No. 679,356. Patented July 30, 1901.

N. C. BASSETT.

WORM GEARING.

(Application filed Oct. 26, 1900.)

(No Model.)

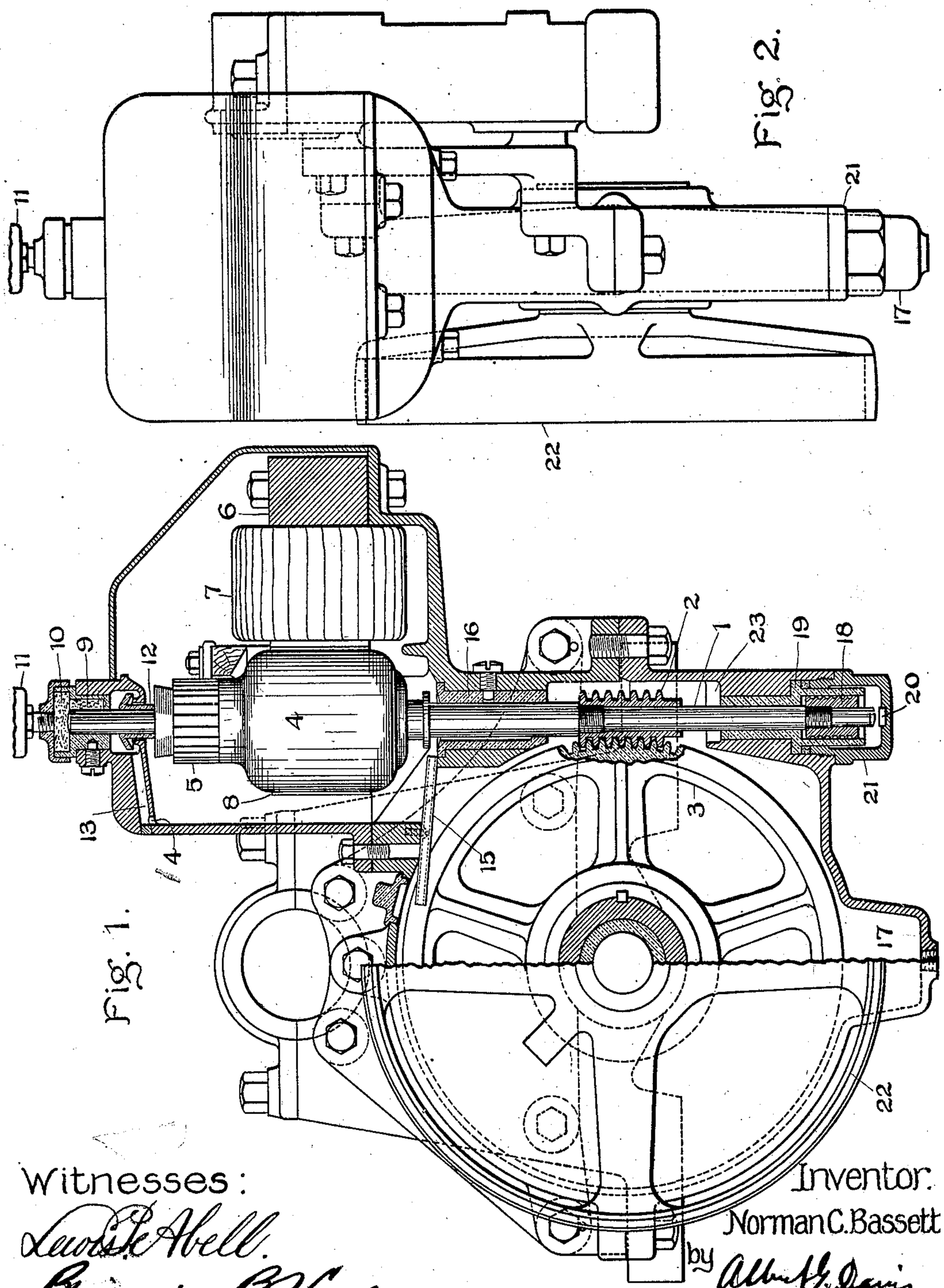

Fig. 1.

Fig. 2.

Witnesses:
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UNITED STATES PATENT OFFICE.

NORMAN C. BASSETT, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, OF NEW YORK.

WORM-GEARING.

SPECIFICATION forming part of Letters Patent No. 679,356, dated July 30, 1901.

Application filed October 26, 1900. Serial No. 34,492. (No model.)

To all whom it may concern:

Be it known that I, NORMAN C. BASSETT, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Worm-Gearing, (Case No. 1,468,) of which the following is a specification.

This invention relates to improvements in worm-gearing for transmitting power from motors.

A considerable part of the inefficiency of worm-gearing is due to the great friction on the bearings resulting from end thrust of the worm-shaft. It is the design of my invention to promote the transmitting efficiency of the gearing by avoiding this end thrust, and I accomplish the result by giving the worm-shaft a bias or thrust in a direction opposite to that imposed by the load and sufficient when the load is normal to counterbalance the end thrust. Thus the worm-shaft engages only the worm-wheel, and the friction due to lateral thrust is avoided. This bias may be effected in a variety of ways, depending on the type of motor and the position of the shaft; but I prefer to effect it by mounting the worm-shaft vertically and loading it so that it will counterbalance the normal working load.

The invention is of particular advantage in connection with worm-gearing driven by electric motors, in which case the armature of the motor may be mounted on the worm-shaft and by reason of its weight act as a counterbalance to the normal load. In addition to this the direction of motion transmitted is such that the effort of the load is to raise the worm-shaft and lift it out of mechanical contact with its lower bearing and hold it floating, as it were, while the worm transmits motion to the wheel it engages. In such a case the field-magnet of the motor acts in the capacity of a frictionless spring or cushion, which assists the weight of the parts in balancing the load, since any tendency of the load to raise the worm-shaft tends to deflect the armature into an unsymmetrical position with relation to its field-magnet, and the latter resists such a tendency.

My invention therefore comprises worm-gearing in which the worm-shaft is given a bias to counterbalance the normal load in order to prevent the losses due to end thrust. It comprises also a system of gearing in which the worm-shaft is mounted vertically and given a bias by weighting or otherwise to counterbalance the load. It comprises also the combination of an electric motor the armature of which is mounted on a vertical worm-shaft, and gearing so related to the load that the latter will tend to lift the shaft. It comprises also details of construction, the novelty of which will be specifically pointed out hereinafter and which will be definitely indicated in the claims appended to this specification.

In the accompanying drawings, which illustrate one form of my invention, Figure 1 is a sectional view of a system of worm-gearing driven by a bipolar electric motor, as adapted for use in operating linotype-machines. Fig. 2 is an elevation on a plane at right angles to that indicated in Fig 1.

1 represents a worm-shaft, the worm 2 of which engages a worm-wheel 3. On the shaft is mounted an armature 4 of an electric motor, of which 5 is the commutator and 6 the field-magnet. The motor is shown in section, one coil being indicated at 7 and the tip of the rear pole-piece being seen at 8. The gearing and motor are surrounded by a cast-metal casing adapted to be separated at suitable points, as indicated in the drawings, for assembly and withdrawal of the parts when necessary. The upper end of the worm-shaft turns in a bearing in the lining of which are placed pads of felt or other absorbent of oil, as indicated at 9, and over the end of the shaft is laid a disk of felt 10, above which is supported an oil-pot 11. Within the motor-casing is placed a thimble 12, on the shaft flanged at the top, as indicated in Fig. 1, to deflect the oil fed from the oil-pot 11 to a hole drilled in the casting of the motor-casing, as seen at 13. A hole 14, bored in the bottom of this channel close to the side of the casing, permits the oil to flow down over the inside into a gutter 15, the end wall of which constitutes a scraper to remove excess of oil from the worm-wheel. This gutter leads the oil to an intermediate bearing 16 of the worm-shaft, through which it passes and discharges upon

the worm. The casing for the gear-wheel 3 contains a well 17, into which dirt may settle. The lower part of the worm-wheel casing is made liquid-tight, so that the oil-level may be raised to a point where it will partially submerge the worm-wheel.

In the operation of the apparatus the wheel carries the oil with it to the scraper, where the excess is removed, and thus sufficient oil is fed to the intermediate bearing 16 and worm to permit an easy operation. To the lower end of the worm-shaft is connected a piston 18, provided with a number of horizontal grooves on its periphery, which makes an easy fit with the lining 19 for the bottom bearing. The shaft rests, when the machine is not running, on a hardened-steel plate 20, fixed in a screw-cup 21, inclosing the end of the shaft. The cup and piston form a dash-pot, which resists sudden motions up or down of the worm-shaft, thereby preventing blows due to end thrust on a sudden change of load.

22 represents a combined clutch and pulley the outer rim of which serves as a pulley and the inner face acts on a clutch member fastened to the shaft of the machine. This forms no part of my invention, but is of advantage in operating linotype-machines, for which my invention is well adapted.

The weight of the armature and worm-shaft may be so designed as to just counterbalance the lifting effect of a normal load on the driven machine. Any excess of load tending to raise the shaft in the case of an electric-motor-driven outfit would lift the armature relatively to its field of force, and such an effort would be strongly resisted by the magnetic pull between the armature-core and the field-magnet. Thus when the gearing is in operation the worm floats, as it were, in its bearings, and the efficiency of power transmission between the motor and the work is greatly increased.

The oil fed from the pot 11, after lubricating the top bearing, drips from the flange of the thimble 12 and passes through the hole 14 over the inner vertical wall of the motor-casing to the gutter formed in the scraper 15, then lubricates the intermediate bearing 16, and falls upon the worm-wheel. The excess of oil from the worm-wheel drops into a cup 23, formed in the upper part of the bottom bearing, which will be kept full when the apparatus is in action. From this it leaks into the dash-pot, and the latter is kept filled. The thimble 12 may have a pushing fit on the shaft, so that it may be removed in order to permit the top of the motor-casing to be taken off.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of a worm-wheel and a worm-shaft adapted to shift endwise under load, with means for giving the worm-shaft a bias to counterbalance the normal load driven by the wheel, whereby the friction of end thrust is obviated.

2. The combination of a worm-wheel and a vertically-mounted worm-shaft weighted to counterbalance the normal load driven by the wheel.

3. The combination of a worm-wheel, a worm-shaft, means for giving a bias to counterbalance its end thrust, and a dash-pot to oppose sudden changes of movement of the shaft.

4. The combination of a worm-wheel, a worm-shaft and an electric motor driving the same, the armature of the motor being mounted on the shaft and fixed thereon to hold the shaft against end thrust when symmetrical in its field of force.

5. The combination of a worm-wheel, a vertical worm-shaft, an electric motor driving the same, the armature of the motor being mounted on the shaft, the parts being so adjusted that when the armature is symmetrical with relation to its field, the shaft floats in its bearings.

6. The combination of a worm-wheel, a vertical worm-shaft, an oil-feed at the top of the shaft, and guides for leading the oil from the top bearing to the bottom bearing over the working face of the worm.

In witness whereof I have hereunto set my hand this 24th day of October, 1900.

NORMAN C. BASSETT.

Witnesses:
DUGALD MCKILLOP,
JOHN J. WALKER.