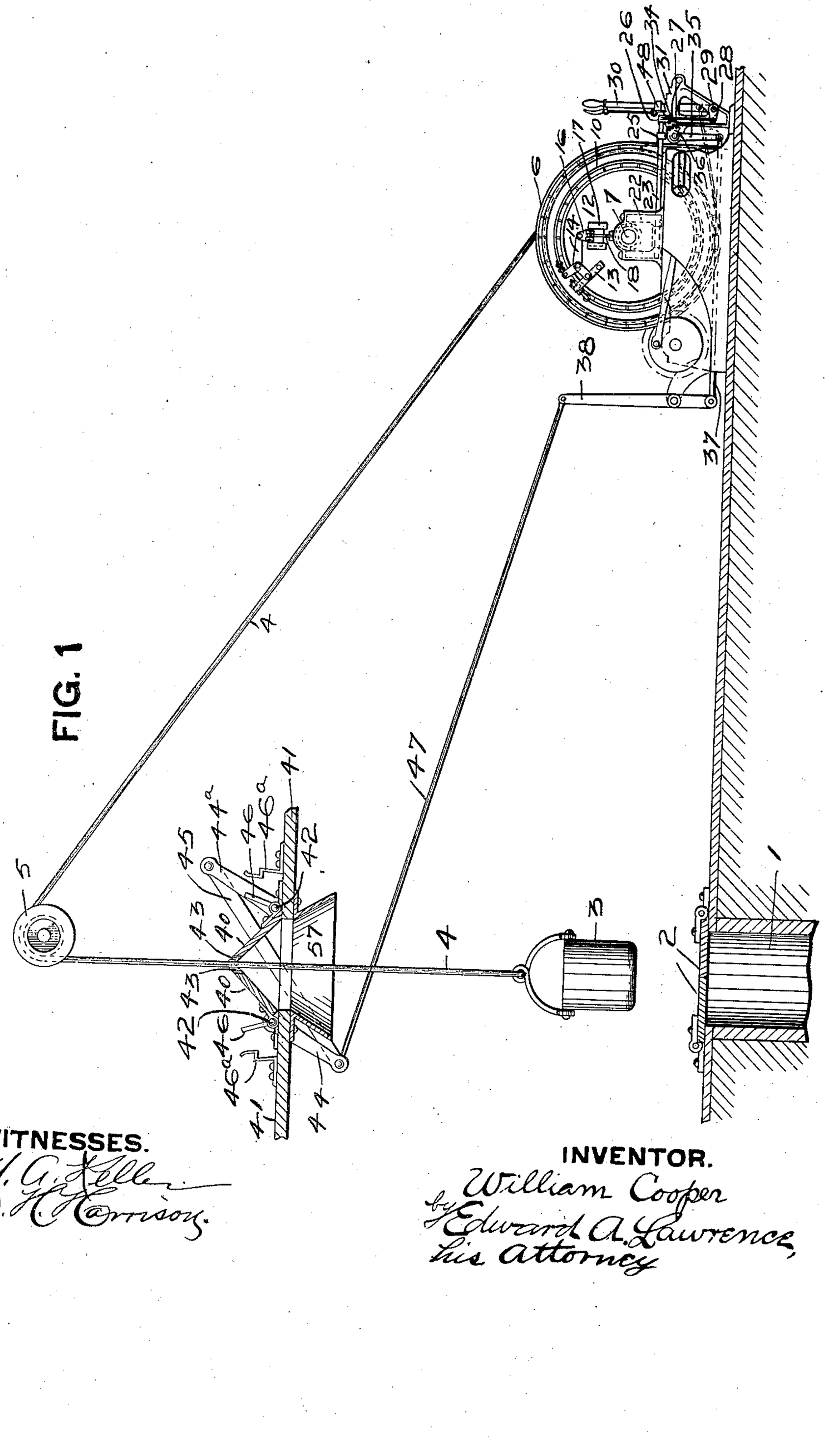
No. 842,629. PATENTED JAN. 29, 1907.

W. COOPER.

AUTOMATIC CLUTCH.

APPLICATION FILED JULY 14, 1906.

3 SHEETS—SHEET 1.



WITNESSES.

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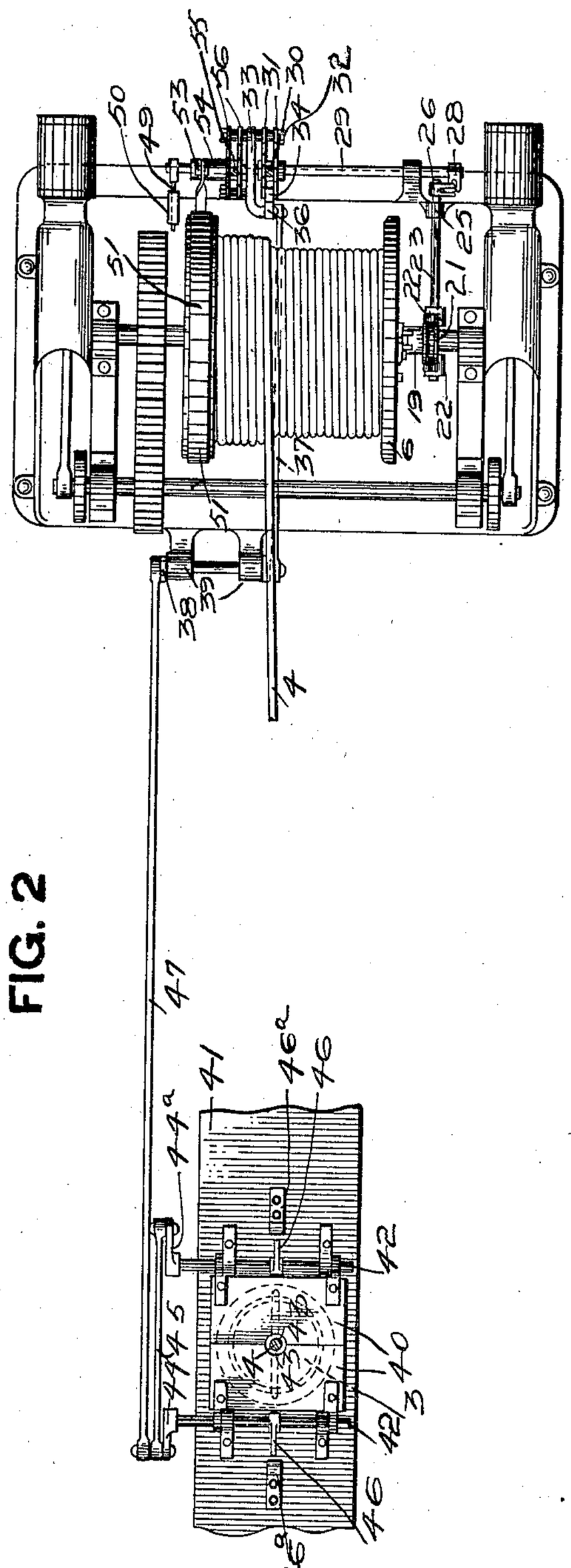
3 SHEETS—SHEET 2.

FIG. 2



WITNESSES.

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3 SHEETS—SHEET 3.

FIG. 3

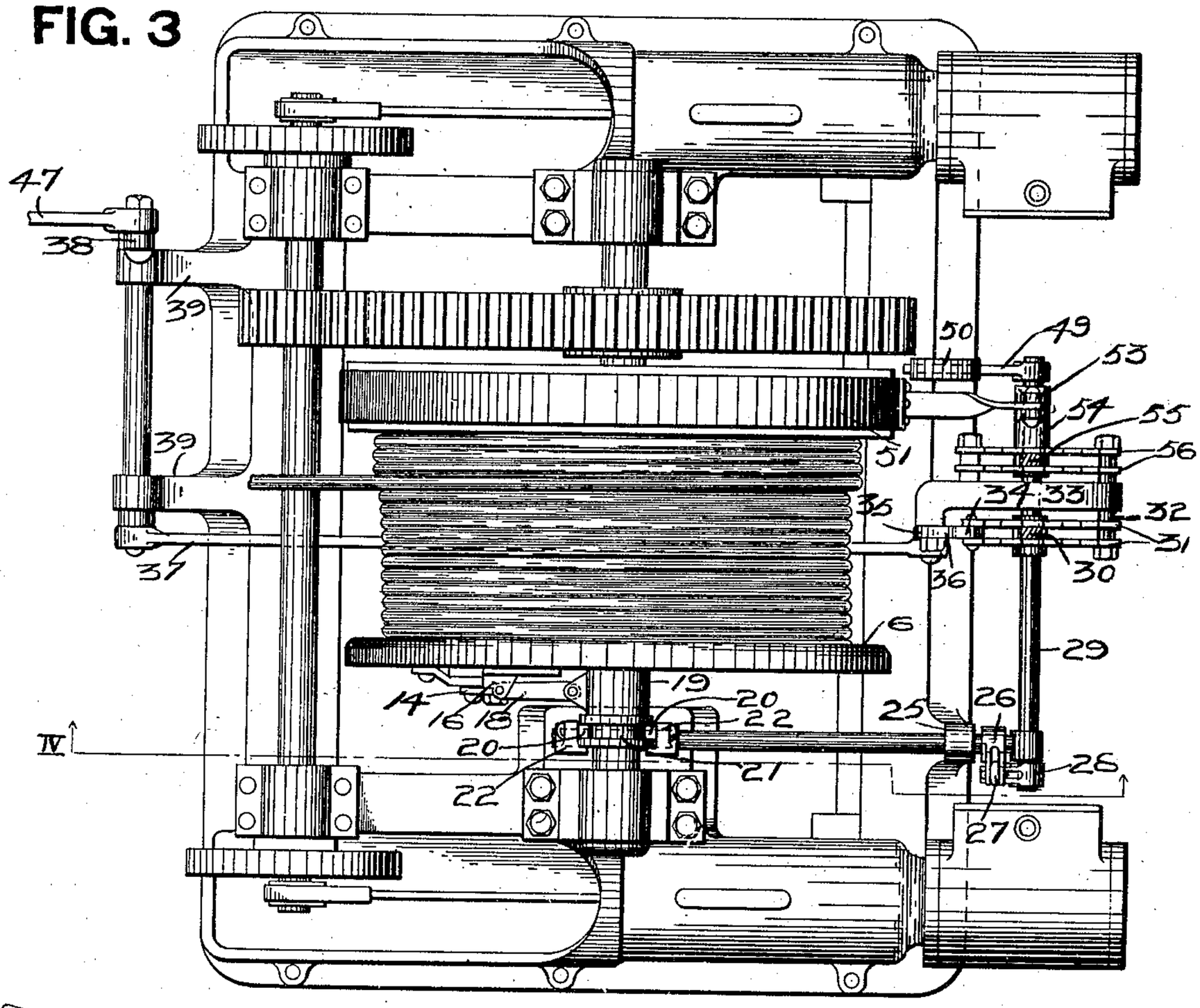
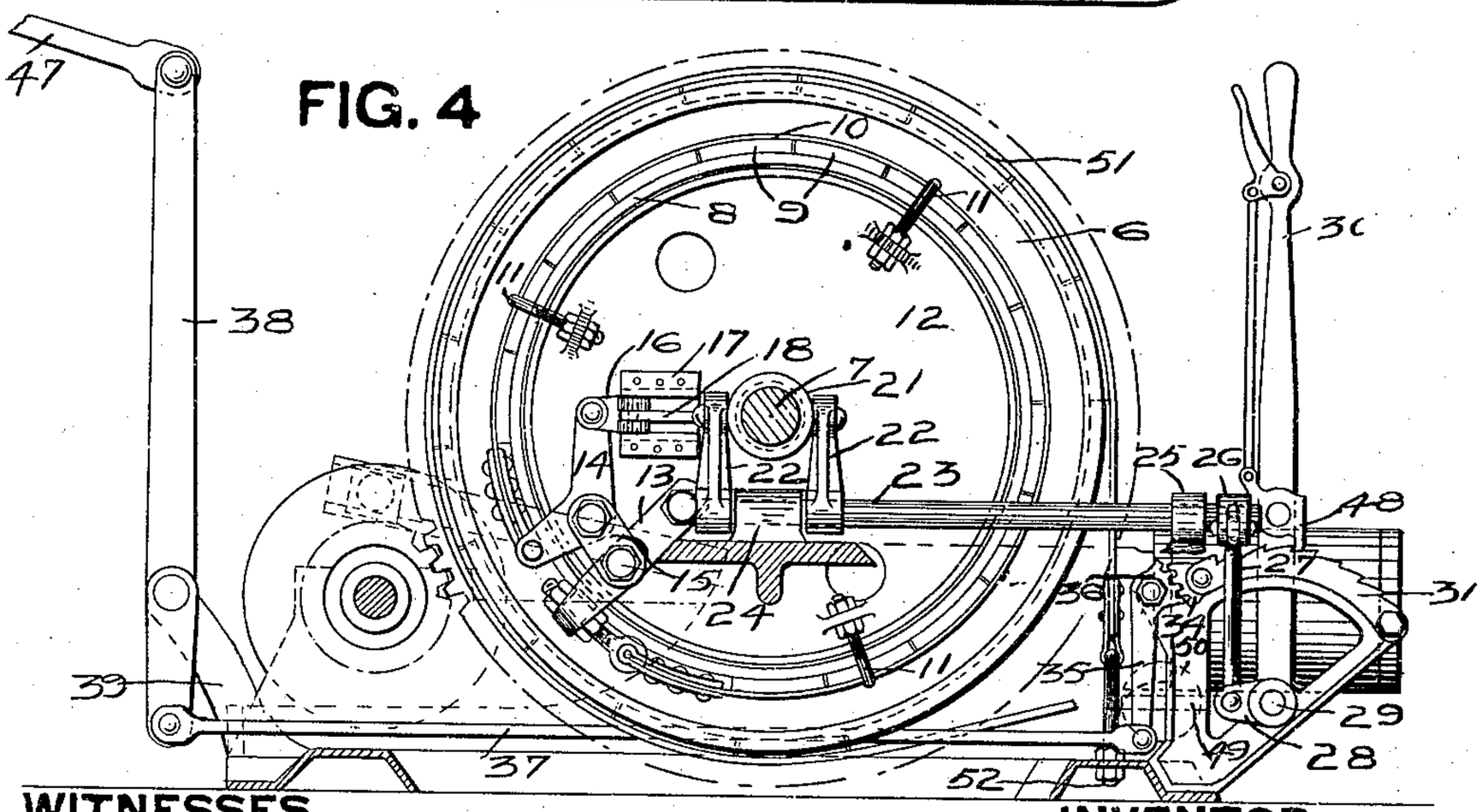


FIG. 4



WITNESSES.

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UNITED STATES PATENT OFFICE.

WILLIAM COOPER, OF DENVER, COLORADO.

AUTOMATIC CLUTCH.

No. 842,629. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed July 14, 1906. Serial No. 326,166.

To all whom it may concern:

Be it known that I, WILLIAM COOPER, a citizen of the United States, residing in the city of Denver, in the county of Denver and State of Colorado, have invented or discovered new and useful Improvements in Automatic Clutches, of which the following is a specification.

My invention consists in new and improved safety devices adapted for use in connection with hoisting mechanism of all kinds, such as mine and other draft mechanisms.

A frequent accident in the use of hoisting machinery and one fraught with great danger to lives and property is due to loss of control over the hoist, resulting in an "overwind" and dashing the cage, bucket, skip, or other receptacle against the sheave or gallows-frame. In such cases the power machinery refuses to respond to the usual controlling apparatus, and I therefore provide automatic means to release the rotating or winding power from the cable drum or spool and render the same idle, so that it may be readily stopped in an instant by means of the hand or other braking means assisted by the weight of the load. I have shown mechanism which engages the runaway bucket or other receptacle at a predetermined point and being actuated thereby in turn releases the device, such as the friction-clutch, which communicates the winding motion to the cable-spool.

In the accompanying drawings, Figure 1 is a general side view of my invention applied to a vertical mine-shaft, the shaft-mouth and operative doors being shown in section and well-known parts of the hoisting-engine being omitted for the sake of clearness. Fig. 2 is a plan view of the same with the cable and sheave omitted. Fig. 3 is an enlarged plan view of the hoisting-engine; and Fig. 4 is a side view along the line IV IV in Fig. 3, the hand-brake-controlling lever being omitted for the sake of clearness.

The following is a detailed description of said drawings, which are, however, only illustrative of the principles of my invention and are not intended to limit the scope thereof to the construction and mechanism shown.

1 is a mine-shaft adapted to be closed by the usual doors 2 2, and 3 is the hoisting-receptacle, shown in this case as a bucket; but any other form may be substituted—as, for instance, a cage or skip. 4 is the cable, suspending said bucket and passing over the sheave 5, supported in the gallows-frame (not shown) and wound about the cable drum or spool 6 of the hoisting-engine. Said cable-spool is loosely mounted in the usual manner on the power-shaft 7 of the engine. 8 is an annular flange or lip extending laterally from said spool 6, against which the friction-blocks 9 9 are forced by the clutch-band 10 when the clutch is thrown on. 11 11 are L-bolts carried by disk 12, which disk revolves with the shaft 7, said bolts serving to retain the said friction-blocks at all times in perfect alinement with flange 8. One end of said clutch-band 10 is secured to the outer end of member 13, rigidly attached to the disk 12, while the other end of said band is pivoted to the outer end of bell-crank lever 14, which is pivoted at its angle to member 13 by means of link or links 15.

To the inner end of lever 14 is pivotally secured the slide 16, which moves in guides 17 17, attached to disk 12.

18 is a connecting-rod pivoted at its outer end to the slide 16 and at its inner end to thimble 19, which is slidably mounted on shaft 7 and rotates therewith.

It is evident that the friction-clutch mechanism above described rotates with the power-shaft 7.

20 20 are antifriction-rollers adapted to engage annular groove 21 in the thimble 19 and mounted on the free ends of standards 22 22, which are rigidly mounted on rock-shaft 23, which shaft is suitably journaled, as at 24 and 25, in the bed-frame of the engine.

26 is a slotted arm rigidly attached to shaft 23.

27 is a connecting-rod pivoted at its upper end to said arm 26 and at its lower end to an arm 28, which is rigidly attached to transverse rock-shaft 29, which is journaled in the bed-frame of the engine.

30 is a hand-lever rigidly keyed or otherwise secured at its lower end to the rock-shaft 29.

It is evident that should lever 30 be thrown to the right in Fig. 4 the rock-shaft 23 would be rotated toward the cable-spool, moving the upper ends of standards 22 22 in a like direction, thus sliding thimble 19 inwardly toward the disk 12. The slide 16 will thus be forced outwardly, in turn forcing out

the inner arm of bell-crank lever 14, whereby the friction-blocks 9 9 are forced into close contact with the flange 8 of spool 6, thus causing said spool to rotate with the shaft 7. If, however, the lever 30 be thrown toward the left in said figure, the above operation would be reversed and the friction-clutch loosened from the flange 8 and allowing the same to be idle.

31 31 are twin locking-quadrants, which are pivoted at one end by pin 32 to framework 33, mounted on the engine-frame. Between the free ends of the quadrants is rigidly secured the sector 34.

35 is a member pivoted to the frame of the engine and provided with an integral sector 36, concentric with said pivot, which sector intermeshes with sector 34, rigid with quadrants 31 31. The longer arm of said member 35 is pivoted at its end to the connecting-rod 37, which may pass forward under the engine, to be pivoted at its forward end to the short arm of lever 38, which is pivoted intermediate of its length to a rigid portion 39 of the engine-frame.

40 40 are twin doors located in the path of the ascending cage or bucket sufficiently above the shaft-mouth not to interfere with loading and unloading. Said doors are hinged, as shown, to the gallows-frame 41 by means of hinge-shafts 42 42, rigidly attached to said doors. Said doors when closed are preferably arranged to assume the illustrated inclined positions, being cut away, as at 43 43, to admit the passage of the cable 4.

44 44^a are levers rigidly attached to doors 40 40, respectively, and connected by pivoted connecting-rod 45, so that both doors are open uniformly when one is struck by the ascending bucket. Owing to the tendency of the bucket to swing wildly, perfect engagement of both doors by the bucket is improbable, and the above mechanism to insure uniform action is desirable. 46 46 are bars rigidly attached to said doors and adapted to be engaged by spring-catches 46^a 46^a on the gallows-frame when the doors are thrown open, thus holding said doors open until released at pleasure.

47 is a connecting-rod pivoted at one end to the lever 44 and at the other end to the upper end of lever 38.

48 is a spring-latch mechanism carried by the hand-lever 30 and adapted to engage the quadrants 31 31 when said quadrants are in the position shown in the drawings.

49 is an arm rigid with shaft 29 and provided with a counterbalance-weight 50.

51 is a band-brake of any known design, having one end fixed to the engine-bed, as at 52, and the other end pivoted to arm 53, rigidly attached to sleeve 54, which is loosely mounted on shaft 29.

55 is a hand-lever having its lower end rigidly attached to sleeve 54 and capable of being locked at any desired position by means of the engagement of its latch mechanism (not shown) with twin quadrants 56 56.

To operate the cable-drum so that the bucket may be elevated, the engineer applies the friction-clutch to the cable-spool by throwing the hand-lever 30 to the right to a degree sufficient to attain the desired speed of revolution. When it is desired to stop the winding up of the bucket, he may either release the friction-clutch from the spool and apply the brake or shut off the throttle, as desired. In case of a runaway and threatened overwind as soon as the bucket rises from the shaft and rushes up against the doors 40 40, into proper engagement with which it is preferably guided by some convenient means, such as the conical guide 57, attached to gallows-frame, the doors 40 40 are thrown open into their vertical position, throwing lever 44 toward the right, thus forcing the upper end of lever 38 toward the engine and drawing forward toward the left the connecting-rod 37, which serves to rotate the sector 36 toward the right, communicating a reverse motion to the sector 34, rigid with quadrants 31 31, thus depressing the free ends of the quadrants until the spring-latch 48 loses its engagement with the teeth of said quadrant. The counterbalance-weight 50 then throws the released lever 30 toward the left, rocking shaft 29 in the same direction, depressing the arm 28, and drawing down the connecting-rod 27, rocking shaft 23 away from the disk 12, and thereby throwing the standards 22 22 in the same direction. This movement of the standards 22 22 draws the thimble 19 outwardly on shaft 7, thereby releasing the friction-clutch from the cable-spool and permitting the rotation of the same to be readily stopped by means of the described hand-brake or other convenient means. The spring-catches 46^a 46^a hold the doors 40 40 open, and thus maintain the clutch thrown off until it is desired to release the automatic safety mechanism.

It is evident from the above that my safety mechanism is entirely automatic in its action, which is positive and instantaneous in releasing the cable-spool from its operative connection with the engine. I have shown my invention for the sake of illustration applied to a well-known type of steam hoisting-engine; but its applicability to any type of engine is self-evident. Its use, moreover, is not confined to steam-engines, but is adapted to gas or explosive engines, electric motors, or any other character of power mechanism.

I have shown my invention applied to friction-clutches; but it may be arranged to

automatically release any form of operative connection between the cable-spool and power mechanism.

I have shown the mechanism in connection with a vertical mine-shaft in which a bucket is used as the hoisting-receptacle; but its use in connection with a cage or other hoisting-receptacle is self-evident.

In case of an inclined shaft or "slope" or a horizontal shaft or "drift," where skips or mine-cars are used instead of buckets or cages, it is equally useful, and its application is clear to those skilled in the art.

Many modifications and variations of mechanism embodying my invention will occur to those skilled in the art, which, however, are within the scope of my invention. I therefore do not wish to limit myself to the embodiments and constructions shown; but

I claim, broadly—

1. In hoists, a hoisting-receptacle, a cable-drum controlling said receptacle, power mechanism, a clutch device interposed between said drum and said power mechanism, locking means for maintaining said clutch device in its operative position, means whereby the said receptacle in passing a given point automatically releases said clutch and automatic means for throwing said clutch into its inoperative position when said locking means are released.

2. In hoists, a hoisting-receptacle, a cable-drum controlling said receptacle, power mechanism, a clutch device interposed between said drum and said power mechanism, a controller attached to said clutch device, locking means adapted to engage said controller and means for automatically throwing said locking means out of engagement with said controller.

3. In hoists, a hoisting-receptacle, a cable-drum controlling said receptacle, power mechanism, a clutch device interposed between said drum and said power mechanism, a controller attached to said clutch device, locking means adapted to engage said controller and means operated by the movement of said receptacle for throwing said locking means out of engagement with said controller.

4. In hoists, a hoisting-receptacle, a cable-drum controlling said receptacle, power mechanism, a clutch interposed between said drum and said power mechanism, a lever controlling said clutch, a quadrant adapted to lock said lever stationary and means for automatically swinging said quadrant out of engagement with said lever.

5. In hoists, a hoisting-receptacle, a cable-drum controlling said receptacle, power mechanism, a clutch interposed between said drum and said power mechanism, a lever controlling said clutch, a quadrant adapted to lock said lever stationary and means operated by the movement of said receptacle for throwing said quadrant out of engagement with said lever.

6. In hoists, a hoisting-receptacle, a cable-drum controlling said receptacle, power mechanism, a clutch interposed between said drum and said power mechanism, a lever controlling said clutch, a quadrant adapted to lock said lever stationary, a sector mounted on said quadrant, a pivoted member adapted to engage said sector and means operated by the movement of said receptacle for swinging said pivoted member.

7. In hoists, a hoisting-receptacle, a cable-drum controlling said receptacle, power mechanism, a friction-clutch adapted to couple said drum to said power mechanism, a lever controlling said friction-clutch, a swinging quadrant adapted to lock said lever stationary, a sector rigidly mounted on said quadrant, a pivoted sector member adapted to intermesh with said sector, a member interposed in the path of said receptacle and adapted to be engaged thereby and operative means connecting said last-mentioned member and said sector member.

8. In hoists, a hoisting-receptacle, a cable-drum controlling said receptacle, power mechanism, a friction-clutch adapted to couple said cable-drum and said power mechanism, a lever controlling said clutch, means for normally maintaining said lever in its inoperative position, means for locking said lever in its operative position, and means operated by the movement of said receptacle for releasing said locking means.

9. In hoists, a hoisting-receptacle, hoisting mechanism controlling said receptacle, a friction-clutch, a lever adapted to control said clutch, a quadrant pivoted at one end and adapted to lock said lever in place, a sector rigidly mounted on the free end of said quadrant, a second sector pivoted to the engine-frame and intermeshing with said first sector, an arm rigidly attached to said second sector, means interposed in the path of said receptacle and adapted to be engaged thereby and operative means connecting said first-mentioned means and said arm whereby the engagement of said first-mentioned means by said receptacle throws said quadrant out of engagement with said lever.

10. In hoists, a hoisting-receptacle, hoisting mechanism controlling said receptacle, a friction-clutch, a lever adapted to control said clutch, a device for automatically throwing said friction-clutch out of its operative position, a quadrant adapted to lock said lever so that said clutch is maintained in its operative position, said quadrant being pivoted by one end, a sector rigidly secured to the free end of said quadrant, a second sector pivoted on the engine-frame and intermeshing with said first sector, an arm rigidly attached to said second sector, means interposed

in the path of said receptacle and adapted to be engaged thereby and operative means connecting said first-mentioned means and said arm whereby the engagement of said first-mentioned means by said receptacle throws said quadrant out of engagement with said lever.

Signed at Denver, Colorado, this 7th day of July, 1906.

WILLIAM COOPER.

Witnesses:
M. H. SEUELS,
J. R HALDEMAN.