

No. 777,834.

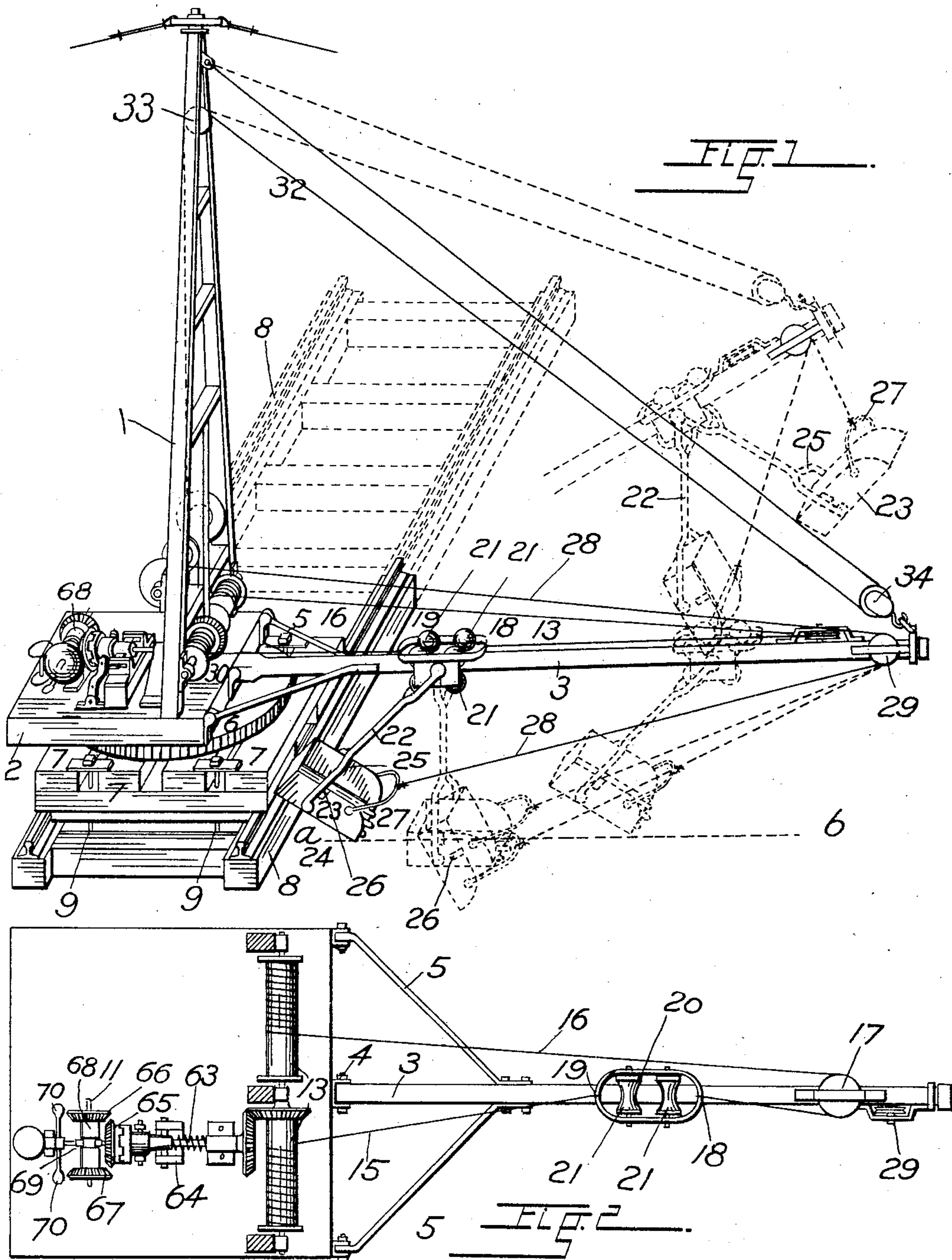
PATENTED DEC. 20, 1904.

C. BISHOP.
COMBINED DERRICK AND EXCAVATOR.

APPLICATION FILED JULY 27, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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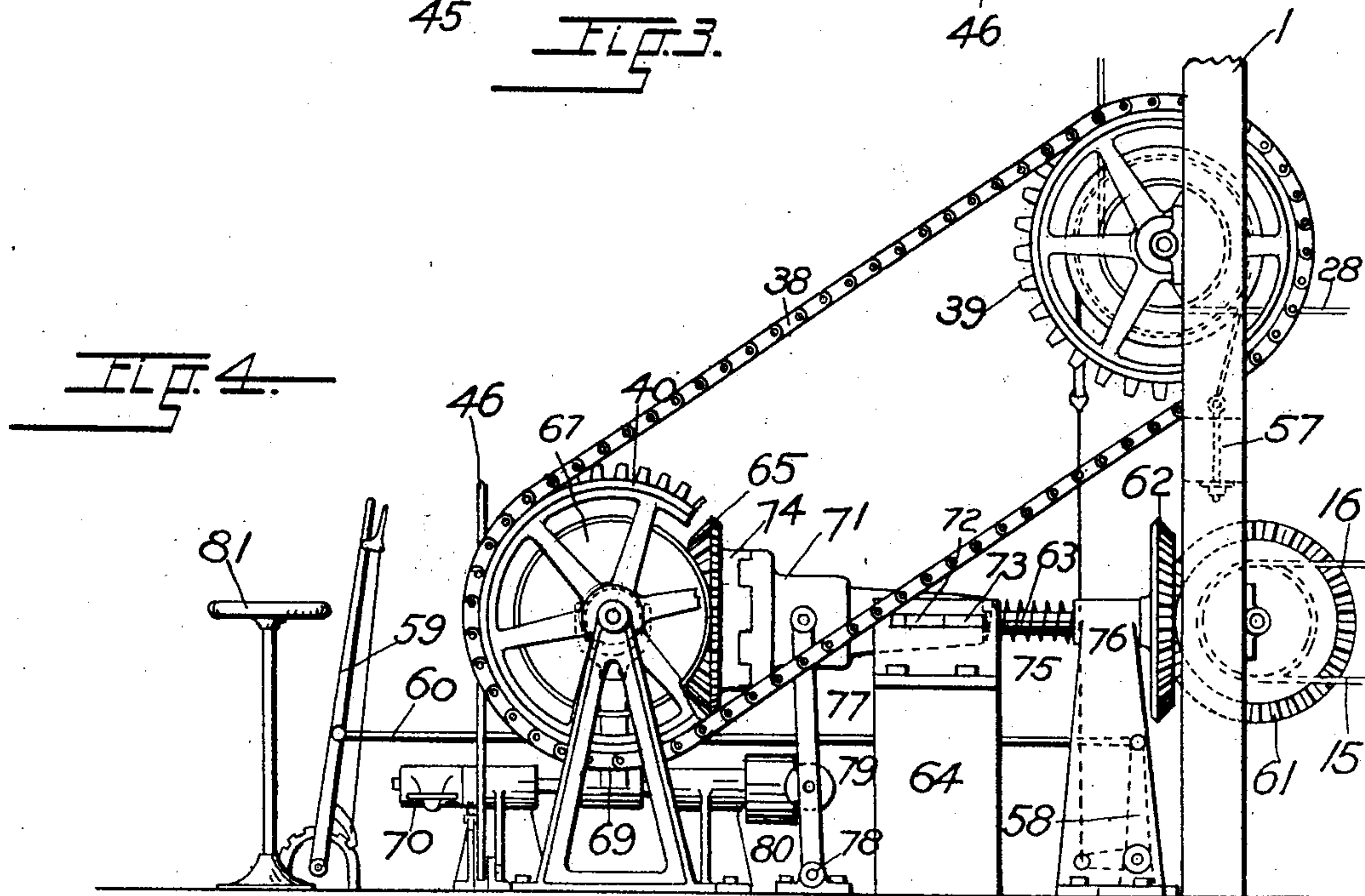
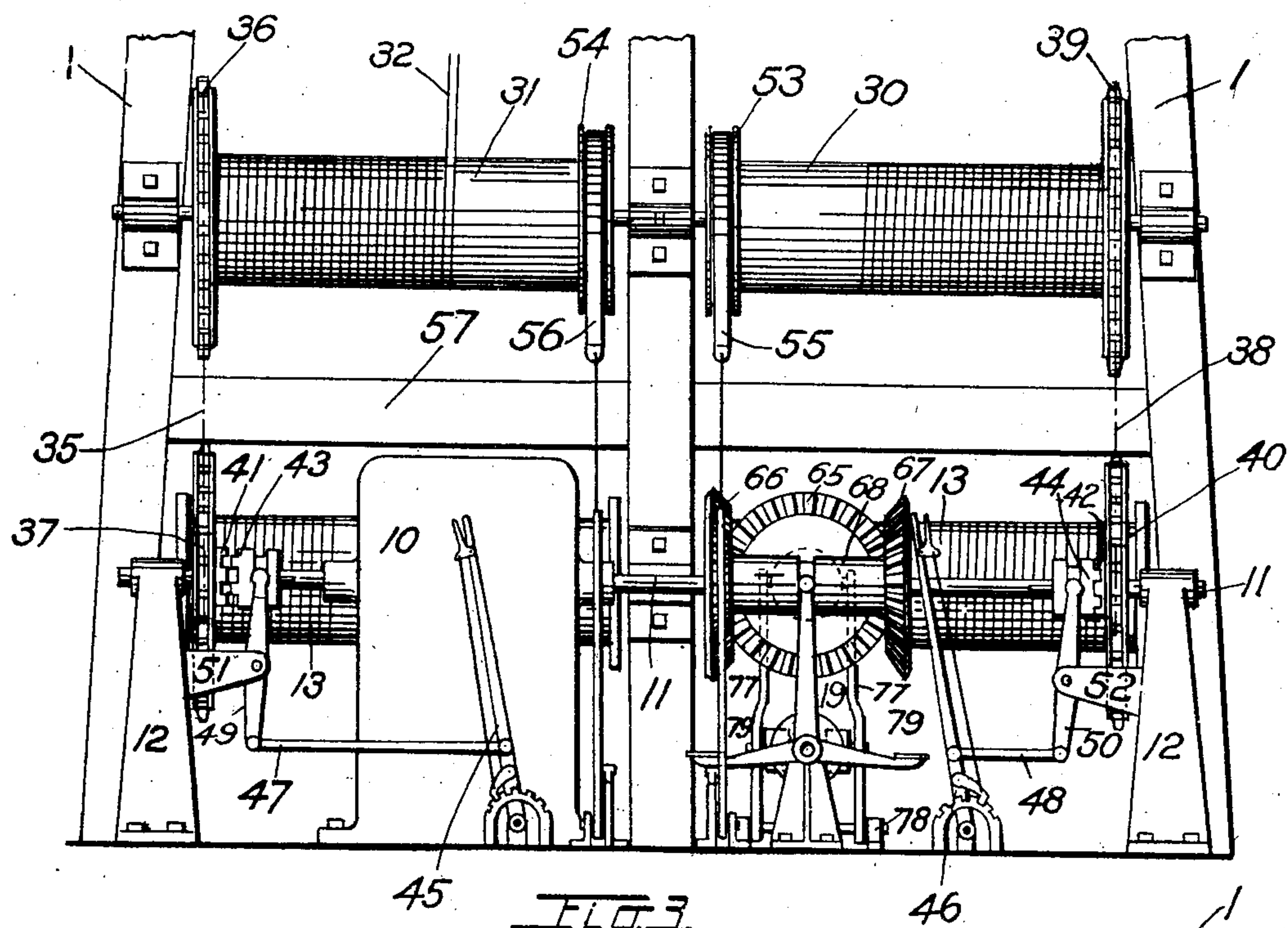
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

CICERO BISHOP, OF DENVER, COLORADO.

COMBINED DERRICK AND EXCAVATOR.

SPECIFICATION forming part of Letters Patent No. 777,834, dated December 20, 1904.

Application filed July 27, 1903. Serial No. 167,139.

To all whom it may concern:

Be it known that I, CICERO BISHOP, a citizen of the United States, residing at Denver, in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in a Combined Derrick and Excavator, of which the following is a specification.

My invention relates to excavators; and it consists of a derrick having a two-legged mast and a boom seated on a rotating platform with a plow or bucket or other excavating instrument suspended from a carriage traveling on said boom.

It further consists in means for independently moving both the excavating instrument and its carriage relatively.

It further consists in the arrangement of the means for so relatively operating the bucket and the suspending-carriage, and the features wherein the improvements reside will be specifically set out in the claims appended hereto.

Referring to the drawings, Figure 1 is a perspective view of my combined derrick and excavator, showing the several movements of the excavating instrument in plowing, in scraping, in excavating at the breast of the work, and in dumping when a bucket is used. Fig. 2 is a plan view of the derrick designed to show conspicuously only the means for controlling the movements of the carriage longitudinally on the boom. Fig. 3 is a rear view of the mechanism located on the revolving derrick-platform. Fig. 4 is a side view of the same.

A two-legged mast 1 is seated on a platform 2, and a boom 3 is hinged to said platform at 4 near the seat of said mast, so as to swing vertically with respect to said platform. Braces 5 from the sides of the boom are hinged to the platform coaxially with the boom-hinge and prevent lateral movement of the boom. The platform itself rests upon and is attached to a bull-wheel 6 after the manner of the fifth-wheel of a wagon, and the bull-wheel itself is securely fixed upon a foundation 7, consisting of lapping ties. The lateral turning of the platform upon its foundation is attained in the usual manner by gear connections between the stationary bull-wheel

and the motor on the platform. The foundation of lapping ties 7 rests upon a section of track 8 and is securely bolted to said track-section 8 by the bolts 9, and to make such foundation solid stones or earth are used to fill in the interstices in the track-section and lapping ties.

Upon the platform 2 and in the rear of the derrick-mast is a motor 10, shown as directly connected on a line-shaft 11, supported in end standards 12 at either side of the platform. This motor 10 is preferably shown as an electric motor.

At the seat of the mast is a drum 13, journaled in both legs thereof and medially divided into two horizontal sections by a collar and a bevel gear-wheel, hereinafter denominated, and upon the two sections of this drum are reversely wound the two legs 15 16 of a rope which connects each end of the carriage and passes around a sheave 17 at the end of the boom. The rope is thus virtually endless in operation. Connected on the leg 15 of this rope at 18 and 19 is a carriage 20, adapted to travel along the boom backward and forward with the movements of said rope. This carriage is provided with antifriction-rollers 21, two of which rest on the top of the boom and two of which are below and encompass the boom. From this carriage a short bucket-boom 22 depends. At its depending end is an excavating bucket or plow 23, hinged at its bottom at 24 to the yoke 25 of the bucket-boom and provided upon its sides, forward of the movement of said yoke 25, with stops 26. The bail 27 of the plowing bucket or excavator is at its forward end, and from this bail a rope 28 extends to an axially-horizontal sheave 29 at the end of the boom 3, around which it passes and is wound upon a drum 30 above the drum 13. Coaxial with this drum 30 and also journaled on the mast is an independently-movable drum 31, around which a rope 32 is wound and extends upward on the mast to a sheave 33, around which it passes and extends diagonally downward to the outer end of the boom, where it passes around a pulley 34 and returns to the top of the mast, where it is fastened.

The drum 31 is connected to the line-shaft 11 by a sprocket-chain 35, meshed on gear 36

on the drum and equal gear 37 on the line-shaft. A sprocket-chain 38 likewise connects gear 39 on the drum 30 with the equal gear 40 at the opposite end of the line-shaft. Gears 37 and 40 are loose upon the shaft, but are provided upon their inner faces with clutch-teeth 41 42, which intermesh with the teeth of the slidable clutch members 43 44. These slidable clutch members 43 44 are movable with relation to the gears 37 40 by means of the ratchet-levers 45 46, to which they are connected by the rods 47 48, and the pivoted shifting-levers 49 50, having bearings in brackets 51 52, extending from the standards 12, and, as shown, these levers 45 46 are located within convenient reach of the operator upon his either side and move in a direction parallel to the length of the line-shaft. On the inner ends of these drums 30 31 are band-wheels 53 54, over which pass brake-straps 55 56, fastened at one end to a horizontal bolster 57 on the mast and at their outer ends connected to right-angled levers 58, Fig. 4, fulcrumed at the base of the mast and connected to ratchet-levers 59 by means of the rods 60, the said ratchet-levers being located on the platform within easy reach of the operator and independently movable by him.

By means of the drum 31 the rope 32 is wound or unwound to raise or lower the derrick-boom. By means of the drum 30 the rope 28 is wound to pull on the bail of the bucket against the sheave 29, located at the end of the boom, and, as will hereinafter be explained, is wound at a speed and in a manner relative to the movements of the independently-movable bucket-suspending carriage 20, yet independently of such movements and is unwound with respect to the same movements, yet independently thereof for the purposes and in a manner hereinafter explained. The carriage-rope on which is spliced or attached the carriage 20, and the two legs 15 16 of which are reversely wound on the drum 13, is moved backward and forward, carrying the carriage with it by the movements of the said drum 13 as follows: The drum 13 is, as stated, journaled at the base of the mast and carries mediately a bevel-gear 61, into which meshes an equal bevel-gear 62 on the end of a shaft 63, journaled in the standard 64 and having at its outer end a bevel-gear 65, which intermeshes with equal bevel-gears 66 67, splined upon the line-shaft but movable longitudinally thereon and from which gears 66 67 it receives its motion to the right or to the left to turn and reverse said drum 13, and therefore to move the carriage 20 on boom 3. The gears 66 67 are distanced apart on the spool-casting 68, and this spool-casting is moved on the line-shaft in order to alternately mesh its gears with the gear 65, which is equal in diameter to the gears 66 67, by means of the lever-yoke 69, which is operated by the double treadles 70.

In order to lock the movements of the drum

13, and therefore to lock the carriage at any position on the boom, I provide a brake or clutch consisting of the member 71, which is a barrel-bearing for the shaft 63 and is mounted to slide in the standard 64 on its squared sliding trunnion 72, moving in the standard-slot 73, the other member, 74, of the clutch being secured to the rear face of the bevel-gearing. The teeth of this brake-clutch mesh normally by virtue of a coil-spring 75, which is interposed between the end of the barrel-bearing-clutch member 71 and the standard 76 near the end of the shaft. This brake-clutch, however, is only locked when both gears 66 and 67 are out of mesh with gear 65, and in order to unlock the clutch when either of said gears is meshed with gear 65 I provide a two-legged lever 77, pivoted to the platform at 78 and carrying between its legs loose rolls 79. Against these rolls a double cam 80, fast upon the end of the treadle-rocker shaft, bears to move the clutch-lever 77 backward upon the movement of the treadle-rocker shaft in either direction. The simplest form of such a cam 80 I have shown in Fig. 4, which is a cylinder having its end cut out diametrically in cuts substantially the counterpart of the periphery of the rolls 79 and into which cuts said rolls are normally held by the spring 75 acting on the slidable clutch member 71. As shown, the leg 15 of the carriage-rope is wound upon one end of the drum 13 in such a manner as to extend from the under side of the drum, and to pull the carriage back the drum 13 would have to operate at its top side away from the operator, who sits upon a stool 81 on the platform, and hence turn the shaft 63 to the right, and since it is desired that the line-shaft 11 turn over from the operator it is seen that the operative gear for such a movement of the twin gears 66 67 is attained by pressing down on the left-hand treadle of the rocker-shaft, which rocks the yoke-arm 69 to the left, carrying with it the twin gears by means of its bearing in the groove in the connecting-spool. To stop such a motion, pressure on the left treadle is released and the spring 75, as before explained, will cause the double cam on the end of the rocker-shaft to turn until the rolls 79 are both closely seated in the cuts in the end of the cam 80, at which position both gears 66 67 are disengaged from the gear 65 and the brake-clutch members 71 74 mesh.

By reason of the fact that the ropes 28 32 and the carriage-rope are movable independently of each other, and especially that the carriage is movable forward and backward at will, it is possible to secure such various movements of the bucket as are shown in Fig. 1 and in addition thereto attain movements of the bucket not possible with any combined derrick and excavator of which I am aware.

In Fig. 1 I have shown in full lines the carriage, the depending bucket-boom, and the bucket in position to be used to skim along

the surface of the ground and fill itself by digging its point into the unplowed ground as it goes on a horizontal line, such as *a b*, and in such a movement the carriage and bucket being positioned as shown in full lines are moved forward by their independent cables at the same rate of speed and the bucket operates as a plow. At another position which is delineated between the positions of the buckets just mentioned the bucket is shown with its boom vertical, and in this position also it is designed that the bucket shall move forward at the same rate of speed as its carriage. This would be the position of the bucket with respect to its carriage when in use as a scoop or scraper for filling itself from earth already plowed or sufficiently loose. In another position I have shown the boom as upraised and with the bucket dumping itself from its forward end by letting the cable 28 slack by disconnecting the drum 30 with the line-shaft and releasing the brake-band 56 on the brake-wheel 54 of said drum, while at the same time maintaining the carriage locked on the boom.

It is obvious that if the boom were horizontal the locking of the carriage on the boom would be unnecessary, and it is also obvious that the bucket may be dumped when its carriage is at any point along the boom so long as the bucket-boom may be vertical or swing back. The outward dotted position of the bucket (shown with the boom upraised) shows the possible movement of the bucket to fill itself at the breast of the excavation. It is seen that the dumping of the bucket from its forward end is attained by reason of its being hinged at its bottom backward of its longitudinal center.

There are two track-sections 8 8, which form part of the foundation of the derrick, and they are each about half the length of the boom-pole. The derrick being positioned upon the section of the track shown in full lines and it being desired to move the derrick-base on the section of track shown in dotted lines it is only necessary to remove the bolts 9, which bind the lapping ties to the track-section, and then by means of pinch-bars push the derrick and the lapping ties of its foundation with it over onto the section of track shown in dotted lines. The bolts 9 are then used to secure the lapping ties to the section of track shown in dotted lines, and the foundation is filled up with loose rock as before.

The excavator is then used to grade a way in front of the track-section shown in dotted lines, and for the further movement of the derrick the track-section, which is shown in full lines, is then picked up by the derrick-grapple and carried by the derrick and positioned forward to form the new foundation as before.

I claim—

1. In an excavator and in combination, a revoluble platform, a mast mounted thereon, a vertically and horizontally swinging boom

projecting from said platform, means for horizontally swinging the boom, means for vertically swinging the boom, a carriage movable on said boom, a rope extending along said boom to one leg of which the carriage is attached, means for driving said rope forward and backward consisting of a drum on said platform around which the two legs of the rope are reversely wound, a power-shaft on said platform, geared connections between said power-shaft and said drum consisting of a power-transmitting shaft having gears at one end in constant operative connection with said drum and operative gear at its other end having intermittently connection, disconnection and reversed connection with the power-shaft, and means for locking said power-transmitting shaft consisting of a clutch having one member fast thereon and its other member loose thereon and trunnioned on said platform and movable longitudinally on said shaft to mesh with its mate only at the period of disconnection between the gear of the power-shaft and the intermittently connective and disconnective gear of the power-transmitting shaft, a rigid bucket-arm hinged to said carriage, an excavating-bucket hinged to the depending end of the bucket-arm, a rope fastened to the forward end of the bucket, passing over a sheave at the outward end of the boom and wound upon a drum on the platform, and geared connections between said drum and said power-shaft geared to equal speed with the geared connections between the power-shaft and the carriage-driving drum, substantially as described.

2. In a combined derrick and excavator, the combination with a mast, a pair of shafts therein, one above the other, a pair of winding-drums on each shaft also arranged relatively in pairs one above the other, means for operating each pair of drums, a boom, a carriage and a bucket, cables connecting both pairs of drums separately with the boom, the carriage and the bucket, and means connected with one of said lower pair of drums for stopping, locking, and starting the carriage at any point in its movements in either direction.

3. In an excavator and in combination, a rotatable platform, a mast mounted thereon, a vertically and horizontally swinging boom, means for horizontally swinging said boom, a carriage on said boom, a bucket carried by said carriage, a shaft mounted horizontally in the mast above said platform, a shaft mounted in the mast above the first-mentioned shaft, a pair of drums fixed on each shaft, a cable 15, 16 connecting the lower pair of drums with the beam and the carriage for operating it back and forth, a cable 28 connecting the bucket the boom and the drum 30 of the upper pair for operating the bucket, a cable 32 connecting the swing end of the boom, the top of the mast and the independent movable drum 31 of the upper pair, for vertically swinging

said boom, means for locking the said lower pair of drums to lock the carriage, and means for operating the upper pair of drums.

4. In combination in a combined derrick and excavator, a mast, a pair of shafts mounted therein one above the other, a pair of winding-drums on each shaft also arranged relatively in pairs one above the other, means for operating each pair of drums, a brake-strap 55 for the upper drum 30, a brake-strap 56 for the upper drum 31, means for operating said straps, means for operating the lower pair of drums, a boom, a carriage and a bucket, cables connecting both pairs of drums separately with the boom, the carriage and the bucket, and means connected with one of said lower pair of drums for stopping, locking and starting the carriage at any point in its movements in either direction.

5. In an excavator and in combination, a revoluble platform, a mast mounted thereon, a boom hinged to and projecting from the mast, means for horizontally swinging the boom, a drum of two sections mounted in the mast, both fixed upon and driven by the same shaft, a carriage upon the boom, a sheave on the end of the boom, a rope connected to each end of the carriage, passing around the sheave, and having that end connected to the inner end of the carriage wound upon one section of the drum from its under side, the other end of the rope wound upon the other section of the drum from its upper side, a bucket, a swing-arm connecting the bucket and the carriage, a pair of drums mounted in the mast above the carriage-operating drums, a rope 28 connected to the bucket, passing around a sheave at the end of the boom and around the drum 30, a motor-driven line-shaft 11, means for connecting it with the carriage-operating drums, sprockets 35, 36 and 37 connecting the drum

31 with said shaft 11, for operating the bucket, a rope 32, connected to the drum 31 passing around a sheave at the top of the mast, thence around a sheave at the end of the boom and back fastened to the top of the mast for operating the boom vertically, and means for controlling the motor.

6. In combination in a combined derrick and excavator, a rotatable platform, a mast mounted thereon, a boom hinged to and projecting from said platform, means for rotating the platform, means for vertically swinging said boom, a carriage on said boom, a bucket suspended from said carriage, a shaft mounted horizontally in the mast, a pair of drums each fixed on said shaft, a motor for driving said shaft, a rope connecting one end of the carriage with one of said drums, a rope connecting the other end of the carriage with the other of said pair of drums, means for operating the drums and means for controlling and locking the carriage at any point in its movements in either direction, consisting of the shaft 63, a clutch slidable brake member 71 thereon, the fixed engaging clutch member 74 having a gear 65, gears 66 and 67 on the drum-shaft meshing with said brake-clutch gear 65, means for engaging either of the gears 66 and 67 with the clutch-gear to lock the clutch to stop the operation of the bucket, levers 77 connecting the slidable clutch member and means for operating said levers to unlock either of the gears in mesh with the gear carried by the slidable clutch.

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

CICERO BISHOP.

Witnesses:

A. ROLAND JOHNSON,
SARA P. JOHNSON.