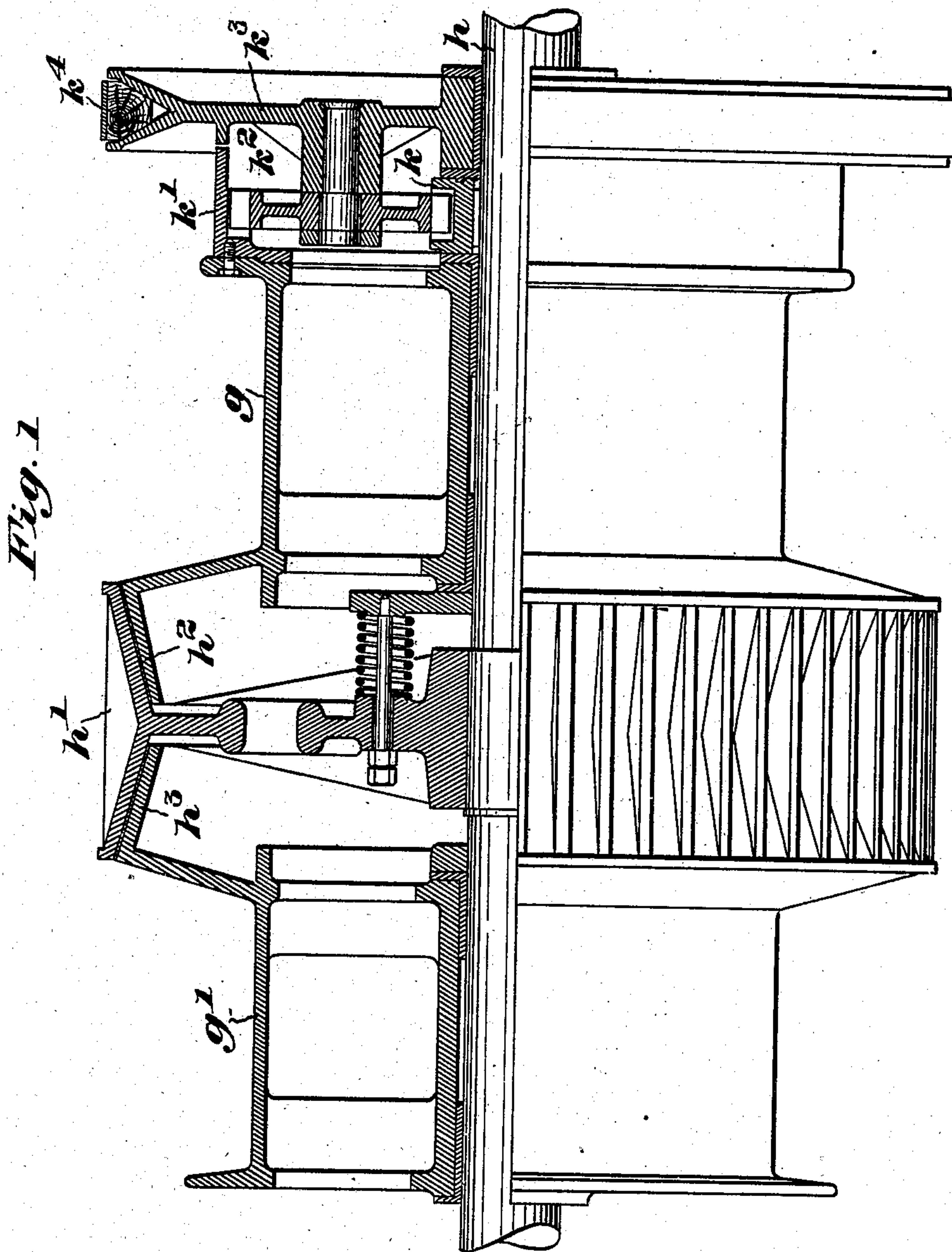


A. E. NORRIS.
HOISTING APPARATUS.
APPLICATION FILED JAN. 14, 1905.

905,213.

Patented Dec. 1, 1908.

3 SHEETS—SHEET 1.



Witnesses:
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Almon E. Norris
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3 SHEETS—SHEET 2.

Fig. 2

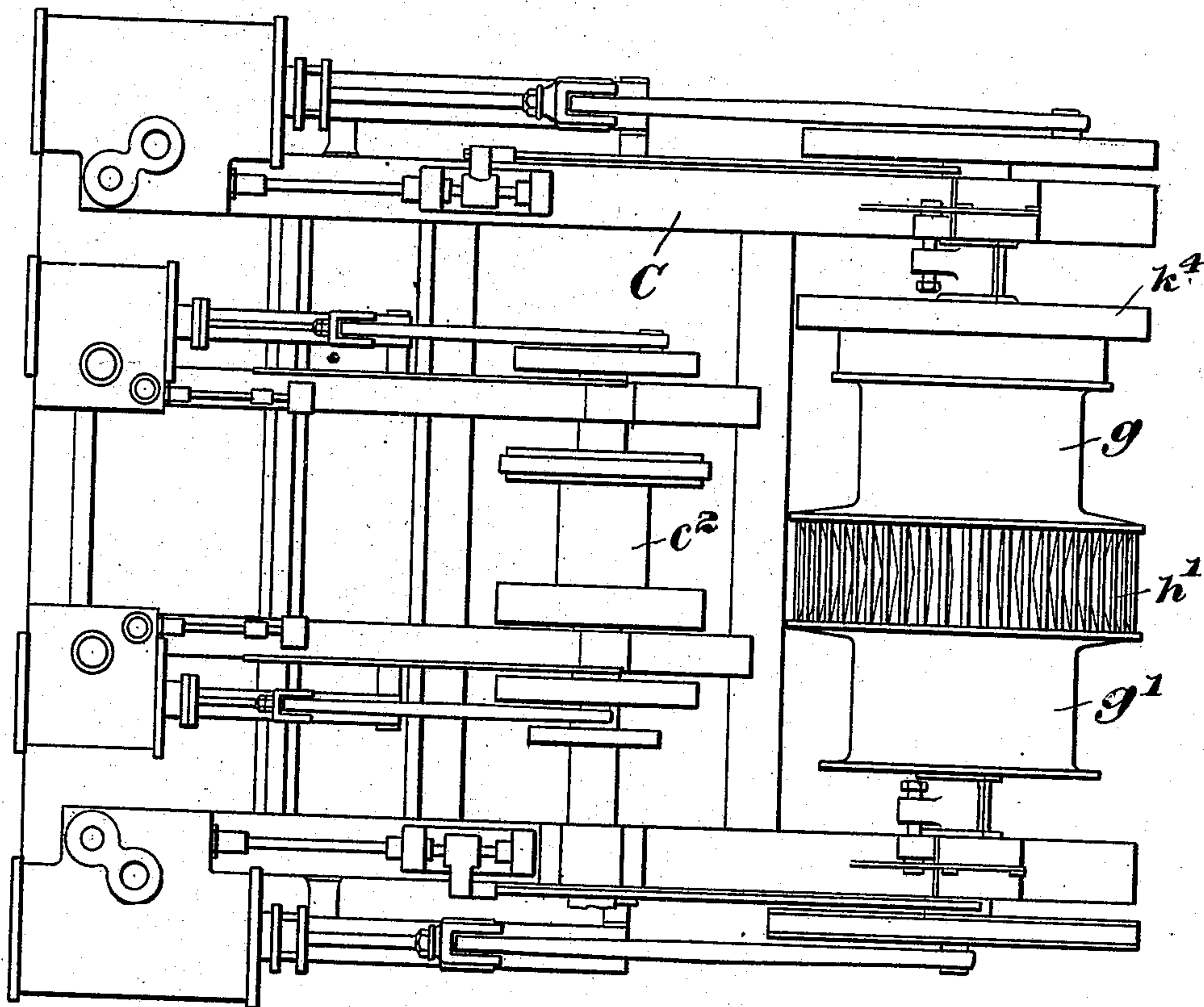
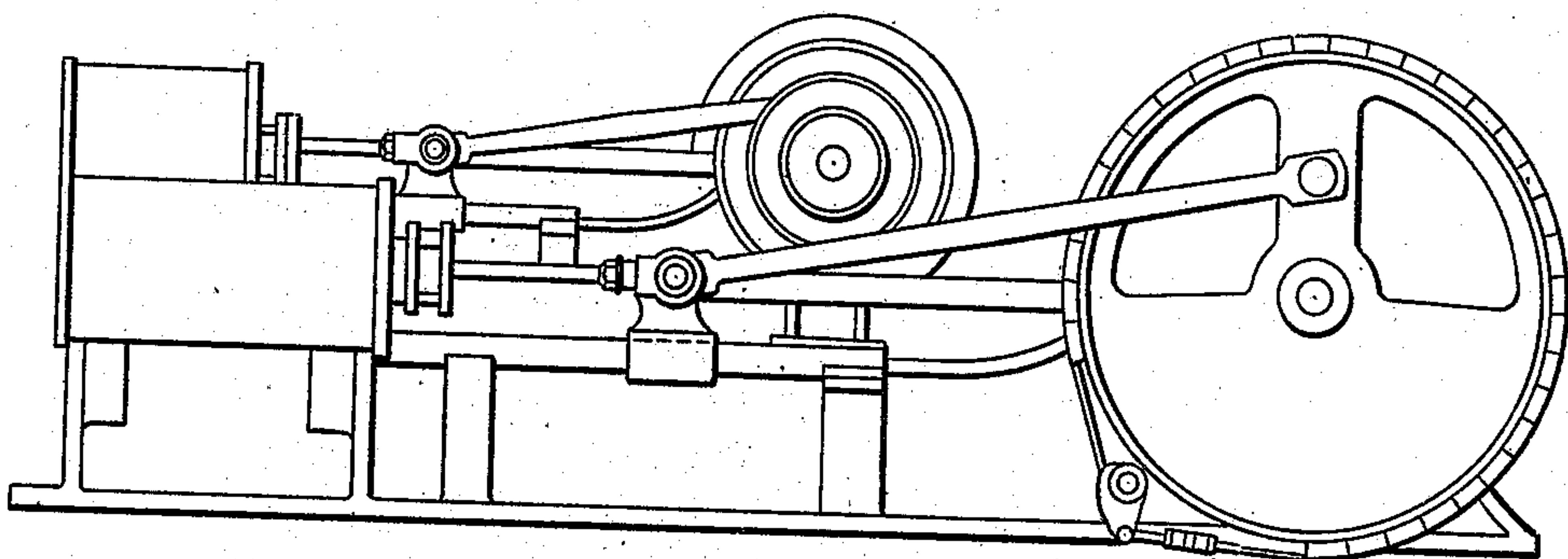


Fig. 3



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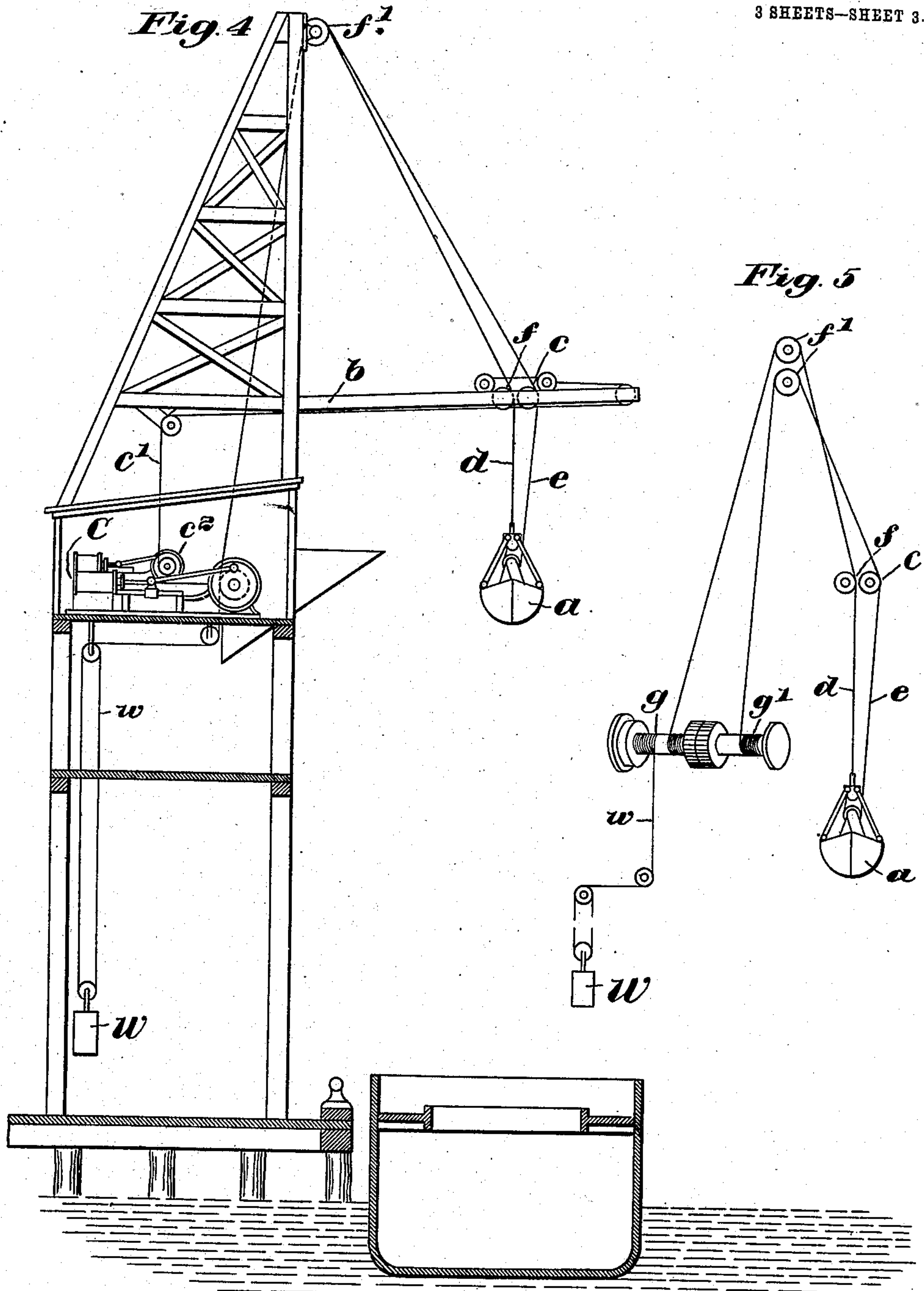
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UNITED STATES PATENT OFFICE.

ALMON E. NORRIS, OF CAMBRIDGE, MASSACHUSETTS.

HOISTING APPARATUS.

No. 905,213.

Specification of Letters Patent.

Patented Dec. 1, 1908.

Application filed January 14, 1905. Serial No. 241,073.

To all whom it may concern:

Be it known that I, ALMON E. NORRIS, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Hoisting Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention consists in improvements in load hoisting devices, being more particularly concerned with those systems wherein the employment of a counterweighted hoisting element is useful. Such for example, is the case where a grab or bucket of the clamshell type is employed for raising coal or the like and I have herein illustrated my invention by showing one embodiment thereof in a system of this character. Where a clamshell bucket or grab is employed for this purpose, the weight of the bucket is frequently more than that of the load which it is designed to lift; and for a load of 2000 lbs. of coal, a bucket of approximately 3,000 lbs. is often employed. The counterweighting of such a bucket obviously reduces to a material degree the power required for lifting the load. The methods of counterweighting, however, heretofore suggested have failed to consider the fact that at times the full weight of the bucket is desirable since it must be largely relied upon to cause the jaws thereof to sink into the coal, or other material to be lifted, after the bucket has been dropped.

My invention provides a counterweighted hoisting device, but so arranged that the effect of the counterweighting means upon the hoisting device may be relieved, when desired, and the entire weight of the latter be made effective. More specifically, as applied to the grab hoist herein, I have also arranged the opening-and-closing rope and the hoisting rope, so that the two may be operated independently of each other, and so that the hoisting rope, by which latter the counterweight is herein carried, may be positively paid out to the hoisting device, while slack in the opening-and-closing rope may be simultaneously taken in.

My invention will be best understood by reference to the following specification when taken in connection with the accompanying drawings, showing one specific and illustrative embodiment thereof, while its scope will

be more particularly pointed out in the appended claims.

In the drawings,—Figure 1 is an elevation, partially in section, of the double rope winding-drum employed in the illustrated embodiment of my invention; Fig. 2 is a plan view of a hoisting engine equipped with the double drum shown in Fig. 1; Fig. 3 is an elevation of the same; Fig. 4 is an outline view showing a hoisting system embodying one form of my invention, employing the engine illustrated, and; Fig. 5 is a diagrammatic view showing the relation of the hoisting and the opening-and-closing ropes.

Referring particularly to Fig. 4, I have herein shown my invention as applied to an ordinary bucket hoisting system employing a grab or bucket *a* of usual form, herein of the well-known Rawson type. The bucket is caused to travel along the boom *b*, by means of the trolley carriage *c* and the trolley rope *c'*, the latter passing about a suitable trolley drum *c''* upon the hoisting engine *C*. The bucket is raised or lowered by the hoisting rope *d*, and its jaws are opened and closed in the usual manner by the opening-and-closing rope *e*. These two operating ropes pass upward over suitable sheaves, *f*, *e* upon the trolley carriage, over sheaves *f'* upon the tower and thence downward to and about the rope-winding apparatus. The system illustrated is of an ordinary and usual type. The usual mode of operation is to raise the bucket when loaded by winding in simultaneously on both the hoisting and opening-and-closing ropes. When hoisted, the load is dumped by holding the hoisting rope and letting out slack in the opening-and-closing rope to cause the jaws of the bucket to open outward. The bucket is then dropped by paying out both ropes until it strikes the coal with its open jaws. With the hoisting rope slack, the bucket will sink into the coal from its own weight, and the opening-and-closing rope is wound in to take up the slack previously let out and to close the jaws, after which both rope are wound in simultaneously to hoist the closed bucket with its load, as before.

In the described embodiment of my invention I have provided means for counterweighting the bucket, so that the force required to lift the latter will be little more than that required to lift its contained load; but I have also provided means whereby the full weight of the bucket may be made effective

ive when the latter strikes the coal and when the slack in the opening- and - closing rope is taken in to close the bucket jaws. To this end I have provided rope operating means comprising herein the winding drums g and g' , the former for the hoisting rope, the latter for the opening-and-closing rope, and these drums, while capable of being operated as a unit, are also independently operable.

Referring more particularly to Fig. 1, the two winding drums g and g' , are journaled upon the main driving shaft h , and are adapted to have a slight endwise movement thereon. A suitable friction clutch, h' , is fixedly secured to the shaft h , between the said two drums, and the drums are provided with clutch surfaces, h^2 , and h^3 , to cooperate with said clutch device, whereby either drum may be clutched to the latter, to rotate therewith and with the shaft h . Any suitable clutch operating devices may be employed and I have here indicated (Fig. 2) sliding collars and clutch operating screws of the type described in my prior patent Reissue No. 12,085, dated February 24, 1903 for forcing said drums either separately or together into clutching engagement with the shaft.

In addition to the direct driving connection described, the hoisting drum g , when unclutched may be driven in a reverse direction and at a slower rate of speed by means of planetary gearing, herein comprising the driving pinion, k , keyed or otherwise secured to the shaft h ; the internal gear k' attached to or comprising a part of the said hoisting drum g and the intermediate pinion k^2 , carried by and journaled upon the rotatable member k^3 , the latter mounted for free rotation about the shaft h , excepting when held or opposed by the brake band k^4 . Thus, when it is desired to reverse the movement of the drum g , the same is unclutched and the band k^4 tightened to hold fast the rotatable member k^3 , whereupon the drum is reversely driven at a slower rate of speed through the pinion k , intermediate gear k^2 , and internal gear k' .

Any means may be employed for counterweighting the bucket, but a simple and effective way is that shown in Figs. 4 and 5, where the counterweight W is carried by a counterweight rope w , which latter after passing over suitable sheaves, is secured to the hoisting drum, g , but in a reverse manner to the hoisting rope, so that the latter winds or unwinds as the counterweighted rope unwinds or winds.

The mode of operation is as follows:—The bucket having been filled and its jaws closed, both clutches are thrown in and the engine started to wind in both the hoisting and the opening-and-closing ropes simultaneously; this action serving to pay out the counterweight, which latter is preferably of

a weight approximately but not quite to counterbalance the weight of the unloaded bucket. When the load has been hoisted and the trolley carriage properly positioned, the engine is stopped, the hoisting drum g held, and the opening-and-closing drum released, to let out enough slack to permit the bucket to open its jaws and dump its load. The drum shaft h is normally held from reverse movement by a friction brake but when the open bucket is ready to be dropped, the friction clutches are thrown to allow both drums to turn and pay out both ropes simultaneously until the open jaws of the bucket touch the coal. At this point the opening-and-closing drum is again clutched to the shaft, the hoisting drum remaining unclutched, the reverse gearing thrown in by tightening the brake band k^4 and the engine started, thereby causing the hoisting drum positively to raise the counterweight and to pay out the slack hoisting rope at a relatively slow speed, while at the same time taking in the slack of the opening-and-closing rope at a relatively greater speed. This renders effective the entire weight of the bucket, permitting the latter to sink into the coal while its jaws are being closed by the winding up of the slack in the opening-and-closing ropes. By the time the jaws are closed, the slack, previously let out in the opening-and-closing rope, has been taken in. The hoisting drum is then again clutched to the shaft, which continues to rotate to take in both ropes similarly and simultaneously for the hoisting of the load, as before.

In Figs. 2 and 3 are illustrated the application of the rope-winding drum illustrated in Fig. 1, to an ordinary form of hoisting engine, the latter employing a double cylinder engine for the trolley drum c^2 , and a separate double cylinder engine for the bucket rope-winding drums g and g' .

Many other devices unnecessary to describe or mention, but embodying nevertheless my invention may be employed for taking up the slack in the opening-and-closing rope while at the same time relieving the bucket of the counterweight; one such system, employing a single winding drum for both ropes and an independently operable slack take-up device for the opening-and-closing rope, is described and claimed in Patent No. 832,744, granted to me October 9, 1906.

It is to be understood therefore that my invention in its broad aspect is in no wise limited to the specific illustrative embodiment herein described.

Claims.

1. In an apparatus of the class described the combination with a clamshell bucket of an opening and closing-rope therefor, a hoisting rope, a trolley, tower and boom, a pair of hoisting drums located in said tower upon which drums said ropes are adapted

respectively to be wound, a counterweight on a rope therefor, the latter connected to the hoisting drum in relation reverse to that of the hoisting rope, said counterweight being
 5 sufficient approximately to counter-balance the weight of the unloaded bucket, a driving shaft upon which said drums are loosely mounted, a centrally arranged clutching device between said drums whereby they may
 10 be clutched to or unclutched from the said shaft at will, planetary gearing between the said shaft and the hoisting drum including a driving pinion fixed on the shaft, an internal gear secured to the drum, one or more
 15 intermediate pinions carried by a member rotatably mounted on the said driving shaft and a band brake for holding said member fixed or for leaving the same free to rotate whereby the said hoisting drum may be
 20 clutched directly to the driving shaft to raise the bucket and lower the counterweight, or driven positively through said planetary gearing at a reduced speed to lower the bucket and raise the counterweight.

2. In an apparatus of the class described the combination with a hoisting device of an operating rope therefor, a hoisting rope, a pair of drums upon which said ropes are adapted respectively to be wound, a counter-
 30 weight connected to the hoisting drum in a relation reverse to that of the hoisting device, a driving shaft upon which said drums are loosely mounted, means for clutching said drums to or unclutch the same from
 35 said shaft at will, and planetary gearing between said shaft and said hoisting drum including a driving and a driven gear and a member intermediate said gears carried by a rotatably mounted member, and means for
 40 throwing said planetary gearing into or out of effective operation whereby the said hoisting drum may be clutched directly to the driving shaft or reversely turned through said planetary gearing at a reduced rate of
 45 speed.

3. In an apparatus of the class described the combination with a clamshell bucket of an opening and closing rope therefor, a hoisting rope, a trolley, tower and boom, a
 50 pair of drums upon which said ropes are adapted respectively to be wound, a counterweight reversely connected to the hoisting drum, a driving shaft, means for driving said drums from said driving shaft and
 55 planetary gearing means for driving said drum indirectly from said shaft in a reverse direction and at a reduced rate of speed.

4. In an apparatus of the class described the combination with a hoisting device, an
 60 operating rope leading thereto, a hoisting rope, means for counterweighting said device, and planetary gearing means for re-

lieving the counterweighting effect thereof while taking in said operating rope.

5. In an apparatus of the class described 65 the combination with a hoisting device, a counterweight connected therewith, a hoisting drum to raise the hoisting device and lower said counterweight, and planetary gearing connections for said drum through 70 which the latter may positively raise said counterweight at a reduced rate of speed.

6. In an apparatus of the class described the combination with a hoisting device *a*, the hoisting rope *d*, the operating rope *e*, 75 the counterweight *W*, the counterweight rope *w*, the operating drum *g'*, hoisting drum *g*, driving shaft *h* and internal planetary gearing members *k*, *k'*, *k*², *k*³, *k*⁴.

7. In an apparatus of the class described, 80 the combination with a hoisting device, a counter-weight connected therewith, a hoisting drum to raise the hoisting device and lower said counter-weight, and positive or toothed gearing connections for driving said 85 drum, through which the latter may be positively driven in a reverse direction to raise said counter-weight.

8. In an apparatus of the class described, the combination with a hoisting device, a 90 counterweight connected therewith, a hoisting drum, a driving member, means for connecting said hoisting drum to said driving member to cause the former to raise the hoisting device and lower the counterweight, 95 positive or toothed gearing connections also for driving said drum at a slower speed in a reverse direction, and means for rendering said gearing connections effective for driving the drum to raise the counterweight. 100

9. In an apparatus of the class described, the combination with a clam shell bucket, of an opening and closing rope therefor, a winding drum for said rope, a hoisting rope, a counterweight associated with said bucket 105 and said hoisting rope, a hoisting drum, driving means, means for connecting said drums to said driving means to wind in the opening and closing rope and the hoisting rope and lower said counterweight, positive 110 or toothed gearing connections also for driving the drum for the hoisting rope in a reverse direction at a slower speed, and means for rendering said gearing connections effective for paying out the hoisting rope and 115 positively raising the counterweight.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ALMON E. NORRIS.

Witnesses:

DAISY C. GWINN,
 THOMAS B. BOOTH.