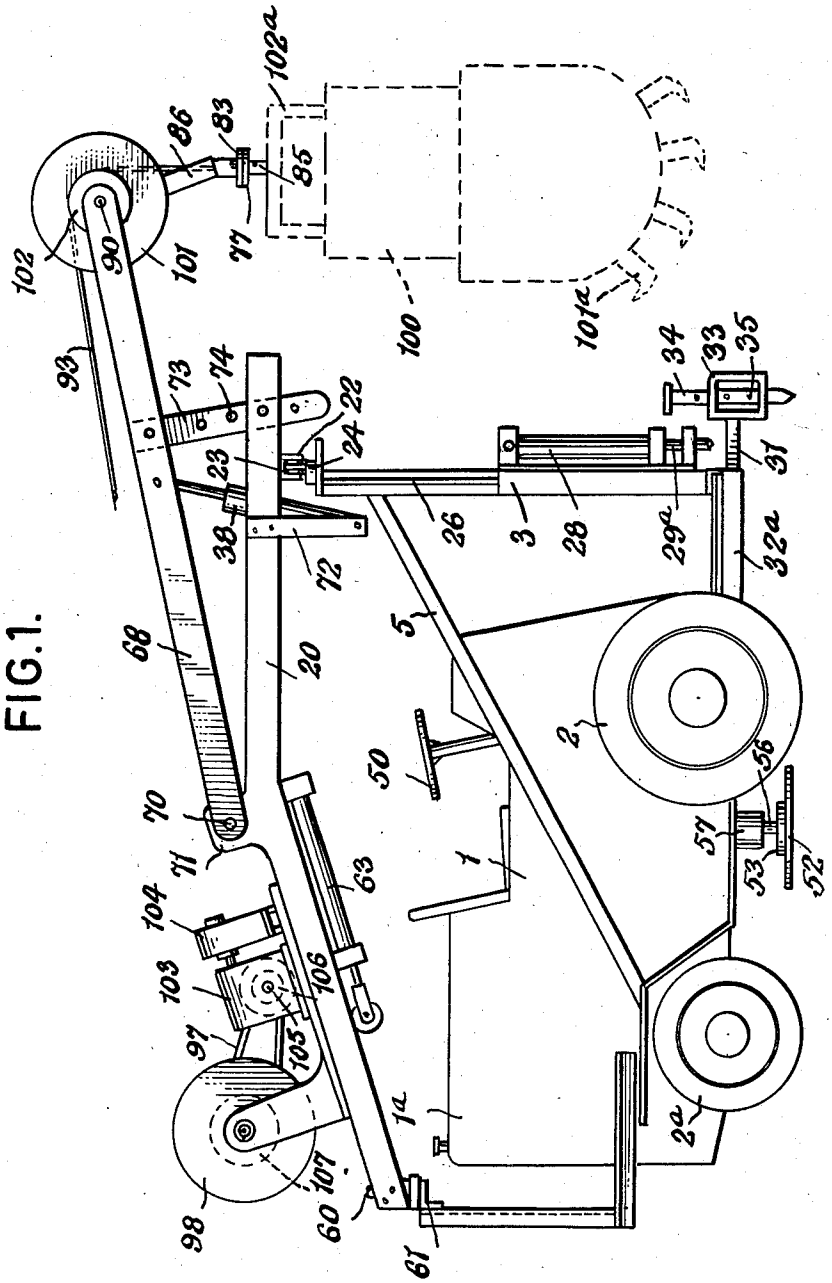
Sept. 29, 1959 J. J. BRELL 2,906,501

EXCAVATING APPARATUS

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FIG. 1.



INVENTOR.

Jules J. Brell

BY Harry Radzinsky

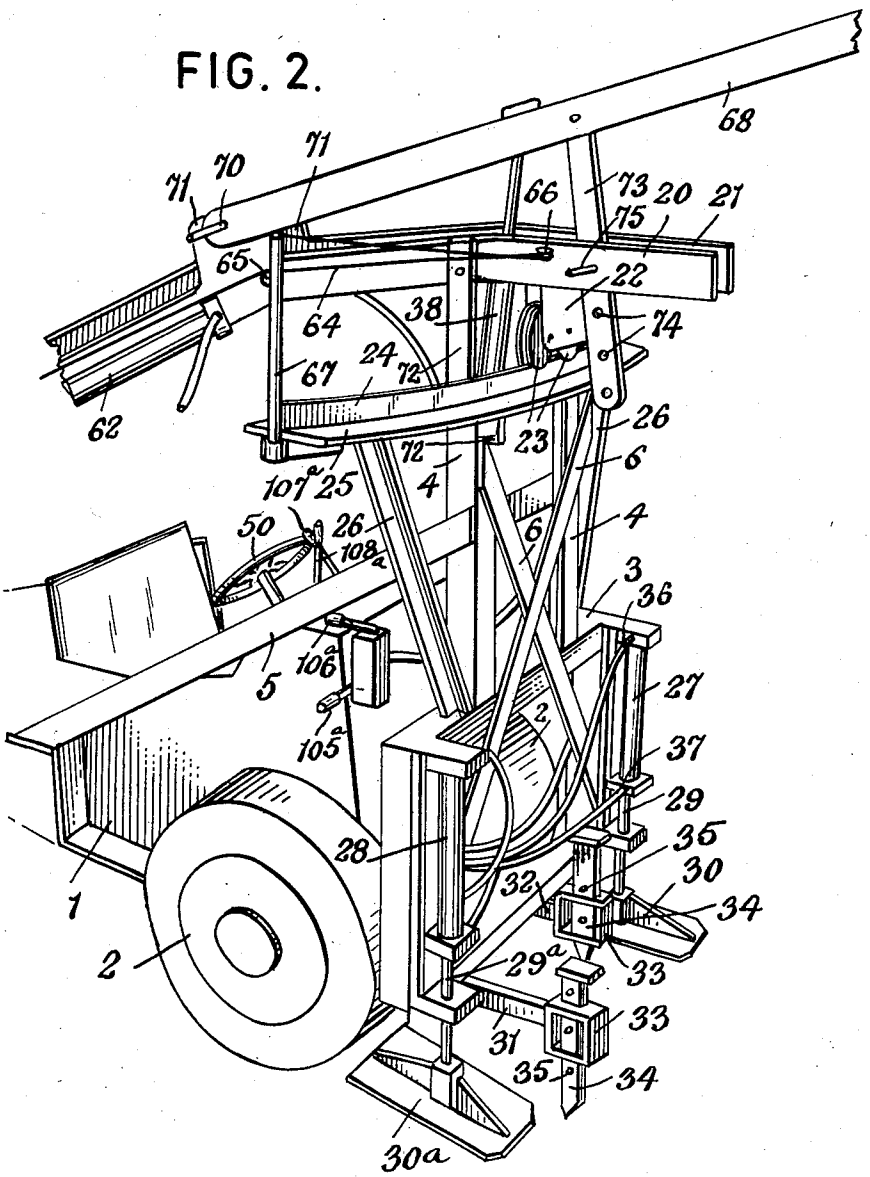
Attorney

Sept. 29, 1959 J. J. BRELL 2,906,501

EXCAVATING APPARATUS

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FIG. 2.



INVENTOR.
Jules J. Brell
BY Harry Radzinsky
Attorney

Sept. 29, 1959 J. J. BRELL 2,906,501

EXCAVATING APPARATUS

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FIG. 3.

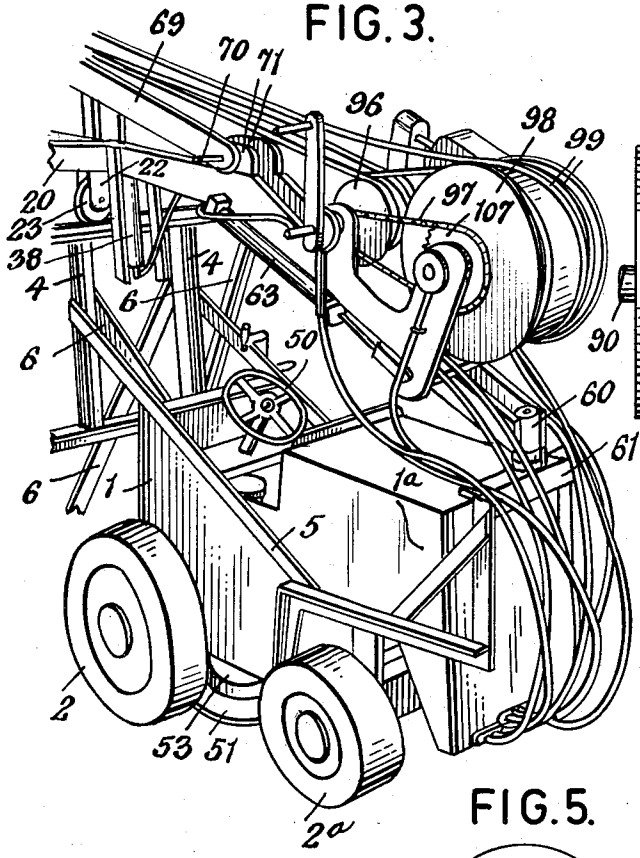


FIG. 4.

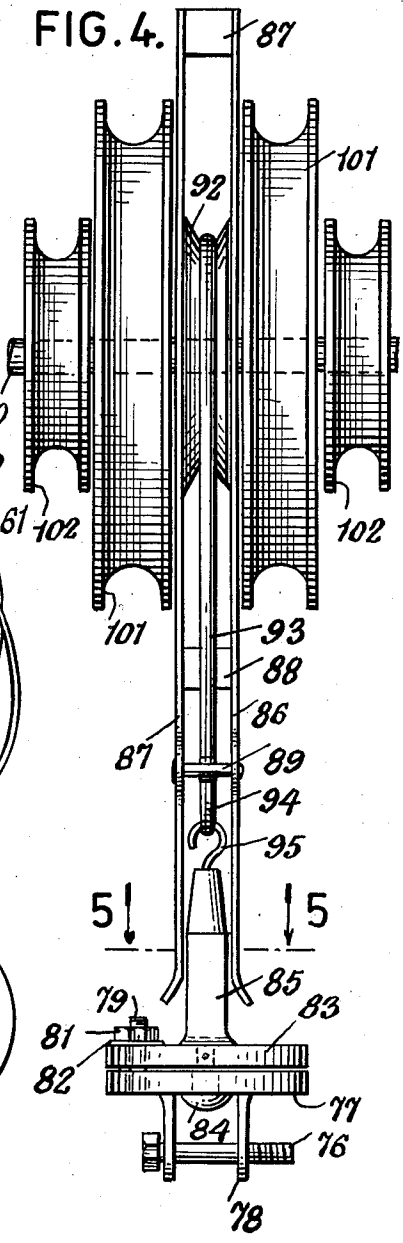


FIG. 5.

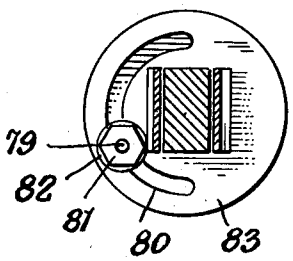
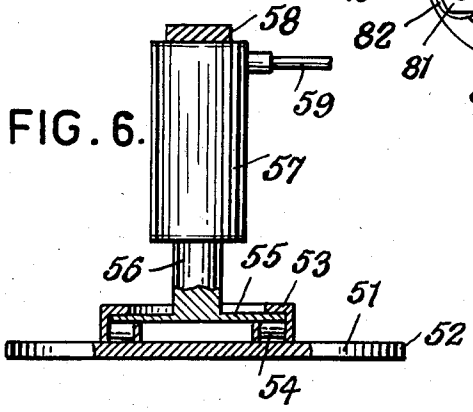


FIG. 6.



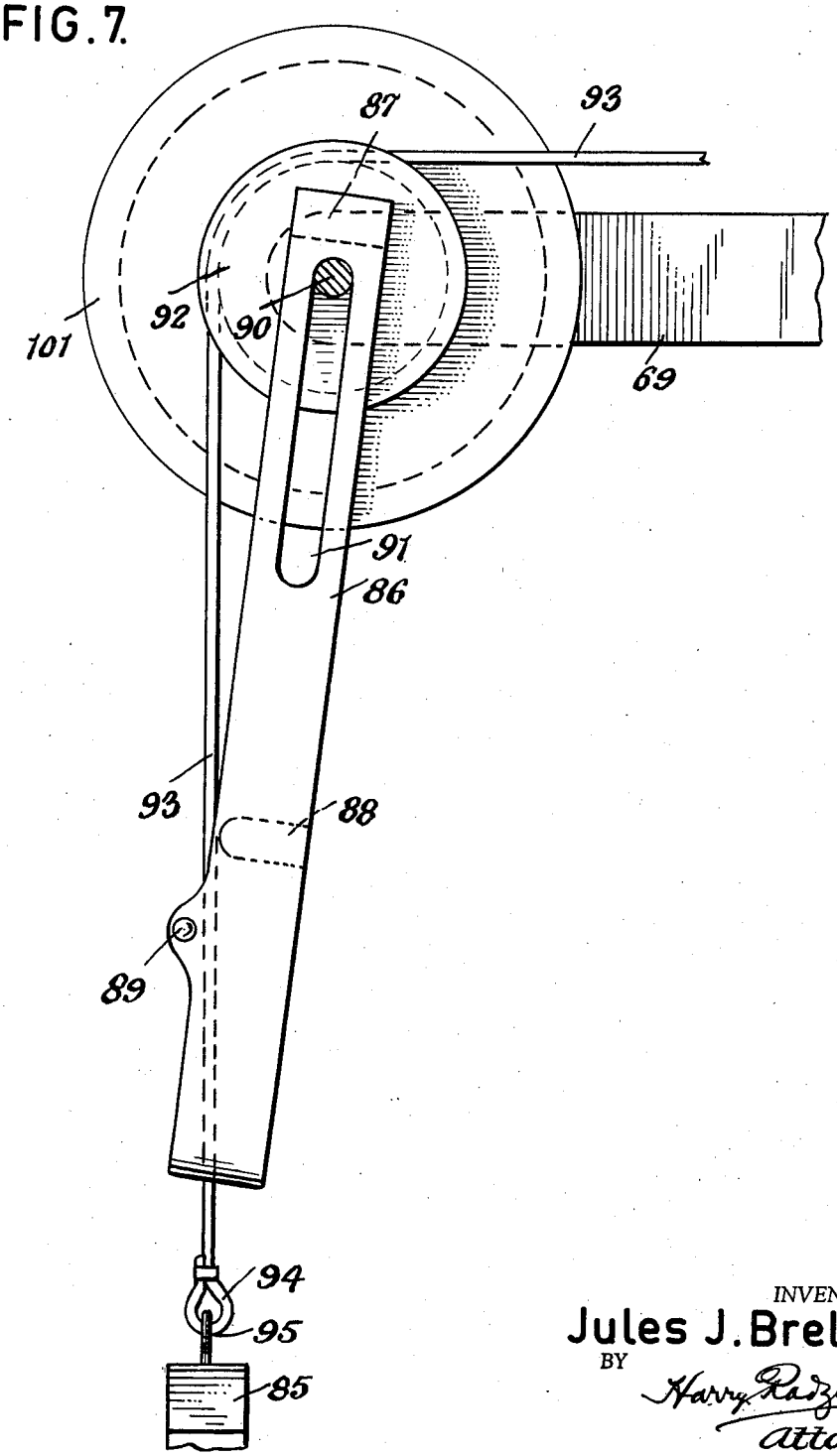
INVENTOR.
Jules J. Brell
BY
Harry Radzinsky
attorney

Sept. 29, 1959 J. J. BRELL 2,906,501

EXCAVATING APPARATUS

Filed Sept. 24, 1957 4 Sheets-Sheet 4

FIG. 7.



INVENTOR.
Jules J. Brell
BY
Harry Radzinsky
Attorney

United States Patent Office 2,906,501
Patented Sept. 29, 1959

2,906,501

EXCAVATING APPARATUS

Jules J. Brell, Baldwin, N.Y.

Application September 24, 1957, Serial No. 685,871

2 Claims. (Cl. 255—2)

This invention relates to excavating apparatus, and more particularly to transporting means for an apparatus of the character shown in my Patent No. 2,872,157, dated February 3, 1959. In that patent is disclosed an excavating unit which consists primarily of a series of scoops or shovels mounted for rotative movement around a dirt-collection bucket, the scoops or shovels being operative to excavate the ground beneath the bucket and carry the displaced earth above the bucket and deposit it therein. The present invention has reference to a supporting vehicle on which an excavating unit of the above character is mounted and which is operative to convey the unit, control the placement of it at the point of excavation and remove it therefrom as required during the excavating operation.

It is one of the objects of the invention to provide a relatively small and readily-mobile vehicle carrying a boom on which the excavating unit is mounted and which will permit of the required lowering and raising movement of the excavating unit as well as permit of its lateral or side-to-side shift as required and permit of precise positioning of the unit. It is an object of the invention to provide a vehicle of this character which will be movable into small areas of excavation; which can be easily controlled and operated and which will possess numerous other advantageous features apparent to those skilled in this art.

With these, and other objects to be hereinafter set forth in view, I have devised the arrangement of parts to be described and more particularly pointed out in the claims appended hereto.

In the accompanying drawings, wherein an illustrative embodiment of the invention is disclosed:

Fig. 1 is a side elevational view of the excavating apparatus constructed according to the invention but with certain parts, such as hydraulic conduits omitted to more clearly show the structural features of the apparatus;

Fig. 2 is a perspective view of the forward end of the apparatus;

Fig. 3 is a perspective view of the rear portion of the apparatus;

Fig. 4 is a front elevational view of the suspension means for the excavator;

Fig. 5 is a sectional view, taken substantially on the line 5—5 of Fig. 4, looking in the direction of the arrows;

Fig. 6 is a side elevational view, with parts in section of the turntable, and

Fig. 7 is a side view of the structure shown in Fig. 4.

Referring to the drawing, 1 indicates generally the body of the vehicle, which is a relatively small but powerful motor-driven vehicle, the type known as a "Payloader" being an example of one vehicle suitable for use for the purpose of the present invention. The body 1 of the vehicle is suitably supported on running gear, including the larger front wheels 2 and the smaller rear wheels 2*a*. The vehicle may be guided and operated through suitable controls forming no part of the present invention, but including the steering wheel shown at 50 and other usual controls not herein disclosed in detail.

For the purpose of enabling the vehicle to be rotatively moved around a vertical axis and thus rotated within its own length to thereby add to its maneuverability within a small area, a turntable 51 is provided as disclosed in detail in Figs. 1 and 6. The same includes a relatively large diameter disk 52 provided with a central, circular housing 53 containing a thrust bearing 54. A disk 55 is provided at the end of a hydraulic piston rod 56 which is operative within a hydraulic cylinder 57 supported by a bracket 58 that is attached to an under part of the vehicle or the chassis therefor. The conduit 59 extends from cylinder 57 to a source of hydraulic fluid under pressure, such as a hydraulic tank housed in the rear portion 1*a* of the body of the vehicle. When it is desired to swing the vehicle about a vertical axis, the disk 52 is lowered by hydraulic pressure exerted in cylinder 57 to bring the disk into contact with the ground and thus elevate the vehicle from off its wheels 2 and 2*a*. The vehicle in its raised position may then be manually swung around to any desired point in its rotative movement, the apparatus shown in Fig. 6 acting as a turntable. When the vehicle is positioned as desired, it may then be lowered and brought to rest on its wheels.

The boom which carries the excavator 100 at its forward end and which is shown in dotted lines in Fig. 1, is composed of a main section consisting of the two connected parallel bars 20 and 21 (Fig. 2) which are secured at their rear ends to a vertical pivot 20 at the rear of the vehicle body 1, said pivot being carried by a frame 61 at the rear of the body. This pivotal arrangement of the main portion 20, 21 of the boom permits the same to be swung from side-to-side as required with the pivot 60 as its axis, particularly when dumping the earth-filled bucket carried by the excavator unit 100.

Adjacent to its forward end, the main boom members 20 and 21 are provided with brackets 22 which carry rollers 23 that ride upon a horizontally-disposed, curved rail 24 (Fig. 2). The rail 24 is supported by angular brace members 26 forming part of a framework 3 mounted at the front end of the vehicle body. The frame 3 also has uprights 4 which aid in the support of the track 24; diagonal braces 6 and rearwardly-extending angular braces 5, all of which co-operate in the formation of a sturdy frame structure located at the front end of the vehicle. Through the arrangement described, it will be apparent that the main boom can be pivotally swung from side-to-side on its pivot 60 as required and this swinging movement is attained by means of two hydraulic cylinders 62 and 63 mounted at the opposite sides of the main boom member 20 and 21 respectively. Each cylinder has a piston rod that controls a cable 64 which extends over pulleys, two of which are shown at 65 and 66, and the cable terminates at a post 67 at the end of the track 24 (Fig. 2). The above arrangement is such that when the piston rod in one of the cylinders 62 or 63 is hydraulically moved it will exert a pull on the cable 54 to swing the main boom to one side. It will be understood that the cable arrangement above described is present on both sides of the boom, one of the cables being connected in the manner above described to each of the piston rods in the respective cylinders 62 and 63.

The forward portion of the boom, and which portion is capable of an up-and-down swing, consists of two connected bars 68 and 69 pivoted at their rear ends on the pivot 70 in the lugs 71 provided on the bars 20 and 21. This forward end of the boom is adapted to be raised or lowered on its pivot 70 by means of a hydraulic cylinder 38 supported between bars 72 on the boom parts 20 and 21. This arrangement is such that by raising and lowering of the bars 68 and 69 the excavating unit 100 can be

caused to descend to the level required for excavating purposes. The brace member 73 which has its upper end secured to the bars 68 and 69 is provided with spaced holes 74 and a pin 75 is selectively inserted through any one of these holes and through a hole in the bars 20 and 21 to thereby hold the forward movable portion of the boom in any desired position.

The excavating apparatus suspended from the forward ends of the bars 68 and 69 of the boom is fully shown and described in my Patent No. 2,872,157, and since it is not claimed per se herein it will not be described in detail. It is sufficient to state that the same consists generally in a bucket around which a plurality of chain conveyors are operated, and which carry shovels or scoops 101*a* that excavate below the bucket and move around over the top of the same to dump their contents in the bucket. When the bucket is full, the excavator is raised out of the excavation by pull exerted on its suspension cable 93 and swung to one side, by operation of either of the cylinders 62 or 63 to dumping position.

The manner in which the excavator is hung or suspended is shown in Figs. 4 and 5. The excavator 100 is provided at the top with a loop 102*a* suspended from a bolt 76 extending through a clevis 78 provided on the bottom of a disk 77. Fixed in the disk 77 is a bolt 79 which extends upwardly through an arcuate slot 80 so that the excavator 100 can be disposed at any desired angle relatively to the support from which it is hung. By tightening the nut shown at 81, with the washer 82 under the same, the two disks 77 and 83 can be clamped together. A central pivot pin 84 holds the two disks together, the lower disk 77 being free to rotate on the pin to the extent permitted by slot 80 when the nut 81 is loosened.

Extending upwardly from the disk 83 is a square block 85 which is guided between a guide member that includes a pair of guide strips 86 and 87 which are held in spaced relation by means of the spacing members shown at 87 and 88 and also by the pin shown at 89. The guide strips 86 and 87 are mounted for free longitudinal sliding movement to a limited extent upon the shaft 90 mounted in the end of the boom members 68 and 69. To permit this sliding movement of the guide strips 86 and 87, the same are each provided with a lengthy slot 91 through which the shaft 90 passes. Freely rotatable on the shaft 90 is a cable sheave or pulley 92, and the cable 93 which suspends the excavating unit, extends over this pulley or sheave and terminates in a loop 94 in engagement with a hook 95 at the top of the block 85. Cable 93 extends rearwardly over the upper part of the vehicle to a take-up drum 96 which is hydraulically operated through gearing in case 103 through hydraulic motor 104. Gearing 103 drives a shaft 105 carrying drum 96 and also carrying a sprocket 106 driving a chain 97 passing around a sprocket 107 on the shaft of a large drum 98 which serves as take-up for the hydraulic tubes 99 used to supply the hydraulic fluid to the hydraulic cylinders and to the motor carried by the excavator. The hydraulic tubes 99 are extended to the excavator over pulleys or sheaves 101 and 102 which are freely rotatable on the shaft 90. When drum 96 is rotated to take up cable 93 it will cause rotation of drum 98 to take up the slack in the various hydraulic conduits.

In order to stabilize and support the apparatus while in excavating operation, supporting feet 30 and 30*a* are employed. The foot shown at 30 is mounted at the end of a vertically-operating hydraulic piston rod 29 operative in a hydraulic cylinder 28 located at the front of the vehicle and supported by the frame 3. Similarly, the foot 30*a* is supported on the piston rod 29*a* of a hydraulic cylinder 28 mounted at the front of the machine and supported in the frame 3. Normally these feet 30 and 30*a* are maintained in an elevated or raised position above the ground. When it is desired to operate the excavator 100, the feet are lowered into firm contact with the surface of the ground thereby stabilizing the vehicle and resisting any tendency toward tipping.

When it is desired to break the ground before setting the excavator to work, such as in a case where asphalt pavement must be first removed before digging, the spikes shown at 34 are employed. Each of the spikes 34 is mounted for vertical adjustment in a guide box 33 at the end of a bar 31 or 32 horizontally movable through a guide 32*a* and connected to a hydraulic cylinder. Normally, the spikes are retracted or in the position of the upper spike in Fig. 2. When it is desired to use the spikes for pavement destruction, they are moved forwardly by hydraulic means to the advanced position of the lower spike 34 in Fig. 2, and then driven into the pavement. The spikes are perforated as indicated at 35 and a pin inserted through the suitable perforation 35 after the spike has been driven into the pavement, will prevent rising movement of the spike as the vehicle is driven forwardly to force the spikes to break up the pavement.

The control of the various hydraulically-operated elements may be effected by levers or other suitable controls positioned near the operator while either seated in the vehicle or standing alongside the same, said levers operating to control valves which control the hydraulic means to move the boom from side to side; which elevate or lower the forward movable portion of the boom consisting of the bars 68 and 69; which raise and lower the excavating unit by movement of the suspension cable 93 and which control the operation of the conveyors on the excavation unit. Control levers for operation of the mechanisms described are shown at 105*a*, 106*a*, 107*a* and 108*a* in Fig. 2.

From the foregoing, the operation of the described apparatus will be readily understood. The small size of the vehicle permits it to be readily maneuverable and it can be moved to readily bring it to the point of excavation. When the excavating unit 100 is lowered to rest on the ground and the conveyors 101*a* thereon are set in operation they will excavate below the bucket and carry the earth above the top of the bucket and deposit it into the bucket. When the excavating unit is in operation it will be noted that the block 85 is located below the end of the guide member composed of the strips 86 and 87 as shown in Fig. 7 and that the guide has descended by gravity until the upper end of the slot 91 reaches the shaft 90. When the cable is drawn upwardly in a manner to raise the excavator 100 the block 85 will have its tapered upper end drawn between the guide strips 86 and 87 and will thus be assured when it again descends for the digging operation, that it will be located at the same straight or angular position which it had before being elevated for dumping. By means of this slot 80 and the bolt 79 the disk 77 carrying the excavator can be positioned at various angles to the longitudinal axis of the vehicle, thus digging a trench or ditch at an angle to the vehicle when required.

Having described a single embodiment of the invention, it is obvious that the same is not to be restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

What I claim is:

1. In an excavating apparatus, a vehicle, wheels on which the vehicle is supported, a boom having one end pivoted on a vertical pivot at the extreme rear end of the vehicle, the boom extending forwardly over the top of the vehicle from the rear to the front thereof, a curved track at the front of the vehicle, rollers carried by the forward end of the boom and resting on and supported by the track and on which the forward end of the boom can be moved through an arcuate path, a supporting arm pivoted at one end on the boom between its point of support on the track and its pivot and extending forwardly beyond the front end of the boom, said arm being capable of upward and downward movement on its pivot relatively to the boom and without requiring movement of the boom, hydraulic means for raising and lowering the

arm, means for fixedly locating the arm at various positions of angularity in its raising and lowering movements, and an excavating device hung at the forward end of the arm.

2. In an excavating apparatus, a vehicle having supporting wheels on which the vehicle is mobile, a main boom located over the top of the vehicle, said boom having a rear portion mounted on a fixed pivot at the extreme rear end of the vehicle, the main boom extending completely forwardly from its pivot over the top of the vehicle, an arcuate track at the forward end of the vehicle, the main boom having rollers on its forward end resting on the track and movable thereon in a manner to permit of swinging movement of said forward end, the boom including a supplemental boom member pivoted on a horizontal pivot on the main boom and at a point substantially midway between the ends of the main boom, means by which the supplemental boom can be pivotally raised and lowered relatively to the main boom, and an

excavating device adjustably suspended from the forward end of said supplemental boom member and forwardly of the vehicle.

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