Feb. 26, 1924. 1,484,763

J. DITSON ET AL.

HOIST

Filed Aug. 12, 1921 2 Sheets-Sheet 1

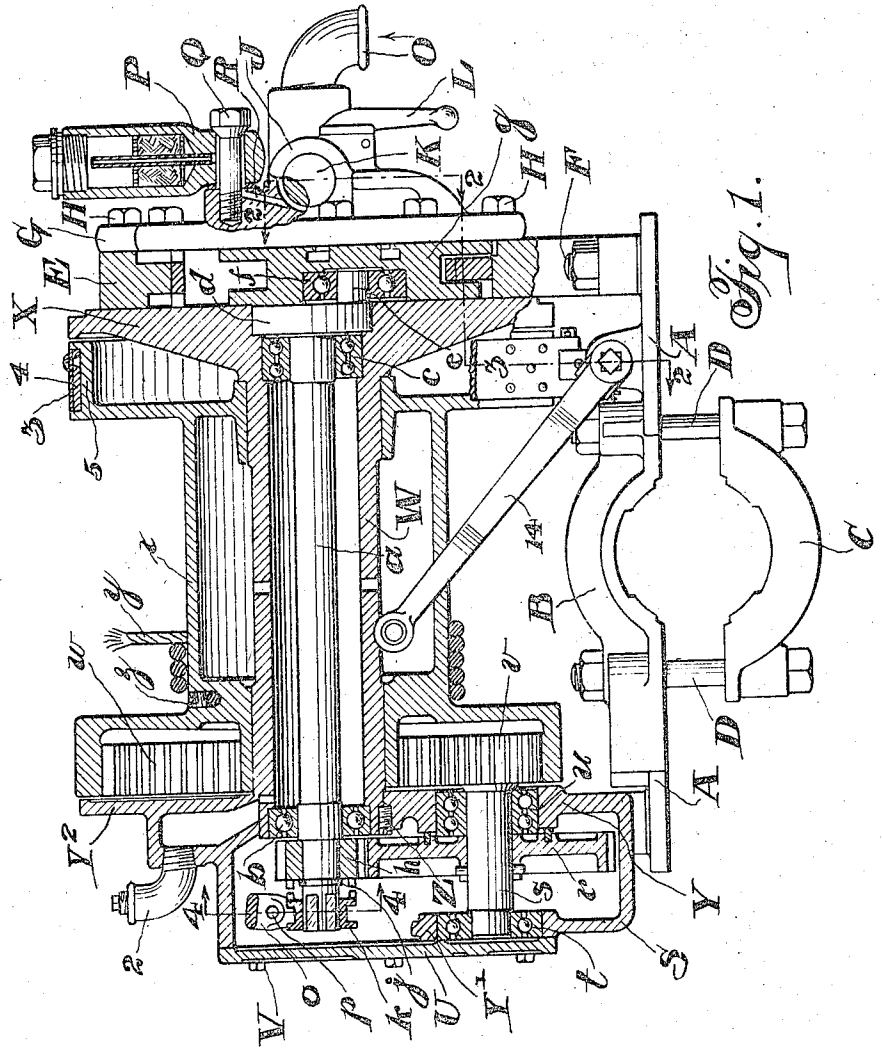

Fig. 1.

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2 Sheets-Sheet 2

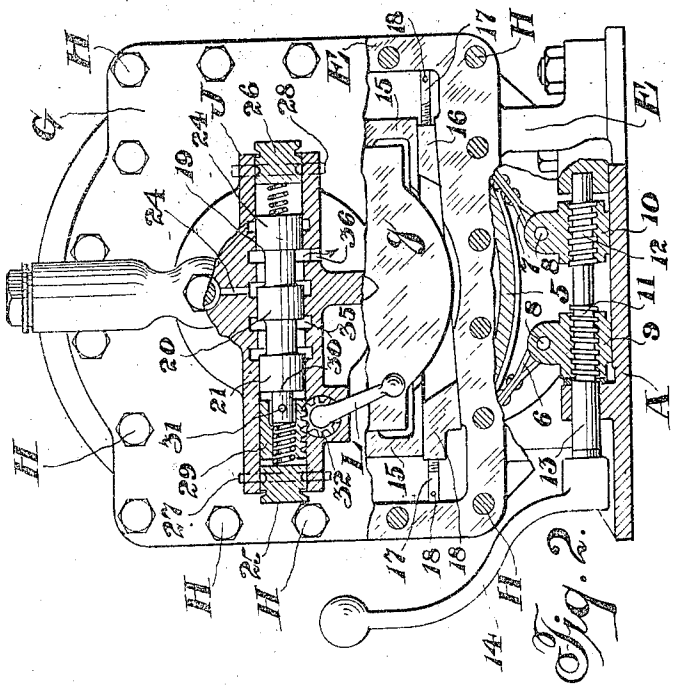

Fig. 2.

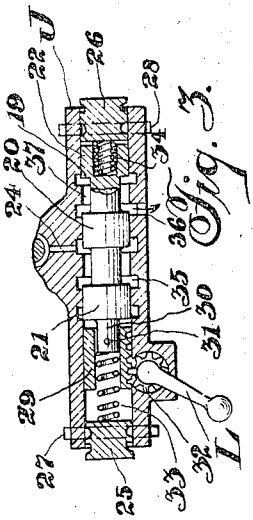

Fig. 3.

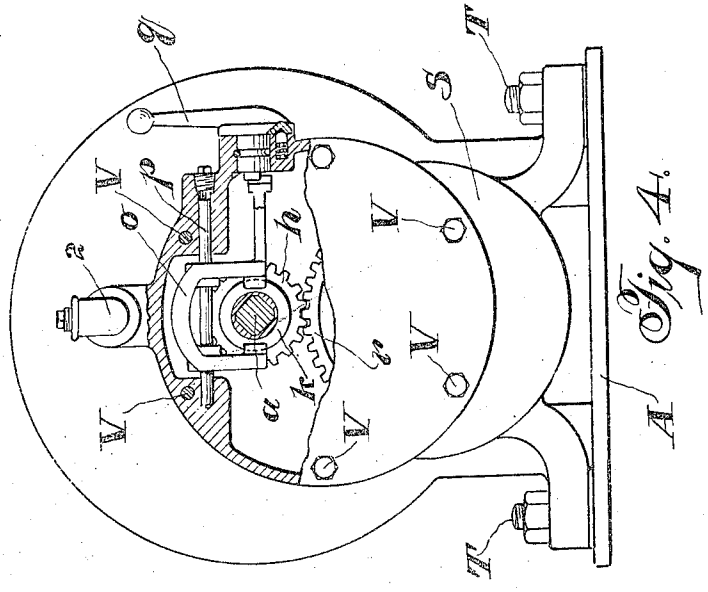

Fig. 4.

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Patented Feb. 26, 1924. 1,484,763

UNITED STATES PATENT OFFICE.

JESSE DITSON AND ARTHUR E. PETERS, OF LITTLETON, COLORADO, ASSIGNORS TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

HOIST.

Application filed August 12, 1921. Serial No. 491,712.

To all whom it may concern:

Be it known that we, JESSE DITSON and ARTHUR E. PETERS, citizens of the United States, and residents of Littleton, county of Arapahoe, and State of Colorado, have invented a certain Hoist, of which the following is a specification accompanied by drawings.

This invention relates to hoists but more especially to hoists adapted to be driven by a reversible fluid pressure motor.

Such hoists are largely used for a variety of purposes in mines and elsewhere for hauling, hoisting, loading and many other useful purposes, and a so called "square piston" or Dake motor has been found particularly adapted to a hoist of this character.

The objects of this invention are to improve upon the construction of such a hoist, simplify the parts, cheapen the cost of manufacture, increase the efficiency and produce a hoist of small or moderate size which is self contained, more compact, lighter, stronger and more rugged than heretofore, so that it will even better withstand rough usage and even neglect under practically all conditions without being rendered unfit for service.

To all of these ends the invention is shown in one of its preferred forms in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional elevation of a hoist embodying the invention.

Figure 2 is an end elevation of the motor end of the hoist, partly in transverse section on the line 2—2 of Figure 1 looking in the direction of the arrows,

Figure 3 is a detail longitudinal sectional view of the motor valve in a different position from that shown in Figure 2, and

Figure 4 is an end elevation of the opposite end of the hoist partly in transverse section on the line 4—4 of Figure 1.

In the drawings we have shown a single drum hoist although it is to be understood that any features of our invention are equally applicable to double drum hoists. We have likewise shown only so much of the operative parts of a fluid pressure motor for the hoist as will serve to illustrate the invention, since the internal construction of the motor of the Dake type forms no part of our present invention.

Referring to the drawings, the base plate A is provided with a clamping member B in the form of a saddle clamp adapted to grip a column or cross bar and clamp the hoist to such support in cooperation with the lower clamping member or cross bar saddle clamp C in the usual manner. The base plate A and the cooperating saddle clamp C are each provided with a plurality of bolt holes for receiving the clamping bolts D.

In accordance with our invention the cylinder casing E of the motor is constructed in the form of a flat rectangular frame open in front and behind at both faces and secured in upright position at one end of the base plate A by means of the bolts F. Such an open cylinder construction has the advantage that those internal surfaces requiring machining may be more readily reached and a separate cylinder casing enables the remaining parts of the machine to be more readily assembled and disassembled.

The outer head G of the cylinder casing is secured thereto by the cap bolts H and this head carries the valve chest J having the distributing valve K which is also a reversing valve controlled by the valve lever L. Motive fluid is supplied through the inlet O and a suitable oiling device P may be mounted on the head as by means of the bolt Q. The oil is carried into the parts of the machine through the passage R.

A gear box S forming a frame having the inner wall Y and the outer wall Y′ is secured to the opposite end of the base plate A by the bolts T, and is provided with a cover U having the securing bolts V. The motor cylinder E and the gear box S form upright supporting frames for the hoists. The gear box S is formed with a protective outwardly extending flange Y^2, which extends in close proximity to the open face of the drum *x* and forms a closure for the internal gear *w*.

A center bearing W in the form of a shell is provided with a tubular body portion, and a head or flange X at one end, preferably integral therewith as shown, which constitutes the inner head of the cylinder casing E secured thereto and against the inner face of the cylinder casing by means of the bolts H, and this flange also closes one end of the drum *x*. The opposite end of the tubular body portion of the center bearing W is supported in and secured to the inner wall Y of the gear box S by means of a suitable fas-

tening device shown as the center bearing retaining screw Z so that the end frames of the machine are securely held together.

A driving shaft *a* extending longitudinally through the center bearing and supported in the roller bearings *b* and *c*, is provided with the crank disc *d* at one end having a crank pin *e*, carried in the roller bearing *f* in the piston *g* of the motor. The opposite end of the driving shaft is provided with a driving pinion *h* loose on the shaft and held from longitudinal movement by the ring *j*. A slidable but non-rotatable clutch member *k* at the end of the shaft is adapted to connect and disconnect the driving pinion *h* from the shaft. A yoke *o* pivoted on the pin *p* engages the clutch member *k* and is provided with an operating handle *q* outside of the gear box for rocking the yoke on its pivot and clutching and unclutching the driving pinion *h*.

The driving pinion meshes with an intermediate gear *r* pinned to a spindle *s* supported in the ball bearings *t* and *u* in the outer and inner walls of the gear box respectively, which spindle carries a pinion *v* meshing with the internal gear *w* upon the winding drum *x* mounted to rotate upon the center bearing W between the center bearing flange X and the guard flange Y^2. The rope or cable *y* is connected at one end of the drum *x* as by means of the screw *z*. A suitable oiling device 2 may be mounted on the gear box adapted to supply oil for the gearing and adjacent parts of the hoist. In this instance, the winding drum *x* bears on the center bearing W at its ends, so that all the wear does not come on the center bearing at one point.

A brake comprising a brake band 3 having a brake lining 4 encircles the flange 5 of the drum and is connected at its looped ends 6 and 7 to pins 8 on the traveling nuts 9 and 10 adapted to travel on the reversely screw threaded portions 11 and 12 of the rock shaft 13 having the operating handle 14. As the handle 14 is rocked, the nuts 9 and 10 approach each other or recede, thus tightening or loosening the brake. As the brake band exerts a braking effect on one of the drum flanges and the internal gear is formed in the opposite flange, the balance of the hoist is obtained, and wear on the center bearing is more evenly distributed.

In Figure 2 the cylinder casing head G is shown broken away to indicate the lower portion of the piston *g* sliding in the piston frame 15 carried on the piston frame gib 16 which is adjustable by means of the adjusting screws 17. These adjusting screws 17 having holes 18 for the insertion of pins, are preferably wholly within the cylinder casing, so that once the adjustment is made, the pins will not be disturbed.

It is to be understood that a Dake motor of the type illustrated is in effect a double reciprocating engine and the piston *g* and piston frame 15 operate one within the other, and transmit a rotary motion to the driving shaft *a*. The outer piston frame 15 has a lateral reciprocating motion and the inner piston *g* has an up and down reciprocating movement.

These movements are so arranged and timed in a motor of this type, that both the piston and piston frame work in unison, transmitting uniform motion to the driving shaft.

The distribution of motive fluid in the motor to start, stop and reverse, is controlled by a suitable slide valve 19 having the center head 20 and the end heads 21 and 22. This valve operates in the valve chest J and controls the ports and passages leading to and from the motor, only one such passage 24 being shown for illustrative purposes. The ends of the valve chest are closed by the plugs 25 and 26 held in position by the pins 27 and 28. A rack 29 in the form of a hollow sleeve is loosely pinned to one reduced end 30 of the valve by the pin 31 and engages a pinion 32 to which the operating handle L is connected.

A spring 33 is adapted to be compressed between the plug 25 and the valve, and another spring 34 is adapted to be compressed between the opposite end of the valve and the plug 26, as the valve is moved longitudinally in one direction or the other. The loose connection between the valve rack 29 and the valve prevents breakage at this point in the operation of the apparatus.

Without describing the entire course of the motive fluid through the interior of the motor, it will be sufficient to say, that motive fluid enters the inlet O and passes to the port 35 of the valve chest with the valve 19 in the position indicated in Figure 2, then passes to the motor and the motive fluid is exhausted from the motor through the passage 24 and thence out through the exhaust port 36, so that the motor will be driven in a given direction. With the valve 19 in the reverse position indicated in Figure 3, the motive fluid is supplied to the port 35 in the valve chest, and will pass through the central passage 24 in the casing and exhaust through the port 37 in the valve chest and thence out through the exhaust port 36 so that the motor will transmit rotary motion to the driving shaft *a* in the opposite direction.

In the operation of the hoist, let it be assumed that the motor is driving the driving shaft *a* in a given direction, and that the driving pinion *h* is clutched to the driving shaft. Rotation will be imparted by the driving shaft to the intermediate gear *r* and the intermediate pinion *v* which in turn drives the internal gear *w* on the hoist-

ing drum *x*. Reversal of the controlling valve 19, which reverses the rotary motion transmitted to the driving shaft *a* will likewise reverse the rotation of the drums *x*.

We claim:

1. In a hoist, the combination of a base plate, a gear box forming a frame mounted on the base plate and having inner and outer integral walls, an open outer side and a closed inner side, a center bearing having one end supported in the inner wall of the gear box, a drum concentric with the center bearing, a driving shaft supported in the center bearing, a pinion on the driving shaft, a clutch for actuating the pinion, a gear shaft having bearings in the inner and outer walls of the gear box, a gear on said gear shaft adapted to mesh with said pinion, an internal gear on the drum, a second gear on the the gear shaft meshing with said internal gear, a cover for said gear box whereby the gears, pinion and clutch are entirely enclosed, and a guard flange on the body of the gear box extending in close proximity to the open face of the drum and forming a closure for the internal gear.

2. A hoist comprising a base plate, a fluid pressure motor, including as a part thereof a flat rectangular cylinder casing open at both faces and secured in upright position at one end of the base plate, thereby forming an end frame for the hoist, an outer head for said cylinder casing, a gear box having integral inner and outer walls and a guard flange, said gear box being secured in position at the opposite end of the base plate and forming an opposite frame for the hoist, an end cover for said gear box, a tubular center bearing supported at one end in the inner wall of the gear box and having an integral flange at the opposite end secured against the inner face of the cylinder casing forming an inner head for said casing, fastening means for rigidly securing the end of the center bearing to the inner wall of the gear box, a drum rotatable upon the center bearing, between the said center bearing flange and the said guard flange, a driving shaft extending longitudinally through the center bearing and connected to be rotated by the motor, gearing within the gear box connected to the drum for rotating the drum, said gearing including a spindle supported in bearings in the inner and outer walls of the gear box, and a gear on said spindle engaging a pinion on the driving shaft and a manually controlled clutch within the gear box for connecting and disconnecting the driving shaft and gearing.

3. A hoist comprising a base plate, a fluid pressure motor, including as a part thereof a cylinder casing in the form of a flat rectangular frame open at both faces and secured in upright position at one end of the base plate, an outer head for said cylinder casing, a gear box having integral inner and outer walls and a guard flange, said gear box forming a frame and being secured in upright position at the opposite end of the base plate, an end cover for said gear box, a center bearing in the form of a shell having a tubular body portion and a flange at one end constituting the inner head of the said cylinder casing, means for securing the cylinder casing, outer head and center bearing flange together, the opposite end of the tubular body portion of the center bearing being supported in the inner wall of the gear box, fastening means for rigidly securing the end of the center bearing to the inner wall of the gear box, a driving shaft connected to be rotated by said fluid pressure motor, a winding drum mounted to rotate upon said center bearing between the said center bearing flange and the said guard flange, and gearing connecting said driving shaft with the drum.

In testimony whereof we have signed this specification.

JESSE DITSON.
ARTHUR E. PETERS.