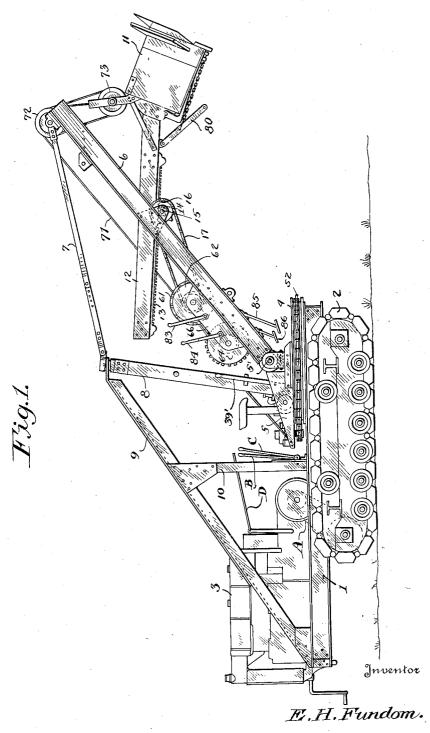
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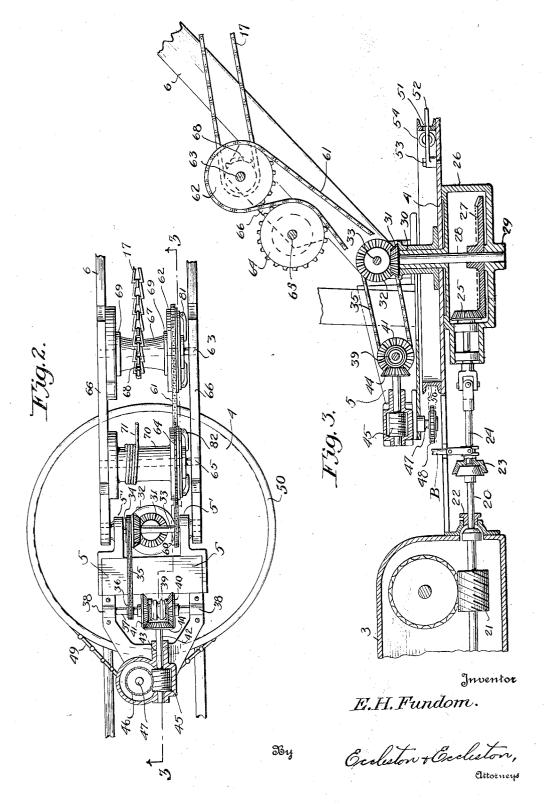


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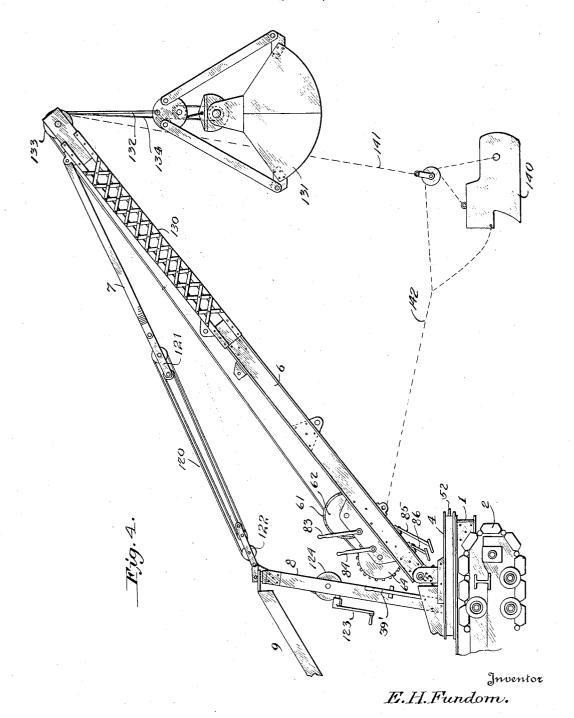
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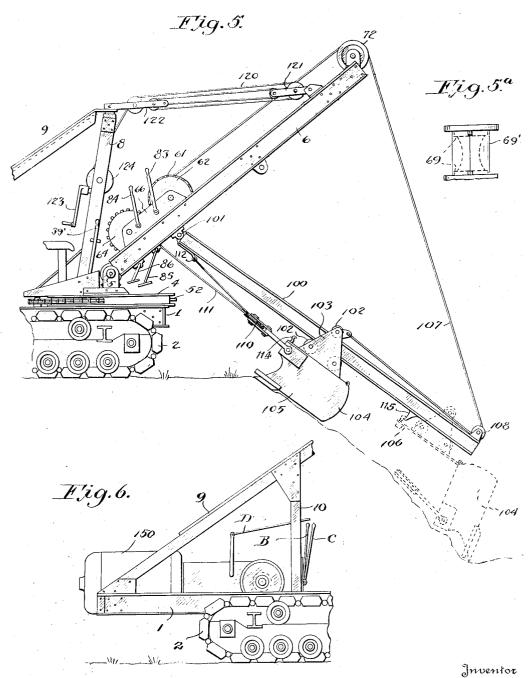


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## UNITED STATES PATENT OFFICE

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## **EXCAVATING APPARATUS**

Application filed January 18, 1927. Serial No. 161,832.

This invention relates to excavating appa- equipped for use with a clam shell and also ratus of the type generally known as steam shovels and has for its object to provide such a device adapted to be used as a shovel, 5 ditcher, clam-shell or dragline operator and use as a ditcher. the like, and which may be operated by an internal combustion engine or an electric motor.

Another object of the invention resides in 10 the construction of such a device which may be operated through the medium of a Fordson and thereby be operated at varying speeds due to the presence of the three speed transmission forming a standard part of such 15 machines.

A further object of the invention consists in incorporating a shock-absorber in the turntable operating means thereby eliminating, to a great extent at least, wear and tear on

Another object of the invention resides in generally improving constructions of this type, and especially by rendering the same more compact and more easily controlled by 25 a single operator this being accomplished to a great extent by mounting the cable drums, clutches and crowder mechanism at the base of the main boom.

An additional object of the invention con-30 sists in the provision of a ditcher boom and ditcher-bucket, an automatic latch for the latter, and cable operating means so arranged as to reciprocate the ditcher bucket along the boom and simultaneously raise and lower

Other objects and advantages of the invention will be apparent from the following deaccompanying drawings; in which

Figure 1 is a side elevation of the excavating apparatus equipped as a dipper or

Figure 2 is an enlarged plan view partly in section showing the winding drum and

other operating parts of the machanism.
Figure 3 is a fragmentary vertical section through the driving mechanism and related parts taken on line 3—3 of Figure 2.

Figure 4 is a side elevation, partly broken away, showing the excavating apparatus (in dotted lines) with a dragline.

Figure 5 is a side elevation, partly broken away, showing the apparatus equipped for

Figure 5<sup>a</sup> is a detail view of a double spool

or drum; and

Figure 6 is a detail showing an electric motor installed as a source of power in lieu of the internal combustion engine disclosed in 60 the other views.

Referring to the drawings in greater detail the numeral 1 indicates the framework of the apparatus which is shown as mounted on a caterpillar 2 although it will be obvious 65 that any type of wheeled support may be employed if desired. Mounted on the rear end of the frame is an internal combustion engine 3 serving as the source of power, and in the present instance this engine is depicted as a 70 Fordson and being of well known construction need not be described in detail. A chain drive or the like A may be associated with the driving axle of the Fordson for operating the wheeled support, and this mechanism is 75 controlled by operating levers B and C and gear shift D. On the forward end of the frame 1 is mounted a base 4 on which is mounted for rotation a platform or turntable 5; this mounting being provided by means of 80 the bearing 30. To the turntable 5 is pivoted at 5' the lower end of the crane or boom 6 which is composed of spaced channel bars.

ported by means of the braces 9 and 10. The dipper or shovel which is indicated by scription when taken in connection with the the numeral 11 is rigidly connected to the dipper stick 12 in the usual way; and the lafter is provided on its under side with a 90 pair of racks 13 for cooperation with pinions 14 carried by the shaft 15. This shaft 15 also carries a sprocket 16 operated by a chain 17 to which power is applied in a manner to be hereinafter described.

This boom is supported by means of an arm 7 secured to the strut 8 which is in turn sup- 85

In Fig. 3 is shown in detail the main driving shaft of the apparatus. This comprises a shaft 20 which is welded onto the worm 21 of a Fordson and is provided with a suitable stuffing box and gland 22. A clutch 23 con- 100

nects shaft 20 with a shaft 24, the latter being connected to a pinion 25 in the reduction gear box 26. The pinion 25 meshes with a gear 27 which is keyed to the vertically disposed shaft 28. A suitable lower bearing 29 is provided for the shaft 28 and the latter is provided on its upper end with a bevel gear 31 which meshes with a similar gear 32 mounted on a shaft 33. A sprocket wheel 10 34 is also mounted on the shaft 33 and carries a chain 35 which meshes with a sprocket wheel 36 keyed to shaft 37. This shaft is mounted in bearings 38 carried by the turntable or platform 5 and carries the clutch 15 cones 39 which are operatively associated with the bevel gears 40 and 41 loosely mounted on shaft 37. A lever 39' is provided for operating this clutch mechanism. Shaft 42 mounted in bearing 43 carries a bevel gear 20 44 which meshes with the similar gears 40 and 41, and also carries a worm 45 meshing with a worm wheel 46. The worm wheel 46 is mounted on the upper end of a vertical shaft 47 which also carries a sprocket wheel 48 (Fig. 25 3) meshing with a chain drive 49 for operating the turntable 5.

From the description of the gearing as thus far described it will be apparent that the turntable may be operated in either di-30 rection due to the clutch mechanism 39 and that the table may be operated at varying speeds due to the three speed transmission which is a standard part of the Fordson 3 and operated by lever D. I will now describe 35 the shock-absorbing mechanism by means of which power is applied to the table 4 gradually thereby avoiding undue wear and tear on clutches and other parts of the mechanism.

The base 4 is provided with an annular 40 channel 50 in which is positioned the chain 49, and extending through an elongated slot 51 in the base of this channel is a finger or draw-bar 52 which is pivoted to the base as indicated at 53. Disposed on opposite sides 45 of the draw-bar 52 are coil springs 54 which normally maintain the bar midway of the length of the slot 51. The draw-bar 52 extends through one of the links of the chain 49 or may be otherwise connected thereto, and obviously as power is applied to the chain it will first compress one or the other of the coil springs 54, depending upon the direction of rotation of sprocket 48, and will therefore apply the power gradually to the

I will now describe the hoist and crowder mechanism by which the dipper 11 is caused to perform its operations.

Mounted on shaft 33 is a sprocket wheel 60 which is geared to a chain 61 which is also geared to a sprocket wheel 62 on shaft 63 and a sprocket wheel 64 on shaft 65, both shafts being mounted on plates 66 carried by the boom 6. It will be noted that chain 61

sprocket 64 thereby causing these wheels to turn in opposite directions. In addition to the sprocket wheel the shaft 63 also has mounted thereon a drum 67 provided with a dished surface and carrying teeth 68 for co- 70 operation with chain 17 for operating the crowder bar 12, and it will be noted that this drum is provided with annular shoulders 69 for the support of a winding drum 69' for use in connection with the ditcher 75 bucket and the like to be later described. A drum 70 is also associated with the sprocket wheel 64 on shaft 65 and serves to operate the cable 71 which passes over guide pulley 72 at the upper end of the boom 6. This cable, 80 of course, is then passed around the pulley 73 carried by the dipper 11 and after again passing over pulley 72 is anchored to the

The usual dumping lever 80 is provided 85 for the dipper 11, and clutches 81 and 82 are provided for the drums 67 and 70; the former being operated by lever 83 and the latter by lever 84. A brake pedal 85 operates a brake (not shown) for controlling the 90 crowder mechanism and a brake pedal 86 is provided for controlling the operation of the hoisting drum 70.

From the foregoing description it will be apparent that I have devised a power shovel operated by an internal combustion engine (Fordson) and incorporating the standard three-speed transmission thereby permitting the dipper to be operated at a speed best suited to the particular circumthat the hoisting mechanism, clutches, etc., are mounted on the base of the boom thereby rendering the apparatus more compact and also providing for complete control thereof by a single operator, and that undue wear and tear is avoided by reason of the shock-absorber associated with the turntable and operating chain.

The present apparatus is adapted for use as a ditcher (Fig. 5) which has many in- 110 herent advantages in addition to those just referred to and I will now describe the means by which the shovel may be converted into a novel type of ditcher.

The dipper, dipper stick and crowder 115 mechanism being removed, an excavator boom 100 is pivotally attached to the main boom 6 as indicated at 101. Suspended from the boom 100 and adapted to reciprocate thereon by means of trolley wheels 102 on trolley 103 is a ditcher bucket 104. This bucket comprises an excavating portion 105 and a top or cover portion 106 to which the excavating portion is pivotally connected.

Attached to the trolley portion 103 is one end of a cable 107 which passes around sheave 108 on the end of boom 100, around sheave 72 on boom 6 and is secured to the drum 69' (Fig. 5") mounted on shoulders leads around the sprocket 62 and the under 69 heretofore referred to in connection with

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the description of the shovel. Pivotally mounted on the excavating portion 105 of the bucket is a pulley block 110 around which passes a cable 111 having one end anchored to the boom 100 as indicated at 112. The 5 opposite end of the cable is secured to the regular cable drum 70 previously described and by winding up on this drum it is obvious that the ditcher bucket will be caused to dig into the soil as it is drawn from the dotted 10 line position of Figure 5 to the full line position. Reverse movement of the drums 70 and 69' will of course swing the boom 100 upwardly about its pivot and will also draw the bucket 104 outwardly to the free end of the boom where it is automatically dumped by engagement with a latch release mechanism 115 which engages the latch 114 normally holding bucket 105 in engagement with the cover portion 106, thereby permitting the portion 105 of the bucket to swing downwardly from the cover portion 106 as shown in dotted lines (Figure 5).

In use of the apparatus as a ditcher the main boom 6 is supported in various adjusted positions by means of a cable 120 which is threaded through pulley blocks 121 and 122 on the boom 6 and brace 9 respectively. Adjustment of the boom 6 is made by means of a manually-operated crank 123 which is geared to a drum 124 to which one end of

cable 120 is attached.

By this arrangement and operation of the ditcher bucket it will be apparent that I have devised a simple yet effective apparatus for excavating ditches which through the medium of two cables drags the bucket through the loading operation, raises it to unloading position, opens it and then returns it to its initial position for reloading.

In Figure 4 I have shown the improved excavating apparatus equipped for use with a clam shell or a dragline bucket, and it will be obvious that only minor changes are 35 necessary to convert the device from a ditcher to an excavator of the clam shell The elongation of the boom 6 is provided by means of the extension 130 which is bolted to the upper end of the boom 6, and the boom is supported in various adjusted positions about its pivot 5 by means of the arm 7 and cable 120 which passes around the blocks 121 and 122 and is operated by the crank 123. The clam shell 131 is of the usual 55 type and need not be described in detail other than to say that it is operated by means of a cable 132 which passes over pulley 133 on the end of the boom extension 130 and is wound about drum 70 in the usual manner; co a cable 134 being employed for controlling the opening and closing of the shell.

The dragline bucket 140 is of a well known type and is operated in the usual way by cables 141 and 142 which are controlled by

65 the drums 70 and 69.

In all forms of the invention heretofore described the apparatus has been shown as being operated by a Fordson having the standard three-speed transmission, but the apparatus is also adapted for use with an electric motor and in Figure 6 is shown a fragmentary view of such a motor 150 mounted on the frame 1 and operatively connected with

the gear shifting mechanism.

From the foregoing description taken in 75 connection with the accompanying drawings it will be seen that I have devised a novel type of mechanical shovel adapted to be operated by a Fordson or an electric motor; that it has the obvious advantage of a plural speed so transmission; that the incorporation of the shock-absorber in the operation of the apparatus eliminates wear and tear to a marked degree; that it is compact and therefore readily controlled by a single operator due to \$5 the arrangement of the parts; that it is readily convertible into a novel type of ditcher; and that it is also adapted for use with a clam-shell, dragline and the like, each having the advantages of the novel transmission, 90 gearing and the like, as disclosed in connection with the dipper.

In accordance with the patent statutes I have described what I now believe to be the best embodiment of the invention, but I do not wish to be understood thereby as limiting myself or the scope of the invention, as many changes and modifications may be made without departing from the spirit of the invention; all such I aim to include in the scope

of the appended claims.

What I claim as new and desire to secure

by Letters Patent is:

1. In a device of the class described, a turntable, a boom pivoted thereto, a dipper and dipper stick associated with said boom, a rack on said dipper stick, a pinion for said rack, a chain drive for said pinion, a sheave on the end of said boom, a cable connected to said dipper and extending over said sheave, a drum on said boom for operating the cable, a gear wheel on said boom for operating said chain drive, and a single means for operating said drum and gear wheel.

2. In a device of the class described, a turntable, a boom pivoted thereto, a dipper and dipper stick associated with said boom, a rack on said dipper stick, a pinion for said rack, a chain drive for said pinion, a sheave on the end of said boom, a cable connected to said dipper and extending over said sheave, a drum on said boom for operating the cable, a gear wheel on said boom for operating said chain drive, a single means for operating said drum and gear wheel, and clutches associated with said drum and gear wheel.

3. In a device of the class described, a turntable, a boom pivoted thereto, a dipper and dipper stick associated with said boom, a rack

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on said dipper stick, a pinion for said rack, a chain drive for said pinion, a sheave on the end of said boom, a cable connected to said dipper and extending over said sheave, a drum on said boom for operating the cable, a gear wheel on said boom for operating said chain drive, and a chain drive for rotating said drum and gear wheel in opposite directions

4. In an excavating device, a turntable, a boom pivoted thereto, a dipper and dipper stick associated with said boom, a crowder mechanism for said dipper stick, said crowder mechanism including a drum having a concaved surface, gear teeth disposed in the concavity of said drum, and shoulders formed on said drum whereby a secondary drum may be disposed around said first-mentioned drum and said gear teeth.

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