To all whom it may concern:

Be it known that I, André Boas, engineer, of 3 Avenue Elyséee Reclus, at Paris, Department of the Seine, in France, citizen of the French Republic, have invented certain new and useful Improvements in Mechanical Screw-Jacks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

The employment of screw jacks, of which the essential elements are a screw and a nut, is common practice, for the purpose of raising or elevating heavy loads by human power. These devices however possess the disadvantage of low efficiency, the co-efficient of friction between the screw and the nut being of great importance in consequence of the low linear speed of the relative movement between the two elements. Further the utilization of human power is generally imperfect because when these jacks are actuated by the alternate movements of a lever, the power is utilized most frequently in one direction of movement of the lever, the movement of the lever in the other direction being idle or performing practically no useful work.

The object of the present invention is to minimize or suppress the above disadvantages. The invention is hereinafter described in detail with reference to the accompanying drawings which show by way of example a construction of screw jack in accordance with the present invention.

Figure 1 is a half section and half elevation of a screw jack in accordance with the present invention.

Fig. 2 is a horizontal or cross section through the nut and the screw.

Fig. 3 is a cross section through the lower part of the jack.

Fig. 4 is a side view of the operating means.

Fig. 5 is a front view of the operating means.

Fig. 6 is an oblique section of the operating means.

The screw-jack shown in the drawing comprises a hollow cylindrical body 1 provided at its upper end with a circular annulus 1' containing the screw and the controlling means; the casing 1' is closed by a screwed cover 2 and provided with a locking screw 3. The hollow cylindrical body 1 is provided at its lower part with projecting lugs 4 which may be used to impel the load when the jack must raise it and have its point of application, or its support on the ground, by means of the part 5 forming an extension of the screw 6. Likewise when the screw jack must act to elevate a load while having its support above the ground it is the lower plate of the annulus 1' which bears on the said support, while the charge is suspended from the part 5.

In the interior of the cylindrical body 1 is fixed a key 7; the part 5 is provided with a groove corresponding to the key which engages the part 5, and by which the screw 6 is turned relatively to the body 1.

The contour or profile of the thread of the screw 6 is such as to engage a certain number of steel balls 8; the nut 9 is provided with a corresponding internal groove. The screw 6 has no direct contact with the nut 9 as the balls 8 serve to transmit the power and the movement.

The groove made in the nut 9, forms one or more threads, extending through one or more turns of a helix. The number of balls engaged between the nut and the screw depend on the load to be elevated or raised and on the diameter of the balls. At the origin and end of the helical portion formed by the balls supporting the load, the nut is provided with extended tangential passages which open onto the exterior surface of the nut, where they present a suitable enlargement and exterior length of surface and are connected by a passage in the form of a half turn to the helicoidal generatrix. This passage is closed by an exterior piece 10 assembled in two parts, which is provided with a helicoidal groove forming the complement to that of the screw proper, so that the balls move out of contact through one of the passages and return under mutual pressure until they re-engage in contact with the screw through the second passage. The screw and the nut being threaded right hand, the return passage for the balls is made in the form of a left handed helix.

The arrangement permits of a considerable reduction in the friction between the screw and the nut, by the substitution of rolling friction for sliding friction.
The exterior part 10 can be used as a brake pulley when lowering the load. For this purpose it is provided with a brake band 11, actuated by a screw 12 which is operated by the hand wheel 15.

Further the nut part 10 carries a bevel wheel 14, with which engages a bevel pinion 15. This pinion 15 is mounted in ball bearings with or without rollers, and is actuated for example by a hand lever 16 or by a ratchet and pawl.

The weight of the load when the latter is applied at 4 and when the part 5 acts as the support, is transmitted to the body 1, to the nut 9 through a thrust ball bearing 17. When the load is suspended at 5 and when 1 acts as the support, the load is transmitted to the nut by 1 through a thrust ball bearing 18.

The ratchet lever mechanism comprises a ratchet wheel 19 having square teeth. Two diametrically opposed and beveled paws 20, 20' act on the wheel 19, the said paws being mounted in cylindrical housings inclosing the gear 19 and maintained in engagement with the teeth of the wheel 19 by spiral springs 21. The paws can be set as desired or at will in order to allow rotation of the wheel in one or other of the two directions of rotation.

The operating lever 22 carries one of the cylindrical housings loosely mounted on a boss 19' of the gear wheel 19, provided with a semi-circular gear 22' and a pawl 20. Engaging gear 22' is a toothed sector 23 loosely mounted on a fixed axis, the sector 23 engaging with a second sector 24 which in turn is in mesh with a gear sector 25 integral with the housing supporting the pawl 20'.

It is to be understood that the housing for the paws 20' and 20 each carry a gear sector 25 and 22', respectively, and are arranged on each side of a gear 19 on the bosses 19'.

Inclosed within the members carrying the paws 20' and 20 and gear racks 25 and 22' respectively is a gear wheel 19, adapted to be engaged by both paws 20 and 20', as clearly shown on the extreme left of Fig. 1, the paws being set so that the beveled sides are facing in the same direction as shown in Fig. 5.

In operation, when the lever 22 is forced downward, the enlarged end of said lever is rotated about the boss 19' of the gear wheel 19. The pawl 20 carried by the lever 22 is also rotated and likewise the rack 22' formed on the large circular end of said lever. On this downward movement of the lever the pawl 20 will ride over the teeth of the gear wheel 19, and the shaft 15' will not be operated thereby. However, the segmental rack 22' of the lever 22 engages the geared sector 23, which in turn meshes with a similar sector 24. This sector 24, as hereinafore stated, is in mesh with the other circular member carrying the rack 25 and pawl 20'.

Through this gear arrangement the downward throw of the lever 22 will move the gear 23 clock-wise, gear 24 counter-clock-wise, which in turn will rotate the sector 25, and pawl 20' clock-wise. This pawl having its straight side in engagement with the teeth of the gear 19 will cause the same to be rotated likewise in the same direction, and the said gear 19 being secured to the shaft 13' the rotation of the shaft is accomplished.

When the movement of the lever 22 is reversed and moved upward, the straight side of its pawl 20 will engage the teeth of the gear 19 and thus continue to rotate the shaft 15' in the same direction, the pawl 20' becoming inoperative and allowing the teeth of the gear 19 to slip by.

Claims—

1. A screw jack, comprising a screw, a cooperating rotary nut, an actuating mechanism, a casing therefor, said nut being anti-frictionally supported within said casing and having a passageway extending from the threads of the screw through to the peripheral face thereof, and a cylindrical member inclosing said nut, and forming the outer wall of the passage way and a manually actuated brake operating on said member.

2. A screw jack, comprising a screw, a cooperating rotary nut, a ratchet mechanism for operating said nut, comprising a shaft, a gear secured to said shaft, having supported on each side thereof a cylindrical housing carrying paws engaging said gear, one of said housings having a lever, toothed sectors on each housing in mesh with intermediate gears and said intermediate gears geared to each other, the beveled sides of said paws facing in the same direction so that the said shaft will be continuously rotated in the same direction on the upward and downward movement of the lever.

In testimony whereof I affix my signature in presence of two witnesses.

ANDRÉ BOAS.

Witnesses:

JOHN F. SIMONS,
ALEXANDRE BERTHOLLE.