

Sept. 15, 1931.

E. H. FUNDOM

1,823,137

POWER SHOVEL

Filed Feb. 24, 1927

4 Sheets-Sheet 1

Fig. 1.

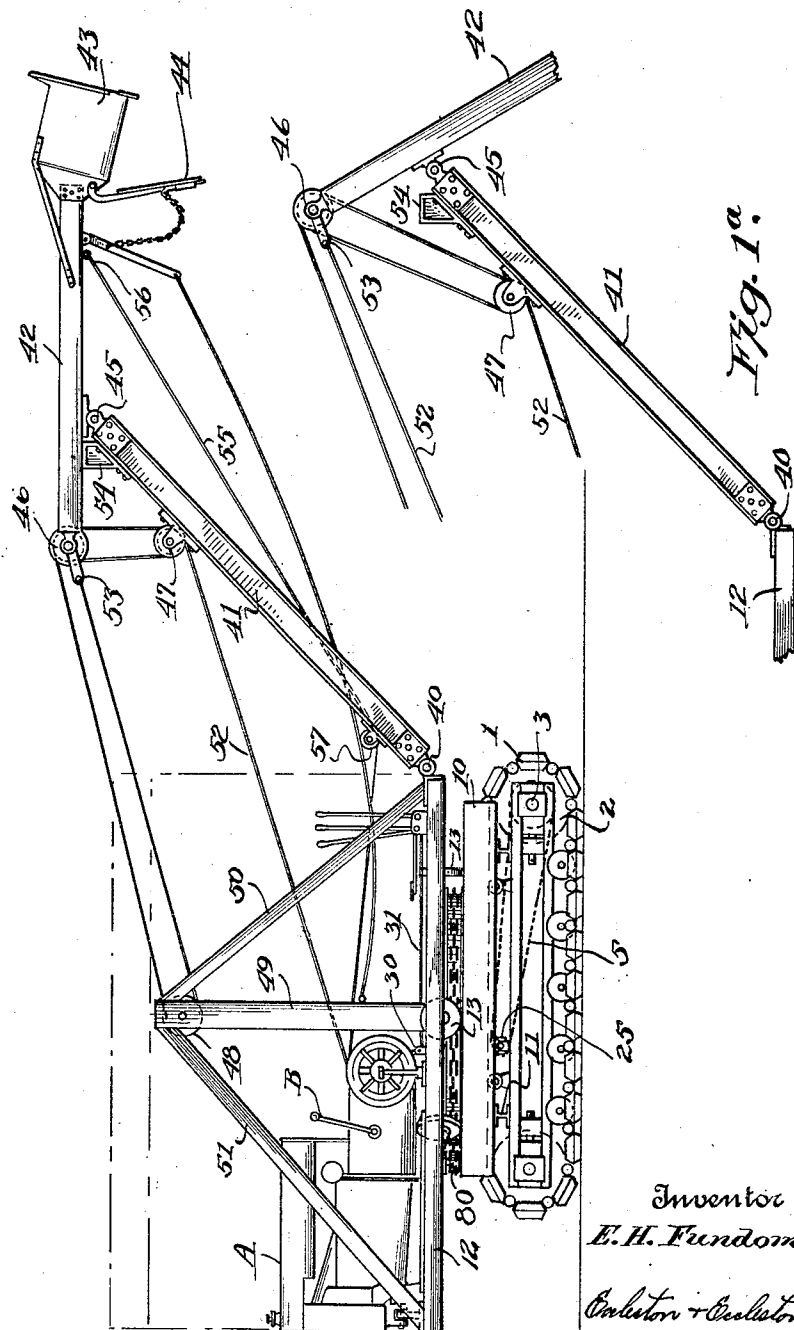


Fig. 1^a.

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Fig. 2.

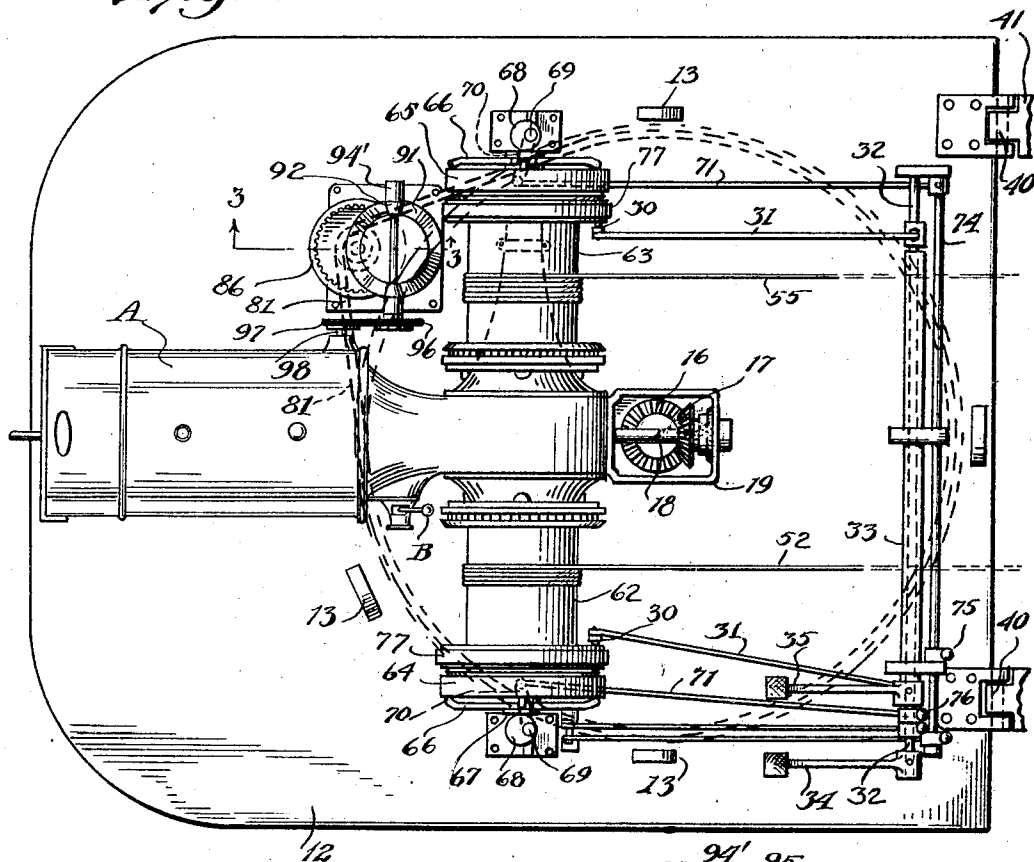


Fig. 3.

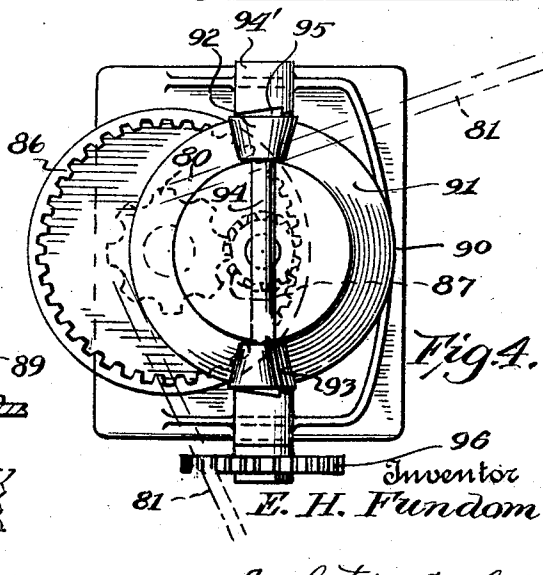
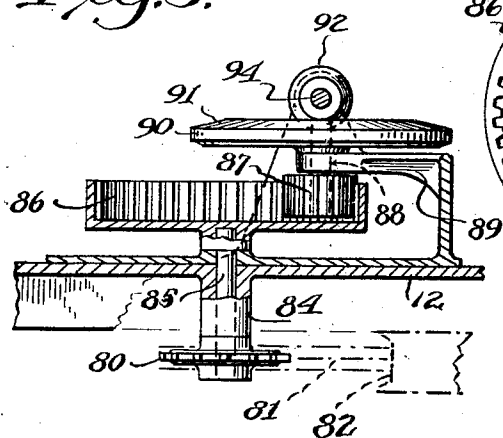


Fig. 4.

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Fig. 5.

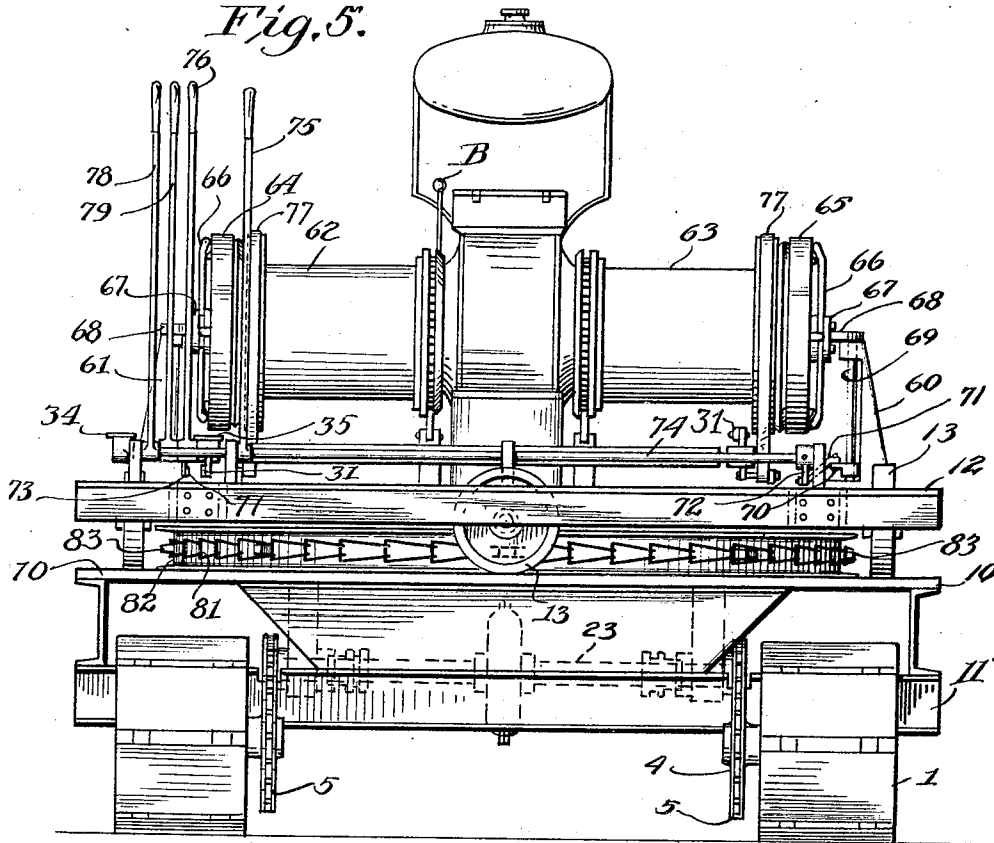
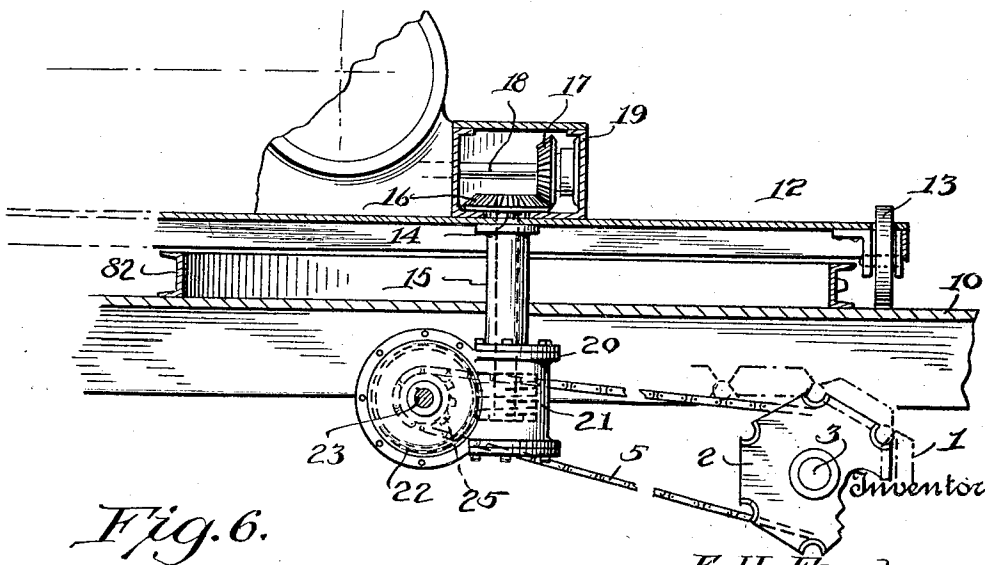


Fig. 6.



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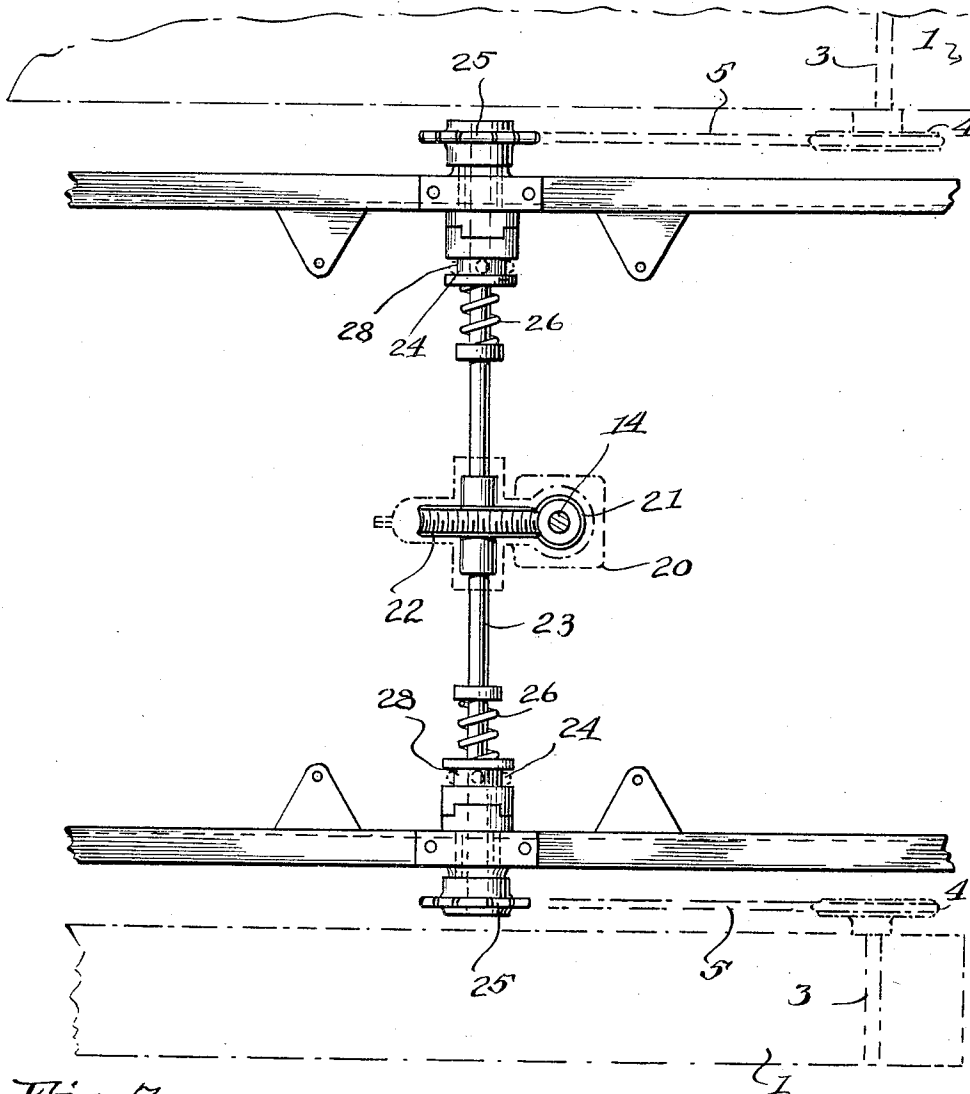
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UNITED STATES PATENT OFFICE

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POWER SHOVEL

Application filed February 24, 1927. Serial No. 170,666.

The present invention relates to power shovels of the medium sizes and has for its object to provide such a device of the dipper stick type which is of simplified construction and which is durable and efficient in operation.

A further object of the invention resides in a novel means of operating the dipper stick and also in operating the turntable with which the dipper stick is associated.

Another object of the invention consists in so arranging the rigging and other mechanism as to provide for a maximum application of power at the point in the operations where the greatest power is desirable.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings; in which

Figure 1 is a side elevation of the complete device with the dipper sticks being in raised position.

Figure 1^a is a detail view showing the dipper stick in lowered position.

Figure 2 is a plan view of the turntable and winding drums mounted thereon.

Figure 3 is a vertical section taken on line 3—3 of Figure 2.

Figure 4 is an enlarged detail view of the drive and clutch mechanism employed in connection with the traverse of the shovel.

Figure 5 is an end elevation of the apparatus with the boom and related parts removed.

Figure 6 is an enlarged sectional detail of the tractor driving mechanism; and

Figure 7 is a plan view of the mechanism for operating the steering devices, the turntable and base being removed.

Referring to the drawings in greater detail the numeral 1 indicates the running gear which in the present instance is of the caterpillar type and is operated by means of the wheels 2 on axles 3. Sprocket wheels 4 are mounted on the axles 3 and are driven by means of chains 5 which are in turn driven by mechanism hereinafter described.

Mounted upon the running gear of the apparatus is a frame or base 10 which is supported by I-beams or the like 11. The

base 10 serves as a support for a turntable 12 which is centered thereon and mounted for rotation by means of a plurality of rollers 13.

Disposed centrally of the turntable 12 is a downwardly extending shaft 14 mounted in a bearing 15 extending through the base portion 10. Mounted on the upper end of shaft 14 is a bevel gear 16 which meshes with a similar gear 17 on the horizontal shaft 18. These gears are inclosed within a casing 19 and the shaft 18 passes through the casing and is welded or otherwise connected to the main shaft (not shown) of the internal combustion engine "A". In the present instance this engine is depicted as a Fordson provided with a transmission gear shift B, although other types of motive power may be employed. Fixed to the lower end of shaft 14 in gear box 20 is a worm 21 which gears with a worm wheel 22 fixed to the floating axle 23.

Mounted on the ends of the axle 23 and adapted to rotate therewith upon suitable operation of the clutches 24 are sprockets 25 which operate the drive chains 5 hereinbefore referred to. The clutches 24 are projected into operative position by means of springs 26 and may be disconnected by means of levers (not shown) having operative connections with the slidable portions 28 of the clutches.

From the foregoing description it will be apparent that movement is imparted to the caterpillars 1 by the motor A through the medium of the worm gear 21—22 and that the direction of movement of the apparatus is controlled by means of levers (not shown) through the clutches 24. The feature of the worm drive is of particular importance in that it constitutes an irreversible transmission of power which serves as a lock for the caterpillars and thereby avoids the necessity of placing chocks at the front and rear thereof when the shovel is being operated.

I will now describe the construction of the dipper, dipper stick and related parts of the mechanism.

Pivoted to the forward end of the turntable 12 as indicated by the numeral 40 is a boom 41. This boom comprises a pair of suitably

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spaced channel members to the upper end of which is pivoted the dipper stick 42. A dipper or shovel 43 is fixed to the lower end of the dipper stick or crowder bar and is provided with the usual line-operated closure 44. The bar 42 is pivoted intermediate its ends to the boom 41 as indicated by numeral 45, and the end remote from the dipper carries the pulley wheels or sheaves 46. A pulley wheel 47 is mounted on the upper side of the boom 41, and a similar wheel 48 is mounted on the upper end of the standard 49 which is suitably supported in its proper position on the turn table by the braces 50 and 51. The operating cable 52 leads from the cable drum to be later described and is reeved through pulleys 47, 46 and 48 and has its end anchored to the dipper stick as indicated by the numeral 53. Operation of the drum to wind up the cable 52 will first swing the dipper stick from its position in Figure 1^a to its position in Figure 1, in which position the stick engages a stop 54 on the boom 41. Further winding of the cable 52 will of course swing the boom 41 upwardly about its pivot 40. For additional movements of the shovel, such as drawing the same backwardly toward the frame of the mechanism, a single cable 55 is provided which is anchored adjacent the end of the dipper stick as indicated at 56 and passes under guide pulley 57 on the base of the boom 41 to another winding drum to be described.

By the manner of mounting the dipper stick on the boom 41, and the arrangement of the pulley wheels 46, 47 and 48 it will be apparent that provision is made for transmitting the greatest force to the dipper during the crowding operation and that thereafter the power is applied so as to increase the speed of movement of the dipper.

Disposed transversely of the turntable 12 is the driving axle of the Fordson A and mounted thereon are the two drums 62 and 63. These drums have associated therewith clutches 64 and 65 respectively, of the type shown in my copending application Serial No. 161,832, filed January 18, 1927, and need not be described in detail herein; it being sufficient to say that the clutches are operated by means of levers 66 which are operatively associated with discs 67. The discs 67 are operated by cams 68 which are mounted on the upper ends of the vertical shafts 69. These shafts have bearing in the standards 60 and 61 and are provided with crank arms 70 on their lower ends to which are pivoted links 71 which are in turn connected to arms 72 and 73. The arm 72 is fixedly secured to a rock-shaft 74 operated by a lever 75, and the arm 73 forms an extension of the boss on a lever 76 which is mounted for oscillation about the shaft 32. It will thus be apparent that by operation of the control levers 75 and 76 the clutches 64 and 65 may be selectively

operated to apply power to the drums 62 and 63 for operating the cables 52 and 55 which control movements of the dipper and dipper stick. Links 30 which are associated with the brake bands 77 are operated by rods 31 to which is imparted longitudinal movement by means of crank arms on the rock shafts 32 and 33; these latter shafts being operated by foot levers 34 and 35.

For the purpose of rotating the turntable 12 so as to provide the necessary traverse of the boom 41, I provide the table with a sprocket wheel 80 for cooperation with a chain 81 which is mounted in a circular channel member 82 fixed to the main frame 10. Teeth 83 are formed on the channel member 82 and serve to hold the chain 81 against circumferential movement about this member. As will be apparent from an inspection of Figures 2, 3 and 4 the chain 81 has a length greater than the circumference of the channel member 82, and it is within the loop or bight thus provided that the sprocket 80 operates.

The sprocket wheel 80 is carried by the lower end of a shaft 85 mounted for rotation in a bearing 84 formed on the under side of table 12. Fixed to the upper end of shaft 85 is an internal gear 85 which meshes with a spur gear wheel 87 fixed to the lower end of shaft 88 which has its bearing in a bracket 89. Keyed to the upper end of shaft 88 is a horizontally disposed friction disc 90 provided with a beveled face 91 for cooperation with a pair of cones 92 and 93 splined to a shaft 94. Either of these cones is adapted to be moved into frictional engagement with the disc 90 by means of suitable mechanism operating against the cam surfaces 95. The shaft 94 is mounted in bearings 94' and is rotated by means of a gear wheel 96 meshing with a gear wheel 97 carried by the auxiliary drive shaft 98 of the Fordson. It is thus apparent that the turntable 12 may be caused to rotate in a full circle in either direction by suitable control of the cones 92 and 93 which will cause reverse rotations of the sprocket wheel 80.

From the foregoing description taken in connection with the drawings it will be observed that I have devised a relatively simple construction of power shovel which is operated by an internal combustion engine so as to accomplish all the functions of an ordinary steam shovel; that it is provided with three speeds; that the relation of the boom, dipper stick and operating cable is such as to provide the greatest power at that point in the operations where the maximum resistance is encountered; that the construction is such as to allow a full swing (360°) of the shovel; that the novel type of drive for the caterpillars is such as to eliminate the use of chocks when the shovel is in use; and that the entire design is such as to pro-

vide a compact arrangement of the parts which permits of ready control by a single operator.

5 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 within the scope of the appended claim.

What I claim as new and desire to secure by Letters Patent is:

15 An excavating apparatus including a turntable, a boom pivoted thereto, a standard on said table, a dipper stick pivoted to the end of the boom intermediate the ends of the former, an outwardly directed shovel on the end of the dipper stick, means to limit the upward movement of the dipper stick about its pivot, pulley wheels mounted on the upper end of the standard and dipper stick, a pulley wheel mounted adjacent the free end of the boom, a cable fixed to the upper end of the dipper stick and reeved through said pulley wheels, and a winding drum on the turntable for operating said cable.

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