April 8, 1930. J. B. NEWTON 1,753,617

ELECTROMAGNETIC HYDROCARBON ACCELERATOR

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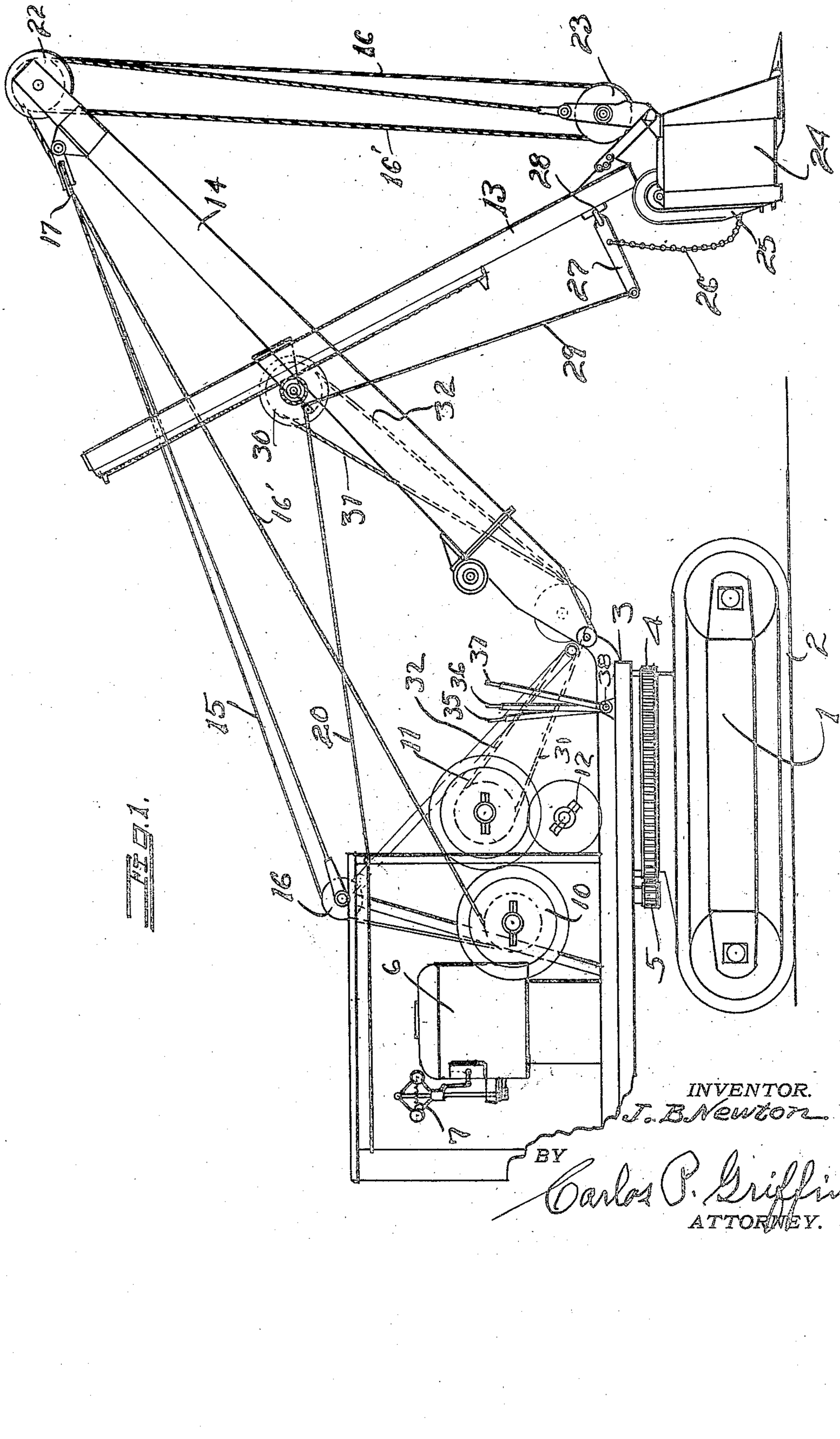


FIG. 1.

INVENTOR.
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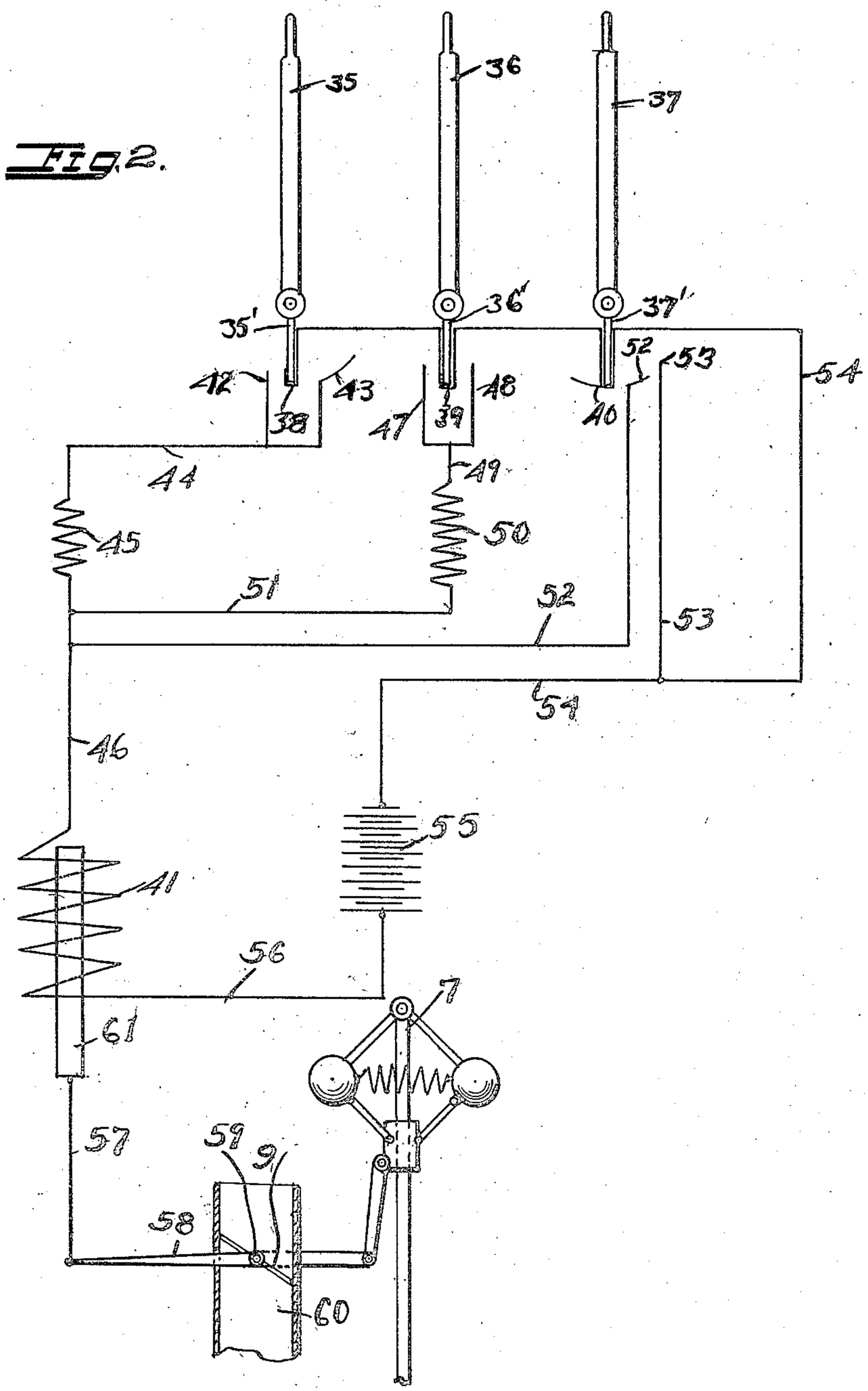
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Fig. 2.



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UNITED STATES PATENT OFFICE

JOSEPH B. NEWTON, OF ROSEVILLE, CALIFORNIA

ELECTROMAGNETIC HYDROCARBON ACCELERATOR

Application filed February 23, 1927. Serial No. 170,167.

This invention relates to an electro-magnetic accelerator for explosion engines, and is especially adapted to engines used in power shovel work, although it is equally well useable for many other purposes where a number of different movements are to be carried out by the engine, and a number of different levers provided for that purpose.

It will be understood by those skilled in the art that in the operation of a shovel, for example, that the engine must be capable of raising the shovel against a heavy load; it must be capable of raising the shovel stick, as well as lowering the same downwardly to push the shovel into the bank, and at the same time the apparatus must be useable for the purpose of turning the shovel in one direction or the other.

Still other levers are provided for carrying out other objects, but these are the principal ones, and they are the ones which ordinarily require a considerable increase in power to operate the shovel with sufficient rapidity to accomplish the desired work.

It will also be understood by those skilled in the art that the engineer having a number of levers and pedals to operate, finds it inconvenient to also operate the engine accelerator so that ordinarily a governor of some kind is provided to permit the engine to run at a minimum rate of speed, and when he wishes to raise a load electrical means operate upon the governor to increase the power generated to operate the engine at a much greater speed under the desired additional load. So that in the present case the operator has nothing to do but operate the clutch levers for the desired operation of the shovel, whereupon the desired acceleration, be it much or little, is effected during the time the clutches are in operation.

Other objects of the invention will be apparent as the description proceeds.

An embodiment of the invention is shown in the accompanying drawings in which the same reference numeral is applied to the same portion throughout the several figures of the drawings and of which there may be modifications.

Figure 1 is a side elevation of the complete shovel with the engine hoist and operating levers diagrammatically illustrated, and

Figure 2 is a diagrammatic view showing the arrangement of the governor and electrical system for operating the speed of the shovel.

In the present instance the shovel is mounted upon a truck 1, and has the endless tread 2 for supporting it, and for the purpose of advancing it over the ground. The secondary truck 3 is revolubly mounted on the truck 1, and it has a ring 4 which engages with the pinion ring 5 to rotate the table 3 whenever necessary.

The pinion 5 engages with the pinion 4, and is rotated from the engine 6 whenever it may be necessary, as will a little later be explained.

The engine has the governor 7, which acts on the butterfly valve 9 to keep the engine 6 running at about 1,000 or 1,100 revolutions per minute. The table 3 supports the hoisting drums 10—11 and 12, the object being to raise or lower the bucket stick 13, while suitable other mechanism is provided for turning the table 3 and hoisting the bucket directly from the boom 14.

The cable 15 passes over a pulley 16 and around a pulley 17 at the end of the boom 14, this hoisting being effected by hand. The cable 16′ passes from the drum 10 to, and around a suitable set of pulleys 22 at the end of the boom 14, and then around a pulley 23 carried by the bail of the bucket 24.

The bucket or shovel, has a door carried by the arm 25 and the latch chain 26 is connected at one end to the latch which holds the door 25 closed, and at the other end to a lever 27 known as the "release lever," which is pivotally mounted on the stick 13 at 28, and connected at the other end to a cable 29 which passes in reach of the operator, thus enabling the shovel to be discharged whenever it is necessary.

On the boom 14 there is a drum 30 which drum is turned in reverse directions by pulling upon the two cables 31 and 32 at different times, thereby either crowding the bucket against the bank, or lifting the bucket up by raising the stick, at the same time the cable 16

may be wound up on the drum 10 after passing under the pulley 23, and over the pulley 22 several times. The precise manner of connecting the operating clutches which drive the several drums from the three operating levers 35, 36 and 37 forms no part of the invention, further than to say that the lever 35 is pushed forward to cause the pinion 5 to so rotate as to swing the supporting table 3 to the left while it is pulled back to swing the supporting table to the right.

The lever 36 is pushed forward to pull up on the shovel stick and pulled back to crowd the shovel stick down while the lever 37 is pulled back to hoist on the cable 16. These levers are loosely mounted upon a single shaft 38 on the platform 3, and they are shown separate from each other in Figure 2 for purposes of illustration.

It will be seen that each lever has a downwardly extending portion as indicated at 35′—36′ and 37′ which parts carry electrical connections 38—39 and 40 for the purpose of completing the circuit through a solenoid 41.

The manner of operation of the electrical part of the apparatus and its several parts is as follows: The electrical connection 38 carried by the arm 35′ is capable of contacting with two connections 42—43 in turn connected to the wire 44 and resistance 45 also connected to the wire 46 extending to the solenoid 41. The electrical connection 39 is capable of contacting with the electrical connections 47—48, which are in turn connected by means of the wire 49 through a given resistance 50 and wire 51 to the wire 46 leading to the solenoid 41. The electrical connection 40 is capable of connecting the two electrical connections 52, 53, one of which extends to the wire 46 without any resistance wire, the other is connected to the wire 54 leading to the battery 55, said battery also having a wire 56 leading to the solenoid 41.

Since the explosion engine is maintained at a given number of revolutions per minute (say about 1,000 or 1,100) by the governor 7, it is necessary to promptly accelerate the engine as soon as any additional demand is placed thereon, and this acceleration is attained by connecting the solenoid by means of a suitable link 57 with the lever 58, which lever is connected to the shaft 59 supporting the valve 9 in the inlet passage 60 of the carburetor, or engine inlet manifold.

Since the two levers 35 and 36 operate the swing and shovel stick handling parts of the mechanism, not very much additional power is instantly required of the engine so that the resistances 45 and 50 are made sufficient to reduce the pulling power of the solenoid 41 on its core 61, but as the power required of the hoisting device is the greatest the engine is capable of giving, the connections 46, 52, 53 and 54 to the solenoid are made as direct as possible so as to give the solenoid its full pulling power, and thereby enable the engine to be instantly accelerated whenever the bucket hoist is to operate. Similarly if the crowding lever is first operated, and the lever 37 is operated the only effect will be to give the greatest pulling effect on the solenoid 41 and thereby most promptly accelerate the engine.

With this arrangement it is possible to permit the engine to run at the proper speed without having the engineer himself operate the engine throttle thereby making it possible for him to be much more expeditious in handling the shovel and to make possible the more rapid manipulation of the shovel in everyone of its movements.

It will be apparent to those skilled in the art that the two resistances 45 and 50 are experimentally determined to give the necessary pulling effect on the armature 61 to move the valve just as may be necessary for the power required, and the same thing is true with respect to the operation of the engine through the control of the circuit 52 and 53.

The operation of the apparatus is as follows: Assuming the operator to wish to turn the shovel, he will operate the lever 35 to turn in which ever way he desires. The movement of the lever 35 will energize the circuit passing through the wire 42, 43 and 44, resistance 45 and to the coil 41 to increase the acceleration of the engine slightly, the governor 7 acting upon the lever 58 the same as the solenoid 41 acts upon the core 61, that is when the solenoid 61 pulls up, the valve 5 will tend to open and would open except for the counter effect of the governor. But notwithstanding this counter effect, the balancing of the governor is so nice that the interference therewith of the solenoid 41 will rapidly accelerate the engine. No very considerable amount of power is required to crowd or lift the shovel stick, hence a resistance 50 is employed in the circuit 49—51 and 46 to the solenoid 41 and hence the resistance 50 will not permit the solenoid to act upon the core very heavily. The greatest power of the engine is required when lever 37 is so operated there is no resistance in the circuit leading to the solenoid 41, and that its greatest effect can be made use of at that time no resistance is placed in the wires 52 or 53.

Having thus described my invention what I desire to secure by Letters Patent of the United States is as follows, but modifications may be made in carrying out the invention as shown in the drawings and in the above particularly described form thereof, within the purview of the annexed claims:

1. In a device of the class described, a power shovel, an engine, and control means for the different operations of said shovel, a slow speed governor for said engine, a series of electrical circuits operated by said control

means, adapted to act on said slow speed governor to increase the acceleration of the engine in different degree for each of said control means.

2. An apparatus of the class described, comprising a power shovel, an engine and mechanism for the different operations of said shovel, levers for controlling said operations, a slow speed governor for said engine, an electrical circuit for each of said levers, adapted to accelerate the engine at different speeds for each operation of said shovel.

In testimony whereof I have hereunto set my hand this 15th day of February, A. D. 1927.

JOSEPH B. NEWTON.