F. HAYES.
DOCK HOIST.
APPLICATION FILED MAY 28, 1912.

1,048,157.

Patented Dec. 24, 1912.

2 SHEETS—SHEET 1.

Fig 1

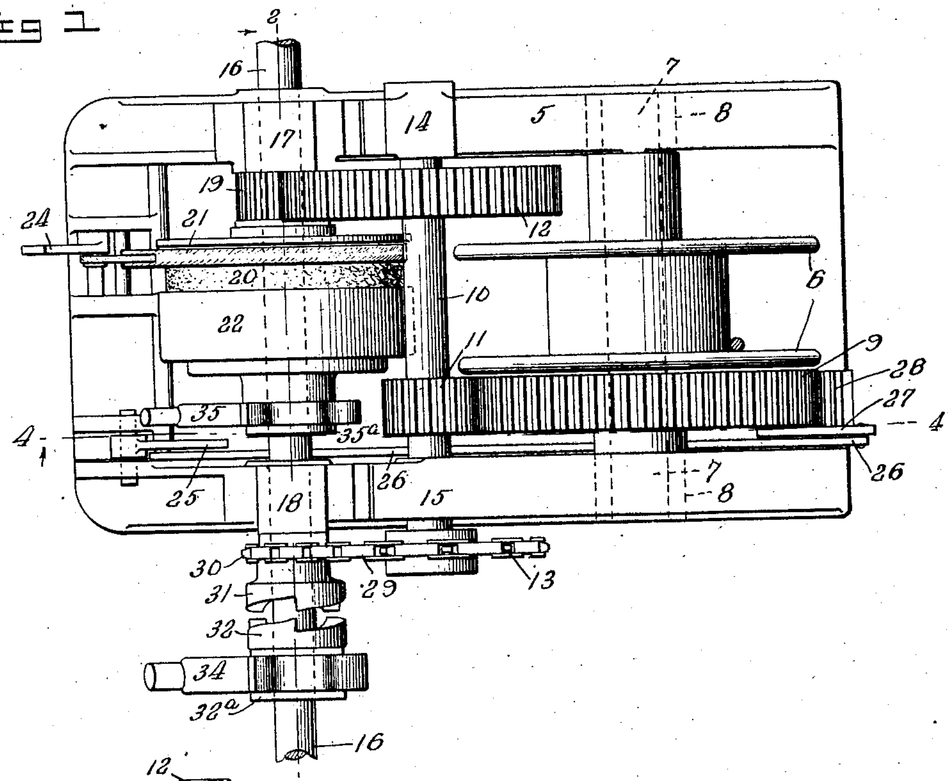

Fig 2

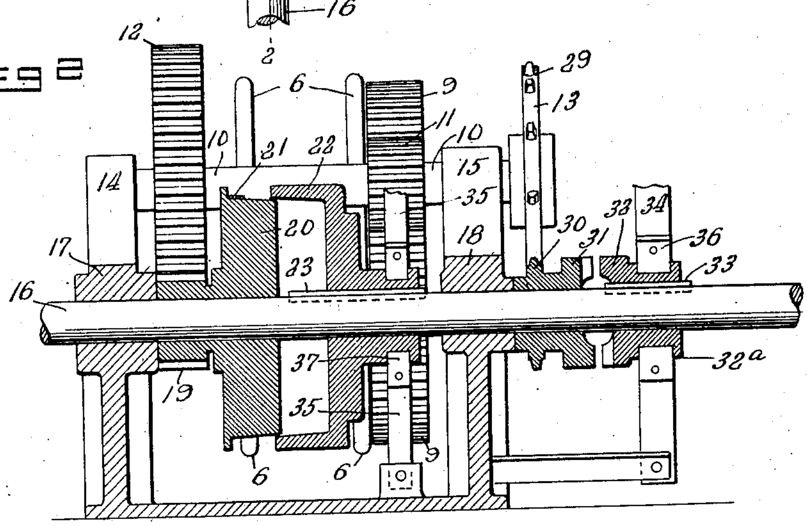

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Fig 3

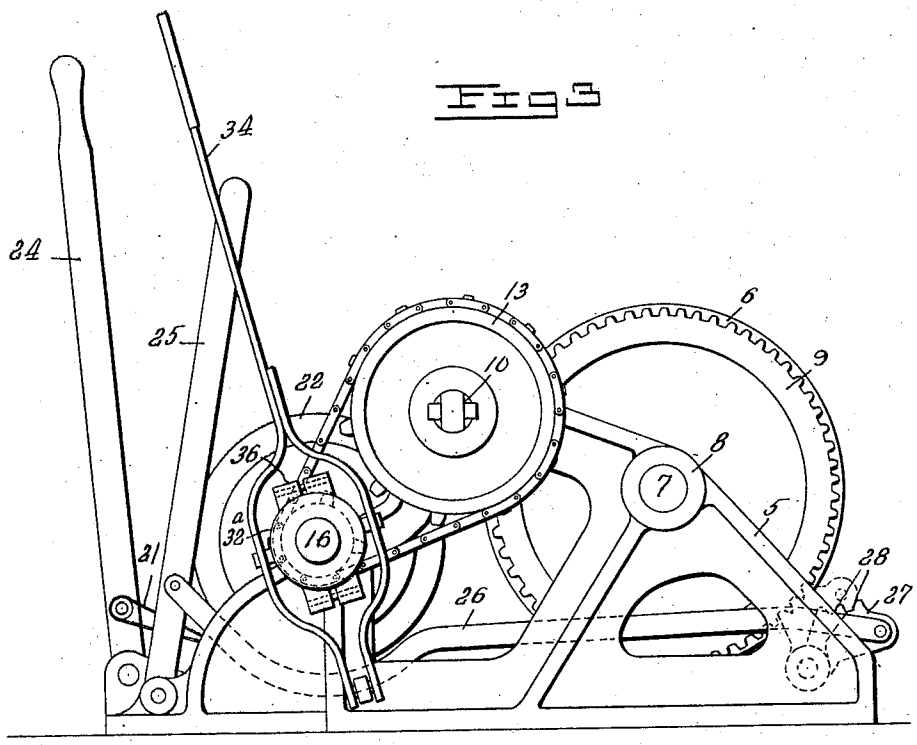
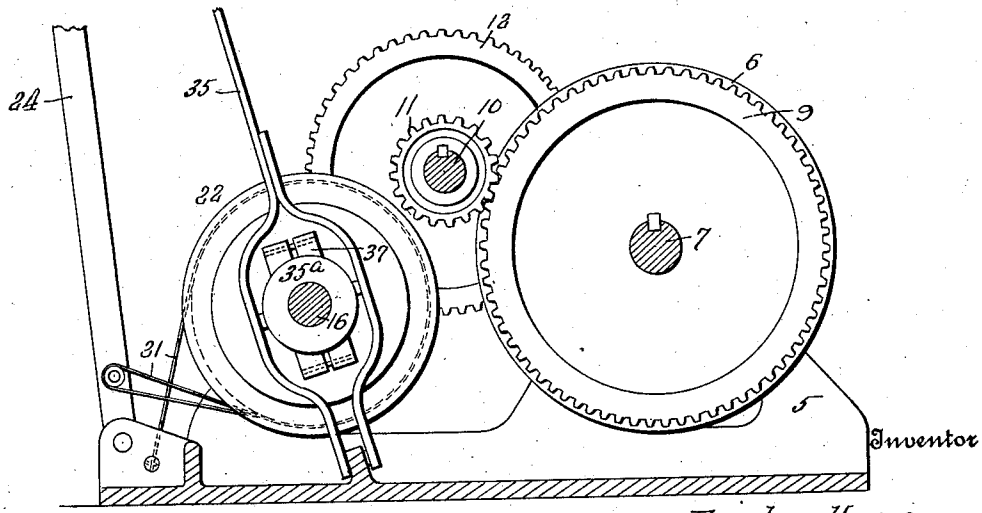


Fig 4



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UNITED STATES PATENT OFFICE.

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DOCK-HOIST.

1,048,157. Specification of Letters Patent. Patented Dec. 24, 1912.

Application filed May 28, 1912. Serial No. 700,262.

To all whom it may concern:

Be it known that I, FRANK HAYES, a citizen of the United States, residing at Superior, in the county of Douglas and State of Wisconsin, have invented new and useful Improvements in Dock-Hoists, of which the following is a specification.

My invention relates to dock hoists, that is, to hoisting mechanism used for raising and lowering spouts employed in connection with docks and landings for the purpose of handling material to be loaded and unloaded.

While my invention relates to dock hoists of the kind mentioned, it is in many instances suitable for use in connection with hoisting machinery of other kinds.

Preferably my invention is employed in connection with dock hoists of the type in which one or more hoisting mechanisms are driven by a revoluble shaft rotating constantly in a particular direction.

The principal object of my invention is to promote safety in handling the load,—usually consisting of a heavy spout; my invention making provision for hoisting the spout, holding it at a predetermined level, and lowering it when desired, the speed of descent of the load while being lowered being limited by the speed of rotation of the driving shaft, so that while the load in descending is the means for operating the hoisting drum and gearing connected immediately therewith, the weight of the load is unable to cause its descent at any rate greater than is permitted by the positive rotation of the driving shaft.

My invention further comprehends a dock hoist construction in which the power used in driving the mechanism is conserved to some extent by utilizing the weight of the descending load for the purpose of practically assisting the motive power of the driving shaft.

My invention further comprehends various mechanical details whereby the efficiency of hoisting mechanism in general, and of dock hoists in particular is greatly increased.

Reference is made to the accompanying drawings forming a part of this specification, and in which like letters indicate like parts.

Figure 1 is a plan view showing a single unit of my improved dock hoist—it being understood that the entire hoisting mechanism may comprise several such units. Fig. 2 is a vertical section on the line 2—2 of Fig. 1, looking in the direction of the arrow. Fig. 3 is a side elevation of the hoisting unit shown in Fig. 1. Fig. 4 is a vertical section on the line 4—4 of Fig. 1, looking in the direction of the arrow.

The frame work is shown at 5, and at 6 is a drum used for lowering and raising the load, which, as above explained, may consist of a heavy spout. The drum 6 is mounted rigidly upon a revoluble shaft 7, the latter being journaled in bearings 8. Secured rigidly upon the shaft 7 is a gear 9 which turns with the drum. Another shaft 10 carries a pinion 11 and a gear 12, this pinion and gear being secured rigidly upon it. The shaft also carries a sprocket wheel 13 secured upon one of its ends. The shaft 10 is mounted in bearings 14, 15. The driving shaft is shown at 16, and is a line shaft employed in connection with the several units. This shaft is journaled in bearings 17, 18, and carries a pinion 19 which meshes with the gear 12.

Mounted loosely upon the line shaft 16 is a clutch member 20, and adjacent to this clutch member is a brake band 21. Another clutch member is shown at 22, and is connected with the line shaft 16 by aid of a spline 23, as will be understood from Fig. 2. The brake band 21 is connected with a brake lever 24 in such manner that when the brake lever 24 is actuated, the brake band is caused to press upon the clutch member 20 with a degree of force controllable by the operator, and when the brake lever is thrown into its extreme position to the right, according to Fig. 1, the brake band is practically disengaged from the clutch member 20. Journaled upon the frame 5 is another hand lever 25. A pitman 26 pivotally connected with this hand lever extends across the frame, and is connected to a dog 27. This dog is located adjacent to the gear 9 and is provided with teeth 28 for engaging the latter. The operator by shifting the hand lever 25 to the right or left, according to Fig. 1, may throw the dog 27 into or out of engagement with the gear 9, and in so doing may lock or release this gear.

Engaging the sprocket wheel 13 is a sprocket chain 29, the latter also engaging a sprocket pinion 30. This sprocket pinion is connected with a clutch member 31, the sprocket pinion and clutch member in ques-

tion being to all intents and purposes a single revoluble member which is mounted loosely upon the line shaft 16. Another clutch member 32 is, by aid of a spline 33, connected with the line shaft 16 so as to turn with the latter. Carried by the clutch member 32 is a collar 32ª, and engaging this collar is a clutch lever 34 having the usual form of a clutch lever, as will be understood from Fig. 3. These clutch members 31 and 32 have in their opposed faces intermeshing ratchet or one-way teeth the walls in the throats of which are inclined so that a forced reverse movement of the part 31 yieldingly releases the opposite part 32 automatically, moving the lever 34 toward inoperative position. Another clutch lever 35 quite similar to the clutch lever 34 is connected with the clutch member 22 for the purpose of shifting the same. To facilitate connection of the clutch lever 34 with the collar 32ª I provide a two part bearing 36 of ordinary construction, as will be understood from Fig. 3. Similarly I provide another bearing 37 to connect the clutch lever 35 with the collar 35ª carried by, and practically forming a part of, the clutch member 22.

The clutch member 20, together with the pinion 19, being loose upon the line shaft 16 as above described, and the clutch member 31, together with the sprocket pinion 30, being also loose upon said line shaft, it is obvious that the train of gearing comprising the gear 12, shaft 10, pinion 11, gear 9, sprocket wheel 13, and sprocket chain 29 can have no operative connection with the line shaft 16 except when the clutch member 22 is in engagement with the clutch member 20, or when the clutch member 32 engages the clutch member 31.

When the clutch member 22 engages the clutch member 20, which result is accomplished by shifting the clutch lever 35, motion is transmitted from the line shaft 16 through the pinion 19, gear 12, shaft 10, pinion 11, gear 9, and shaft 7 to the drum 6. The load is thus raised, the direction of rotation of the line shaft 16 being contraclockwise, according to Fig. 3. If, however, the clutch member 22 is out of engagement with the clutch member 20, and the brake band 21 is loose relatively to the clutch member 20, and the clutch member 32 be now brought into engagement with the clutch member 31, the drum, under impulse of the load hanging from it, may turn the shaft 7, gear 9, pinion 11, shaft 10, sprocket wheel 13, sprocket chain 29, and sprocket pinion 30, the direction of rotation of the sprocket pinion 30 and clutch member 31 being contraclockwise, according to Fig. 3, and further having the same direction of rotation as the line shaft 16. The clutch member 31 because of its locking engagement with the clutch member 32 is unable to travel any faster than the clutch member 32, and hence the drum 6 under impulse of the weight hanging from it is unable to descend at a rate of speed faster than is commensurate with the speed of rotation of the line shaft 16.

The operation of my device is as follows: I will suppose first that the several clutch members are disconnected, and that the brake 21 is out of active engagement with the clutch member 20. The line shaft 16, turning continuously in a contraclockwise direction, according to Figs. 3 and 4, now has no effect upon any of the gear members except the clutch members 22 and 32 which are rotating continuously. The load or spout is now resting upon the ground, or in its lowermost position. The operator in order to raise the load grasps the hand lever 35 and shifts it to the left, according to Fig. 2. This causes the clutch member 22 to engage the loose clutch member 20 so that this loose clutch member now turns with the line shaft. Motion is therefore transmitted through pinion 19, gear 12, shaft 10, pinion 11, gear 9, and shaft 7 to the drum 6 which turns in a contraclockwise direction, according to Fig. 4, and the load is thus raised. While the sprocket wheel 13, sprocket chain 29, sprocket pinion 30, and clutch member 31 are in motion, this motion is idle, owing to the fact that the clutch member 31 is loose upon the line shaft, and for the time being disconnected from the clutch member 32. The load being hoisted to the desired altitude, the operator shifts the lever 35 to the right, according to Fig. 2, thus disconnecting the clutch member 22 from the clutch member 20. At the same instant the operator, by aid of the brake lever 24, applies the brake band 21 to the clutch member 20. This locks the latter, and thus prevents the drum 6 from turning backward under the influence of the load which now hangs from it. If the operator desires the load to be sustained for any length of time he now swings the lever 25 back, according to Fig. 1, and thus throws the dog 27 into engagement with the gear 9. This dog now automatically prevents the gear 9 and drum 6 from turning, and the operator therefore shifts the lever 24 into such position as to release the brake band 21 from the clutch member 20. Suppose now that the load is to be lowered. For this purpose the operator shifts the lever 25 back into its original position, and so disconnects the dog 27 from the gear 9. At the same instant he shifts the lever 24, and thus applies the friction brake. The load now begins to descend at a rate permitted by the slipping of the clutch member 20 relatively to the brake band 21. The descent of the load being started, the operator by shifting the clutch lever 34

brings the clutch member 32 into engagement with the clutch member 31. The brake is now released. This being done the tendency of the clutch member 31 is to turn more rapidly than the line shaft 16. Since, however, the clutch members 31 and 32 are in engagement, the clutch member 31 is prevented from overrunning or turning more rapidly than the line shaft. The rapidity of descent of the load is therefore limited by the speed of rotation of the line shaft 16, and as the latter turns the load is allowed to descend at the same rate of speed as if the gearing were being driven by the line shaft 16. That is to say while the load in descending now acts as the motive power, the positive rotation of the line shaft 16, by limiting the rate of descent of the load, prevents the rapid descent of the load. As the load nears the ground or the lower limit of its travel, the operator may again apply the brake with any desired degree of pressure. By so doing he may check the descent of the load, and cause the latter to be deposited gently in its lowermost position. When this occurs the clutch member 32 simply disengages itself from the clutch member 31, there being no shock to any part of the mechanism owing to the fact that the teeth of each clutch member slip idly over those of the other clutch member. It will thus be seen that while the descent of the load may to any desired degree be controlled by the operation of the brake lever 24, if the operator should lose control of the brake lever the descent of the load can be limited to such extent that the speed of descent can never exceed a predetermined ratio relatively to the speed of rotation of the line shaft. It will also be understood that while several units are employed in connection with the same line shaft, descent of a load associated with one of the units, by tending to turn the line shaft 16, practically conserves the power imparted to this shaft by the prime mover. The descent of one load therefore may assist the ascent of another load located at a different point along the line shaft. Because of this the device is economical in saving the power required for operating the spouts.

What I claim is:—

1. The combination of a drum for raising and lowering a load, gearing connected with said drum, a revoluble shaft adapted to turn in a single direction, means for connecting said shaft to said gearing whereby to turn said drum in one direction upon the turning of the shaft to raise said load, means for freeing said gearing from said shaft whereby to admit said load to turn said drum and gearing in a reverse direction and independently of said shaft, and mechanism associated with said gearing and said shaft for connecting said gearing in a different relation to said shaft, said mechanism having positive connection with said shaft in a reverse direction whereby said shaft is adapted to hold the gearing and drum from racing in a reverse direction, and having yielding connection in a forward direction whereby to admit of the stopping of the mechanism without stopping the rotation of said shaft.

2. The combination of a drum for raising and lowering a load, a train of gearing connected with said drum, a line shaft adapted to be driven continuously in one direction, means controllable by the operator for connecting the line shaft to a member of the train of gearing and for disconnecting the same therefrom, means controllable by the operator for connecting the line shaft to a second member of the train of gearing and disconnecting the same therefrom, said second member of the train of gearing having yieldable connection to the line shaft in a reverse direction whereby to admit of the slackening and the stopping of the connected gearing during the rotation of the line shaft.

3. In a hoisting device, a drum, a line shaft adapted for continuous rotation at a predetermined speed in one direction, gear members extending from said shaft to said drum, means for connecting said gear members to said shaft and said drum whereby to rotate the drum to raise a load, means for disconnecting said gear members from the line shaft whereby to release the drum for reverse rotation under the weight of the load to lower the same, other gear members between said shaft and the drum connecting the drum in reverse order to the shaft and having unyielding connection in one direction of rotation whereby to prevent the racing of the drum with respect to said shaft and having yielding connection in the other direction whereby said drum may be slackened and stopped with respect to said continuously rotating shaft, and means separate from said gear members for controlling the reverse rotation of said drum when freed from said line shaft.

4. The combination of a revoluble drum adapted to be turned in either direction, a revoluble driving shaft adapted for rotation continuously in one direction, gearing connecting said drum to said driving shaft whereby to turn said drum in one direction, means for disconnecting said gear members from said shaft whereby to free said drum for rotation in a reverse direction, means associated with said gearing whereby to connect the same to said shaft whereby to drive the drum in a reverse direction, said means having unyielding connection with said drum in one direction of rotation whereby to prevent the racing of the drum with respect to said shaft and having yield-

ing connection with said shaft in an opposite direction whereby to admit of the slackening of the speed of rotation of the drum with respect to the speed of rotation of the driving shaft.

5. The combination of a revoluble drum free to turn in two directions, a revoluble driving shaft adapted to turn continuously in a single direction, gearing connected in operative relation to said drum and including a plurality of revoluble members mounted loosely upon said shaft and so arranged as to turn in opposite directions relatively to each other, means for locking one of said revoluble members to said shaft in order to turn said drum in one direction to raise a load, means for temporarily preventing the descent of said load after it is raised, and one-way clutch mechanism for connecting the other of said revoluble members to said shaft in order to limit the speed of descent of said load.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANK HAYES.

Witnesses:
ROBT. B. NYE,
CHAS. GRAY.