

UNITED STATES PATENT OFFICE

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HOIST

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This invention relates to hoists and has for its object to provide a self contained hoist adapted to be driven by an elastic fluid motor capable of being easily controlled.

5 The present invention consists of a hoist having a drum driven by a rotary motor, wherein the drum forms the casing of the rotary motor. The rotary engine may be arranged to drive the drum through a train
10 of gearing.

A manner of carrying out the invention is illustrated by the accompanying drawing of which Figure 1 is a general sectional elevation of the hoist, and Figure 2 is a sectional
15 view through line A²—A² of Figure 1.

In this drawing *a* is a cable drum arranged as the casing of a coaxial rotary compressed air or steam motor.

20 The engine has a central cylindrical valve *b* around which rotates a cylinder carrier *c* having radial cylinders *c*10 in which reciprocate pistons *c*2.

The cylinder carrier *c* is provided with cylindrical extensions *c*1 and *c*21 extending from each side of the cylinders *c*10 along the axis of the carrier *c* into the opposite sides of the drum and is supported therein by ball
25 bearings *c*4 and *c*5. Plain bearings may be substituted for the ball bearings *c*4 and *c*5.

30 One end of the drum *a* has a cylindrical extension *a*5 arranged to rotate in a bearing *a*6 in the main standard *s* of the hoist, while the other end of the drum *a* has a cylindrical extension *a*7 arranged to rotate on a cylindrical
35 extension *s*1 formed in or supported by the standard at the other side of the hoist.

The outer end of the central cylindrical valve *b* extends through the cylindrical extension *a*5 at one end of the drum *a* to a reversing wheel *w* provided with a spring controlled stop *w*1 adapted to engage recesses on a plate *w*2 fixed on the end of the drum extension *a*5 extending through its bearing
40 *a*6, so as to hold the valve relatively to the drum in either of two positions according to the desired direction of rotation of the hoist drum.

45 The gudgeon pins *d* of the pistons extend through longitudinal slots *c*7 in the walls of the cylinders and carry at their ends roller

bearings *d*4 of which the outer races form rollers *e* running in lateral grooves formed in rings *f* rotating freely on ball bearings *f*1 carried by eccentrics, *g*, *g*1 formed on the inner sides of the ends *a*1 and *a*2 of the hoist drum *a* and through which the valve extends freely at one side *a*2 of the drum, while at the other side of the drum a power shaft extension *c*1 of the cylinder carrier *c* extends freely through the adjacent eccentric
55 *g* to the pinion *h* of spur gearing of the drum. In the carrier *c* is formed a ball bearing *b*1 supporting the inner end of the valve *b* independently of the cylindrical valve faces.

To facilitate the reversing action, the radial cylinders *c*10 are arranged at 120° apart in the same transverse plane and the valve provided with oppositely disposed ports *b*2 adapted to register during the rotation of the drum with radial ports *c*11 formed in the ends of cylinders *c*10, the oppositely disposed ports of the valve being arranged to open into longitudinal passages extending through the valve to inlet and outlet fluid passages *b*3 and *b*4. The outlet fluid passage *b*4 opens directly into the outer end of the valve *b*, while the inlet passage *b*3 opens laterally to an annular air or steam supply passage *k* formed in the standard *s* of the hoist.

The pinion *h* at the end of the power shaft extension *c*1 of the carrier *c* is arranged to mesh with a spur wheel *h*1 on a shaft *h*2 running in bearings *h*3 *h*4 in the standard *s* of the hoist and carrying a pinion *h*5. The pinion *h*5 of the shaft *h*2 is arranged to gear with a spur wheel *h*6 on a second shaft *h*7 also running in bearings *h*8, *h*9 in the hoist standard and carrying a pinion *h*10 adapted to mesh with an internally toothed wheel *a*10 provided in the side *a*1 of the hoist drum *a*. The pinion *h*5 is arranged to slide on the shaft *h*2 in or out of gear with the wheel *h*6 by means of a lever *l* of which the shaft *l*1 extends through the casing of the engine and has at its lower end a crank *l*2 of which the pin *l*3 extends into an annular groove *l*4 provided in an extension of the pinion *h*5.

The gearing may be provided with any suitable disengaging mechanism and may be of the variable ratio type.

In operation it will be seen that to stop the motor after either hoisting or lowering, it is only necessary to grasp the slowly rotating reversing wheel *w* which also operates as a

control wheel when the necessary relative angular movement of the valve or the phase of the valve will be changed. If the control wheel *w* is released when the motor stops after the hoisting operation, lowering can be effected by the gravity of the load alone under control of a brake *m* operated by means of a shaft *m1* and lever *m2* or by holding the control wheel *W* till the appropriate valve position is attained the motor will reverse, and lowering can be effected by the reverse running of the motor under control of the brake.

It will thus be seen that if the control wheel *W* is stopped the hoist stops, for the ports *b6* in the drum sleeve *a5* overtake those of the valve *b* and so cut off the supply of motive fluid from passage *k*. Further when the momentum of the drum is so high that the drum sleeve *a5* during control moves into a position corresponding to reverse, the drum *a* will then rotate in the opposite direction, and if the control wheel *W* is still held, the drum sleeve *a5* will again cut off the supply of motive fluid to the cylinders.

What we claim and desire to secure by Letters Patent is:—

1. A hoist comprising a drum, gearing for driving the drum, a rotary cylinder carrier driving the gearing, cylinders on the carrier containing reciprocating pistons, means for reciprocating the pistons during the rotation of the carrier, a normally fixed power supply valve supplying power to the cylinders and on which the cylinder carrier rotates, bearings on which the drum rotates and standards carrying the bearings, the drum having coaxial extensions at both ends supported by the bearings in the standards, while the cylinder carrier has an axial extension extending through one end of the drum and forming the first member of the gearing driving the drum.

2. A hoist comprising a drum, gearing for driving the drum, a rotary cylinder driving the gearing, cylinders on the carrier containing reciprocating pistons, means for reciprocating the pistons during the rotation of the carrier, a normally fixed power supply valve supplying power to the cylinders and on which the cylinder carrier rotates, ball bearings on which the drum rotates, inner and outer races for the bearings, and two standards carrying the bearings, the drum having an axial extension at one end which carries the inner race of one of the bearings, the outer race of the said bearing being carried in one of the standards, a concentric extension at the other end of the drum carrying the outer race of the corresponding ball bearing, the inner race of the said bearing being carried by the other standard, while the cylinder carrier has

an axial extension extending through one end of the drum and the latter standard and forming the first member of the gearing of the drum.

3. A hoist comprising a drum, gearing for driving the drum, a rotary cylinder carrier driving the gearing, cylinders on the carriers containing reciprocating pistons, means for reciprocating the pistons during the rotation of the carrier, a normally fixed power supply valve supplying power to the cylinders and on which the cylinder carrier rotates, bearings on which the drum rotates and standards carrying the bearings, means for controlling the supply of power and for reversing the direction of rotation of the carrier, a control and reversing wheel for operating said means, the drum having coaxial extensions at both ends supported by the bearings in the standards, the cylinder carrier having an axial extension extending through one end of the drum and forming the first member of the gearing driving the drum, and the supply valve having an extension projecting through the standard at the other end of the drum, the control and reversing wheel being fixed on such extension.

4. A hoist comprising a drum, a train of toothed gearing arranged to drive the drum, an internally toothed wheel driving the drum, a rotary cylinder carrier driving the gearing, cylinders on the carrier containing reciprocating pistons, means for reciprocating the pistons during the rotation of the carrier, a normally fixed power supplying valve supplying power to the cylinders and on which the cylinder carrier rotates, bearings on which the drum rotates and standards carrying the bearings, the internally toothed wheel being fixed on the outside of one end of the drum and forming the last member of the train of gearing, the drum having coaxial extensions at both ends supported by the bearings in the standard, while the cylinder carrier has an axial extension extending through the end of the drum carrying the internally toothed wheel and forming the first member of the train of gearing.

5. A hoist comprising a drum, a train of toothed gearing arranged to drive the drum, an internally toothed wheel driving the drum, a brake drum, a rotary cylinder carrier driving the gearing, cylinders on the carrier containing reciprocating pistons, means for reciprocating the pistons during the rotation of the carrier, a normally fixed power supplying valve supplying power to the cylinders and on which the cylinder carrier rotates, bearings on which the drum rotates and standards carrying the bearings, the internally toothed wheel being fixed on the outside of one end of the drum and forming the last member of the train of gearing and carrying the brake on its periphery, the drum

having coaxial extensions at both ends supported by the bearings in the standard, while the cylinder carrier has an axial extension extending through the end of the drum carrying the internally toothed wheel and forming the first member of the train of gearing.

6. A hoist comprising a drum, gearing for driving the drum, a rotary cylinder carrier driving the gearing, cylinders on the carrier containing reciprocating pistons, gudgeon pins extending from the pistons, floating rings having lateral grooves into which the gudgeon pins extend, fixed eccentrics on which the floating rings rotate freely, a normally fixed power supply valve supplying power to the cylinders and on which the cylinder carrier rotates, bearings on which the drum rotates and standards carrying the bearings, the drum having coaxial extensions at both ends supported by the bearings in the standards, while the cylinder carrier has an axial extension extending through both ends of the drum and through the fixed eccentrics and one of the axial extensions forming the first member of the gearing driving the drum.

In witness whereof we affix our signatures.

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