

Sept. 8, 1931.

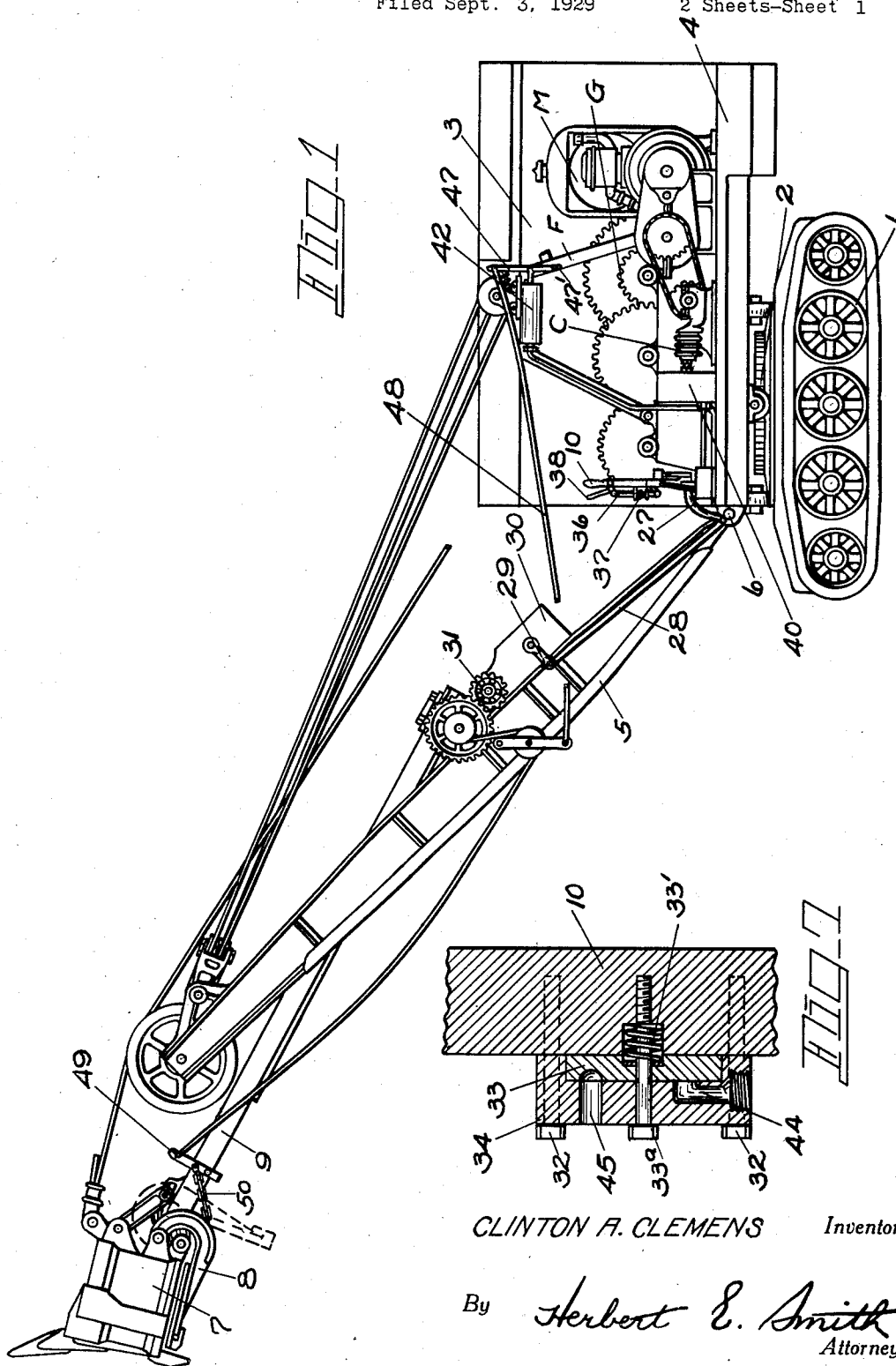
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EXCAVATOR

Filed Sept. 3, 1929

2 Sheets-Sheet 1



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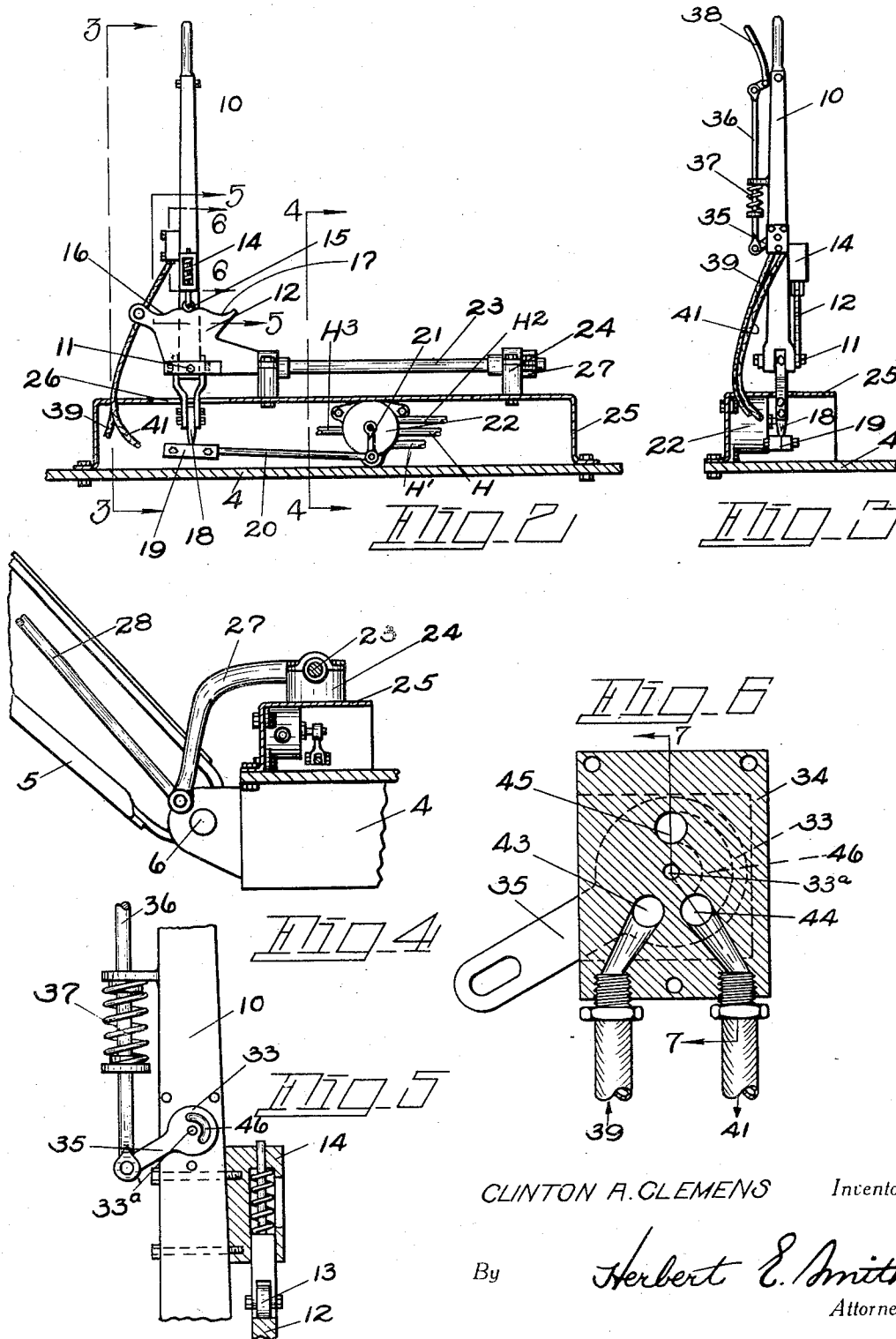
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EXCAVATOR

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My present invention relates to improvements in excavators of the "steam shovel" type and particularly to the lever control mechanism of such implements, for the purpose of simplifying the manipulation of these control devices. The control mechanism of my invention is specially adapted for use in connection with an excavator equipped with an internal combustion engine or motor and with auxiliary air motors for supplying and distributing the power for the performance of three different functions in the operation of the excavator, as follows: for vertically swinging or hoisting the shovel or bucket; for projecting and retracting the shovel and its stick with relation to the boom; and for releasing the closed, hinged, bottom of the bucket or shovel.

In carrying out my invention I utilize a single lever that is employed in the performance of these functions, and in addition, the excavator may be equipped with, and usually is, equipped with a lever mechanism for swinging or rotating the upper structure of the excavator about its vertical axis. In the use of my invention the excavator is equipped with two levers, in lieu of three levers and a rope control, the latter customarily employed for releasing the hinged bottom of the shovel or bucket. As a result of the employment of only two levers, the operator of the excavator has all of the devices to be manipulated in ready access for his two hands, and consequently his hands may at all times be kept on the control levers without necessity for removal.

My invention consists in certain novel combinations and arrangements of parts as will hereinafter be more fully set forth and claimed. In the accompanying drawings I have illustrated one complete example of the physical embodiment of my invention wherein the parts are combined and arranged according to the best mode I have thus far devised for the practical application of the principles of my invention.

Figure 1 is a view in side elevation of an excavator equipped with the mechanism of

my invention, showing in dotted lines the open position of the shovel-bottom.

Figure 2 is an enlarged view of the lever mechanism as seen from the rear, or from the right side in Figure 1.

Figure 3 is an edge view of the lever mechanism, as seen from line 3—3 in Figure 2.

Figure 4 is an enlarged, sectional detail view, at line 4—4 of Figure 2.

Figure 5 is a detail view in elevation, with parts in section, at line 5—5 of Figure 2.

Figure 6 is an enlarged sectional detail view of the pneumatic valve for the motor that operates the hinged lid of the shovel.

Figure 7 is a transverse sectional view at line 7—7 of Figure 6.

In order that the general arrangement and relation of parts may readily be understood I have shown in Figure 1 an excavator of well known type supported on the wheel substitutes or carriage 1, and having a frame 2 upon which the rotary housing 3 and deck 4 are supported in usual manner. A usual type of boom 5 is pivoted at 6 on the deck-frame and the scoop, bucket, or shovel 7 with its hinged lid 8 is carried at the outer end of the "dipper stick" or beam 9, the beam and shovel being adapted for projection and retraction with relation to the boom, and the hinged bottom 8 being adapted to swing open to dotted line position, to empty the shovel of its load.

Suitable mechanism is employed for swinging the superstructure about the vertical axis of the frames 2—4, but as such mechanism forms no part of my invention, a description of it will be omitted.

The single, control lever 10, as shown in Figure 1 is located in position accessible for the operations required, and adjacent the other control lever heretofore referred to. The lever 10 is pivoted at 11 in a plate 12 so that it may be swung to the right or left in Figure 2 in directions transversely of the longitudinal axis of the boom 5, and this lateral movement of the lever is used to control the hoisting or vertical swinging movement of the bucket.

The lever is shown in neutral position in

Figure 2 with its spring pressed roller-detent 13, which is supported in a housing 14 attached to the lever, resting in the neutral or central notch 15 at the upper edge of the plate. The lever can be moved to the right and rest in notch 15, or to the left and rest in notch 16, for the raising and lowering movements of the bucket, which are accomplished with power from the main motor M. The gearing G of the hoisting mechanism has in connection therewith air rams, friction clutches, hoisting drums, etc., that are under control of the lever 10 through its connections. Below the pivot of the lever it has a short arm 18 which is connected at 19 to a drag link 20, and the latter is pivoted to the valve arm 21 for operating an air valve within the casing 22, the air hose connections H, H', H2 and H3 being indicated in Figure 2 for supplying air pressure to and distributing the air pressure from the valve casing for the operation of the hoisting mechanism or drums.

In addition to the movement of the lever laterally, or transversely to the longitudinal axis of the boom, the lever is movable in a plane parallel with the longitudinal axis of the boom, that is toward and away from the operator, for the purpose of moving the shovel and its beam 9. Thus, an air motor is controlled to cause forward projection or rearward retraction of the "dipper stick" or shovel, as follows.

The plate 12, in which the lever 10 is pivoted for lateral movement, is rigidly bolted at one end of a rock shaft 23 which is journaled in bearings 24 mounted on the housing 25 secured to the deck 4. The short arm 18 of the lever 10 projects through a slot 26 in the housing, and the linkage between this arm and the air valve in casing 22, as well as the valve casing, are enclosed within the housing. The shaft is rocked on its longitudinal axis for the purpose of controlling the projecting and retracting movements of the shovel and its beam, 7-9, and for this purpose the shaft is provided with a crank arm 27 at its right end in Figure 2, to which a long link 28 is pivoted, and as seen in Figures 1 and 4 the link extends outwardly along the boom to a valve arm 29, the valve (not shown) being used for control of the air motor 30 that is mounted on the boom. Through the usual gearing and rack mechanism indicated at 31 in Figure 1, the motor operates the beam 9 to project and retract the beam and the shovel with it.

As thus described, the lever is capable of two pivotal movements in planes at right angles one to another, for controlling the hoisting mechanism and the pivoted boom, and for "crowding" or operating the shovel and its "stick" or beam 9.

The air motor 30 is supplied with air under pressure from the compressor C, or the tank

40, by means of flexible hose or in other usual manner.

The third function performed in connection with the lever 10 is the releasing of the hinged bottom 8 of the shovel, in order that the loaded shovel may be emptied, the hinged bottom being opened, after release, by gravity or by the weight of the contained load in the shovel.

At one side of the lever 10 is carried an air control valve mechanism, including a rotary disk valve 33, which is spring pressed at 33' and rotatable on the center bolt 33a within the casing 34, and the latter is bolted at 32 to the lever 10.

The rotary valve has an arm 35 that extends through a slot in the valve casing, and by means of a draw link 36 loosely pivoted to the arm, the spring 37 and the hand-grip or lever 38, the rotary valve may be turned. The hand-grip, which is located at the end of the lever 10 in position to be grasped by the fingers is of the usual bell-crank shape, and the spring 37 coiled about the link normally holds the air valve and its arm in the positions indicated by Figures 3, 5, and 6.

In Figure 6, an inlet air hose 39 and an outlet air hose 41 are shown connected with the valve casing, the hose 39 receiving air under pressure from the tank 40, and the hose 41 conveying air under pressure to an air motor 42 supported on the gantry frame F in Figure 1. In Figure 6 the interior of the air valve is disclosed as having an air inlet port 43, outlet 44, and discharge port 45, and the air valve or disk has an arcuate groove or air channel 46 adapted to establish communication between the outlet port and the discharge port, as in Figure 6, or to connect the inlet and outlet ports 43 and 44 to supply power to the motor, for releasing the fastening means, as a latch bolt, for the hinged bottom of the shovel.

When the motor 42 is supplied with air pressure a pivoted lever 47 (Figure 1) is swung on its pivot 47' to cause a pull on the release rope 48, and this rope extends outwardly along the boom to the beam end where it is connected with a release lever or trip lever 49 to which a chain 50 is connected. The chain is connected to a release latch or bolt, or other suitable retaining device for the hinged lid, and when this retaining device is withdrawn by power from the motor, the hinged lid or bottom swings open to dotted position in Figure 1. The hinged bottom is again closed in usual manner by skilled manipulation of parts by the operator of the excavator.

From the above description taken in connection with my drawings it will be apparent that an excavator equipped with the lever mechanism of my invention may with facility be controlled and operated for performing the various functions heretofore enumerated.

The operator may work with ease, inasmuch as he is required to manipulate only two levers, one for each hand, and the compact arrangement of the mechanism of my invention not only assures more efficiency in the performance of the work, but the unoccupied space about the control mechanism inures to the comfort and convenience of the operator.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination in a lever mechanism with a rock shaft having a crank arm and a rigid supporting plate, of a lever pivoted in said plate to swing longitudinally of the shaft and co-acting means on the lever and plate for retaining said lever in adjusted position, said lever having a hand grip pivotally secured to its upper end an air control valve having a valve-arm and a draw link connecting the hand grip with said valve arm.

2. The combination with a slotted housing and a rock shaft journaled in bearings thereon, of a crank arm at one end of the shaft and a segment plate rigid with the other end of the shaft, a lever pivoted in the segment plate and a spring pressed detent on the lever for co-action with the segment plate, said lever having a short arm which projects through the slotted housing, an air control valve within the housing and a valve-arm for the valve, and link connecting said valve arm and the short arm of the lever, a second air control valve, secured to said lever, and a hand grip, also secured to said lever, to operate the same.

In testimony whereof I affix my signature.

CLINTON A. CLEMENS.