W. M. HALE.

DIGGING MACHINE.

APPLICATION FILED MAR. 19, 1912.

1,039,932.

Patented Oct. 1, 1912.

3 SHEETS—SHEET 1.

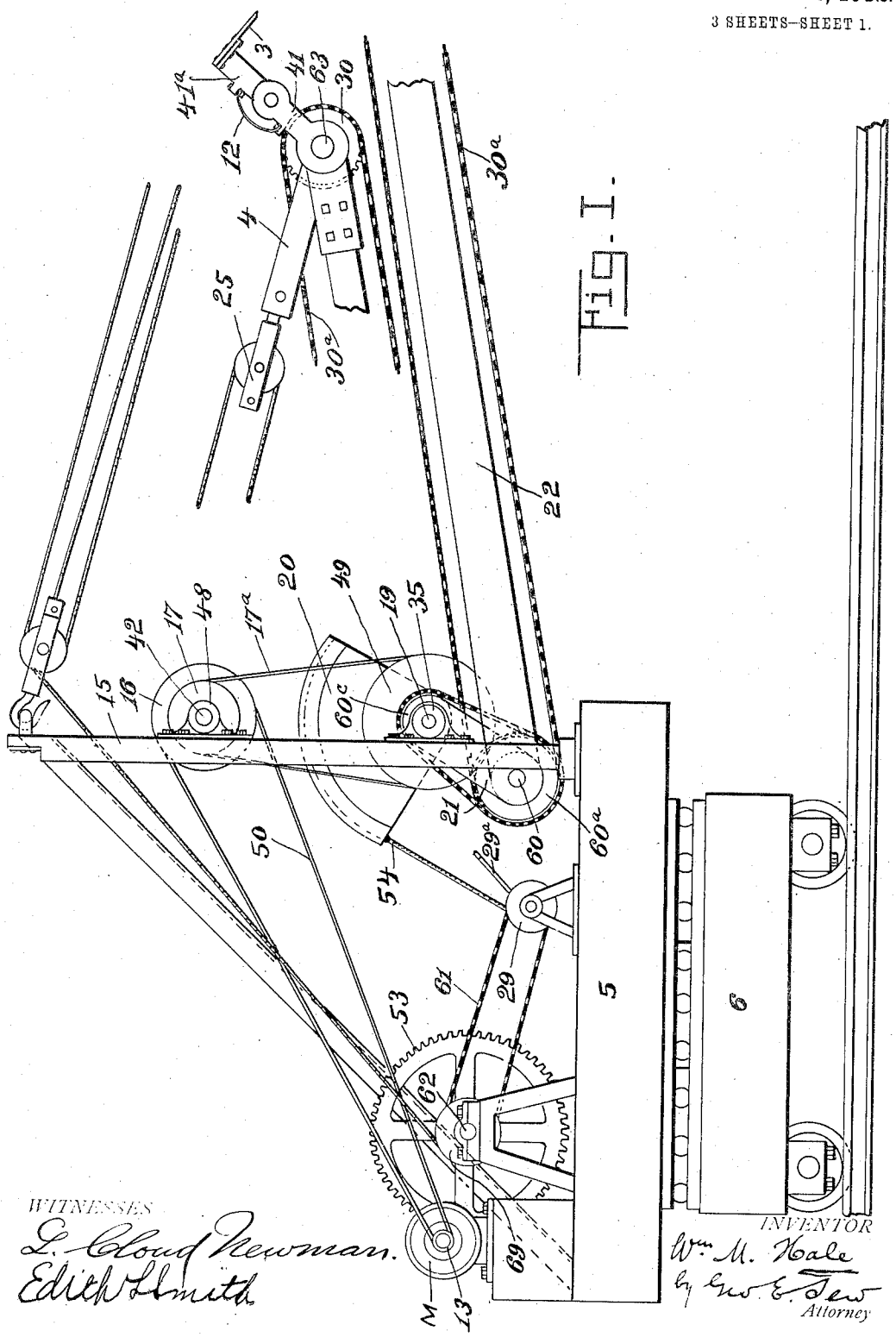



Fig. 1.

WITNESSES

L. Cloud Newman.

Edith L. Smith

INVENTOR

Wm. M. Hale

by Geo. E. Dew

Attorney

W. M. HALE.

DIGGING MACHINE.

APPLICATION FILED MAR. 19, 1912.

1,039,932.

Patented Oct. 1, 1912.

3 SHEETS—SHEET 2.

Fig. 2.

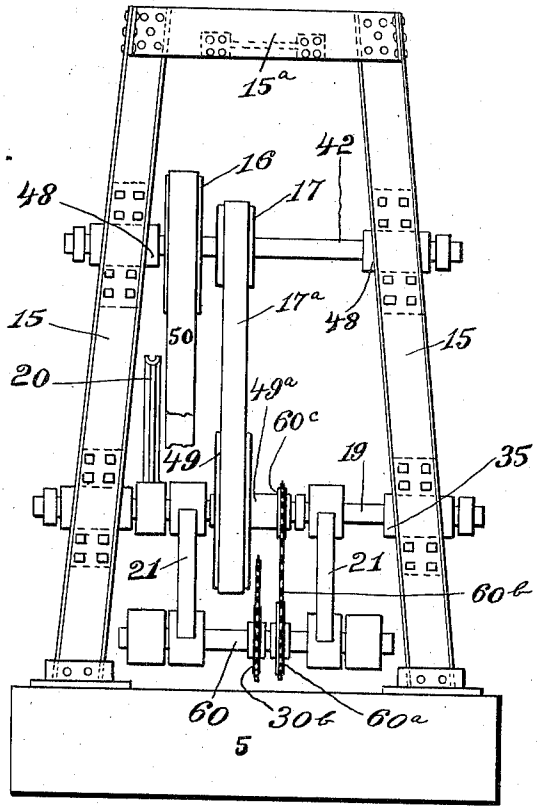
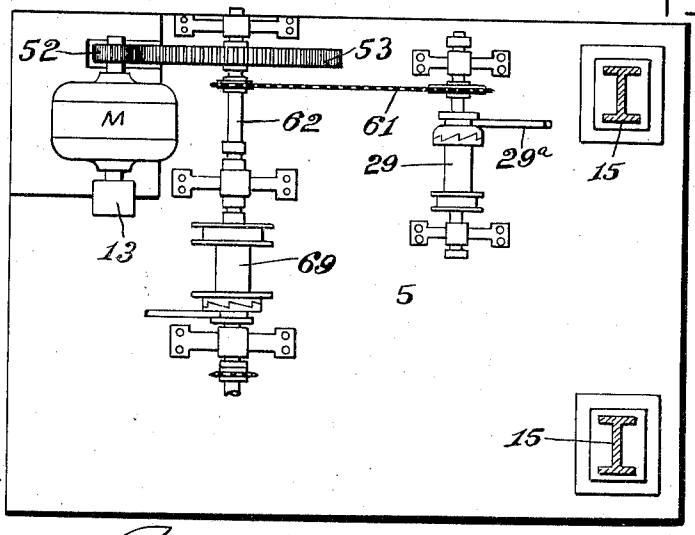



Fig. 3.




WITNESSES

L. Cloud Newman.

Edith L. Smith

INVENTOR

Wm M. Hale

by Chas. E. Tew Attorney

W. M. HALE.

DIGGING MACHINE.

APPLICATION FILED MAR. 19, 1912.

1,039,932.

Patented Oct. 1, 1912.

3 SHEETS—SHEET 3.

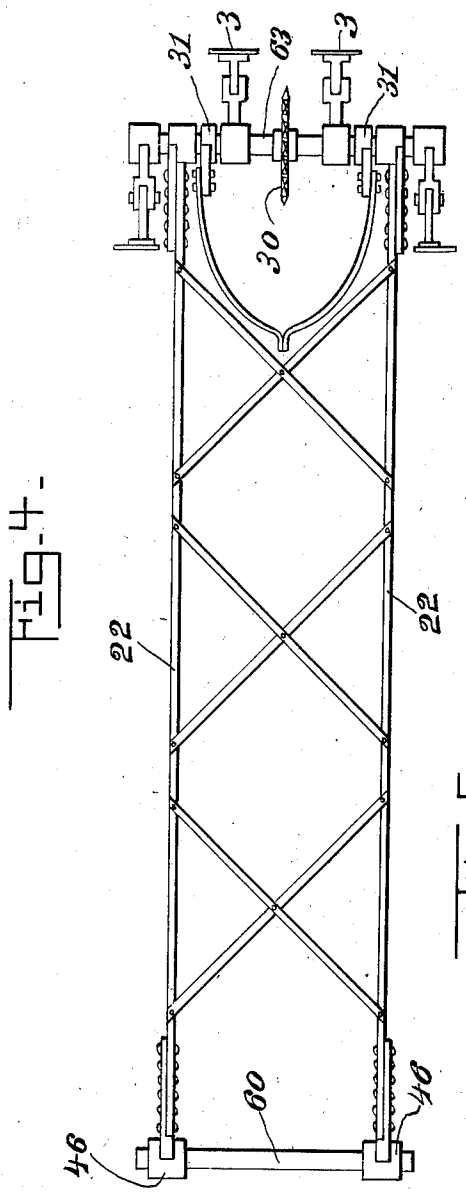



Fig. 4.

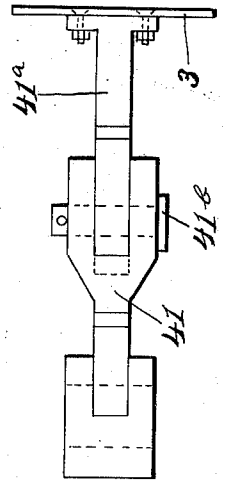



Fig. 6.

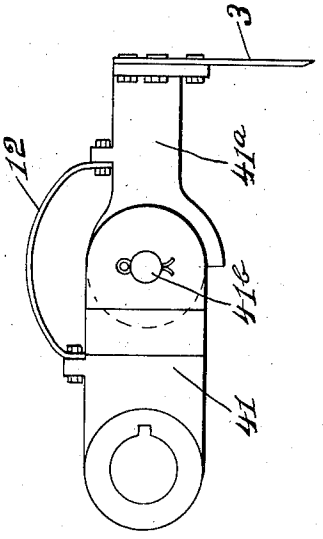



Fig. 5.

WITNESSES

L. Cloud Newman.

Edith L. Smith

INVENTOR

Wm. M. Hale

by Geo. E. Lee Attorney

# UNITED STATES PATENT OFFICE.

WILLIAM M. HALE, OF CHARLESTON, SOUTH CAROLINA.

## DIGGING-MACHINE.

1,039,932. Specification of Letters Patent. Patented Oct. 1, 1912.

Application filed March 19, 1912. Serial No. 684,881.

*To all whom it may concern:*

Be it known that I, WILLIAM M. HALE, a citizen of the United States, residing at Charleston, in the county of Charleston and State of South Carolina, have invented certain new and useful Improvements in Digging-Machines, of which the following is a specification.

This invention relates to machine diggers, and particularly to such diggers adapted for breaking a bank of material for the purpose of being removed or otherwise treated by other machines.

A special use for the machine is found in digging down banks of acid phosphate in fertilizer works, although it is to be understood that no limitation is implied with respect to the uses of which the machine is capable.

The machine is characterized by improvements with respect to the means for supporting, adjusting and controlling rotary digger blades or knives. The blade or blades are mounted on a shaft at the end of a boom, which boom may be raised or lowered by means of a winding drum and tackle. The inner end of the boom is connected to a pair of cranks which may be operated to advance or retract the boom lengthwise. The shaft which carries the blades is rotated by means of chain belt and sprocket gearing so arranged as to drive the same in any angular or longitudinal position in which the boom is placed.

The longitudinal movement provided for the boom by means of the crank enables the digging head to be quickly placed in any position desired, since it may be advanced or retracted without disturbing the windlass or winding drum by which the major lift or drop of the boom is effected.

The apparatus referred to above is mounted on a rotating platform which in turn is carried on a car, so that the digger may be used to work along a pile or bank, or in a large bin or storage chamber, and so manipulated or controlled as to reach any desired part of the material.

The mechanism for rotating the table or platform, and for driving the car, may be operated by the same motor that operates the digger, or by any other mechanism suitable for the purpose, and since means for driving a car and for turning a platform are well known in the art, a description thereof is omitted in the present specification, the invention being directed particularly to the digger devices which are mounted on the turntable.

In the accompanying drawings, in which the invention is illustrated—Figure 1 is a side elevation of the machine. Fig. 2 is an end elevation, parts being omitted. Fig. 3 is a top view of the turntable, parts being omitted, showing especially the motor and the winding drums driven thereby. Fig. 4 is a plan of the boom and the knife shaft carried thereby. Fig. 5 is a side view and Fig. 6 is a top view, enlarged, showing the arm and cutting blade carried thereby.

Referring specifically to the drawings, 6 indicates the car on which the machine is mounted, and 5 is the turntable or revolving platform thereon. As stated above, the car may be driven and the platform revolved by any suitable means. The platform carries a standard composed of two columns 15 and a cross piece 15ª at the top. The boom is a skeleton structure composed of two beams 22, with cross braces, and with bearing pieces 46 at the inner ends which bearing pieces receive a shaft 60. This shaft extends through the eyes at the ends of crank arms 21 which are keyed or otherwise secured to a cross shaft 19 mounted in bearings 35 on the legs 15 of the standard. This shaft may be rocked by means of a grooved segment 20 to which is attached a cable 54 connected to a drum 29 which has a brake 29ª which may be applied to hold the parts in any adjusted position. Power is applied to the drum 29 by means of a sprocket chain 61, from a shaft 62 which is driven through spur gear 53 and pinion 52 from an electric motor M, these parts being mounted on the turntable.

By the means described the cranks 21 may be swung, and when they are swung the boom is advanced or retracted lengthwise to a desired extent.

For raising or lowering the boom it is provided with a yoke 4 connected by eyes 31 to the digger shaft 63 at the outer end of the boom, the yoke being connected by suitable block and tackle indicated at 25 to the top of the standard, the cable being continued to a clutch drum 69 on the shaft 62 which drum is controlled by a suitable lever in a well known manner. By operation of the drum the boom can be raised and lowered.

The cutting blades 3 are carried at the end of jointed arms, shown particularly in

Figs. 5 and 6, the inner member of each arm being indicated at 41, keyed to the shaft 63, and the outer member of the arm being indicated at $41^a$, to which the blade is attached, the members being connected by a pivot pin at $41^b$. A spring 12 is attached at its opposite ends to the respective members, and bridges the joint. Ordinarily the spring keeps the members of the arm in line with each other, but should the cutting blade strike any substance so hard that it will not penetrate, the spring at the joint will allow the outer member to swing backward and pass the obstruction. This prevents breaking of the arm or the blade. The shaft 63 on which the arms are mounted is rotated by means of a wheel 30 connected by a chain belt $30^a$ to a sprocket $30^b$ fast on the shaft 60. This shaft is driven by sprockets $60^a$ chain belt $60^b$ and sprocket $60^c$ on the hub $49^a$ of a pulley 49, this sprocket and pulley being loose on the shaft 19. The pulley 49 is driven by a belt $17^a$ from a pulley 17 fast on a shaft 42 carried in bearings 48 on the upper part of the standard, and the shaft 42 is driven by a pulley 16 and belt 50 from a pulley 13 on the shaft of the motor M. The arrangement is such that transmission devices will operate to drive the blade shaft in all positions of the boom.

In the operation of the machine the boom is placed in proper position, preferably at the bottom of the bank to be dug and is then advanced to drive the digging head into the bank, the advance of the boom being effected by means of the cranks 21 and the operating devices therefor. Then as the work progresses the boom is raised by the winding drum 29 and tackle, and the knives will cut into the bank and dislodge the material. The turntable may be turned to swing the boom to any desired position, laterally, and by means of the hoisting device and the other boom controlling devices the digger head may be positioned according to the work at hand for the purpose of breaking down or excavating the bank. The control of the boom by means of the crank will give a considerable range of operation from one position on the car, although when necessary the car may be moved along to permit operation on other sections of the bank.

What I claim as new is:

1. In a digging machine, the combination of a standard, a crank mounted thereon, means to swing the crank, a boom pivotally connected at its inner end to the crank, whereby it may be moved lengthwise by the crank, a rotary digger at the outer end of the boom, means connected between the outer end of the boom and the top of the standard to raise and lower the boom, and means to rotate the digger.

2. In a digging machine, the combination of a standard, a crank mounted at the lower part thereof, means to swing the crank, a boom pivotally connected at its inner end to the crank, whereby it may be moved lengthwise by the crank, a rotary digger at the outer end of the boom, a hoisting cable connected to the outer end of the boom to lift and lower the same, and means to rotate the digger including a shaft located at the pivotal connection between the crank and boom.

3. In a digging machine, the combination of a standard, a boom the inner end of which is pivotally connected to the lower part of the standard, hoisting devices connected between the outer end of the boom and the top of the standard to raise or lower the boom, independent means to advance or retract the boom lengthwise, a rotary digger at the outer end of the boom, and means to rotate the digger independent of the movement of the boom.

In testimony whereof, I affix my signature in presence of two witnesses.

WILLIAM M. HALE.

Witnesses:

W. W. HOSELDEN,

T. J. LIPSCOMB.