C. S. BOWMAN.

HOIST.

APPLICATION FILED MAY 7, 1918.

1,307,954.

Patented June 24, 1919.

4 SHEETS—SHEET 1.

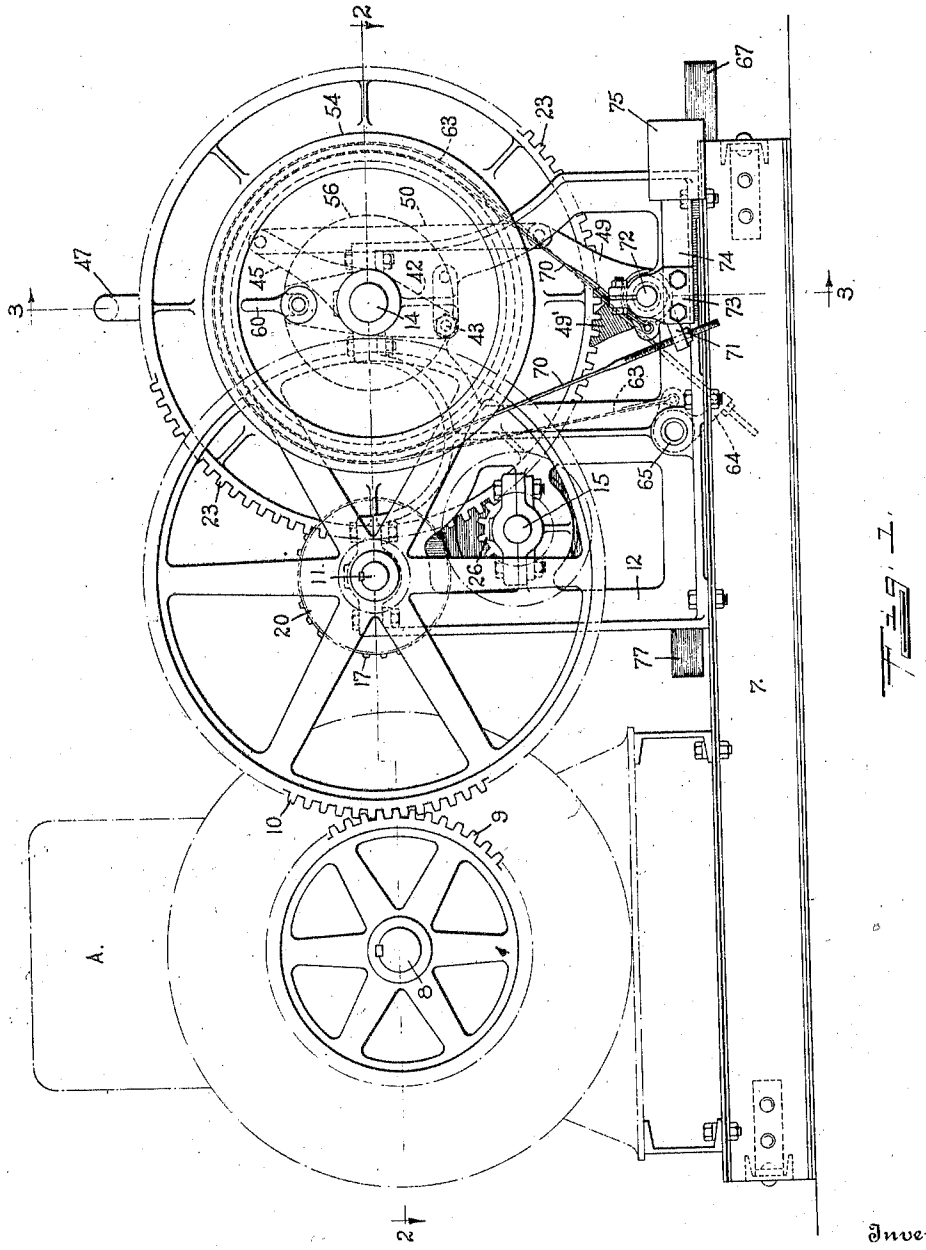


Fig. 1.

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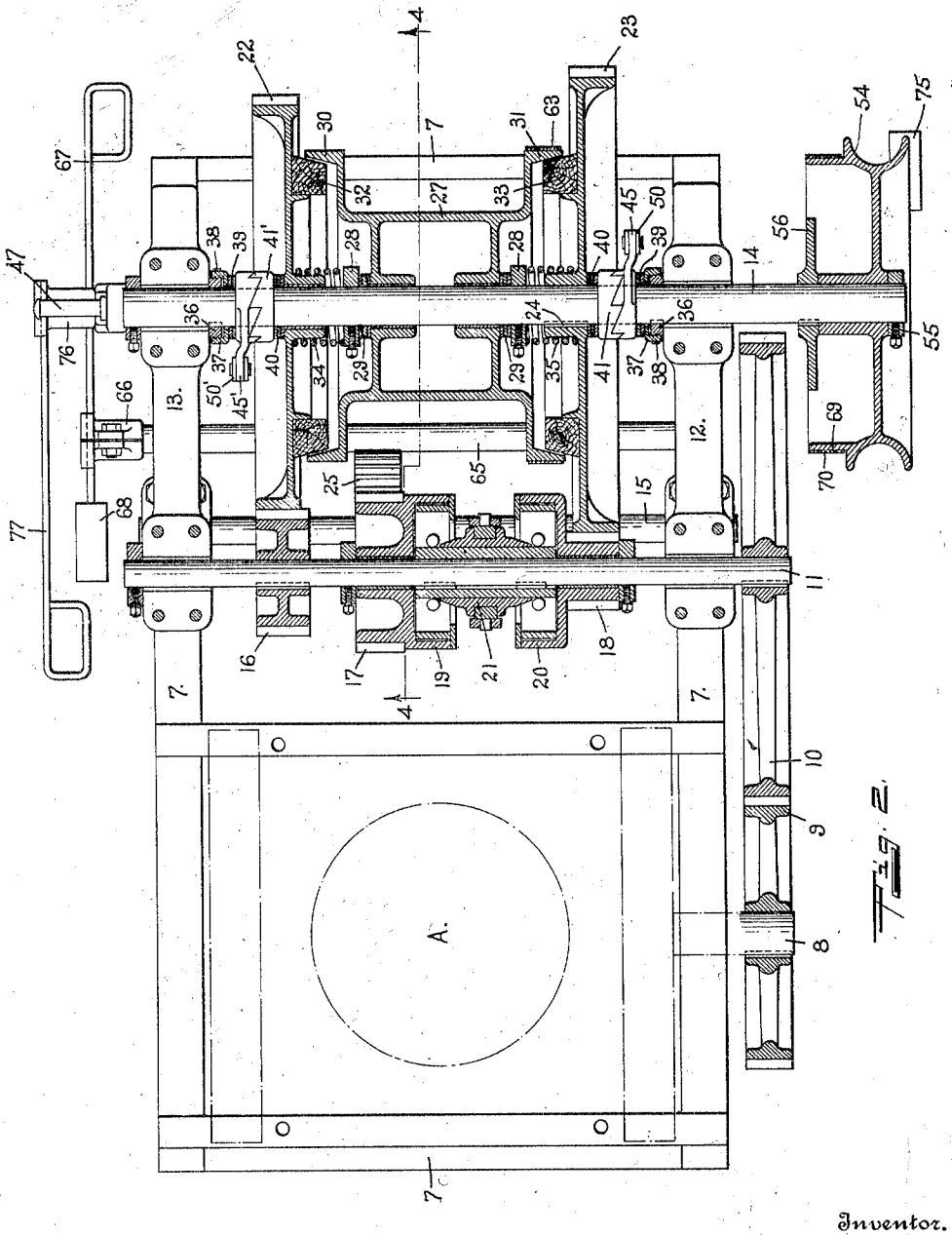


Fig. 2.

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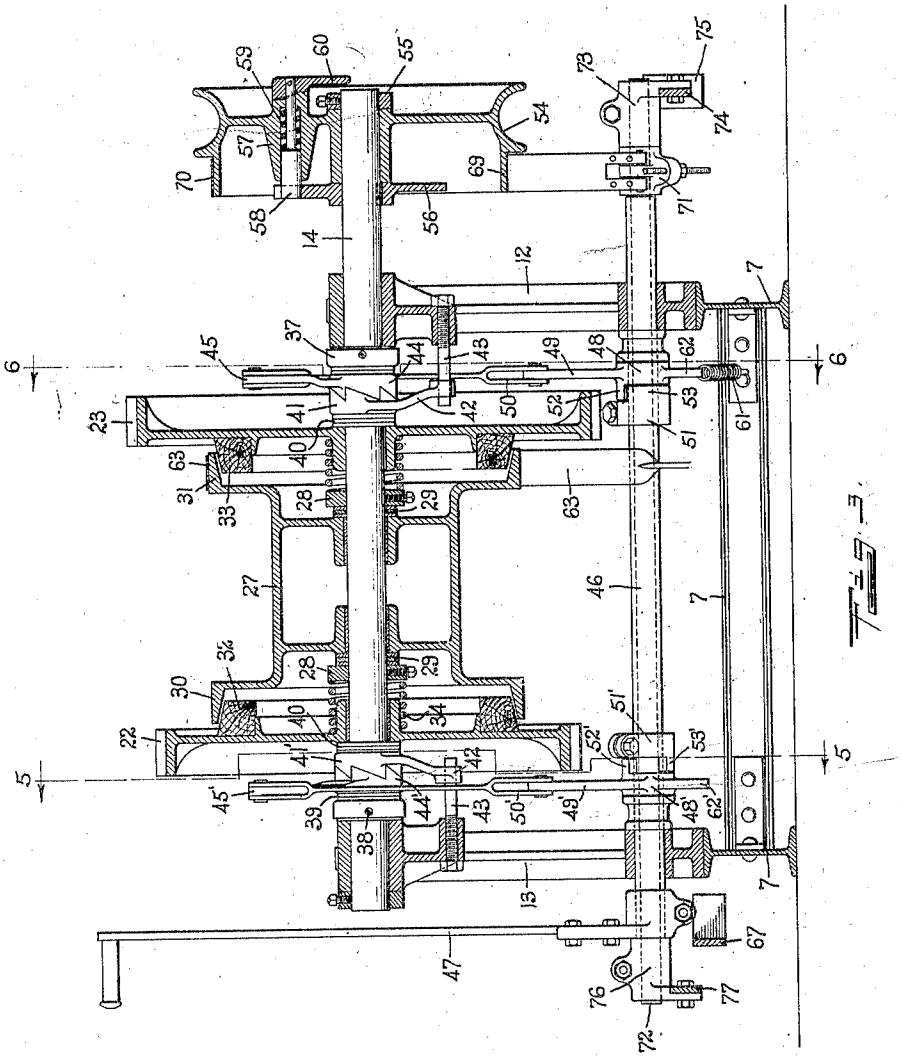


Fig. 3.

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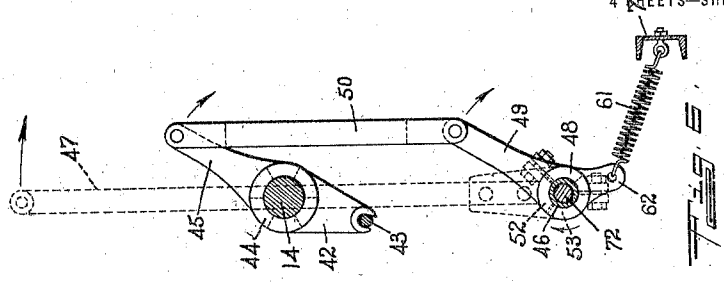


FIG. 3.

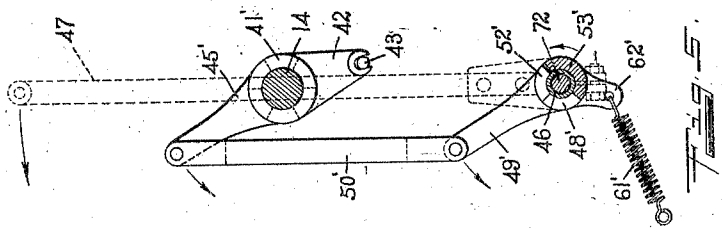


FIG. 5.

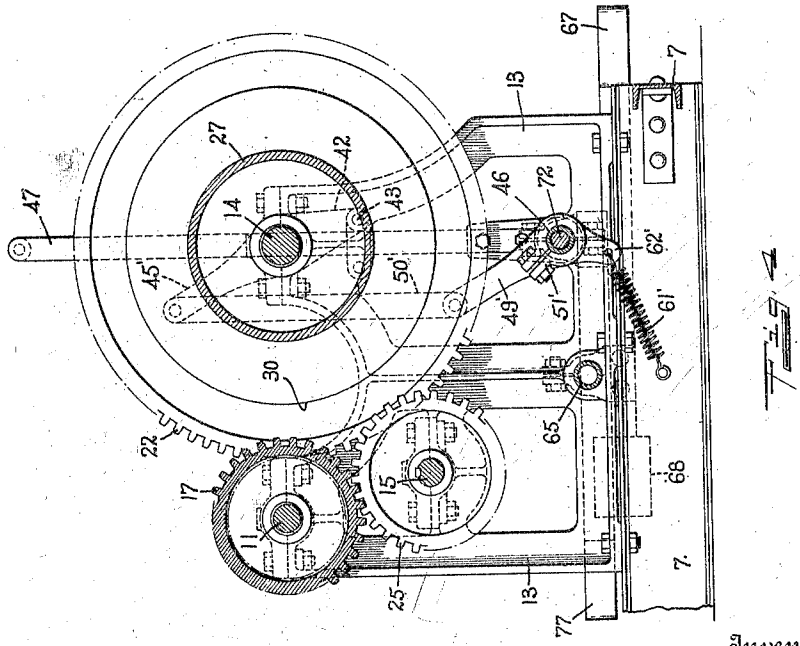


FIG. 4.

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UNITED STATES PATENT OFFICE.

CYRUS S. BOWMAN, OF OMAHA, NEBRASKA.

HOIST.

1,307,954. Specification of Letters Patent. Patented June 24, 1919.

Application filed May 7, 1918. Serial No. 233,173.

To all whom it may concern:

Be it known that I, CYRUS S. BOWMAN, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Hoists, of which the following is a specification.

My invention relates to engine or power-driven hoisting apparatus. It is the object of my invention to provide a simple and efficient apparatus of this type, having a cable-drum and a rope-sheave mounted on the same shaft, and actuating means for operating the drum and sheave either jointly or independently, said actuating means being adapted to drive the drum and sheave in either normal or reverse direction, and to drive the drum in normal direction at two different speeds. Further objects of my invention will appear hereinafter.

In the accompanying drawings Figure 1 is a front view of a hoisting mechanism embodying my invention, Fig. 2 is a horizontal section thereof on the plane of the line 2—2 of Fig. 1, Fig. 3 is a vertical section on the line 3—3 of Fig. 1, Fig. 4 is a vertical section on the line 4—4 of Fig. 2, and Figs. 5 and 6 are detail front views of the drum-clutch control devices, partly in section on the respective lines 5—5 and 6—6 of Fig. 3.

In the construction illustrated, I provide a base-frame 7 on which is mounted near one end a suitable engine A having a shaft 8 carrying a drive-gear 9. Said gear 9 meshes with and drives a gear 10 which is secured on the hoist drive-shaft 11. Said shaft 11 extends horizontally through the front and rear side-frames 12 and 13, being suitably journaled therein, and said side-frames being mounted on opposite sides of the base-frame 7 in the vertical and parallel positions shown. The drum-shaft 14 is disposed parallel with the drive-shaft 11, and is similarly journaled in the side-frames 12 and 13. The reverse-shaft 15 is journaled in the side-frames below the drive-shaft 11 and extending parallel therewith. On the shaft 11, intermediate the side-frames, there is disposed a pinion 16 which is keyed to the shaft, and pinions 17 and 18 which are revolubly mounted thereon. The pinions 17 and 18 are formed integrally with annular clutch-members 19 and 20, respectively. Between said clutch-members there is mounted on the shaft a double friction-clutch device having a sleeve 21 which may be moved longitudinally of the shaft by means of a suitable lever, to thereby operatively connect one or the other of the annular clutch-members to the shaft, or at an intermediate position to leave both of the clutch-members free to revolve independently of the shaft. Any suitable clutch-mechanism of the type indicated may be employed, and the detailed structure thereof need not be described herein.

The pinion 16 is in constant mesh with a gear 22 which is mounted revolubly and slidably on the shaft 14, the position of the gear longitudinally of the shaft being controlled as hereinafter explained. The pinion 18 is in constant mesh with a gear 23 which is of larger diameter than the gear 22, and is mounted on the shaft 14 so as to be slidable axially thereof, but is connected with the shaft by a spline or loose key 24, so that the shaft may be driven by said gear. The pinion 17 meshes with a gear 25 secured on the reverse-shaft 15, and a second pinion 26 on said shaft 15 meshes with the gear 23. It will be seen that, by the described gearing, the gear 23 and shaft 14 will be driven in one direction when the clutch 21 is operated to connect the shaft 11 and clutch-member 20, and that said gear 23 and drum-shaft will be driven in the opposite or reverse direction when the clutch is operated to connect the drive-shaft 11 and clutch-member 19. It will also be seen that, as the pinion 16 is larger than the pinion 18, and the gear 22 is smaller than the gear 23, said gear 22 will be driven at a greater speed than the gear 23, but always in a normal or forward direction.

The cable-drum 27 is mounted revolubly on the shaft 14 between the gears 22 and 23, there being collars 28 secured to the shaft adjacent to the ends of the drum, and loose thrust-washers 29 being interposed between said collars 28 and the drum-ends, as shown in Figs. 2 and 3, so that while the drum may revolve freely upon the shaft, relative axial movement of the drum and shaft is prevented. At the ends of the drum, and formed integrally therewith, there are annular flanges 31 and 30 of which the inner surfaces are trunco-conical and adapted for engagement by wooden clutch-cones 33 and 32 carried, respectively, by the gears 23 and 22. Springs 34 and 35, disposed around the shaft between the collars 28 and the gears 22 and 23, normally press said gears away from the drum, so that the clutch-cones 32

and 33 are held out of engagement with the drum-flanges 30 and 31. For causing engagement of said clutch-cones and drum-flanges, the gears 22 and 23 are moved toward the drum by means of controlling devices disposed on the shaft 14 between the gears and the inner ends of the bearings for said shaft in the side-frames 12 and 13.

On the shaft adjoining said bearings, there are secured peripherally threaded collars 36, on which are screwed cup-shaped take-up collars 37, the latter being secured in adjusted positions by means of set-screws 38. Loose thrust-washers 39 are disposed on the shaft adjoining said take-up collars, and similar thrust-washers 40 are disposed on the shaft adjoining the outer ends of the hubs of the gears 22 and 23. Adjoining the thrust-washers 40, collars 41—41′ are disposed slidably upon the shaft, the inner ends of said collars being plane-surfaced and the outer ends thereof having ratchet-like teeth formed thereon. From said toothed collars 41—41′ arms 42 extend downwardly, as shown in Figs. 3, 5 and 6, the ends of said arms being forked and straddling pins 43 carried by the side-frames 12 and 13, to thereby prevent rotation of the collars, while permitting axial movements thereof. Collars 44—44′ are disposed on the shaft between the collars 41—41′ and the outer thrust-washers 39, the outer ends of said collars 44—44′ being plane-surfaced, and the inner ends thereof being toothed to conform with the toothed ends of the collars 41—41′. Arms 45—45′, formed integrally with the collars 44—44′, normally extend diagonally upward therefrom, said arms being at opposite sides of the vertical plane of the shaft axis. The inclination of the teeth on the contacting ends of the pairs of collars 41—44 and 41′—44′ are such that by pivotal movement of the collars 44—44′ about the shaft axis, resulting from downward movement of the arms 45—45′, the collars 41—41′ are moved axially to press the gears 22—23 toward the drum.

A tubular rocking-shaft 46 is mounted pivotally in the side-frames 12—13 beneath and parallel with the drum-shaft 14; a handle or control-lever 47 is secured to the rear end of said shaft 46, and normally extends vertically therefrom. On the intermediate portion of said rocking-shaft 46, collars 48—48′ are loosely mounted, said collars having integral arms 49—49′ which extend, respectively, in the same vertical planes as, and substantially parallel to, the arms 45—45′. The pairs of arms 45—49 and 45′—49′ are connected to each other by vertically extending bars 50—50′ having forked end-portions which straddle the ends of the arms and are pivotally connected thereto. The arms are held normally in the raised positions shown, by means of springs 61—61′ attached to short arms 62—62′ on the collars 48—48′, and connected with the frame as shown. Adjacent to the inner ends of the collars 48—48′, collars 51—51′ are secured to the shaft 46, said collars being kerfed at one side and secured to the shaft by clamping thereon. Lugs 52—53 and 52′—53′ are provided on the adjoining ends of the pairs of collars 48—51 and 48′—51′, said lugs overlapping axially, as shown in Fig. 3, and the circumferential extent thereof being such that a clearance-space of ninety degrees or more is left between the ends of each pair. The collars 51—51′ are so arranged upon the shaft that when the control-lever 47 is in its normal vertical position the lug 52 is adjacent to one end of the lug 53, while the lug 52′ adjoins the opposite end of the lug 53′. Thus, viewing the parts as in Figs. 5 and 6, movement of the control-lever and rocking-shaft in a clockwise direction is communicated through the lugs 53—52 to the arm 49, resulting in a similar movement of the arm 45 and collar 44, while the arms 49′ and 45′ remain in normal position. Similarly, movement of the control-lever and rocking-shaft from normal position in a counter-clockwise direction, as indicated in Fig. 5, results in downward movement of the arms 49′ and 45′, while the parts controlling clutching movement of the low-speed gear 23 remain in normal position. Thus, by movement of the control-lever 47 in opposite directions from its normal vertical or neutral position, the drum 27 may be caused to be actuated by either the high-speed gear 22 or the low-speed gear 23. The latter gear is driven in either normal or reverse direction, accordingly as the clutch 21 is thrown to connect the pinion 18 or the pinion 17 with the drive-shaft 11, or if the clutch 21 is in intermediate or neutral position the gear 23 will not be driven.

Rotation of the gear 23 is communicated by the spline 24 to the shaft 14, and said shaft is employed optionally to drive a rope-sheave 54, as follows: The shaft is extended forwardly from the bearing in the side-frame 12, and has secured on the end thereof a collar 55. A plate 56 is keyed to the shaft intermediate the end thereof and the side-frame, and the sheave 54 is mounted revolubly upon the shaft between said plate 56 and the collar 55. The web of the sheave has a lug 57 extending from the side thereof and bored to receive slidably a pin 58 which is adapted to extend into a notch in the plate 56, as shown in Fig. 3, to thereby connect the plate and sheave so that the latter will be driven by the shaft. The pin 58 is pressed rearwardly by a spring 59 disposed around a reduced portion thereof, and said reduced portion of the pin is extended through the

front end of the lug 57 and provided with a handle 60. Said handle and the end of the lug have inclined engaging surfaces, such that by turning the handle to a position opposite that shown in Fig. 3, the pin will be pulled forwardly and thereby withdrawn from and held out of engagement with the plate 56, thus releasing the sheave so that the shaft will not drive the same.

A brake-band 63 extends about the flange 31 of the drum 27, and the ends of said brake-band are connected with cranks 64 on a tubular shaft 65 extending horizontally through the lower portions of the side-frames 12 and 13. The rear end of the shaft, projecting beyond the side-frame 13, has a head 66 clamped thereon, and to said head is secured a horizontally extending foot-lever 67. Said foot-lever is provided at one end with a counterweight 68 which is arranged so that the tendency thereof is to so turn the shaft as to loosen the brake-band 63. A brake-flange 69 is formed integrally with the sheave 54, and a brake-band 70 is disposed around said flange. The ends of said brake-band 70 are connected with cranks 71 secured on a shaft 72 which extends through and fits revolubly within the tubular rocking-shaft 46. At the front end of said shaft 72 a head 73 is clamped thereon, said head having a horizontally extending arm 74 carrying a counterweight 75 of which the tendency is to so rotate the shaft as to loosen the brake-band 70. At the rear end of the shaft 72 a head 76 is clamped thereon, and to said head there is secured a foot-lever 77 which may be depressed to tighten the sheave-brake.

From the foregoing the operation of the mechanism as a whole will be apparent. Wear of the drum-clutches and the controlling devices therefor may be compensated, within reasonable limits, by adjustments of the take-up collars 37 on the collars 36. Through the driving connections made by the clutch 21, the low-speed gear 23 may be driven in either normal or reverse direction, thereby similarly actuating the shaft 14. The drum 27 may be driven at low speed in either normal or reverse direction, through the clutch-connection established by the cone 23 and flange 31, when the gear 23 is moved toward the drum by the described controlling means therefor. The sheave 54 may also be driven at low speed in either normal or reverse direction, or, by turning the handle 60 to withdraw the connecting-pin 58 from the plate 56, said sheave may be freed, so as to idle upon the shaft. As the driving connection of the high-speed gear 22 is not made through the clutch 21, said gear 22 may drive the drum at high speed, and the sheave 54 simultaneously be driven in either normal or reverse direction, the actuation thereof being controlled by the clutch 21. The separate brakes for the drum and sheave enable the stopping thereof to be controlled either independently or jointly, according to the driving connections established by the clutch mechanism.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a hoisting apparatus, a rotary drum shaft, a rotary drum loose on the said shaft, driving members located at opposite sides of the drum and provided with means for engaging the same to rotate the said drum, one of the driving members being slidably interlocked with the drum shaft, a power shaft, a gear fixed to the power shaft and meshing with the other driving member for rotating the same in a forward direction, and direct and indirect gearing having means for connecting the slidably interlocked driving member with the power shaft for rotating the same in either direction.

2. In a hoisting apparatus, a rotary drum shaft, a rotary drum loose on the said shaft, driving members located at opposite sides of the drum and provided with means for engaging the same to rotate the said drum, one of the driving members being slidably interlocked with the drum shaft, a power shaft, a gear fixed to the power shaft and meshing with the other driving member for rotating the same in a forward direction, and direct and indirect gearing having means for connecting the slidably interlocked driving member with the power shaft for rotating the same in either direction, said means comprising a clutch operating between the said direct and indirect gearing for clutching either of the same to the power shaft.

3. In a hoisting apparatus, a drum-shaft, a frame in which said shaft is journaled, a drum mounted revolubly on the shaft and provided with clutch-members at the ends thereof, driving members mounted on the shaft adjoining the ends of the drum, means for engaging said driving members with the drum clutch-members alternatively, means for connecting one of said driving members with the shaft to actuate the latter, clutch-controlled means for actuating the latter driving member in either normal or reverse direction, and means for actuating the other driving member continuously in a normal direction at a speed different from that of the reversible driving member.

4. In a hoisting apparatus, a frame, a shaft revolubly mounted therein, a drum revolubly mounted on said shaft, a sheave revolubly mounted on said shaft, releasable means for effecting a driving connection between the shaft and sheave, a driving member mounted revolubly upon the shaft adjoining one end of the drum, a driving member mounted non-rotatively upon the shaft

adjoining the other end of the drum, means for clutch-connecting said driving members with the drum alternatively, means for actuating the first driving member continuously in a normal direction, clutch-controlled means for actuating the second driving member in either normal or reverse direction at a speed different from that of the first driving member, and separate braking means for the drum and sheave.

5. In a hoisting apparatus, a frame, a shaft journaled therein, a drum mounted revolubly on the shaft and having clutch-flanges at the ends thereof, means for preventing longitudinal movement of the drum relatively to the shaft, revoluble driving members slidably mounted on the shaft adjoining the ends of the drum and having clutch-cones adapted for engaging the clutch-flanges thereon, means for actuating one of said driving members at a greater speed than the other, means normally pressing said driving members away from the drum, and controlling means for pressing said members alternatively toward the drum to operatively engage the respective clutch-cones and clutch-flanges; said controlling means comprising a rocking-shaft, members actuated respectively by movement of said rocking-shaft in opposite directions from a normal position, a pair of collars disposed on the shaft adjoining each driving member, each pair of collars having adjoining axially inclined faces, means for preventing rotation of one collar of each pair, and means connecting the other collars to the respective rocking-shaft-actuated members.

6. In a hoisting apparatus, a rotary drum shaft, a rotary drum loose on the said shaft, driving members located at opposite sides of the drum and provided with means for engaging the same to rotate the said drum, one of the driving members being slidably interlocked with the drum shaft, a power shaft, a gear fixed to the power shaft and meshing with the other driving member for rotating the same in a forward direction, a pair of gears loosely mounted on the power shaft, one of the gears meshing directly with the slidably interlocked driving member, an intermediate shaft, gears on the intermediate shaft for connecting the other of the said pair of gears with the slidably interlocked driving member, and a clutch mounted on the power shaft and operating between the said pair of gears for clutching either of the same to the power shaft whereby the slidably interlocked driving member may be rotated in either direction.

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