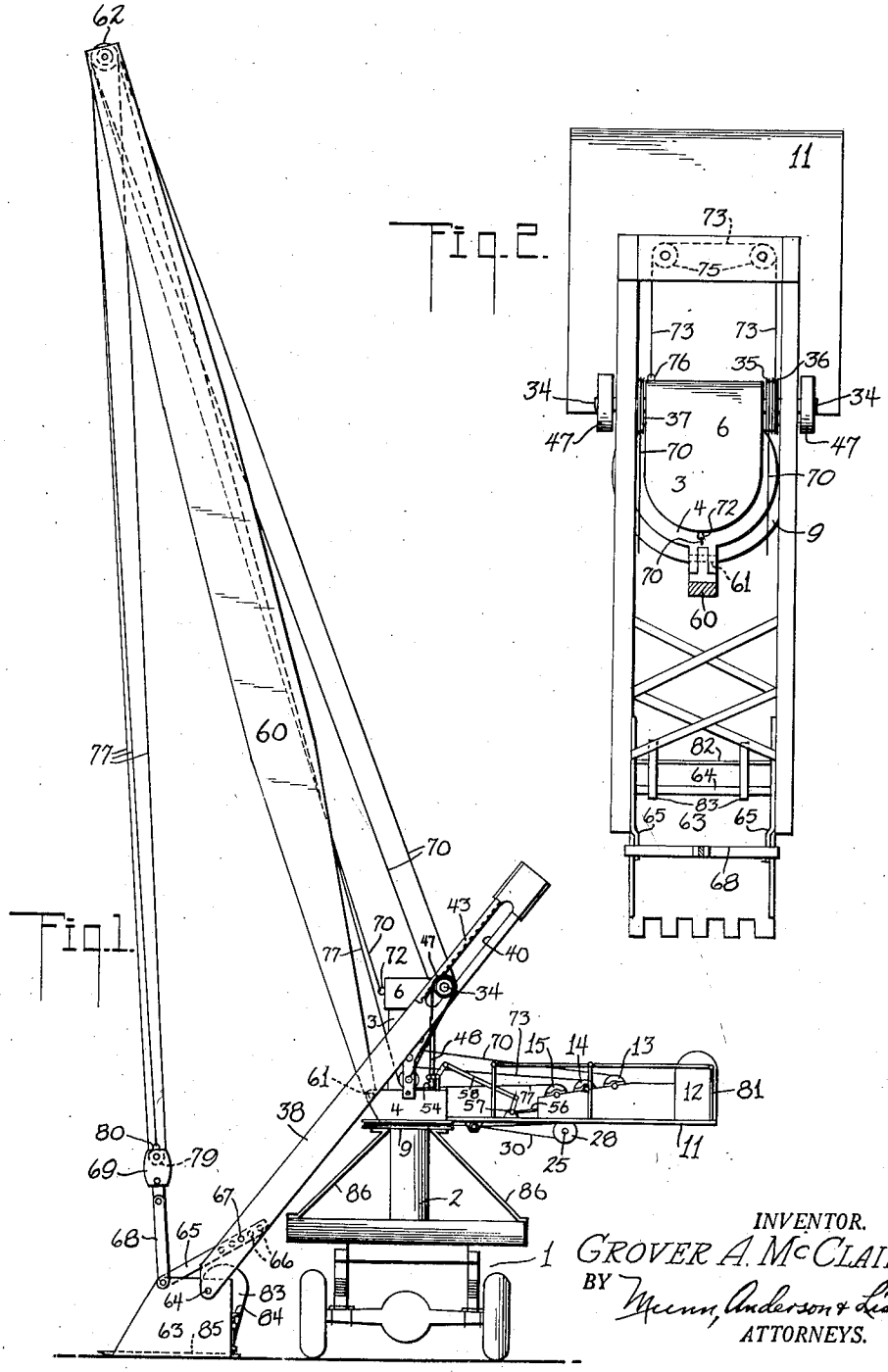
June 1, 1937. G. A. McCLAIN 2,082,018

PORTABLE SHOVEL

Filed July 13, 1935 3 Sheets-Sheet 1



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PORTABLE SHOVEL

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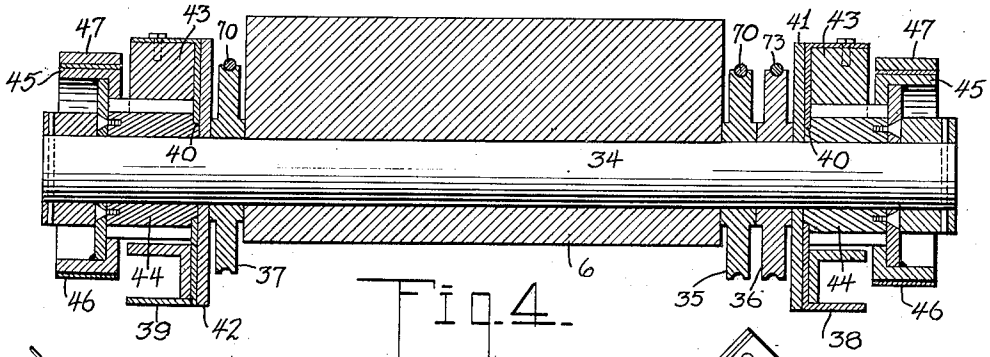

Fig. 4.

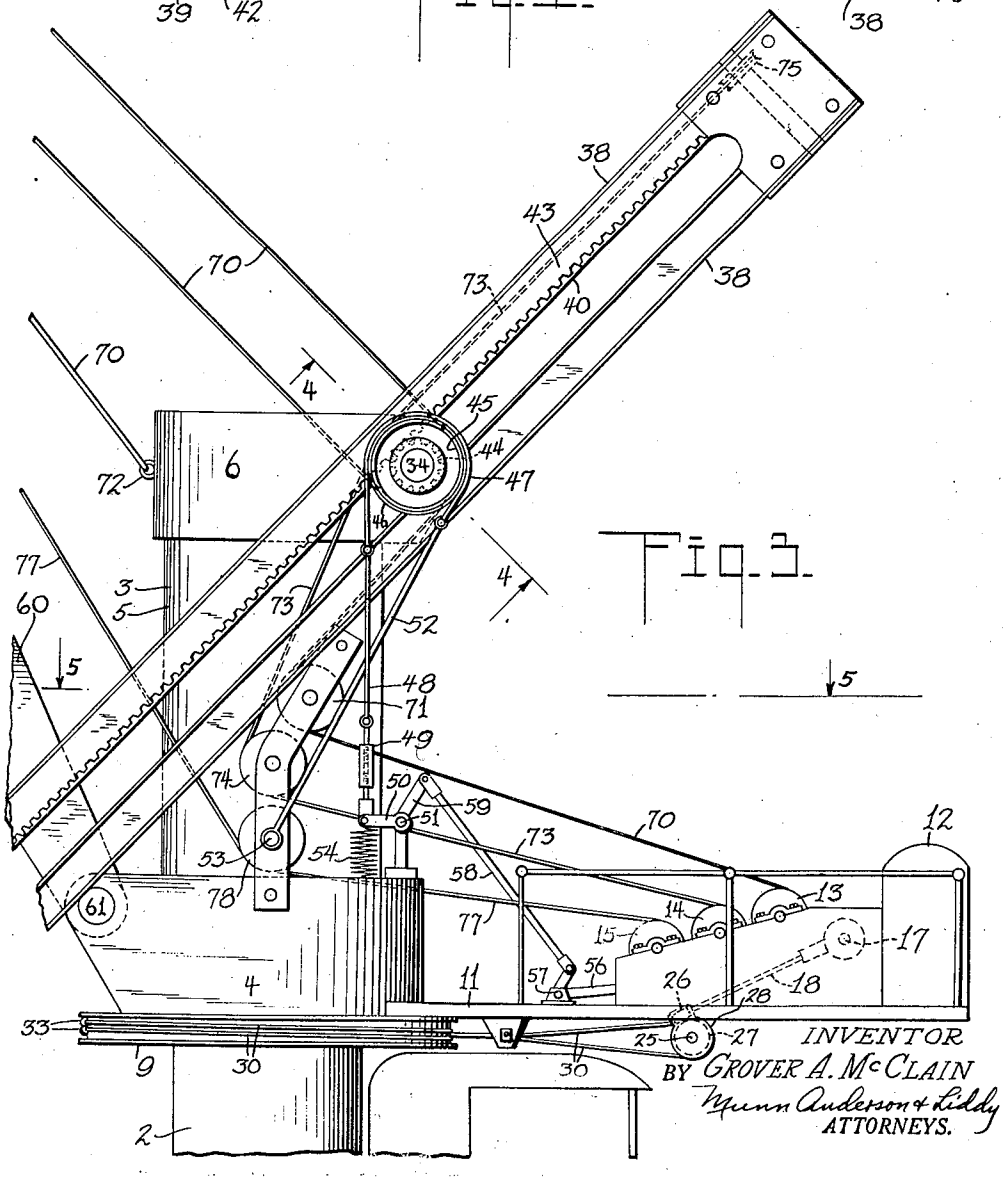

Fig. 3.

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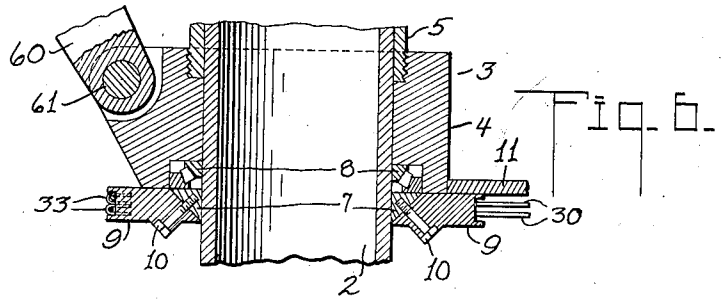

Fig. 6.

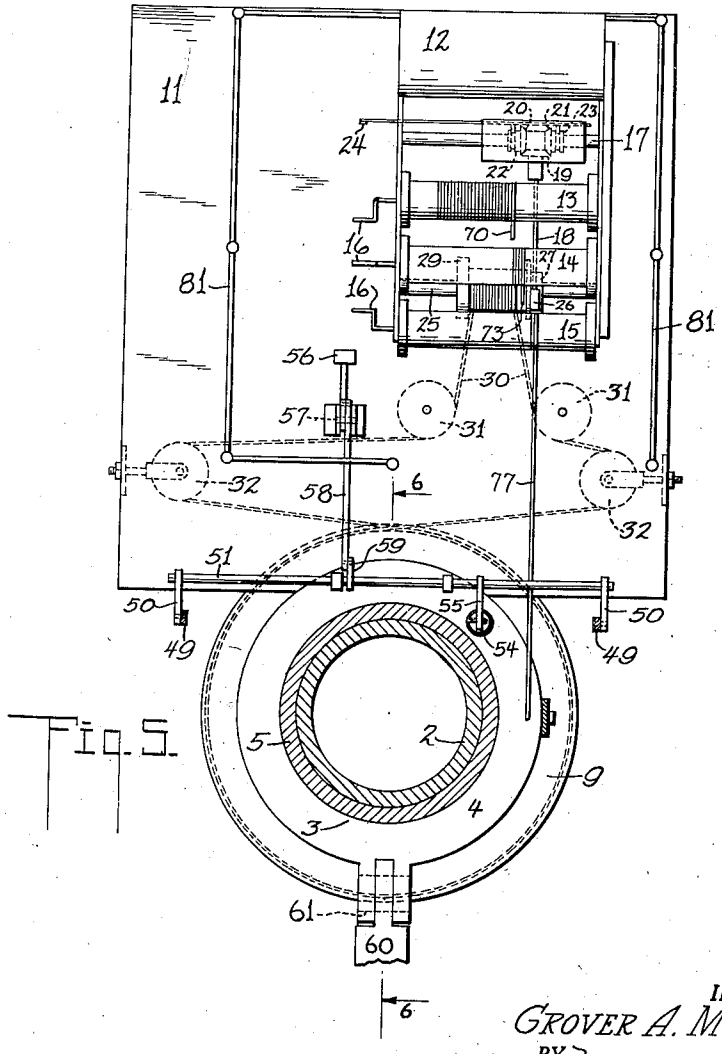

Fig. 5.

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2,082,018

PORTABLE SHOVEL

Grover A. McClain, San Francisco, Calif., assignor of one-tenth to James Harry Layne, Alameda, Calif., one-tenth to Harold L. McClain, and one-tenth to Romey McClain, both of San Francisco, Calif.

Application July 13, 1935, Serial No. 31,265

11 Claims. (Cl. 214—135)

My invention relates to improvements in portable shovels, and it consists of the combinations, constructions and arrangements hereinafter described and claimed.

An object of my invention is to provide a portable shovel in which the bucket arm is pivotally mounted on a rotatable mast which in turn is rotatably mounted on a fixed mast, the latter being carried by a truck chassis or the like. The rotatable mast also carries the power source. In this respect the present invention is similar to my co-pending application on a portable crane, filed May 18, 1935, Serial No. 22,273.

In the standard portable shovel the boom is made extremely heavy, and this boom carries the bucket arm approximately at the mid-portion of the boom. The force of the digging operation and the weight of the load is therefore transmitted to the middle of the boom, and it is for this reason that the boom must be strongly built at its mid-portion. This increases the weight of the entire device unnecessarily.

In the present invention the boom is used merely for lifting the load, and the bucket arm is pivotally and movably connected to the rotating mast instead of to the boom. Therefore the strength of the boom can be materially reduced. I further employ cable means for crowding the bucket arm into the earth during the digging operation. This arrangement takes the place of the standard mechanism mounted in the middle of the boom for forcing the bucket arm into digging position.

The device is efficient for the purpose intended, and is much lighter in construction because of the novel actuating means. Cables take the place of the usual gearing found in the standard portable shovels.

Other objects and advantages will appear in the following specification, and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings forming a part of this application, in which

Figure 1 is a side elevation of the device shown mounted on a truck chassis;

Figure 2 is a top plan view of the device on a larger scale;

Figure 3 is an enlarged side elevation of the operating mechanism;

Figure 4 is a section along the line 4—4 of Figure 3,

Figure 5 is a section along the line 5—5 of Figure 3; and

Figure 6 is a section along the line 6—6 of Figure 5.

In carrying out my invention I make use of a truck chassis indicated generally at 1, and on this chassis I mount a stationary mast 2, and secure it in vertical position in any desired manner. Figure 3 shows a rotatable mast 3 mounted on the stationary mast 2, and the rotatable mast comprises the lower casting 4, a tubular member 5, and a top casting 6. The tubular member or sleeve 5 is threaded into the castings 4 and 6, and connects them together, so that all three parts rotate as a unit. In this respect the present device is similar to the form of the invention shown in my co-pending application.

In place of the gear mechanism for rotating the mast 3 on the stationary mast 2 I provide a cable for accomplishing the same purpose. In Figure 6 the sleeve 5 is shown threaded into the casting 4 and this casting is shown rotatably mounted on a cone-shaped member 7 that is welded or otherwise made integral with the stationary mast 2. A thrust bearing 8 is disposed on the cone-shaped support 7 and rotatably carries the casting 4. A large wheel 9 is also shown in Figure 6, and this wheel is formed in two sections, and these sections are rigidly secured to the support 7 by bolts 10, or other suitable fastening means. In this way the wheel 9 is held against rotation, while permitting the casting 4 to rotate thereabove.

I will now briefly describe the power plant, and will show how motion is imparted to the rotatable mast for swinging it about the fixed mast. In Figures 3 and 5 I show a platform 11 that is rigidly secured to the casting 4 so that the platform will rotate with the casting. Bracing means not shown may extend from the outer end of the platform to the casting 6 for supporting the platform. An internal combustion engine 12 or other suitable power source is mounted on the platform 11, and is operatively connected to three drums 13, 14 and 15. These drums are independently and selectively connected to the engine 12 in any manner desired, such as by the use of clutches, which are operated by hand cranks 16.

The means for rotating the rotatable mast 3 comprises a shaft 17, see Figures 3 and 5, which is operatively connected to the engine 12. A second shaft 18 extends at right angles from the shaft 17, and has a beveled gear 19 constantly meshing with two beveled gears 20 and 21. The gears 20 and 21 are loosely mounted on the shaft 17, and may be independently connected to the shaft by clutches 22 and 23, these clutches being operated by a lever 24 in the same manner as that shown in my co-pending application. In fact the unit just described is identical to the similar unit in the companion case.

Figure 3 shows the shaft 18 operatively connected to a shaft 25 by a worm 26 mounted on the shaft 18, this worm meshing with a worm gear 27 that is secured to the shaft 25. This construction is such as to permit the shaft 18 to rock slightly about the shaft 17 if necessary, and the

casing 28 housing the worm 26 and the worm gear 27 can also rock slightly about the shaft 25 if desired. This mechanism has also been shown in my co-pending case in detail.

Again referring to Figure 5 the shaft 25 is shown carrying a drum 29, and a cable 30 is wrapped around the drum a few turns, and is then guided over pulleys 31 and adjustable pulleys 32 to the wheel 9. One or more turns on the cable 30 may be made about the wheel 9 as shown in Figures 3 and 6, and the cable is anchored to the wheel at 33, see Figure 6, in order to be held against slipping. It will be seen from this construction that when the lever 24 is moved in one direction in Figure 5, the drum 29 will be rotated in one direction, and this will cause the cable 30 to swing the rotatable mast and the platform about the stationary mast 2 in the desired direction. After the desired position has been reached the lever 24 is swung into neutral position, and this disconnects the drum 29 from operative connection with the continually rotating shaft 17. If it is desired to rotate the mast 3 in the opposite direction, the lever 24 is moved in the opposite direction. This causes the drum 29 to rotate oppositely and to swing the platform 11 and the rotatable mast 3 in the other direction. It is obvious that any other type of mast-rotating means may be used such as, for example, the means shown in my co-pending case.

I will now describe the construction of the bucket arm. Figures 3 and 4 show this part of the device in detail. The mast 6 carries a pin 34. Figure 4 shows two pulleys 35 and 36 rotatably mounted on the pin 34 and disposed adjacent to the casting 6. A third pulley 37 is rotatably mounted on the opposite side of the casting 6 and is carried by the pin 34. The arms of the bucket carrier are channel-shaped as shown at 38 and 39. These arms are slotted at 40 for slidably receiving the pin 34. A separating plate 41, see Figure 4, is disposed between the channel 38 and the pulley 36. A second separating plate 42 is disposed between the channel 39 and the pulley 37. A rack 43 is mounted in each arm 38 and 39, and extends throughout a predetermined length of the arm for a purpose hereinafter described. Pinions 44 are rotatably mounted on the pin 34 and mesh with the racks 43. The pinions are rigidly connected to the brake drums 45, and the drums carry brake linings 46. Figures 3 and 4 show brake bands 47 mounted on the linings.

One end of each brake band 47 is connected by the link 48 to an adjustable coupling 49, which in turn, is pivotally connected to an arm 50 that is rigidly connected to a cross rod 51. The other end of the brake band 47 is connected by a link 52 to a stationary part of the device such as a stub shaft 53. There are two arms 50 each of which is connected to its respective brake band 47. A spring 54 is connected by means of an arm 55 to the rod 51, and this spring exerts a constant braking action against the brake drums which, in turn, prevent the bucket arms 38 and 39 from moving downwardly too rapidly due to gravity.

The operator may release the brake bands 47 by pressing a foot pedal 56, see Figure 5. This foot pedal is pivoted at 57, see Figure 3, and is connected by a link 58 to an arm 59 which, in turn, is rigidly connected to the rod 51. A depressing of the foot pedal will simultaneously actuate both arms 50 to free both brakes.

The casting 4 pivotally supports a boom 60 at 61, see Figure 6. The boom carries a number of pulleys 62 at its outer end. The bucket arms 38 and 39 pivotally carry the bucket 63 at 64, and the bucket is secured in adjusted position by links 65 having perforations 66 through which a pin 67 may be passed. A bail 68 is pivotally secured to the front top of the bucket, and in turn is pivotally connected to a block and tackle 69.

I will now describe the various drums 13, 14 and 15, and show how they are connected to the various parts. The drum 13 has a top lift cable 70 wrapped therearound, and Figure 3 shows this cable as being passed around a pulley 71 on the rotatable mast 3. The cable is then passed over the pulley 35, see Figure 4, and thence out to one of the pulleys 62 on the boom 60. The cable is then brought back and wrapped around the pulley 37, shown in Figure 4, and then out over another one of the pulleys 62. The end of the cable 70 is dead ended at 72 to the casting 6. The drum 13 when actuated in one direction will, through the cable 70, raise the boom 60 about the pivot 61, and when rotated in the opposite direction will lower the boom.

A crowd cable 73 is wrapped around the drum 14 and extends over a sheave 74 on the rotatable mast 3, see Figure 3, and then is passed over the sheave 36 shown in Figure 4. Figures 2 and 3 show the cable 73 as being passed around two pulleys 75 disposed at the outer end of the bucket arm and then the end of the cable 73 is dead ended at 76 to the casting 6. The operator actuates the drum 14 for winding up the cable when he desires to crowd the bucket 63 into the material during the digging operation. The cable 73 through the pulleys 75 exerts a downward force on the bucket arm in the direction of its length, and this will give sufficient force for the digging operation.

The last drum 15 has a load cable 77 wound therearound and this cable is passed over a sheave 78 on the rotatable mast. The cable 77 then extends out over one of the pulleys 62 and then down around a pulley 79 in the block 69. The cable 77 then extends over another sheave 62, and has its end dead ended at 80 to the block 69. It is obvious that additional turns of the cable and more sheaves 62 and 79 may be used if extra power is needed. When the drum 15 is actuated it will wind up the cable 77 for lifting the bucket 63 during the digging operation, and when loaded.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood.

The operator stands on the platform 11, and can actuate any one of the hand cranks 16, the lever 24 or the pedal 56 from his position within the railing 81. The engine 12 operates the gearing mechanism not shown, so that rotation is imparted to the shaft 17 and so that rotation can be imparted to any one of the drums 13, 14 and 15 at the will of the operator. The lever 24 is actuated for rotating the mast 3 in either direction in the manner already described. The boom 60 is lifted into the desired angular position by means of the cable 70 connected to the drum 13. The actual digging operation is performed by the crowd line 73 and by the load line 77. Both of these lines are actuated by the drums 14 and 15 respectively.

The bucket 63 is of standard construction and has a swingable back 82, see Figure 2. The back

is carried by arms 83, see Figure 1, and these arms are pivoted at 64. A spring-pressed latch 84 normally is received in a recess in the bottom wall 85 of the bucket and secures the rear wall 82 from swinging outwardly. A dump line not shown is connected to the spring latch 84, and the operator by this means releases the rear wall 82 when the bucket is loaded, and this permits the contents of the bucket to be dumped.

Practically the entire strain of the digging operation is carried by the rotatable mast 3, and not by the boom 60. In this way the weight of the device can be materially lessened. The stationary mast 2 is shown reinforced by struts 86, see Figure 1. Any other type of reinforcement may be utilized.

I claim:

1. In a portable shovel, a mast, a pin carried thereby, a bucket arm slidably and pivotally mounted on the pin, a rack carried by the arm, a pinion mounted on the pin and meshing with the rack, a brake drum connected with the pinion, a brake shoe riding on the drum, and means for exerting a continual braking action of the shoe on the drum for preventing longitudinal movement of the bucket arm.

2. In a portable shovel, a mast, a pin carried thereby, a bucket arm slidably and pivotally mounted on the pin, a rack carried by the arm, a pinion mounted on the pin and meshing with the rack, a brake drum connected with the pinion, a brake shoe riding on the drum, and means for exerting a continual braking action of the shoe on the drum for preventing longitudinal movement of the bucket arm, and manually controlled means for freeing the brake for permitting longitudinal movement of the arm.

3. In a portable shovel, a rotatable mast, a pin carried thereby, a bucket arm pivotally and slidably carried by the pin, a bucket mounted on the lower end of the arm, pulleys carried by the other end of the arm and by the pin, a cable passed around the pin pulley and extended over the arm pulleys and being dead ended at the mast, and means for winding up the cable for exerting a downward pull on the arm for moving it in the direction of its length.

4. In a portable shovel, a rotatable mast, a pin carried thereby, a bucket arm pivotally and slidably carried by the pin, a bucket mounted on the lower end of the arm, pulleys carried by the other end of the arm and by the pin, a cable passed around the pin pulley and extended over the arm pulleys and being dead ended at the mast, and means for winding up the cable for exerting a downward pull on the arm for moving it in the direction of its length, and a brake for stopping the downward movement of the arm.

5. In a portable shovel, a support, a bucket arm slidably and pivotally carried thereby, a bucket carried by the arm, a boom carried by the support, a crowder line for moving the arm downwardly when the bucket is digging, a load line passed over the boom and connected to the bucket for lifting it, and power means manually controlled, for simultaneously winding up on both lines for moving the bucket through a digging operation, means for moving the boom into the desired angular position, and means for rotating the support for swinging the boom about a vertical axis.

6. In a portable shovel, a mast, a pin carried thereby, channel-shaped arms pivotally and slidably carried by the pin, a bucket carried by the free ends of the arms, pinions mounted on the pin, racks carried by the arms and meshing with the pinions, and spring means for continually applying a braking force to the pinions for balancing the weight of the arms for normally preventing the sliding of the arms along the pin.

7. In a portable shovel, a mast, a pin carried thereby, channel-shaped arms pivotally and slidably carried by the pin, a bucket carried by the free ends of the arms, pinions mounted on the pin, racks carried by the arms and meshing with the pinions, and spring means for applying a bracking force to the pinions for controlling the sliding of the arms along the pin, and a manually actuated pedal operatively connected to the brakes for freeing them when the pedal is depressed.

8. A portable shovel comprising a vertical stationary mast, a rotatable mast rotatably mounted on and partially telescoping the stationary mast, a bucket arm pivotally and slidably carried by the rotatable mast adjacent to the top thereof, a bucket carried by the arm, a boom pivotally carried by the rotatable mast adjacent to the bottom of the mast, and manually controlled means for actuating the rotatable mast, the bucket arm, and boom for digging purposes.

9. A portable shovel comprising a stationary mast, a rotatable mast rotatably mounted on the stationary mast, a bucket arm pivotally and slidably carried by the rotatable mast adjacent to the top thereof, a bucket carried by the arm, a boom pivotally carried by the rotatable mast adjacent to the bottom of the mast, and manually controlled means for actuating the rotatable mast, the bucket arm, and boom for digging purposes, said means including cable actuated means for moving the bucket arm, cable actuated means for moving the boom, cable actuated means for lifting the bucket, and cable actuated means for rotating the rotatable mast.

10. In a device of the type described, a vertical stationary mast, a rotatable mast rotatably mounted on and partially telescoping the stationary mast, a platform carried by the rotatable mast, a cable wrapped around the rotatable mast and being connected therewith, a drum mounted on the platform, the ends of the cable being secured thereto in such a manner that a rotation of the drum in one direction will rotate the rotatable mast in one direction and vice versa, and means for rotating the drum in either direction.

11. In a device of the type described, a vertical stationary mast, a rotatable mast rotatably mounted on and partially telescoping the stationary mast, a platform carried by the rotatable mast, a cable wrapped around the rotatable mast and being connected therewith, idler pulleys carried by the platform, the ends of the cable being passed around the pulleys, the pulleys being so arranged that the cable portions extending between the pulleys and the mast are disposed substantially tangent with respect to the mast, a drum mounted on the platform, the ends of the cable being secured thereto in such a manner that a rotation of the drum in one direction will rotate the rotatable mast in one direction and vice versa, and means for rotating the drum in either direction.

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