Dec. 31, 1929. L. A. MAXSON 1,742,088

HOISTING MECHANISM

Filed Dec. 30, 1921 2 Sheets-Sheet 1

Fig. 1.

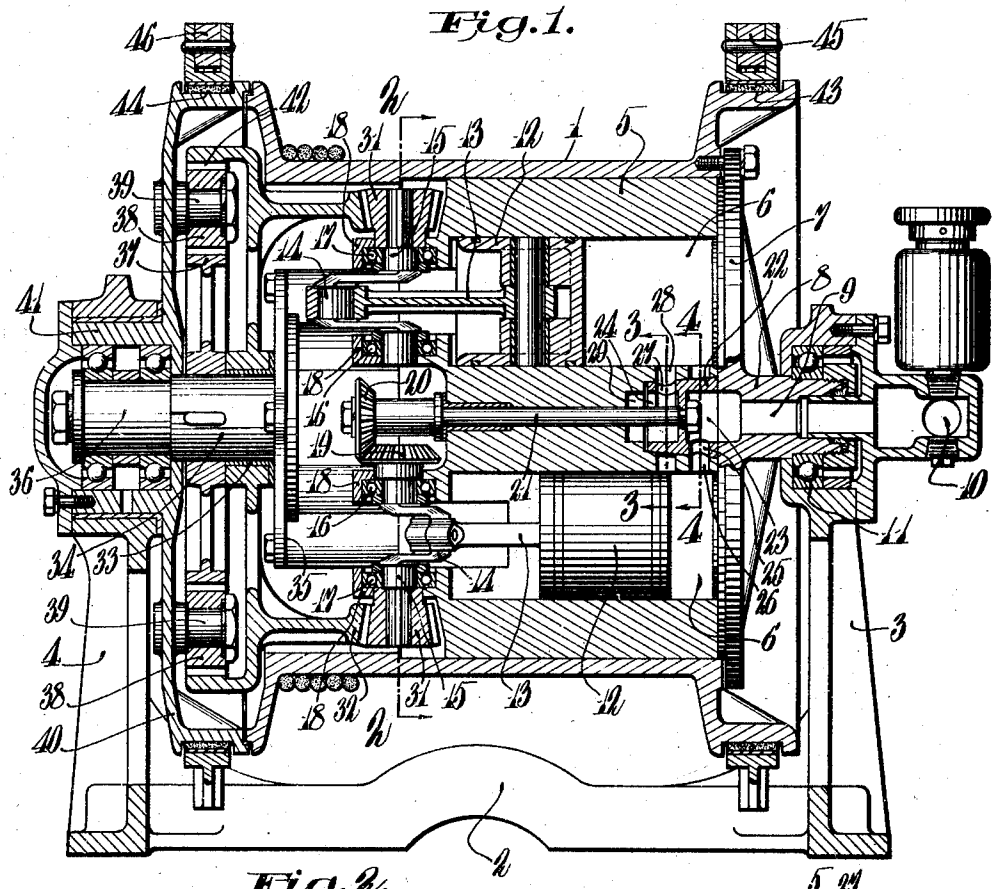


Fig. 2.

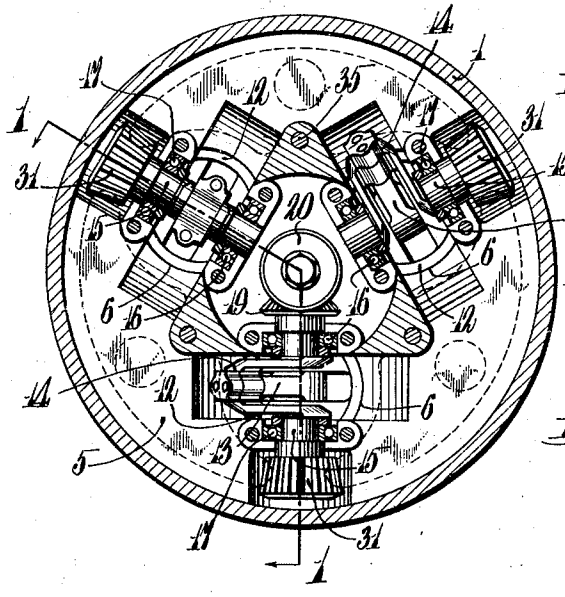


Fig. 3.

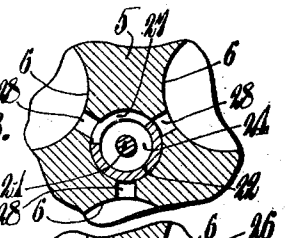
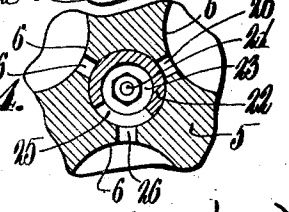


Fig. 4.



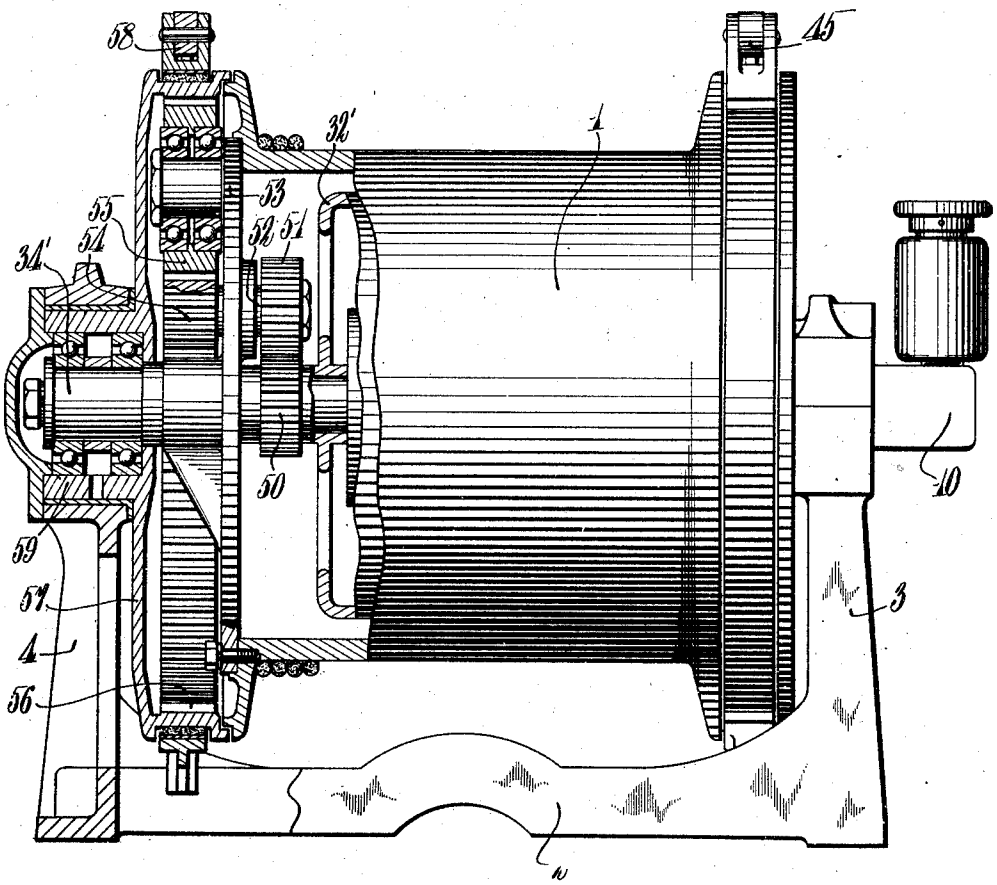
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HOISTING MECHANISM

Filed Dec. 30, 1921 2 Sheets-Sheet 2

Fig. 5.



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Patented Dec. 31, 1929

1,742,088

UNITED STATES PATENT OFFICE

LOUIS A. MAXSON, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS

HOISTING MECHANISM

Application filed December 30, 1921. Serial No. 525,982.

My invention relates to hoisting or hauling mechanisms.

An object of my invention is to provide and improved hoisting or hauling mechanism. Another object of my invention is to provide an improved portable hoisting mechanism of relatively great power, but of small compass. A further object of my invention is to provide an improved hoisting mechanism in which an expansible chamber motor of the reciprocable piston type may be employed and in which maximum piston area may be attained. Other objects and advantages of my invention will hereinafter more fully appear.

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

In these drawings,—

Fig. 1 is a view in longitudinal section on line 1—1 of Fig. 2.

Fig. 2 is a transverse section on line 2—2 of Fig. 1.

Figs. 3 and 4 are detail transverse sections on lines 3—3 and 4—4, respectively, of Fig. 1.

Fig. 5 is a view partially in elevation and partially in central vertical section showing a modified form of reduction gearing.

In the first embodiment of my invention which I have elected to describe for purposes of illustration and shown in Figs. 1 to 4, it will be noted that a drum 1 is mounted for rotation in a supporting frame 2 which comprises hangers 3 and 4, the necessary bearings being mounted in the hangers 3 and 4 as will be hereafter described. Within the drum 1 and rigidly secured thereto is a motor casing 5 in which there are arranged a plurality, herein three, of cylinders 6; these cylinders being arranged with their axes parallel to the axis of rotation of the drum. The drum at one end is closed by a head 7 which also constitutes an end closure for the cylinders 6; and the head 7 is provided with a projecting shaft member 8 having a hollow bore or passage 9 therein through which fluid is supplied from any given source by way of a connection 10. The shaft portion 8 is rotatably mounted in bearings 11 in the hanger 3.

Reciprocable within the cylinders 6 are pistons 12, which pistons are connected by connecting rods 13 to crank pins 14 of radially extending cranks 15. These cranks are mounted in suitable bearings 16 and 17 formed one-half on the housing member 5 and the other half in members 18 bolted securely to the end of the housing 5. One of the crank shafts 15 is provided with a beveled gear 19 which drives a beveled gear 20 keyed to a shaft 21 extending axially of the drum and motor casing. This shaft 21 drives a valve 22 which constitutes the distributing means for controlling the supply and exhaust of operating fluid to the cylinders 6. It will be noted that this valve is divided into two chambers 23 and 24 separated by a transverse partition. The chamber 23 receives pressure fluid from the inlet passage 9, and is adapted to supply this fluid by means of an arcuate passage 25 serially through ports 26 opening into the several cylinders 6 near their rear ends. The exhaust of fluid is controlled by the portion of the valve 22 which comprises the chamber 24, the exhaust fluid being admitted to chamber 24 through a passage 27 which serially communicates with ports 28, spaced somewhat from the ends of the cylinders 6. The left hand end of the chamber 24 opens into a chamber formed in the casing 5 and designated 29 from which exhaust is conducted to the atmosphere in any suitable manner, as by passages extending through the casing and the head 7 of the drum. Each of the crank shafts 15 is provided with a bevel gear 31, which gears mesh with a large bevel gear 32 which is journaled, as indicated at 33 upon a shaft 34, which shaft is rigidly secured as at 35 to the casing member 5 and is journaled at its outer end as at 36 within the hanger 4 inside a member hereinafter more fully described. It will be noted that as the several pistons 12 reciprocate in the cylinders 6 the gears 31 will be rotated and if the gear 32 be held stationary will rotate the casing 5 and accordingly the drum 1 upon the axis of the drum.

In assembling the device the several gears 31 are so arranged with respect to the gear 32 that the crank pins 14 are arranged at 120 degrees apart whereby a substantially con-

stant stream of power is transmitted from the three serially acting pistons 12 to cause rotation of the drum. Keyed to the shaft 34 is a pinion 37 which meshes with a series of gears 38 carried on studs 39 secured to a member 40 which is journaled in the hanger 4 between the shaft 34 and the hanger bearing surface as indicated at 41. The gear 32 is provided with an integral internal gear 42 with which the gears 38 also mesh. Suitable braking surfaces 43 and 44 are provided upon the drum 5 and upon the member 40 and suitable brakes 45 and 46 cooperate with the braking surfaces so that the drum may be braked and the member 40 held against rotation or released at will.

The mode of operation of this improved hoisting mechanism will be readily apparent from the foregoing description. Fluid being admitted under the control of a suitable throttle valve to the passage 9, will pass through the valve port 25, and through whichever port or ports 26 are open; and the pistons 12 to which the fluid pressure is admitted will travel downward in their cylinders. As this occurs the crank shaft 15 will turn over, the valve 22 will be rotated, and the motor will continue to operate in a usual manner, exhaust taking place through the ports 28, and passage 27 in the valve to space 29, etc. Now it will be noted that if the gear 32 were held stationary, the hoist drum 1 would rotate at a rate equal to the number of revolutions of one of the crank shafts 15 multiplied by the ratio of the teeth on one of the pinions 31 to the teeth on the gear 32. As the motor is of a relatively high speed type, however, it is desirable not to have the speed of rotation of the drum so high; and the speed of drum rotation will be noticed to be reduced by the reduction gearing provided as follows: As the casing 5 rotates, the shaft 34 is rotated and accordingly the gear 37 is rotated. The gear 37 in rotating causes the pinions 38 to rotate and, when the member 40 is held stationary, causes the gear 32 to be rotated backwards. Thus the angular advance of the drum 1, upon one of the complete rotations of the pinion 31, is cut down to a small fraction of what it would be, where the gear 32 to remain stationary. It will thus be seen that the drum rotates at a relatively slow speed, although the motor is running at a high number of reciprocations of the pistons 12 per minute. When it is desired to brake the drum, this can be accomplished by operating the braking mechanism 45 and releasing the mechanism 46, which will then permit the member 40 to be rotated while the drum remains stationary, though the motor may be still running.

In Fig. 5 I have illustrated another form which my invention may assume in practice. In this form the motor is the same and the only change is in the reduction gearing. A gear corresponding to the gear 32, will be noted at 32′. This gear is freely rotatable on the shaft 34′ and has rigid therewith a pinion 50 which meshes with a pinion 51 and drives the latter. The pinion 51 is mounted upon a rotatable shaft 52 which extends through a head member 53 closing the end of the drum 1. At the opposite end of the shaft 52 is a pinion 54 which drives pinion 55 which in turn meshes with an internal gear 56 formed upon a member 57 which may be maintained stationary by means of a braking mechanism 58 or released as desired. The member 57 is journaled at 59, the same as the member 40 in the first form of my invention, in the hanger 4. The mode of operation of this form of my invention will be readily apparent. As the pistons 12 reciprocate the gear 32′ will be rotated. This will cause rotation of the pinion 50 which will drive the pinion 51 and so the pinions 54 and 55, and the pinion 55 being mounted upon a stud rigidly secured to the head 53 and intermeshing with the internal gear 56 which may be held stationary by the brake mechanism 58, will cause the drum 1 to be rotated. When it is desired to interrupt rotation of the drum 1, the brake 58 may be released and the brake mechanism 45 applied and then, although the motor continues to rotate the pinion 32′, the drum 1 will remain stationary while the member 57 rotates.

While I have in this application described two forms which my invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be modified and embodied in various 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. In a hoisting mechanism, a rotatable drum and driving means therefor comprising a motor comprising a plurality of cylinders disposed within said drum and rotatable therewith whose axes lie in planes passing through the axis of the drum and also in a surface of revolution whose directrix coincides with the axis of the drum, and a plurality of pistons reciprocable in said cylinders, and operative driving connections between said motor and drum.

2. In a hoisting mechanism, a rotatable drum and driving means therefor including a motor comprising a cylinder supported by said drum and whose axis is substantially parallel to the axis of said drum and rotates about said axis at an angular speed equal to the angular speed of rotation of said drum, and a piston reciprocable in said cylinder, and operative driving connections between said motor and drum.

3. In a hoisting mechanism, a rotatable drum and driving means therefor comprising

a motor comprising a movable cylinder therein whose axis is substantially parallel to an element of the surface of said drum, and a piston reciprocable in said cylinder, and operative driving connections between said motor and drum.

4. In a hoisting mechanism, a rotatable drum and driving means therefor comprising a motor having a plurality of movable cylinders therein whose axes are arranged substantially parallel to the axis of the drum and a distributing valve mechanism controlled by a shaft coaxial with said drum, and operative driving connections between said motor and drum.

5. In a fluid actuated rotary cylinder motor hoist, the combination of a rotary winding drum, a rotary cylinder rectilinearly reciprocating piston type motor within the drum having longitudinally arranged cylinders rotating with the drum, and operative driving connections between the motor and the drum.

6. In a fluid actuated rotary cylinder motor hoist, the combination with a rotary winding drum of a rotary cylinder motor within the drum having the longitudinal axes of the cylinders parallel to the longitudinal axis of the drum, said cylinders rotating with the drum, said engine having a distributing valve for distributing motive fluid to said cylinders in turn, said valve having port means formed in the circumference thereof adapted to control admission and also having port means in its circumference adapted to control exhaust, said port means controlling admission and said port means controlling exhaust occupying angularly spaced positions in the circumference of said valve.

7. In a fluid actuated rotary cylinder motor hoist, the combination with a rotary winding drum of a rotary cylinder motor within the drum having the longitudinal axes of the cylinders parallel to the longitudinal axis of the drum, said cylinders rotating with the drum, said motor having a distributing valve for distributing motive fluid to said cylinders in turn and said valve having a series of ports in the circumference thereof adapted to serve as admission ports for said motor and a second series of ports alternate to said first series adapted to serve as exhaust ports for said motor.

8. In a fluid actuated rotary cylinder motor hoist, the combination of a rotary winding drum, a rotary cylinder motor within the drum having longitudinally arranged cylinders rotating with the drum, pistons adapted to reciprocate in said cylinders, and means for translating the reciprocating motion of said pistons to rotary motion for said drum including crank shafts extending radially of said drum, pinions on the outer ends of said crank shafts, and a gear coaxial with said drum and engaged by said pinions.

9. In a hoisting mechanism, a rotatable drum and driving means therefor including a motor comprising a cylinder disposed within said drum with its axis substantially parallel to the axis of said drum and rotatable about said drum axis at an angular speed equal to the angular speed of rotation of said drum and a piston reciprocable in said cylinder, and gearing operatively connected to said piston for reducing the speed at which said drum is driven by said motor.

10. In a hoisting mechanism, a rotatable drum and driving means therefor comprising a motor having a plurality of cylinders arranged substantially parallel to the winding surface of said drum, pistons reciprocable in said cylinders, and means for translating the reciprocating motion of said pistons to rotary motion for said drum including crank shafts driven by said pistons and disposed within said drum in planes passing through the axis of said drum and a member operatively connected to said crank shafts and movable relative to said drum and rotatable about the axis thereof.

11. In a hoisting mechanism a rotatable drum and driving means therefor comprising a motor having a plurality of cylinders whose axis lie substantially in a surface of revolution whose directrix coincides with the axis of said drum, pistons reciprocable in said cylinders, and means for translating the reciprocating motion of said pistons to rotary motion for said drum including crank shafts driven by said pistons and set with the cranks thereof at equal angles, said crank shafts being disposed within said drum and rotatable therewith, and a common driven element operatively connected with said crank shafts.

12. In a hoisting mechanism, a rotatable drum and driving means therefor comprising a motor having a cylinder disposed within said drum and whose axis is parallel to an element of the winding surface of said drum, a piston reciprocable in said cylinder and a crank shaft driven by said piston, and gearing operatively connected to said motor for reducing the speed at which said drum is driven by said motor including a normally stationary reaction member carrying a gear and other gears operatively connected to said crank shaft and cooperating with the gear carried by said stationary member.

13. In a hoisting mechanism, a rotatable drum and driving means therefor comprising a motor comprising a cylinder disposed within said drum with its axis parallel to the axis of rotation of said drum, said cylinder rotating at an equal angular speed with said drum during the rotation of the latter, a piston reciprocable in said cylinder and a crank shaft driven by said piston, and gearing operatively connected to said motor for reducing the speed at which said drum is driven by said motor including a gear coaxial with said drum, operatively connected with said

crank shaft, and rotatable relative to said drum, a gear rotatable with said drum, a reaction member mounted on an axis coincident with said drum axis and rotatable thereon under manual control, and a gear carried by said member and operatively connecting said first and second mentioned gears.

14. A hoisting mechanism comprising a rotatable drum, a motor disposed therein, and constantly intermeshing gearing operatively connected to said motor for reducing the speed at which said drum is driven by said motor including a pair of gears formed upon a common rotatable supporting member, said pair of gears being each coaxial with the drum and one of said gears projecting inwardly of said drum and the other of said gears lying wholly outside said drum.

15. A hoisting mechanism comprising a rotatable drum, a motor disposed therein, and constantly intermeshing gearing operatively connected to said motor for reducing the speed at which said drum is driven by said motor including a pair of gears formed upon a common rotatable supporting member, said pair of gears being each coaxial with the drum and one of said gears projecting inwardly of said drum and the other of said gears outwardly thereof, and a gear cooperating directly with said outwardly projecting gear, said cooperating gear being supported upon a rotatable member with which cooperates means for holding the same stationary or releasing it for rotation.

16. The combination comprising a drum and driving means for said drum comprising a reciprocating multi-piston type motor disposed therein, and means for translating the reciprocating motion of said pistons to rotary motion for said drum including a plurality of separate crank shafts driven by said pistons, said crank shafts being transversely disposed with respect to the drum axis, and a common driven element operatively connected with said crank shafts.

17. The combination comprising a drum and driving means for said drum comprising a reciprocating multi-piston type motor disposed therein, and means for translating the reciprocating motion of said pistons to rotary motion for said drum including a plurality of separate crank shafts driven by said pistons, said crank shafts being set with the cranks thereof at equal angles, and a common driven element operatively connected with said crank shafts, said common driven element being rotatable about the drum axis.

18. In a hoisting mechanism, a rotatable drum and driving means therefor comprising a motor including a cylinder disposed within said drum and adapted for rotation about the axis of said drum, the axis of said cylinder lying at all times in a plane which includes the axis of the drum, and a piston reciprocable in said cylinder in a path making an angle with a plane to which the drum axis is perpendicular, and operative driving connections between said motor and drum.

19. In a hoisting mechanism, a rotatable drum and driving means therefor comprising a motor comprising a plurality of cylinders disposed within the drum and whose axes lie at all times in planes including the axis of the drum, and pistons reciprocable in said cylinders in paths each making an angle with a plane to which said drum axis is perpendicular, and operative driving connections between said motor and drum.

In testimony whereof I affix my signature.

LOUIS A. MAXSON.