No. 880,566. PATENTED MAR. 3, 1908.

D. O. PAIGE.

ERECTING HOIST.

APPLICATION FILED FEB. 9, 1905.

2 SHEETS—SHEET 1.

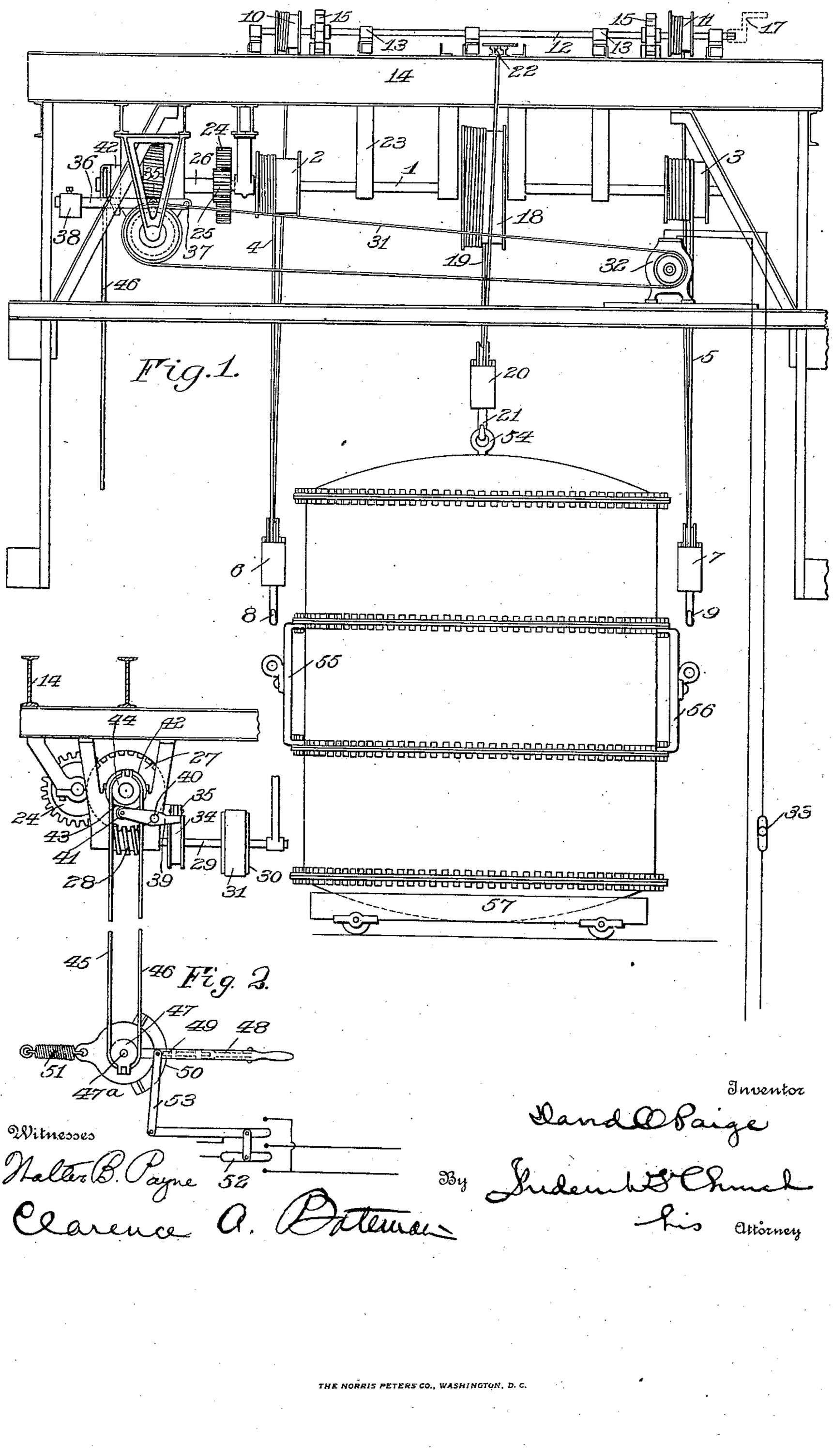

Fig. 1.

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 3.

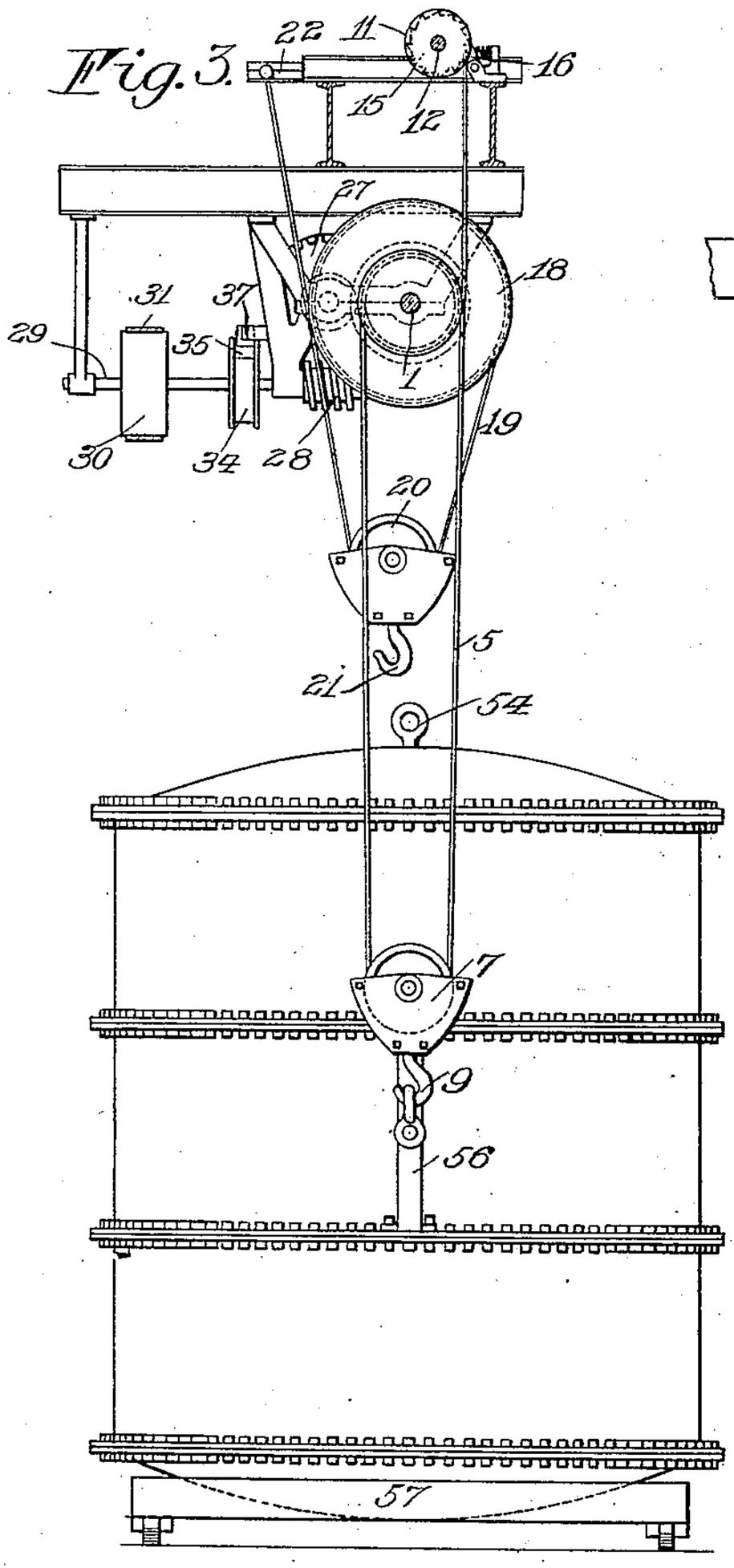
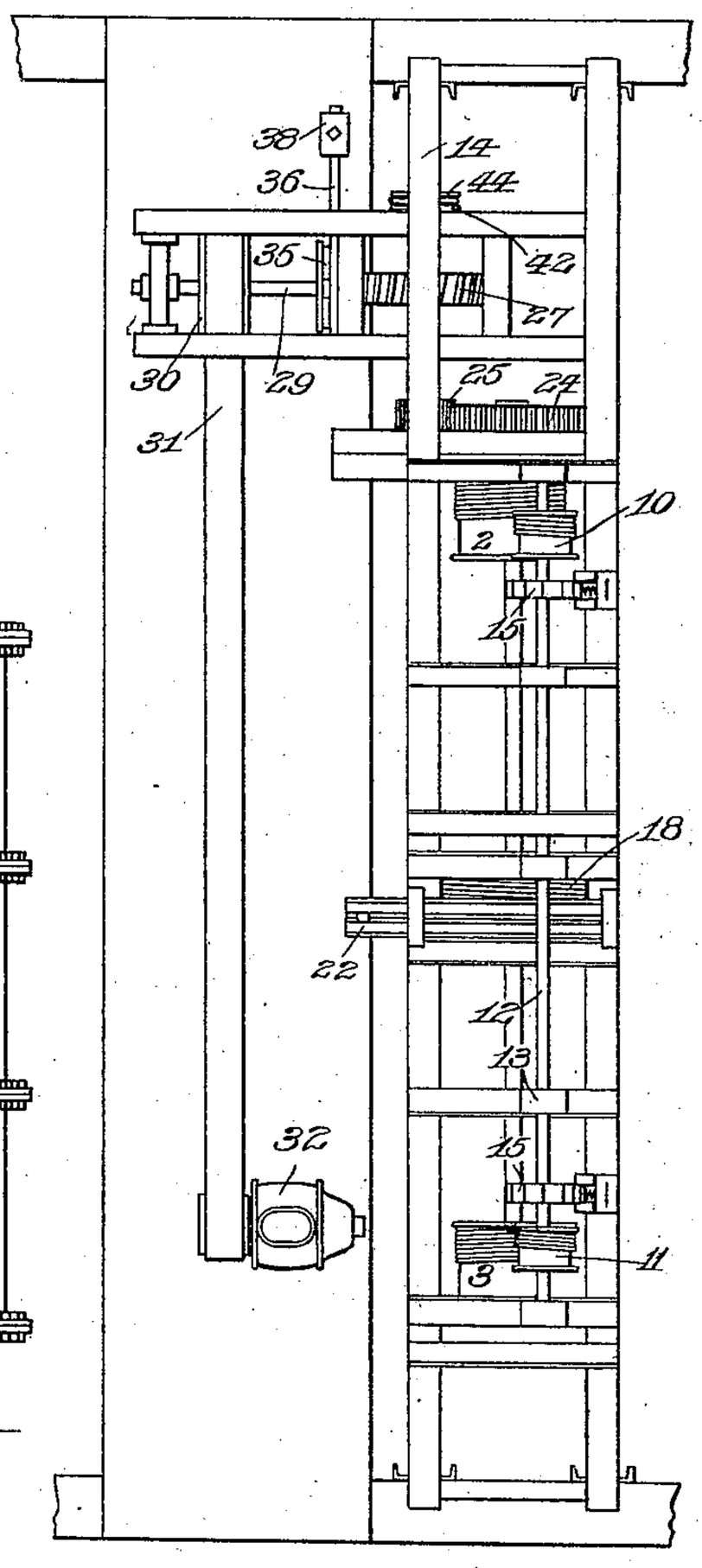


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ERECTING-HOIST.

No. 880,566. Specification of Letters Patent. Patented March 3, 1908.

Application filed February 9, 1905. Serial No. 244,850.

To all whom it may concern:

Be it known that I, DAVID O. PAIGE, of Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Erecting-Hoists; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, and to the reference-numerals marked thereon.

My present invention relates to improvements in hoisting apparatus, and more particularly of that class which are adapted for use in handling tanks, vessels and other bodies of considerable size and weight which would otherwise be unwieldy and would be liable to damage if handled in the ordinary way, and the purpose of my invention is to provide a hoist which is capable of lifting and supporting the different sections of the tank while they are being assembled and which may be operated to elevate the completed tank or vessel and swing it upon a transverse axis so that it may be turned from a vertical to a horizontal position.

To these and other ends my invention consists in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawing: Figure 1 is an elevation of a hoist constructed in accordance with my invention showing a tank in readiness to be lifted. Fig. 2 is a view of the controlling devices and the contiguous portions of the hoisting apparatus. Fig. 3 is an end elevation looking from the right in Fig. 1, and Fig. 4 is a plan view of the apparatus shown in Fig. 1.

In the several views the same numerals of reference designate similar parts.

In manufacturing tanks, vessels and other hollow bodies of considerable size and weight it is customary to employ a plurality of rings or sections which are bolted or otherwise secured together to form a complete tank, and in manufacturing tanks of this kind which are provided with a lining of enamel or other frangible material which would be easily damaged when improperly handled, it is particularly desirable to employ a hoist which is capable of supporting the completed portion of the tank while the individual sections are being applied thereto from underneath, and which is capable of inverting or turning the tank from a vertical to a horizontal position when it has been completed, the hoisting device being so arranged as to operate upon the tank and its sections so as not to render them liable to damage and is under the immediate control of the operator. A hoisting apparatus of this kind constructed in accordance with my invention embodies in its present form a main hoisting shaft 1 upon which are fixed the drums 2 and 3 which are preferably of equal diameter and are spaced at a given distance on the shaft, and wound upon each of these drums are the hoisting cables 4 and 5, respectively, both of which are wound in the same direction on their respective drums and are each provided with the pulleys 6 and 7 carrying the hooks 8 and 9 respectively. The cable 4 of the drum 2 passes around the pulley 6, and its free end is attached to a drum 10, and the cable 5 which is attached at one end to the drum 3, passes around its respective pulley 7 and is attached at its free end to the drum 11. Each of these drums 10 and 11 are fixed on the shaft 12 which is mounted in bearings 13 on the supporting frame 14, and is provided with a pair of ratchet wheels 15 which coöperate with their respective pawls 16 to retain the drums 10 and 11 in any adjusted position, one end of the shaft 12 being adapted to receive an adjusting crank 17 by means of which the said shaft may be rotated.

On the shaft 1 intermediate of the drums 2 and 3 is fixed a drum 18 which is preferably of a diameter greater than the drums 2 and 3, and to this drum is connected one end of the hoisting cable 19 which passes around the pulley 20 carrying the hook 21 and is attached at the opposite end to the projecting portion 22 of the frame. The cable 19 of the drum 18 is wound in a direction opposite to that of the cables 4 and 5, and this will cause the hook 21 of the central hoisting drum 18 to be raised, and the hooks 8 and 9 of the smaller drums 2 and 3 to be lowered while the hoisting shaft 1 operates in one direction, at a differential speed, and when the shaft is operated in the opposite direction, the hook 21 of the drum 18 will be lowered at a greater speed while the hooks 8 and 9 of the smaller drums are being slowly raised.

The main hoisting shaft 1 is suitably supported in bearings 23 which are attached to the main frame 14, and it is provided with a

gear wheel 24 meshing with a pinion 25, the latter being fixed to a counter shaft 26. This counter shaft 26 is provided with a worm wheel 27, and meshing with this worm wheel is a worm 28, the latter being fixed to a shaft 29 provided with a pulley 30 over which the belt 31 driven by a motor 32 passes. Any form of motor may be employed, but I prefer to use an electric motor which is provided with the usual controlling and reversing switches 33 which are located at a convenient position to enable the motor to be controlled by the operator at a point in proximity to the tank or other body which is being handled.

On the shaft 29 is provided a brake wheel 34, and the latter coöperates with the brake shoe 35 which is carried by the lever 36, the latter being pivoted at 37, and provided with a weight at 38 which will normally operate to hold the brake shoe 35 and the brake wheel 34 in frictional engagement. Coöperating with the lever 36 is a trip 39 the latter being pivoted to a relatively fixed portion of the frame at 40 and provided with a roller 41 at its free end to ride upon the periphery of a cam 42. This cam 42 has a depression 43 in its periphery which is arranged to coöperate with the roller 41 of the trip 39 to cause the latter to release the lever 36 and permit the latter under the action of the weight 38 to produce sufficient friction between the shoe 35 and the brake wheel 34 to prevent operation of the shaft 29 by the motor 32, the high portions of the cam 42 coöperating with the roller 41 of the trip 39 to cause the latter to lift the lever 36 and thereby disengage the brake shoe 35 and the brake wheel 34, thereby permitting the shaft 29 to operate. The cam 42 is preferably mounted upon an extension of the counter shaft 26, although it may be mounted on any other convenient support, and extending over a drum 44 attached to the cam in opposite directions are the operating cords 45 and 46, respectively, the latter being wound in opposite directions upon a drum 47. This drum 47 may be conveniently located so as to enable the operator to control the operation of the hoisting apparatus from a position in proximity to the tank or other object which is being lifted or operated upon, and this is readily accomplished by extending the operating cords 45 and 46. The drum 47 is provided with an operating handle 48 having a pawl 49 cooperating with a sector 50 to enable the handle 48 to be locked in its central position at which time the cam 42 will be in such a position that the trip 39 will permit the brake shoe 35 to coöperate with the brake wheel 34 to prevent operation of the shaft 29. If desired, a spring 51 or an equivalent device may be employed which will normally tend to return the operating handle 48 and the parts controlled thereby to rest in its central position.

In operating the hoisting apparatus it is advantageous to so arrange the parts that the hoisting devices may be entirely controlled in their operation by the lever 48, and in order to accomplish this result I prefer to employ a controlling switch for the electric current for operating the motor 32, an ordinary reversing switch or pole changer 52 being provided in the present instance which is operatively connected to the handle 48 either by being mounted on the same shaft 47^a or through the connection 53 so that operation of the lever 48 in one direction will release the brake to permit the parts to rotate, and it will simultaneously operate the controlling switch to start the motor in a given direction. When the handle 48 returns to its central position the cam 42 will be operated to set the brake and simultaneously break the circuit through the controlling switch 52, and by operating the lever 48 in the opposite direction the cam 42 will operate to release the brake and the controlling switch 52 will be simultaneously operated to establish the electrical circuit through the motor, causing the latter to operate in a reverse direction.

A hoisting apparatus of the kind described is particularly adapted for use in facilitating the erection of tanks and other large vessels which are made up of a plurality of superposed sections, and in assembling the sections of a tank by the use of a hoister of this kind, an attaching eye 54 is preferably secured in the head of the tank to receive the hook 21 of the hoisting drum 18, and the controlling lever 48 is operated to release the brake and start the motor 32 in such a direction as to raise the hook 21 and lower the hooks 8 and 9 of the drums 2 and 3 so that they may engage the attaching devices 55 and 56 which are secured to the tank section which is to be applied, and which is usually moved into operative position by the platform 57 which is mounted on rollers, and in order to enable the hooks 8 and 9 to be lowered sufficiently without unduly elevating the hook 21 the crank 17 may be applied to the shaft 12 and rotated while the pawls 16 are retracted from their corresponding ratchet wheels 15, to unwind a portion of the cables 4 and 5 which are connected respectively to the drums 10 and 11 of the shaft 12, and this will permit the pulleys 6 and 7 carrying the hooks 8 and 9 to be lowered sufficiently to engage the attaching devices of the section which is to be applied to the tank. The controlling lever 48 may now be reversed, causing the motor 32 to operate the hoisting shaft 1 in an opposite direction, and this will allow the hook 21 which is carried by the cable 19 of the

drum 18 to be lowered, and the hooks 8 and 9 controlled by the drums 2 and 3 and attached to the section, to be simultaneously elevated, and this will cause that portion of the tank carried by the hook 21 and the section carried by the hooks 8 and 9 to be brought together into operative position, and while the parts are held in this position, the bolts or other securing devices may be readily applied. The operation just described is repeated each time an additional section is applied to the tank, but it will be understood that the additional sections applied to the bottom of the tank will render it necessary to maintain the hook 21 of the hoisting drum 18 at a higher elevation after each section has been applied, and consequently it will be necessary to adjust the shaft 12 through the crank 17 until the drums 10 and 11 thereon have wound a portion of their respective cables 4 and 5, and this is necessary in order to permit the hooks 8 and 9 to perform the hoisting operation even though their cables 4 and 5 have been unduly unwound by the degree of winding of the drum 18 in order to allow the hook 21 of the latter to support its load at the proper point.

When the tank has been completely assembled, the attaching devices 55 and 56 may be suitably secured at diametrically opposite points on its circumference and at points midway of its length, and with the hook 21 secured to the attaching eye 54 in the end of the tank, the controlling handle 48 is operated to cause the drum 18 to wind its cable 19 and elevate the tank until the hooks 8 and 9 of the drums 2 and 3 respectively may be secured to the attaching devices 55 and 56. While the hooks 8, 9 and 21 are attached to the tank in this manner, the motion of the hoisting drums is reversed, causing the drum 18 to unwind its cable and permit the hook 21 attached to the eye 54 to lower that portion of the tank while the drums 2 and 3 will operate to wind their cables 4 and 5, and the hooks 8 and 9 respectively controlled by these drums will be elevated at a slower speed, and this will cause the tank to be rotated about its transverse axis with the attaching device 55 and 56 as centers, and by detaching the hook 21 from the eye 54 and reversing the hoisting apparatus, the hooks 8 and 9 may be detached from the tank, and as the latter is resting upon its circumference, it may be readily rolled into any desired position.

A hoist of the kind described is particularly adapted for use in handling tanks which are provided with frangible linings or other parts which are liable to be easily damaged from improper handling, as it enables the various hoisting operations to be performed with precision, and the parts are under positive control of the operator at all times, as the operating lever 48 not only serves to control the brake which operates as a stop for the hoisting devices, but also controls the operation of the motor, and therefore the hoisting devices are at all times under the direct control of the operator and there is little chance of the parts getting beyond control which would result in damage or destruction of the tank.

I claim as my invention:

1. In hoisting apparatus, the combination with a hoisting shaft, of a drum mounted thereon having a hoisting cable wound thereon in one direction, and a pair of drums mounted on the shaft one on each side of the drum first mentioned and having a hoisting cable wound thereon in a direction opposite to that of the first mentioned drum to cause the pair of drums to wind their cables while the other drum unwinds its cable during the rotation of the shaft, a separate load-attaching device for each cable, and means independent of the hoisting cables for operating said drums.

2. In hoisting apparatus, the combination with a hoisting shaft, of a drum mounted on the shaft having a hoisting cable wound thereon in a given direction, and a pair of drums of smaller diameter than the first mentioned drum and each having a hoisting cable wound thereon in a direction opposite to that of the first mentioned drum, a separately operable load-attaching device for each cable, and means independent of said cables for operating their respective drums simultaneously.

3. In hoisting apparatus, the combination with a hoisting shaft, of a pair of drums mounted on the shaft of substantially equal diameter having hoisting cables wound thereon in the same direction, and a drum of a different diameter than that of the first mentioned drums and having a cable wound thereon in a direction opposite to that of the first mentioned drums, a separately operable load-attaching device for each cable, and means independent of the cables for operating their respective drums.

4. In hoisting apparatus, the combination with a hoisting shaft, of a pair of drums of substantially equal diameters mounted on the shaft having hoisting cables wound thereon in the same direction, and a drum of larger diameter than that of the first mentioned drums mounted on the shaft intermediate of the first mentioned drums and having a hoisting cable wound thereon in a direction opposite to that of the first mentioned cables and means independent of the cables for operating said drum shaft.

5. In hoisting apparatus, the combination with a shaft and a drum on the said shaft having a hoisting cable wound in a given direction thereon, of a second drum mounted to operate with the first mentioned

drum and having one end of a hoisting cable wound thereon in a direction opposite to that of the first mentioned drum, a hoisting pulley supported intermediately of the length of the cable of the second drum, and an adjusting device having the opposite end of the cable of the second drum attached thereto for varying the length of cable which is unwound from the second drum.

6. In hoisting apparatus, the combination with a shaft, and a drum on the said shaft having a hoisting cable wound in a given direction thereon, of a pair of drums of smaller diameters than that of the first mentioned drum and having hoisting cables wound at one end upon the pair of drums in a direction opposite to that of the cable of the first mentioned drum, hoisting devices arranged intermediate of the ends of the cables which are wound upon the pair of drums, compensating drums to which the opposite ends of the said cables are attached, an adjusting shaft carrying the compensating drums, and devices for locking the adjusting shaft in different positions of adjustment.

7. In hoisting apparatus, the combination with a shaft, and hoisting devices adapted to be operated thereby, of a brake operating upon said shaft to arrest the motion thereof, a rotary cam for controlling the operation of the brake, means normally moving said cam to apply the brake and means for operating the cam to release the valve.

8. In hoisting apparatus, the combination with a shaft, and hoisting devices adapted to be operated thereby, of a brake operating upon said shaft to arrest the motion thereof, a cam operatively connected to the brake and arranged to apply the brake when it occupies a predetermined position and to release it when rotated in either direction out of the said position, an operating lever operatively connected to the cam, and means normally operating to retain the lever and the cam in a given position to apply the brake.

9. In a hoisting apparatus, the combination with a motor and a shaft driven thereby, of a brake operating on the shaft, a pair of operating cords for controlling the brake, a controlling device connected to said cords for moving them and movable to three positions, the intermediate position applying the brake, and devices operated by the controlling device to start the motor when the controlling device is movable to either extreme position, and to stop the motor when the brake is applied.

10. In a hoisting apparatus, the combination with a motor and a shaft driven thereby, of a brake operating on the shaft, a pair of operating cords for controlling the brake, a controlling device connected to said cords for moving them and movable to three positions, the intermediate position applying the brake, devices operated by the controlling device to start the motor when the controlling device is movable to either extreme position, and to stop the motor when the brake is applied, and means normally operating to return the controlling device to the intermediate position.

11. In hoisting apparatus, the combination with a shaft having a motor connected thereto, and hoisting devices arranged to be operated by the said shaft, of a brake arranged to operate upon said shaft, a rotatable cam for applying the brake when it occupies a predetermined position and operating to release the brake when rotated in either direction out of the said position, controlling devices for operating the cam, and devices operated by the controlling devices for stopping the motor when the cam is operated to apply the brake, and operating to start the motor in opposite directions when the said cam is operated in opposite directions to release the brake and means normally operating said controlling devices to stop the motor and apply the brake.

12. In hoisting apparatus, the combination with a shaft having a motor operatively connected thereto, and hoisting devices arranged to be operated by the said shaft, of a brake operating upon the said shaft, means for applying and releasing the brake embodying a rotatable cam, a member normally operating to apply the brake, and a trip controlled by the motion of the cam for operating the said member to apply and release the brake, a manually operable controlling device located at a point distant from the cam, and movable to three positions, the intermediate position applying the brake; and devices operated by the controlling device to start the motor when the controlling device is moved to either extreme position and to stop the motor when the controlling device is moved to the intermediate position.

13. In hoisting apparatus, the combination with a shaft, a motor for operating it, and hoisting devices arranged to be operated by the said shaft, of a brake arranged to operate upon the said shaft, means for applying the said brake, a cam coöperating therewith for releasing the brake, a controlling device for the motor operatively connected to the said cam, and a device for normally retaining the controlling device and cam in such a position that the motor will be stopped and the brake will be applied.

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