discharge. More particularly, the invention relates to earth moving equipment making use of both a main bowl structure and an auxiliary bowl or front apron, together with controlled operating means whereby one may take a load into both the main bowl structure and the front apron, and after carrying the load to a point of discharge, it may be discharged from both the front apron and the main bowl structure. In the preferred embodiment of the invention disclosed herein, the main bowl structure is provided with a hinged bottom which is swung upwardly and forwardly for a load discharging operation.

It is an object of the invention to provide improved equipment of the above character, having novel means directly interconnecting the hinged bottom with the front apron. This means is characterized by the fact that for relatively small movements of the hinged bottom near its loading position, the front apron is moved between open and closed positions, with the extent of movement of the apron being sufficient for loading operations.

Another object of the invention is to provide improved equipment of the above character which will afford a predetermined variable ratio of movement between the front apron and the discharge means for the main bowl.

Another object of the invention is to provide simplified frame and bowl structures for earth moving equipment.

Additional objects of the invention will be apparent from the following description, which sets forth the preferred embodiment thereof in detail in conjunction with the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of earth moving apparatus embodying the instant invention;

Figure 2 is a view similar to Figure 1 but showing the parts as they are positioned after initial movement from the load carrying position shown in Figure 1;

Figure 3 is a view similar to Figures 1 and 2 but showing the parts as positioned for discharging a load of earth from the bowl structure.

Figure 4 is a plan view of the rear end of the apparatus; and,

Figure 5 is a detailed sectional view through a portion of the automatic control means, the view being taken in a plane indicated by the line 5—5 in Figure 1.

Referring to Figure 1, the apparatus chosen for illustration is of the type including a wheeled frame A carrying the main and auxiliary bowls B and C. The apparatus is of the type adapted to be drawn by a tractor which is usually provided with a suitable power take-off to operate parts of the apparatus.

The bowl structure selected for illustration may comprise reenforced side walls 11 (Figs. 1 and 4) having rear extensions 12 which connect with an axle for the rear supporting wheels 13. The frame A is in the form of a yoke with the extensions of the yoke having pivotal connections 14 with the sides 11 of the bowl. At the forward end of the main bowl structure there is a cross connecting beam or strut 16 serving as a mounting for the earth cutting or scraping blade 17.

As a part of the main bowl structure, and for carrying out a discharge operation, the bottom and rear walls of the bowl are formed as a movable member 18, which has a hinged connection 19 with the cross strut 16. It will be evident that when the hinged member 18 is swung upwardly and forwardly from the position shown in Figure 1, it effectively causes the discharge of the load from the main bowl structure over the cutting blade 17.

The auxiliary bowl structure C, or front apron, includes the side wall 21 and bottom load supporting wall 22. For supporting this auxiliary bowl to enable it to move in a forward and vertical direction with respect to the cutting blade 17, it is rigidly attached to the side arms 23, which have pivotal connections 24 to the sides 11 of the main bowl structure.

The main frame A has a suitable swivel connection (not shown) with the front axle 25 on which the front supporting wheels 26 are mounted. Attached to the axle is a draft bar 27 for connection to the draft vehicle.

Various forms of motive means may be employed for raising and lowering the blade 17, for raising and lowering the front apron C and for swinging upwardly and forwardly the hinged bottom 18 of the main bowl structure. In the present embodiment forces are applied to these parts by two cables 28 and 29. Cable 28 is employed for raising and lowering the front end of the main bowl structure, and thereby to move the cutting blade 17 between cutting and load carrying positions. Cable 29 is employed for simultaneous operation of the front apron and

the hinged bottom of the main bowl structure as will be referred to more particularly hereinafter.

One end of cable 28 (Fig. 1) is suitably anchored to a portion of the frame A from which it extends around the sheave 31 carried by cross beam 32 of the main bowl structure and over sheave 33 on the main frame A from which it extends forwardly to the power take-off and control means of the tractor. It will be noted that if cable 28 is pulled to the left as viewed in Figure 1, the main bowl structure and the cutting blade 17 will be raised with respect to the main frame A, and if the cable is played out, that is moved to the right as viewed in Figure 1, the main bowl structure and the cutting blade 17 thereof will be lowered from the load carrying position shown in Figure 1 until the blade 17 can engage and cut earth for bowl filling operation.

The second operating cable 29 (Figs. 1 and 4) is trained over sheave 36, carried by mounting 37 on cross beam 38 of the main bowl structure and extends rearwardly and downwardly to be wrapped around sheave 39, carried by mounting 41 centrally disposed on the hinged bottom 18. From sheave 39 cable 29 extends forwardly and upwardly to be anchored to the mounting 37.

To provide for simultaneous operation of the front apron with the hinged bottom 18 of the main bowl structure, I provide positive connecting mechanism including a cable 46 which is anchored to bracket 47 on the apron C and which extends upwardly and over sheave 48, also carried by mounting 37. From sheave 48, cable 46 extends rearwardly and over sheave 49 suitably mounted on rear cross beam 51 of the main bowl structure and then downwardly to be anchored at 52 to a cam drum 53, having a cam track 54 (Figs. 1, 4 and 5) engaged by the cable 46.

Cam drum 53 (Figs. 1, 4 and 5) is journalled on transverse shaft 56 mounted between extensions 12 of the side walls 11 of the main bowl structure. To connect the cam drum 53 with the hinged bottom 18 the cam drum 53 has a second cam track 57 about which the cable 58 is wrapped with one end anchored to the cam drum at 59 and the other end to the hinged bottom 18 at 61.

From the foregoing description it will be seen that upon winding up of cable 29 to cause upward and forward movement of the hinged bottom 18 about its pivot 19, cable 58 causes rotation of the drum 53 in a clockwise direction as viewed in Figure 1, so that cable 46 is wrapped around cam track 54 on the drum to pull cable 46 to the right as viewed in Figure 1 and thereby lift the apron C.

It will be noted that a very steep cam rise 57*b* is provided from the low concentric portion 57*a* of the cam track 57 to the high concentric portion 57*c* thereof, and that initial unwinding movement of the cable 58 is from portion 57*a* of track 57 which corresponds to and acts simultaneously with high portion 54*a* of cam track 54. Thus, rotation of cam drum 53 from the position shown in Figure 1 to that shown in Figure 2, results in wrapping a greater length of the cable 46 around track 54 for a given angle of movement than the length of cable 58 unwrapped from track 57. As a result during such initial movement the cable 46 is pulled farther and causes considerably more movement of the apron C, than the movement of the hinged bottom 18 from the positions shown in Figure 1 to that shown in Figure 2. This initial disproportionate movement makes it possible to properly control the front apron C for loading operations without interfering with loading capacity of the main bowl.

During further movement of the cable 29 to cause movement of the hinged bottom 18 from the position shown in Figure 2 to the full dumping position shown in Figure 3, the cable 58 is being unwrapped from cam rise 57*b* to the high concentric portion 57*c* of cam track 57. At the same time cable 46 is wrapped about cam rise 54*b* of rapidly reducing radius and low concentric portion 54*c*, so that the effective ratio of movement between cables 58 and 46 is greatly reduced. As a result front apron C does not move a great distance for movement of hinged bottom B from the position shown in Figure 2 to that shown in Figure 3.

Operation of the machine described above can be described as follows: Figure 1 shows the front apron closed with respect to the main bowl structure. If an operator desires to take a cut while the machine is being traversed over a ground surface, the cable 29 is wound up by operating a winch drum located upon the tractor, and cable 28 is played out. Cable 29 is wound up only sufficiently far to open the front apron C to a proper position for taking on a load. Because of the action of the cam drum 53, the hinged bottom B need be moved only a fraction of its complete movement between loading and discharge positions, in order to elevate the apron C sufficiently for taking on a load. As an example of actual practice, movement of the upper end of hinged bottom B through a distance from 5 to 8 inches, may move the front apron from say 20 to 25 inches away from the cutting blade 17. Thus initial angular movement of the hinged bottom B causes more than twice as much angular movement of the apron C. Playing out of cable 28 lowers the cutting blade 17 to a proper level depending upon the depth of cut which one wishes to take.

While the machine is taking on a load it may be desirable to vary the position of the front apron C, and this can be accomplished by manipulation of the cable 29. The material entering over the cutting edge 17 fills the main bowl structure and also the front apron. As the operator approaches a condition of maximum load, cable 29 is played out, thus permitting the apron C to move back to closed position as shown in Figure 1. Cable 28 is also wound up in order to elevate the main bowl structure and the cutting blade for carrying position.

When the machine has traversed to the location where it is desired to discharge the load, the operator winds up cable 29, and during initial movement of the hinged bottom B, apron C is swung upwardly and forwardly, whereby a considerable part of the load discharges over the cutting blade 17. Assuming that traversing movement of the machine continues, the height of blade 17 can be adjusted in order to adjust the depth of spread. To continue the discharge of the load, the operator continues to wind up on cable 29, whereby the hinged bottom B continues to swing from the position shown in Figure 2 to the full discharge position shown in Figure 3. For such continuous movement of the hinged bottom, the front apron C moves upwardly to its limiting position shown in Figure 3, from the position of Figure 2.

As an example of suitable practice, the cam drum can be made so that for a pull of about 7 inches on cable 58, from the position shown in Figure 1 to that shown in Figure 2, cable 46 is

pulled a total of about 23 inches. For the next 20 inches of movement of cable 58, cable 46 can be moved 17 inches. For the next 25 inches of cable 58, cable 46 can be moved 7 inches, and for the last 25 inches of cable 58, cable 46 can be moved about 7 inches. These relative movements can, of course, be varied and modified in practice, depending upon the size of the apparatus and the construction of the cam drum.

Assuming that cable 29 is wound up at a constant rate for a discharge operation, it will be apparent that the hinged bottom B will be swung upwardly and forwardly at a substantially constant rate. However, the front apron C will initially have accelerated movement from the position shown in Figure 1 to that of Figure 2, while for the remainder of its movement, it will travel more slowly to the limiting position shown in Figure 3.

I claim:

1. In earth moving equipment of the character described, a wheeled frame, a main bowl structure carried by the frame and having an earth cutting blade movable in a vertical direction, said main bowl structure including a hinged bottom movable to discharge earth from said main bowl structure over said blade, an auxiliary load carrying bowl or apron carried in front of the main bowl structure and movable in a forward and vertical direction relative to the cutting blade, and operating means for moving said hinged bottom and said apron simultaneously, said operating means including a cam drum having a pair of reversely arranged cam tracks thereon and respective cables attached to said cam drum and engaged with said cam tracks and attached respectively to said apron and said hinged bottom, the relation of said cam tracks providing a faster initial movement of said apron than the initial movement of said hinged bottom during movement thereof from their load-carrying positions.

2. In earth moving equipment of the character described, a wheeled frame, a main bowl structure carried by the frame and having an earth cutting blade movable in a vertical direction, said main bowl structure including a hinged bottom movable to discharge earth from said main bowl structure over said blade, an auxiliary load carrying bowl or apron carried in front of the main bowl structure and movable in a forward and vertical direction relative to the cutting blade, a cam drum journalled on a rearward portion of said main bowl structure and having a pair of reversely arranged cam tracks, a cable anchored at one end to said hinged bottom and at the other end to said drum, said cable being cooperatively related with one of said cam tracks to be wrapped therearound in the load carrying position of said hinged bottom with said cable extending from the low portion of said one track to said hinged bottom, a second cable anchored at one end of said drum and at its other end to said apron for cooperative engagement with the other of said cam tracks, said second cable being related to a portion of said other cam track having a greater radius than the low portion of said one cam track in the load carrying position of said apron, and an operating cable connected to said hinged bottom to effect lifting movement thereof and also of said apron, said cam tracks providing for initial lifting movement of said apron at a faster rate than the initial lifting movement of said hinged bottom.

3. In earth moving equipment of the character described, a main bowl structure including side walls and a forward earth cutting blade, extensions secured to the rear end of the bowl structure, ground engaging wheels carried by the extensions, said main bowl structure including an expeller member movable from a lowermost load carrying position to a forward discharge position to discharge earth from the main bowl structure over the blade, an auxiliary load carrying bowl or apron carried in front of the bowl structure and capable of angular movement in a forward and vertical direction relative to the cutting blade from lower closed to elevated loading and discharge positions, means for adjustably supporting the forward portion of the main bowl structure, a rotatable cam element mounted upon said extensions behind the expeller member when the expeller member is in its rearmost position, a connection between the cam element and the expeller member to cause rotation of the cam element when the expeller member is moved towards its discharge position, and a connection between the cam element and the apron to elevate the apron when the cam element is rotated by movement of the expeller.

4. In earth moving equipment of the character described, a wheeled frame, a main bowl structure carried by the frame and having an earth cutting blade movable in a vertical direction, the main bowl structure including an expeller member movable from a rearmost load carrying position to a forward discharge position to discharge earth from the main bowl structure over the blade, an auxiliary load carrying bowl or apron carried in front of the bowl structure and capable of angular movement in a forward and vertical direction relative to the cutting blade between lower closed and elevated loading and discharge positions of the same, a rotatable cam element carried by the frame, cables connecting both the expeller member and the apron to the cam element, said cam element and said cables forming a mechanical connection between the hinged bottom and the front apron for conjoint and simultaneous movement of the same between loading, load carrying and discharge positions, the cam element including reversely arranged cam surfaces engaged by the cables and formed to cause angular movement of the front apron to an elevated position to enable loading of the main bowl structure for movement of the expeller member from said load carrying position through a distance which is only a minor fraction of complete movement of the same between said loading and said discharge positions.

GERALD I. CLARK.