No. 864,798. PATENTED SEPT. 3, 1907.

J. L. PILLING.

PORTABLE HOIST.

APPLICATION FILED OCT. 3, 1906.

3 SHEETS—SHEET 1.

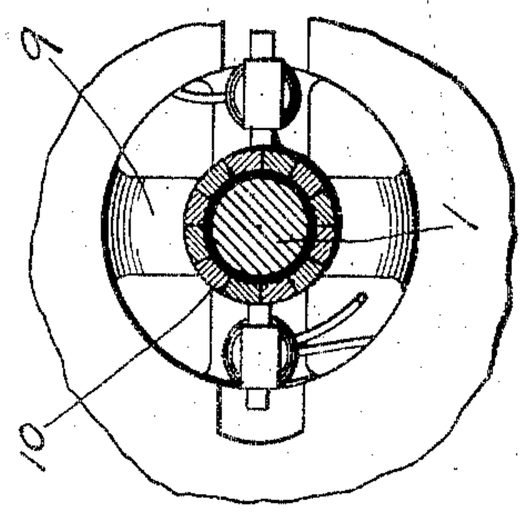

FIG. 2.

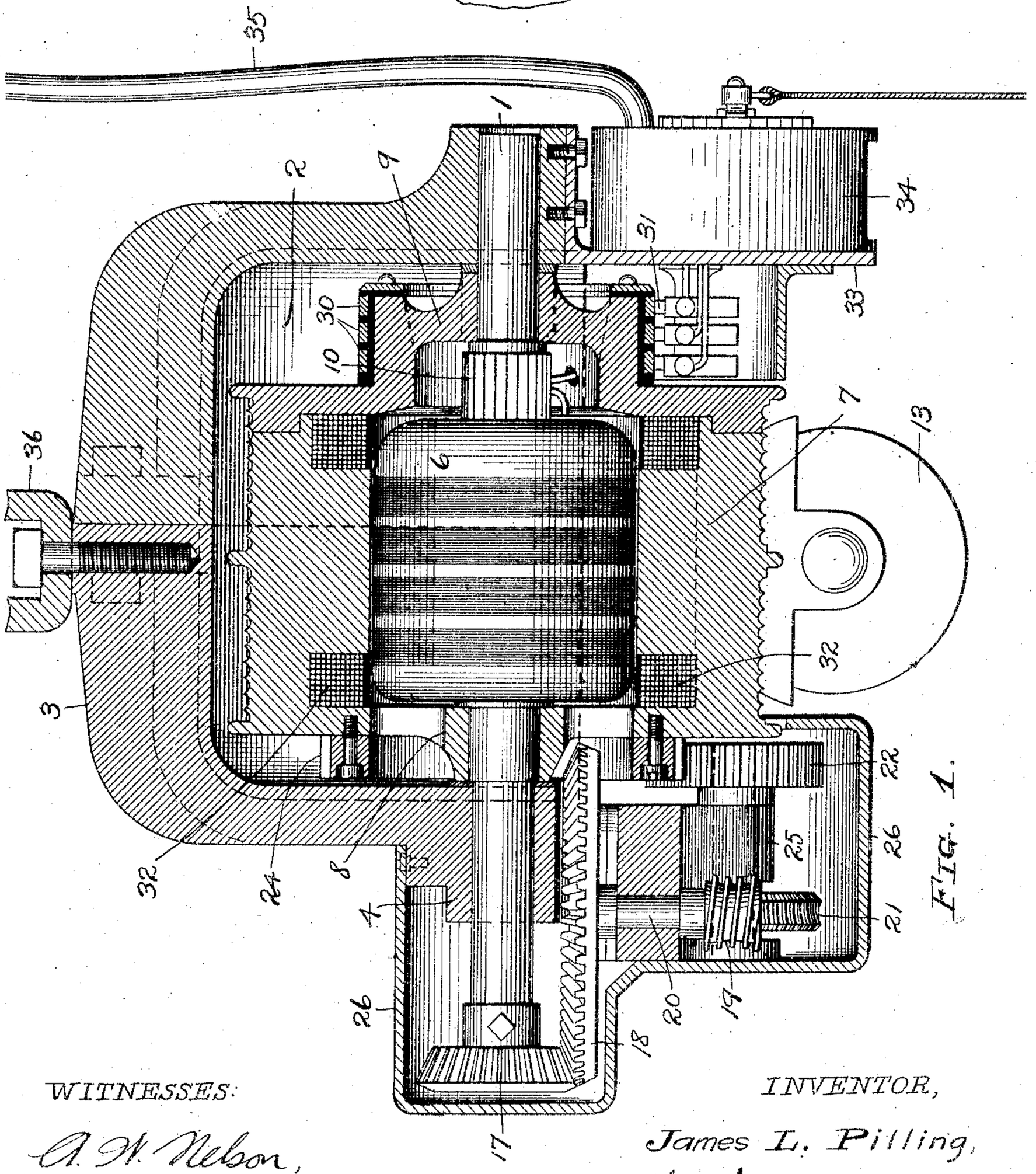

FIG. 1.

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3 SHEETS—SHEET 2.

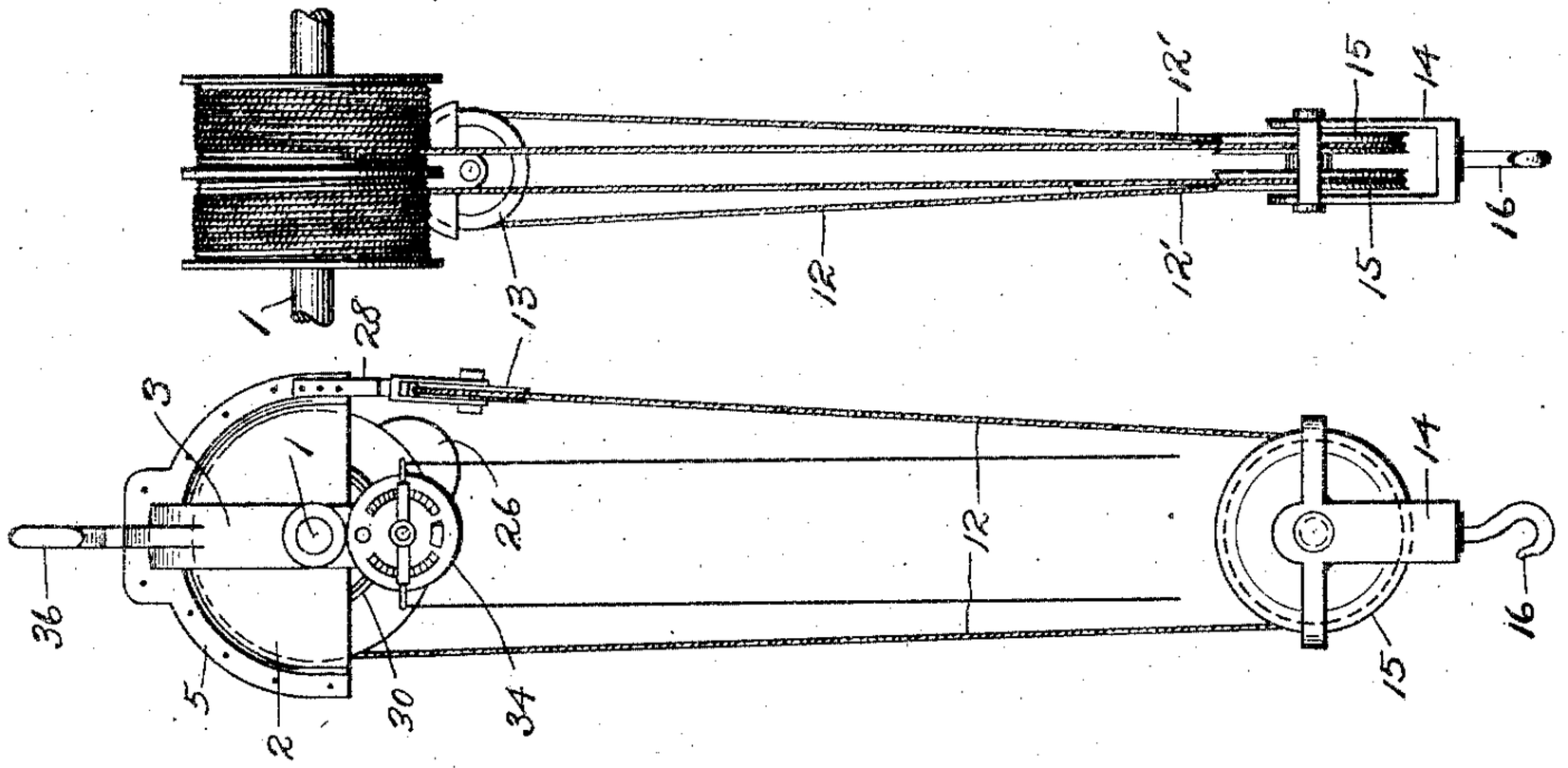

FIG. 4.

FIG. 5.

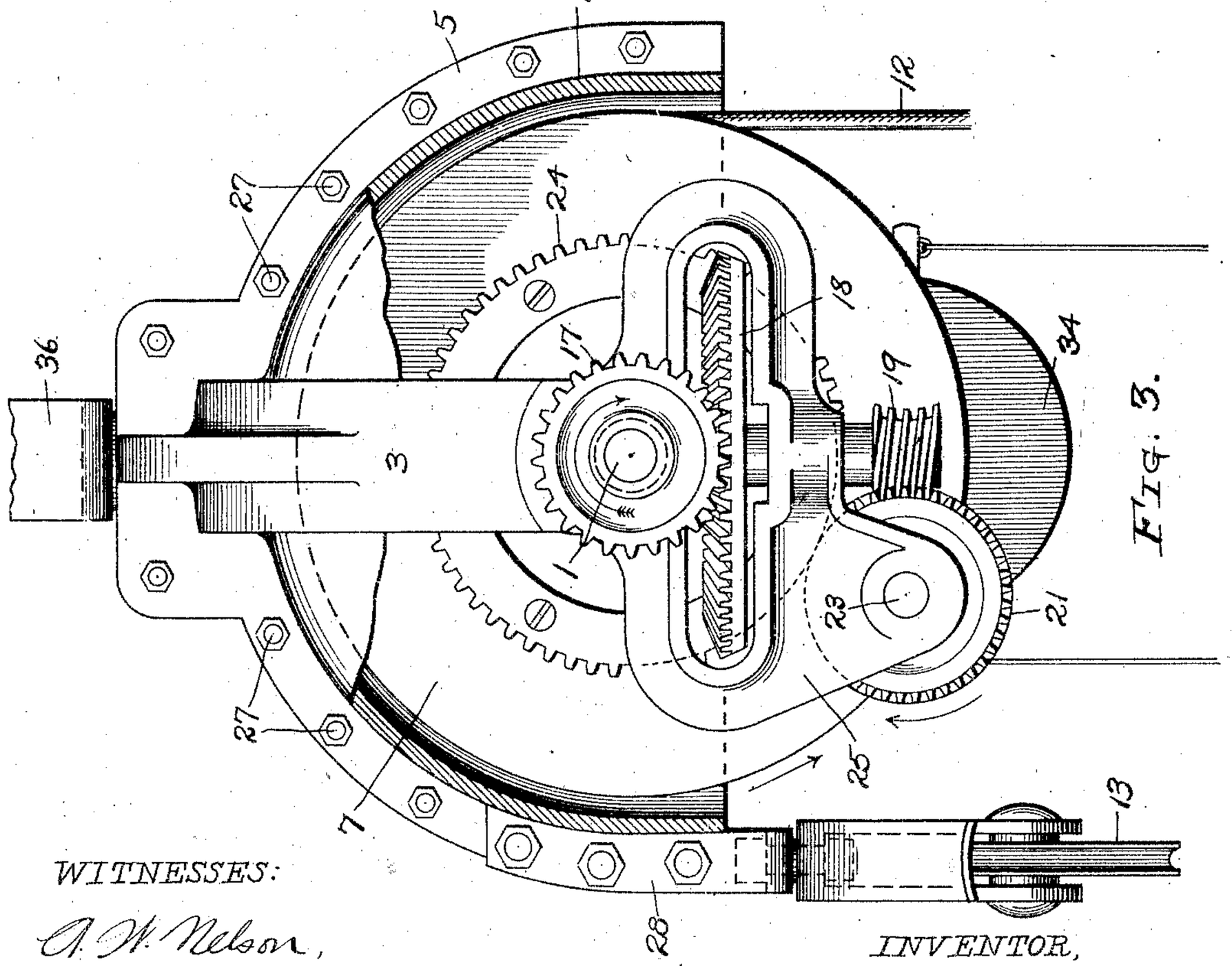

FIG. 3.

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3 SHEETS—SHEET 3.

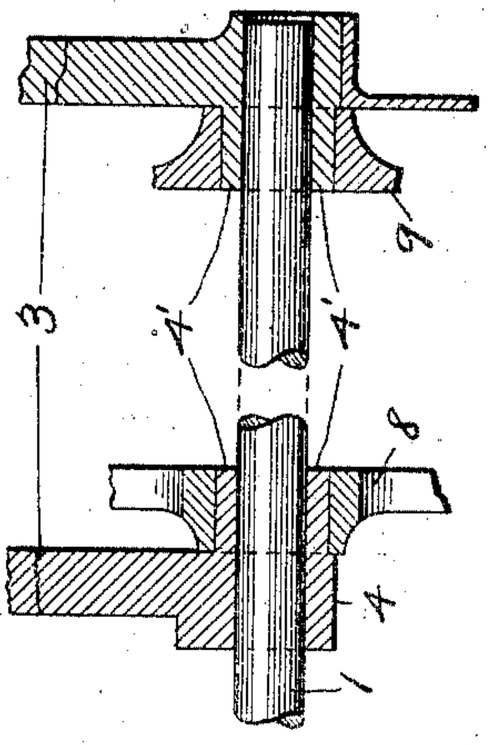

FIG. 1 A.

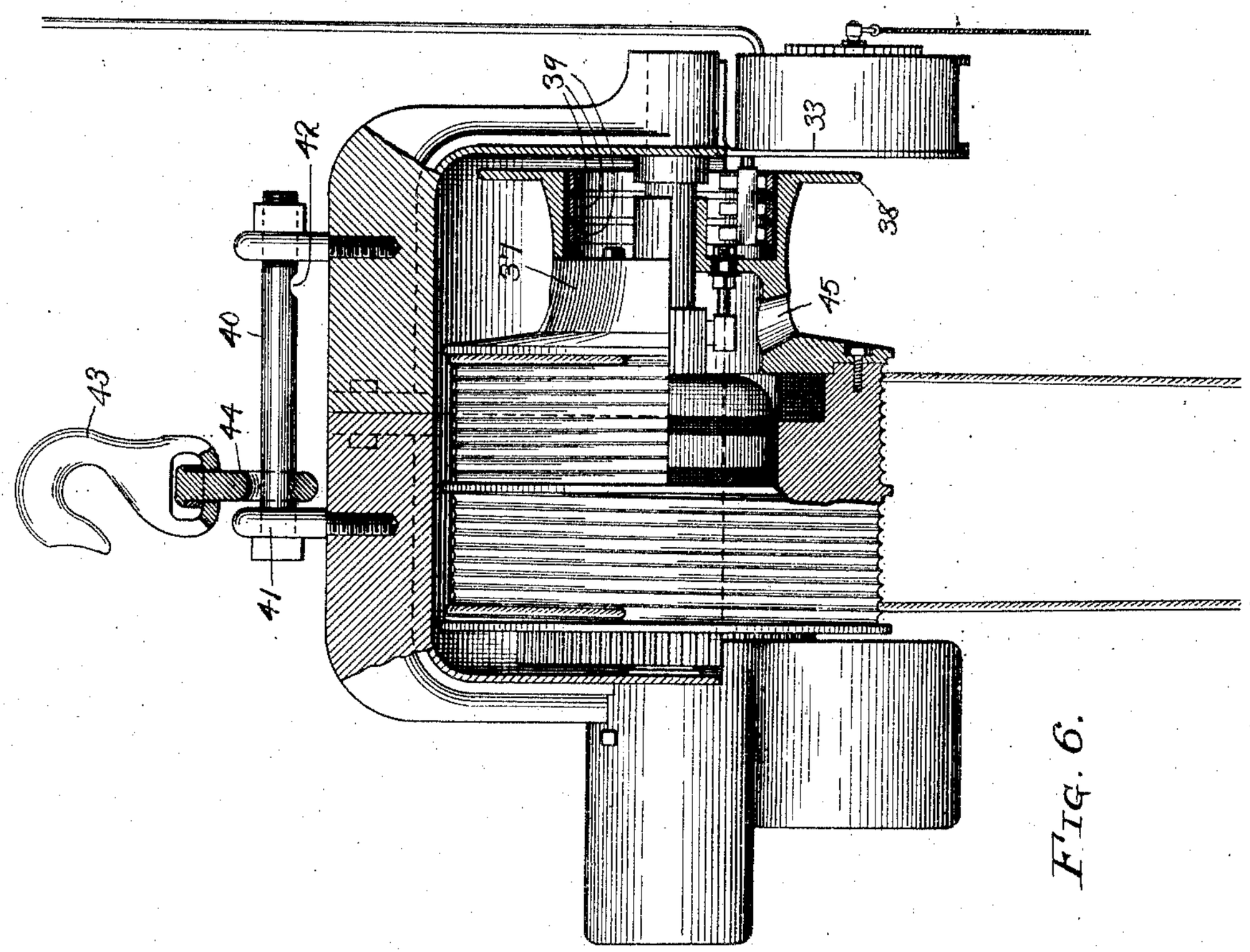

FIG. 6.

WITNESSES:

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UNITED STATES PATENT OFFICE.

JAMES L. PILLING, OF CHICAGO, ILLINOIS.

PORTABLE HOIST.

No. 864,798. Specification of Letters Patent. Patented Sept. 3, 1907.

Application filed October 3, 1906. Serial No. 337,287.

To all whom it may concern:

Be it known that I, JAMES L. PILLING, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented a certain new, useful, and Improved Portable Hoist, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to automatic power hoists of that type in which the construction is analogous to that of a block and tackle.

The general object of my invention is to provide such an automatic power hoist which shall occupy a very small space as compared with other portable hoists; to provide a hoist which may be constructed at less cost than others; and to provide a hoist that shall be simple of construction and capable of raising heavier loads in proportion to its own weight.

A further and particular object of my invention is to provide a hoist wherein the load elevated thereby shall be always under control, when being raised or lowered, and whereby the load may be held suspended at any desired point, and lowered with safety and at any speed desired.

My invention consists generally in a hoist comprising a two-part motor, which parts have relative rotation; one of said parts being adapted for winding a lifting cable thereon; and my invention also consists in a hoist comprising a two-part motor, one of the motor parts being within the other part, and the outer one forming a winding drum for the lifting cable.

My invention further consists in a hoist characterized as above, and provided with suitable gearing between the motor shaft and the winding drum, for the purpose hereinafter explained.

My invention further consists in a hoist characterized as above and provided with means for holding the load suspended at any point when the motor is stopped, said means also providing full control of the load when lowering it.

My invention further consists in various details of construction and in combinations of parts all as hereinafter described and particularly pointed out in the claims.

In the application of my invention to hoists, the motor of the hoist may be constructed to be driven by any of the well known motive powers, such as compressed air, steam or electricity. On account of its convenient distribution, electricity is a desirable motive power, and the construction of the electric motor is particularly adaptable to the purposes of my invention. Therefore I have illustrated in the accompanying drawings forming a part of this specification, an electrically-driven hoist.

In the said drawings, Figure 1, is a vertical longitudinal section of an electric hoist embodying my invention; Fig. 1ª is a detail view of a modification; Fig. 2 is a detail view of the commutator and brushes of the motor; Fig. 3, is an end elevation of the hoist, the gear case being removed and the bell partly broken away; Fig. 4, is an elevation of the opposite end of the hoist; Fig. 5 is a view similar to Fig. 4 omitting the frame of the hoist; and Fig. 6, is a partly sectional elevation of a modified hoist.

The structures shown in the drawings are two of many possible constructions which fall within the spirit and scope of my invention, and hence I do not limit the invention to any non-essential feature of construction.

The frame of the hoist comprises an inverted U shaped portion or yoke 3, and a bell-shaped portion, 2, the latter covering and protecting the working parts from rain, snow and dust. The yoke portion and the bell-shaped portion are preferably integral, but are transversely or vertically divided into halves which are provided with attachment flanges, 5, held together by bolts, 27. A suspension device, for example a hook, 36, or a bar, 40, is attached to the top of the frame or yoke, 3. The bottom of the bell shaped portion, 2, is open and need not hang far below the axial plane of the hoist.

The yoke 3 terminates in the two bearings, 4, in which the main shaft, 1, is journaled. This shaft may provide bearings for both the inner and the outer parts of the motor as shown; or the outer part of the motor may be rotatively mounted on inner extensions, 4′, of the shaft bearings, 4; as shown in Fig. 1ª.

The motor consists of the inner rotative part, 6, and the outer part, 7, which in the preferred construction is also rotative. When referring to an electric motor these parts will be termed the armature and the field, respectively. The field is provided with two hub portions, 8 and 9, whereby it is mounted for rotation, either directly upon the shaft 1, or upon bearings 4′ concentric with said shaft. The armature 6 is keyed upon the latter.

Both the armature and the field are rotated by the application of the motive power thereto. I prefer that they turn in opposite directions, though they may be so geared together as to be forced to turn in the same direction, at unequal speeds.

The periphery of the field 7 is made cylindrical, whereby it forms the drum upon which the lifting cable or cables are wound. It may be spirally grooved,

as shown. Or instead of being grooved, it may be turned smooth, and a suitably grooved sleeve may be shrunk or otherwise secured upon the cylindrical surface thus provided. In order to preserve the balance of the hoist when loaded, I prefer to attach both ends of the cable 12 to the drum (at opposite ends thereof) thus forming one or more loops or bights for carrying a sheave-block. As shown, two loops or bights 12′ are formed by carrying the cable up and around a sheave 13, suspended from the frame 2 of the hoist. A sheave block 15, suspended from the loops 12′, carries two sheaves 15, and a lifting hook 16. The top sheave-block 13 is swiveled on a wrought metal clip 28 which is bolted to the flanges 5 at one side of the bell 2. This arrangement of the hoisting cable is adapted to balance the frame of the hoist when loads are being lifted. The tendency of the load is to cant the hoist upwardly at the side to which the sheave 13 is attached. The downward pull of the cable upon said sheave, counterbalances the tendency referred to, and the hoist frame will hang substantially the same when loaded as when unloaded.

The frame or bell may be removed from the mechanism of the hoist in two different ways: the halves of the frame may be separated by removing the nuts of bolts 27 and then slid off the shaft 1. Or, if the shaft bearings 4 are made in two parts, the frame may be removed without being so separated.

The armature and the field are geared together, in order to provide for holding suspended loads, and also in order to utilize the rapid rotation of the inner part or armature of the motor. This gearing may be of any suitable type and arrangement, but I prefer to employ a locking gear that shall permit the rotation of the motor in either direction but shall not permit rotation of the cable drum by the suspended load (not shown) even though the motor be deënergized. The gearing as shown comprises a bevel pinion 17 on the shaft 1, a bevel gear wheel 18 and a worm 19 on a shaft 20, a worm wheel 21 and a spur pinion 22 on a shaft 23, and a gear 24, driven by the pinion 22 and secured to the field 7. The bearings for shafts 20 and 23 are provided by a casting 25 which may be either integral with or secured to, the frame 2. The worm gear 19—21 forms a noiseless and absolutely reliable lock against backward rotation of the drum by a suspended load, and holds the load at any height while the motor is stopped. Preferably the said gearing is so arranged as to cause the two parts 6 and 7 of the motor to turn in opposite directions, whereby the full power of the motor is obtained. When lifting a load, the parts rotate in the direction of the arrows, Fig. 3.

The object of driving from pinion 17 to a larger wheel 18 is to avoid excessive heating of the worm gearing by reducing the speed thereof.

The gearing may be inclosed by a casing 26, the lower portion of which forms a chamber for oil to lubricate the worm gear 19—21.

The bearings of the shafts are provided with suitable lubricating devices (not shown).

As the field is rotative, it is provided with collector-rings 30 and brushes 31, through which the current is taken into the field windings 32. One field hub, 9, carries the armature brush holders, and two of the rings 30 are in connection with them. The brushes 31 may be held by the frame arms 3, but preferably are held by a bracket 33 supporting also the motor controller 34. The leads from said brushes 31 pass into the controller, and a cable 35 leads from the controller to the supply conductors (not shown).

The operation is as follows: The hoist is suspended by its hook 36 and the object to be lifted is attached to the sheave-block hook 16. When the motor is started its two parts turn in opposite directions, the inner one at a comparatively high speed; the speed of the outer part being controlled by that of the inner part through the medium of the gearing. The outer part, that is, the drum, draws up the two ends of the cable 12, which draws up the sheave-block 14. The cable winds from the ends toward the center of the drum. Suppose now that the motor should be intentionally or accidentally stopped. The weight of the load tends to turn the worm wheel 21, but that member cannot turn while the worm is at rest; thus the load is held suspended without the use of brakes, ratchets, or other troublesome devices. The load is lowered by running the motor in reverse directions. The worm gearing prevents racing of the motor at such times, and enables the operator to lower away as slowly as desired. The worm gear may however be dispensed with, and other means for holding and controlling the load, employed.

The winding drum need not be of the same diameter from end to end. A portion thereof may be of smaller diameter to receive a cable for hoisting very heavy loads. Such a construction is shown in Fig. 6, in which the field hub portion of Fig. 1 is simply extended from the field body 7, thus forming a smaller drum 37. Preferably this drum is concave-faced as shown, and is provided with a flange 38. The collector rings 39 are placed within the smaller drum, and the brush-holders are held by the controller bracket 33. It is desirable to provide this hoist with two suspensions, one for each drum, 7 and 37; as otherwise the hoist would be canted toward one end or the other when lifting a load. One suspension should be located above the middle of the larger drum and the other suspension at a point adjacent to the middle plane of the smaller drum. To this end the frame of the hoist may be provided with two hooks, but I prefer to employ a bar 40, connected to the frame with eye-screws 41. The bar may be a heavy bolt, as shown. Its lower side is provided with two or more flats or notches 42, of only sufficient depth to prevent a hook or a swivel from slipping along the same. The notches or flats are located at such points that the hoist will hang evenly, or substantially so, when either drum is in active use. The hook 43 is provided with a swivel 44 having an eye large enough to be slid upon the bar 40 from one notch to the other. The smaller drum 37 may be provided with hand-holes 45, to give access to the motor, in this case to the brushes thereof.

It will be evident from the foregoing description that I have devised a hoist which combines the desirable features of safety, compactness, strength, cheapness of construction, and ease of operation.

Modifications not herein shown will occur to persons skilled in the art, and I do not limit my invention to the specific constructions herein described.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

In a hoist, a suitable frame adapted for suspension, in combination with an electric motor mounted therein and comprising an inner armature part and an outer field part having relative rotation, said outer part constituting a winding drum for a hoisting cable, a horizontal shaft for said armature having its bearings in said frame, a short shaft at substantially right angles to said shaft, beveled gearing connecting said shafts, a worm on said short shaft, a third shaft parallel with said horizontal shaft and having a worm wheel meshing with said worm, a gear upon the field part of said motor and a pinion upon said short parallel shaft and meshing therewith, substantially as and for the purpose described.

In testimony whereof, I have hereunto set my hand, this 27th day of September, 1906, in the presence of two subscribing witnesses.

JAMES L. PILLING.

Witnesses:

CHARLES GILBERT HAWLEY,

K. M. IMBODEN.