Dec. 24, 1929. R. C. OSGOOD 1,740,704

HOISTING MECHANISM

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Fig. 1.

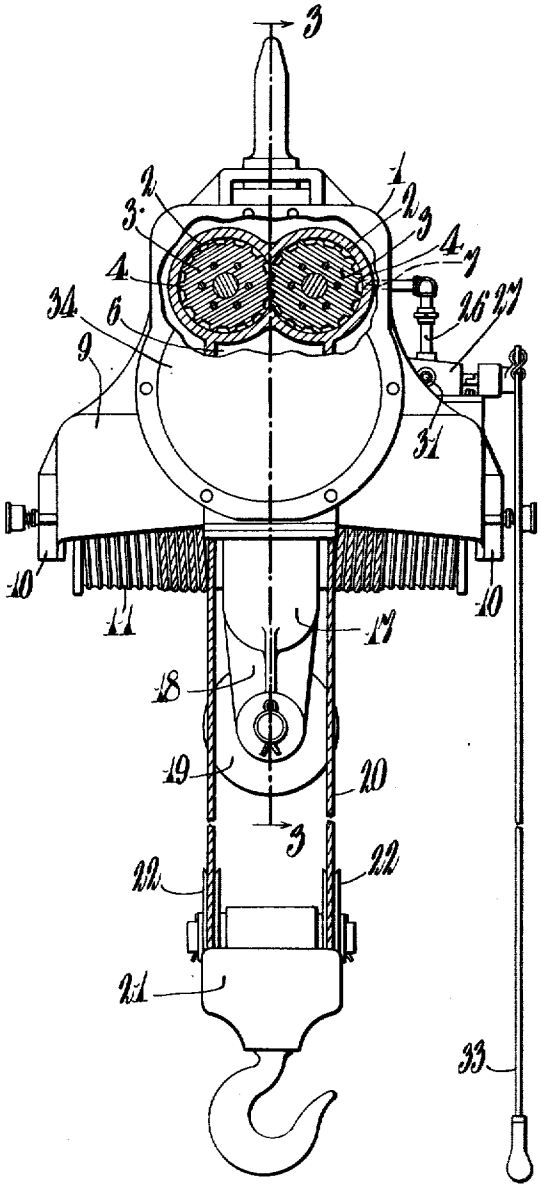
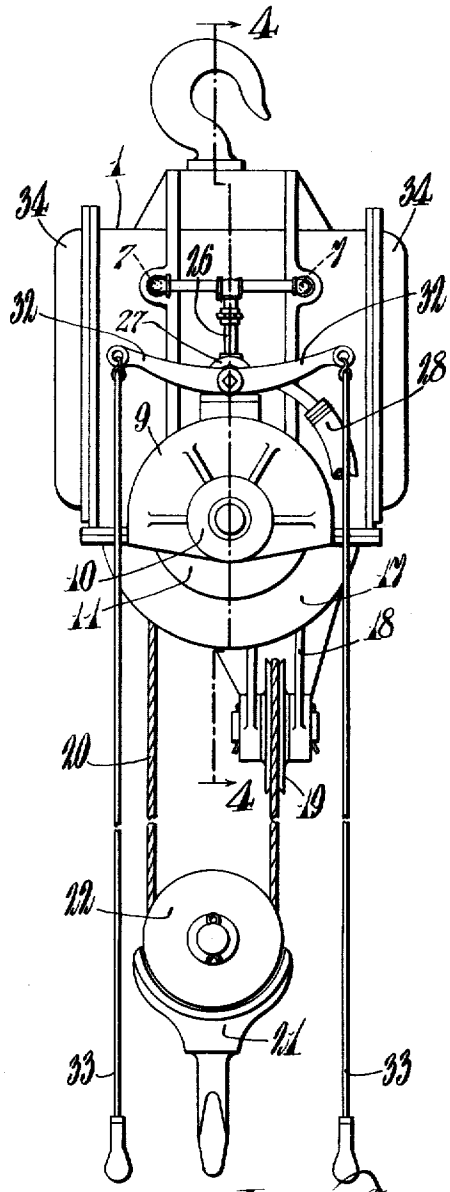


Fig. 2.



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Fig. 3.

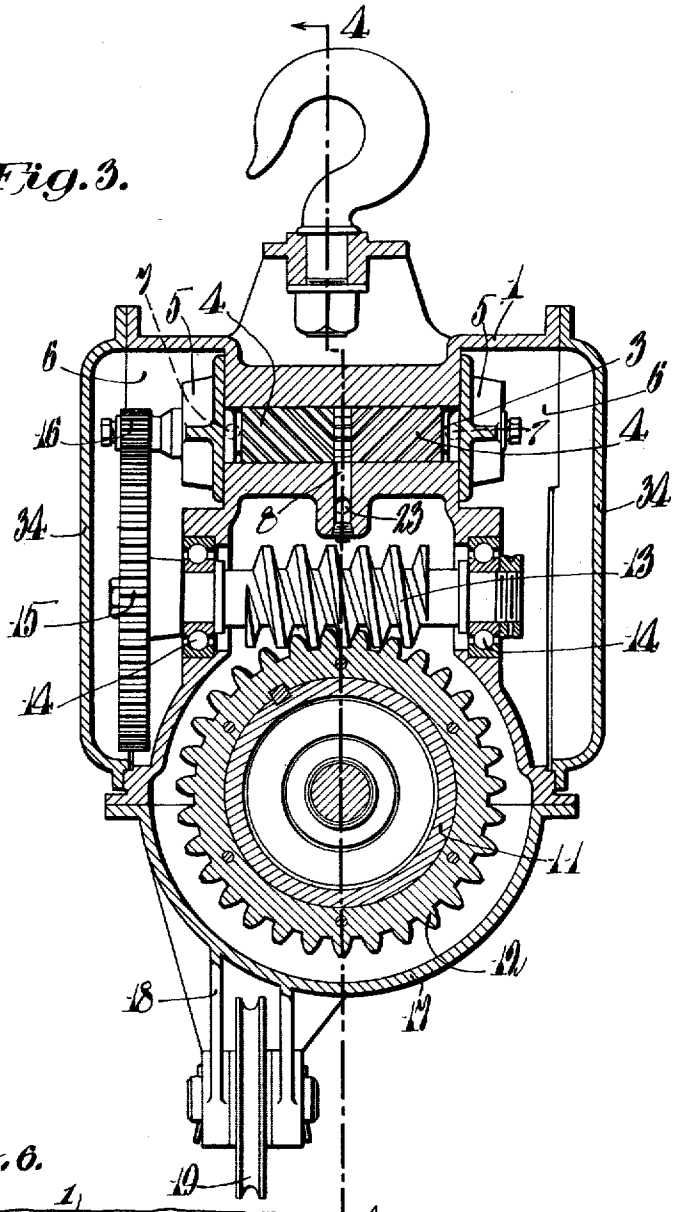
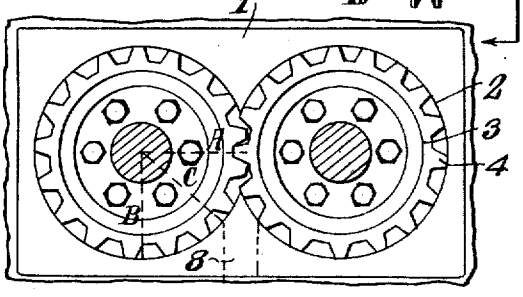


Fig. 6.



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HOISTING MECHANISM

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Fig. 4.

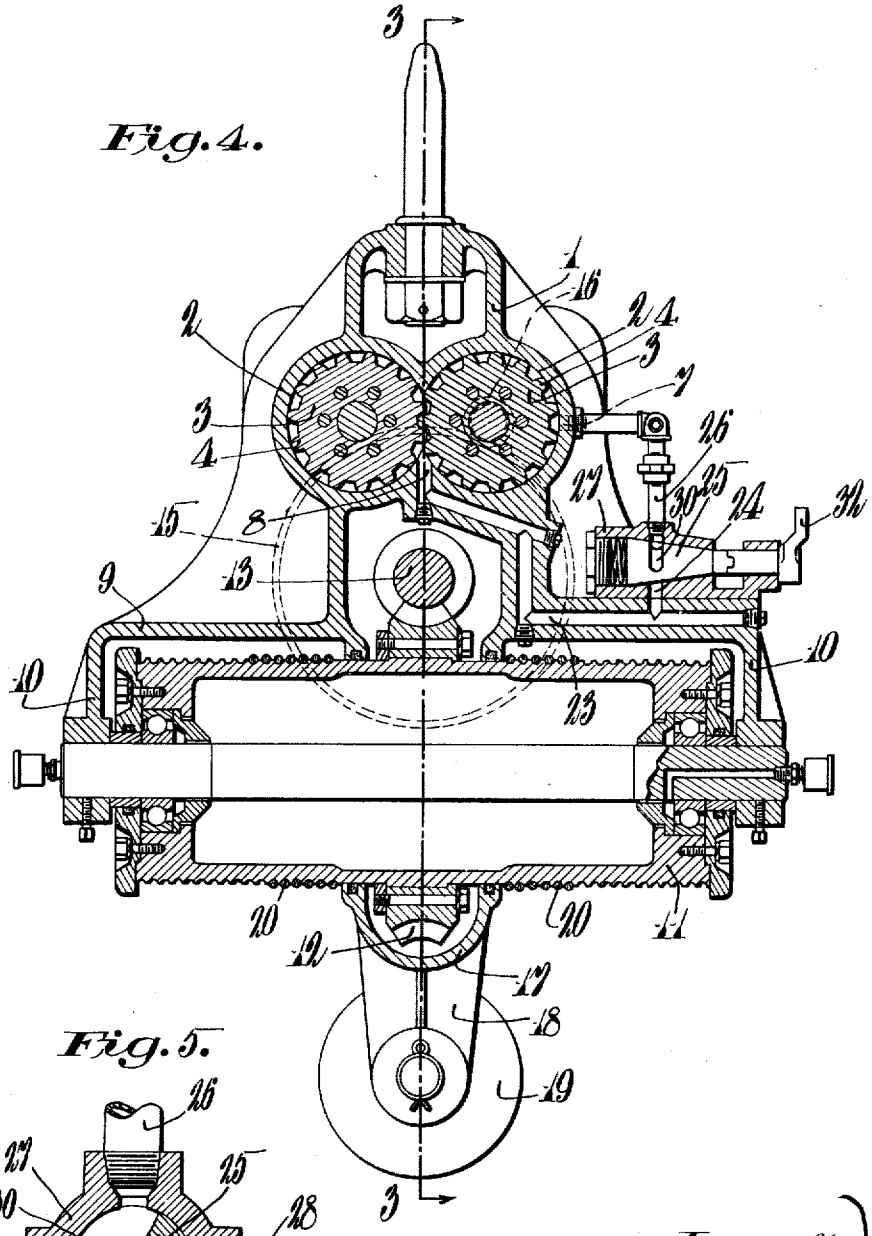
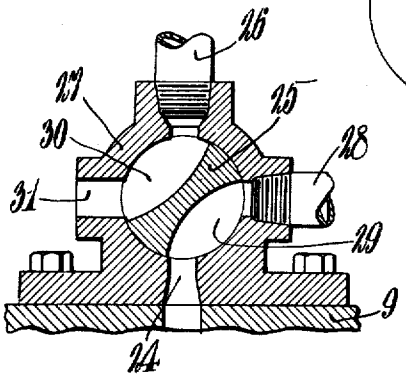


Fig. 5.



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UNITED STATES PATENT OFFICE

ROBERT C. OSGOOD, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS

HOISTING MECHANISM

Application filed January 17, 1924. Serial No. 686,908.

My invention relates to hoisting mechanisms, and more particularly to a hoist adapted for foundry use or where an object is to be vertically lifted.

It has for its object to provide an improved type of hoist. A further object is to provide an improved hoisting mechanism which is extremely compact and has relatively few elements. Another object is to provide a hoist having a pressure fluid operated motor which may be reversely rotated to drive the hoist drum in opposite directions. A further object is to provide improved means for controlling the flow of actuating fluid to said motor. Still another object is to provide improved controlling means which will automatically prevent a flow of fluid, which would ordinarily drive the motor in one direction, while allowing flow of fluid to drive the motor in another direction.

In the accompanying drawings I have shown for purposes of illustration one form which my invention may assume in practice.

In these drawings,—

Fig. 1 is a front elevation, parts being broken away to show the motor rotors in section.

Fig. 2 is a side elevation.

Fig. 3 is a vertical transverse section taken on line 3—3 of Figs. 1 and 4.

Fig. 4 is a vertical longitudinal section taken on line 4—4 of Figs. 2 and 3.

Fig. 5 is an enlarged detail of the control valve.

Fig. 6 is a diagrammatic end view of the motor with the end closure removed to show the intermeshing rotors, the arc through which the pressure fluid acts during forward operation and the arc through which compression takes place during reverse operation being indicated in dotted lines.

In my improved hoist I propose to use a pressure fluid operated motor having inlet and exhaust means and to provide suitable means whereby the motor may be operated in opposite directions by controlling a flow of actuating fluid through the exhaust or inlet means. I have shown for purposes of illustrating my invention, and as one embodiment which the same may take, a hoisting mechanism comprising a frame 1 having disposed in the upper portion thereof a plurality of overlapping cylindrical bores 2 in which intermeshing motor rotors 3 are mounted. These rotors have usual piston forming elements 4, herein in the form of spiral teeth. The rotors are journaled within end brackets 5 which are spaced from the ends of the rotors and close the bores 2. The end brackets are spaced inwardly from the outermost edge of the casing 1, thereby leaving a chamber 6 within which gear mechanism to be hereafter described is disposed. In the space between the end of the rotors and the end brackets are usual exhaust chambers with which exhaust ports 7 communicate. An inlet nozzle 8 communicates with the center of the rotors between the two sets of spiral teeth. Projecting downwardly from the rotor casing is an inverted U-shaped frame member 9 having its depending arms 10 adapted to support a rotatable drum 11. Disposed intermediate the ends of the drum 11 is a worm wheel 12 fixed thereto and having engagement with a worm 13 which has its axis disposed transversely to the axis of the drum. The worm is journaled in bearings 14 carried by the frame immediately below and preferably in line with the intermeshing axis of the two rotors, thus insuring a symmetrical arrangement of the parts and a perfectly balanced hoist. Fixed to the outer end of the worm shaft is a gear 15 having engagement with a pinion 16 fixed upon one of the rotor shafts. Disposed adjacent the lower half of the drum and adapted to surround the worm wheel is a casing 17 adapted to be held to the upper casing in any suitable manner and adapted to provide a suitable reservoir for oil. Not only is lubricating oil disposed in the casing 17, but also in the chamber 6 which is made oil-tight, as by a cover 34. Projecting downwardly from this casing 17 is a supporting member 18 within which is rotatably mounted a sheave 19. The drum has two sets of spiral grooves formed on the periphery thereof, one set to each side of the member 12. A flexible member 20 cooperates therewith and is adapted to carry a hook supporting member 21 as by a pair of sheaves 22 one being disposed

on each side of the member 21. The flexible member 20 passes around the sheaves 22 and 19, thereby securing the necessary mechanical advantage.

The particular means shown in this illustrative embodiment for controlling the direction of rotation of the motor comprises a rotatable valve 25 controlling the flow of fluid through passage means 23 and through a passage means 26. Passage means 23 is herein illustrated as a passage formed within the framework of the hoist and communicating at one end with inlet nozzle 8 (which is likewise disposed within the framework of the hoist) and at the other end with a passage 24 in the casing 27 of valve 25 (by which it is controlled). The exhaust ports 7 lead into the passage means 26 which is herein disclosed as a pipe. Passage means 26 communicates with the valve 25 at the upper side of the valve casing 27. Actuating pressure fluid is admitted through pipe 28 and, in the present position of the valve as shown in Fig. 5, flows through passage 29 formed in the valve to inlet passages 23 to nozzle 8, thereby driving the motor in its normal direction. The exhaust from the motor passes out through the end chambers and exhaust pipe 26 and passage 30 formed in the other side of the valve, and thence to the atmosphere through the port 31. Suitably connected to the valve stem are actuating arms 32 having pull ropes 33 fixed thereto. When it is desired to rotate the motor in the opposite direction and thereby lower the member 21, one of the ropes 33 will be pulled to rotate the valve approximately 90 degrees in a counterclockwise direction from that shown in Fig. 5 so that pressure fluid will now flow from the pipe 28 through the exhaust pipe 26 into the end chambers and thus cause the motor to run backwards, the actuating fluid now exhausting out through passages 8, 23 and 24. With the aid of Fig. 6 the action of the pressure fluid upon the teeth of the intermeshing rotors during forward and reverse operation will be understood. During forward operation the pressure fluid enters through the inlet nozzle 8 and fills the V-shaped pressure chambers formed between adjacent teeth, as shown in Fig. 3, adjacent the centers of the rotors. As the rotors turn, at the moment when the back edge of the apex of each V-shaped chamber reaches the line C, communication between the inlet 8 and each chamber is interrupted and from the point indicated by the line C, Fig. 6, to the point indicated by the line B, the pressure fluid acts expansively. When the position indicated by line B is reached, the ends of the tooth pockets, so to speak, open to the exhaust chambers at the opposite ends of the rotors, exhaust taking place when the ends of the tooth blades bounding a pocket run out of mesh. During the reverse operation of the motor, the pressure fluid is supplied to the chambers at the ends of the rotors and fills all of the spaces between the teeth, or tooth pockets, except those whose ends are sealed off. Were all of the pockets, whose ends are sealed off, vented to the atmosphere, there would be the same rotative force as would be the case with an ordinary spur gear type motor with teeth of the same height as the teeth of the rotors and of a length equal to the length of the rotors. As the left hand rotor in Fig. 6 turns, at the position where the apices of the tooth pockets thereon reach the point B (the rotor rotating counter-clockwise), the ends of each tooth pocket are sealed off; and from that position until the leading edge of the apex of the V-shaped tooth pocket reaches the position of the line C, there is compression. This compression brings about only a small increase in the fluid pressure and it is insufficient to counteract the driving force of the motive fluid which has previously been described. It will of course be understood that when the leading edge of the apex of a tooth pocket reaches the line C, it comes into communication with the passage 8 which is then connected to exhaust; and accordingly the fluid entrapped in the pockets and which has been in process of compression is immediately vented. The reason the motor runs backward may be summarized in this manner: The rotors turn because there is a turning moment produced by the action of inlet pressure upon an area equal substantially to the product of the height of a tooth multiplied by the length of the rotor, which turning force is greater than the opposing force which is produced by the compression between the lines B and C of the entrapped fluid.

From the above disclosure it will be obvious that I have provided a spiral tooth motor having exhaust chambers at the ends of the rotors and that actuating fluid may be caused to flow into these same chambers to actuate the rotors in the reverse direction and thereby reverse the motor. Also I have provided an extremely simple means for elevating and lowering a hoist member by utilizing a reversibly operable pressure fluid actuated motor. I have also provided an extremely simple means whereby the supply of fluid to this motor and the exhaust therefrom may be controlled without requiring any skill on the part of the operator. It will be noted that there are relatively few parts to get out of order or to cause excessive wear, it being noted that it is made possible to eliminate clutch mechanism and to minimize the gearing necessary.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in other forms

without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A driving motor comprising a casing, intermeshing spiral tooth rotor elements therein, inlet and exhaust means, said motor being so constructed that fluid admitted through the inlet may work expansively and be exhausted at substantially reduced pressure, and means for reversing said fluid flow through said motor.

2. A driving motor comprising a casing having communicating rotor chambers circular in cross section, intermeshing spiral tooth rotor elements in said chambers, means for admitting fluid to said elements, means for exhausting fluid therefrom, said motor being so constructed that fluid admitted through the inlet may work expansively in said motor and be exhausted at a substantially reduced pressure, and means for effecting a reversal of fluid flow through said motor.

3. A driving motor comprising a casing, intermeshing rotors therein each comprising portions each having mutually diverging spiral teeth, passage means communicating with said rotors adjacent their longitudinal centers, passage means communicating with the extremities of said rotors, and means permitting either of said passage means to be connected to supply and the other to exhaust.

4. A driving motor comprisng a casing, intermeshing rotors therein each comprising portions each having mutually diverging spiral teeth, passage means communicating with said rotors adjacent their longitudinal centers, passage means communicating with the extremities of said rotors, and means permitting either of said passage means to be connected to supply and the other to exhaust including a single valve controlling said passage means respectively.

5. A fluid pressure motor having a plurality of rotors with intermeshing spiral teeth, inlet means, and an exhaust chamber communicating with the peripheries of the ends of the rotors, means selectively operable to connect said inlet means with a supply of live fluid and said exhaust chamber with exhaust or vice versa, said rotors being reversely rotatable when actuating fluid is admitted to the chamber and allowed to exhaust through the inlet means.

6. A fluid pressure motor having a plurality of rotors with sets of intermeshing spiral teeth extending out from the centers of the rotors, inlet means disposed adjacent the center of said motor, exhaust chambers communicating with the peripheries of the ends of the rotors, and means for admitting actuating fluid to the chambers to reversely actuate the rotors.

In testimony whereof I affix my signature.

ROBERT C. OSGOOD.