J. C. KOPF AND F. H. SCHWERIN.

HIGH SPEED JACK.

APPLICATION FILED AUG. 2, 1920.

1,410,577.

Patented Mar. 28, 1922.

3 SHEETS—SHEET 1.

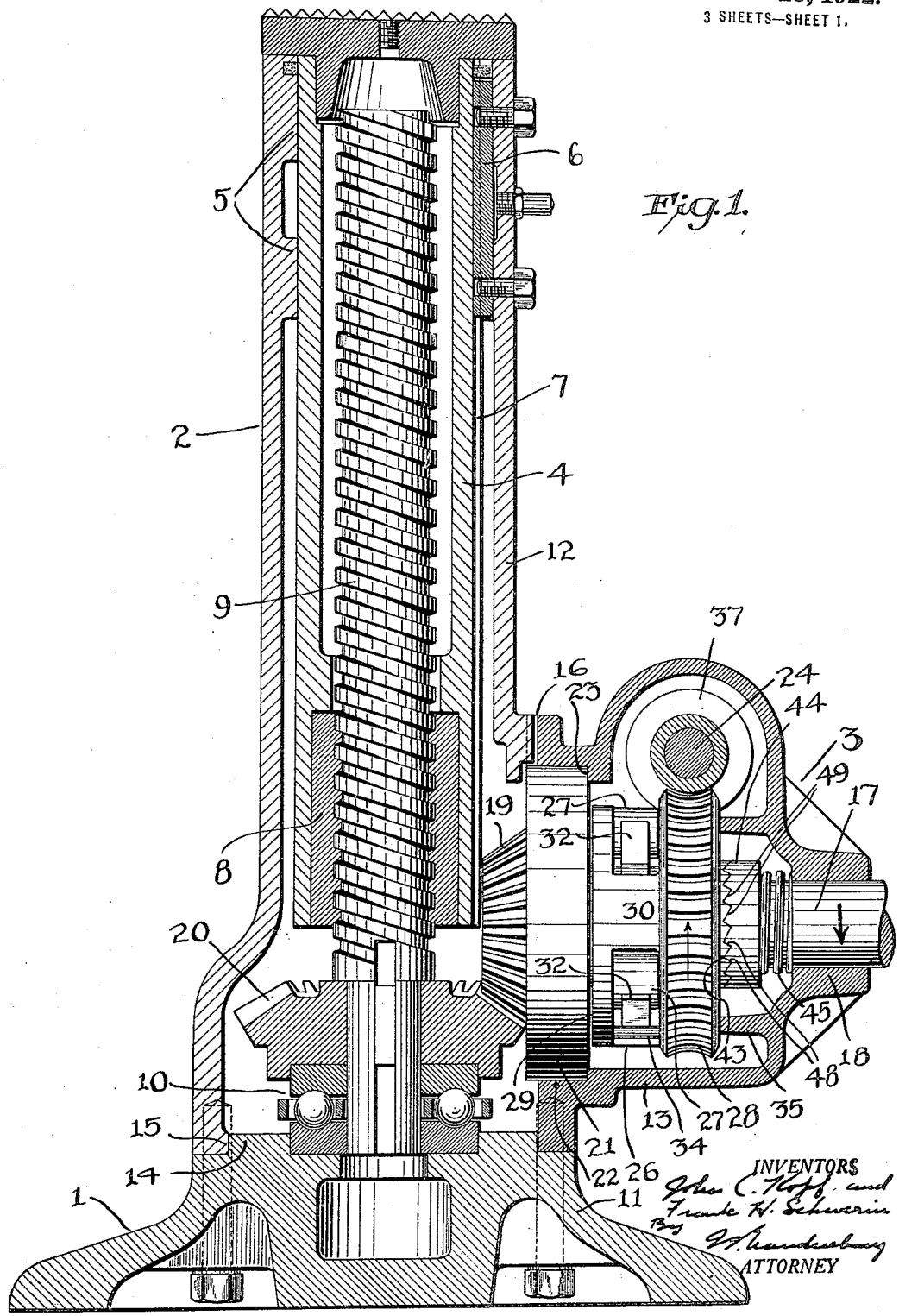

Fig. 1.

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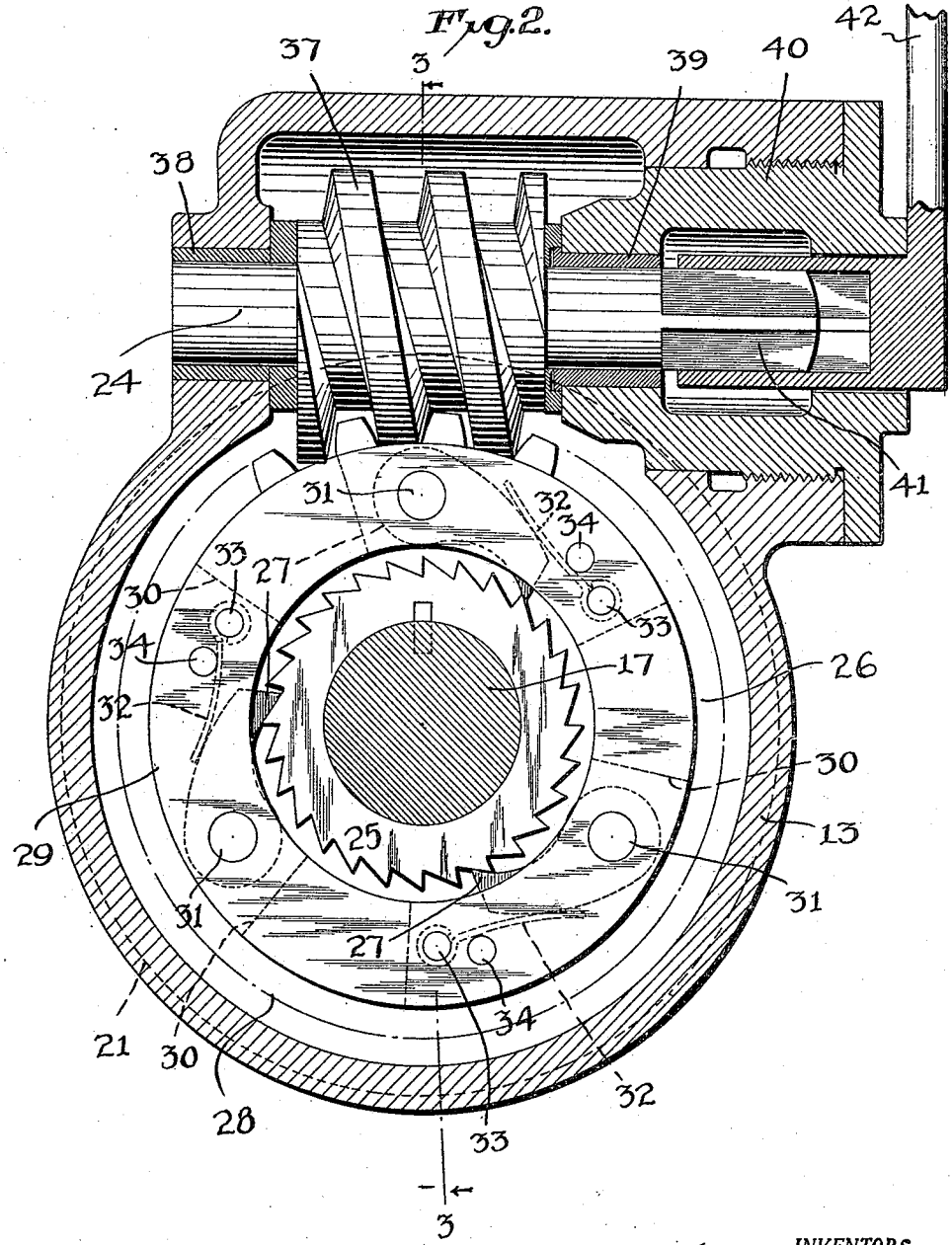
Fig. 2.



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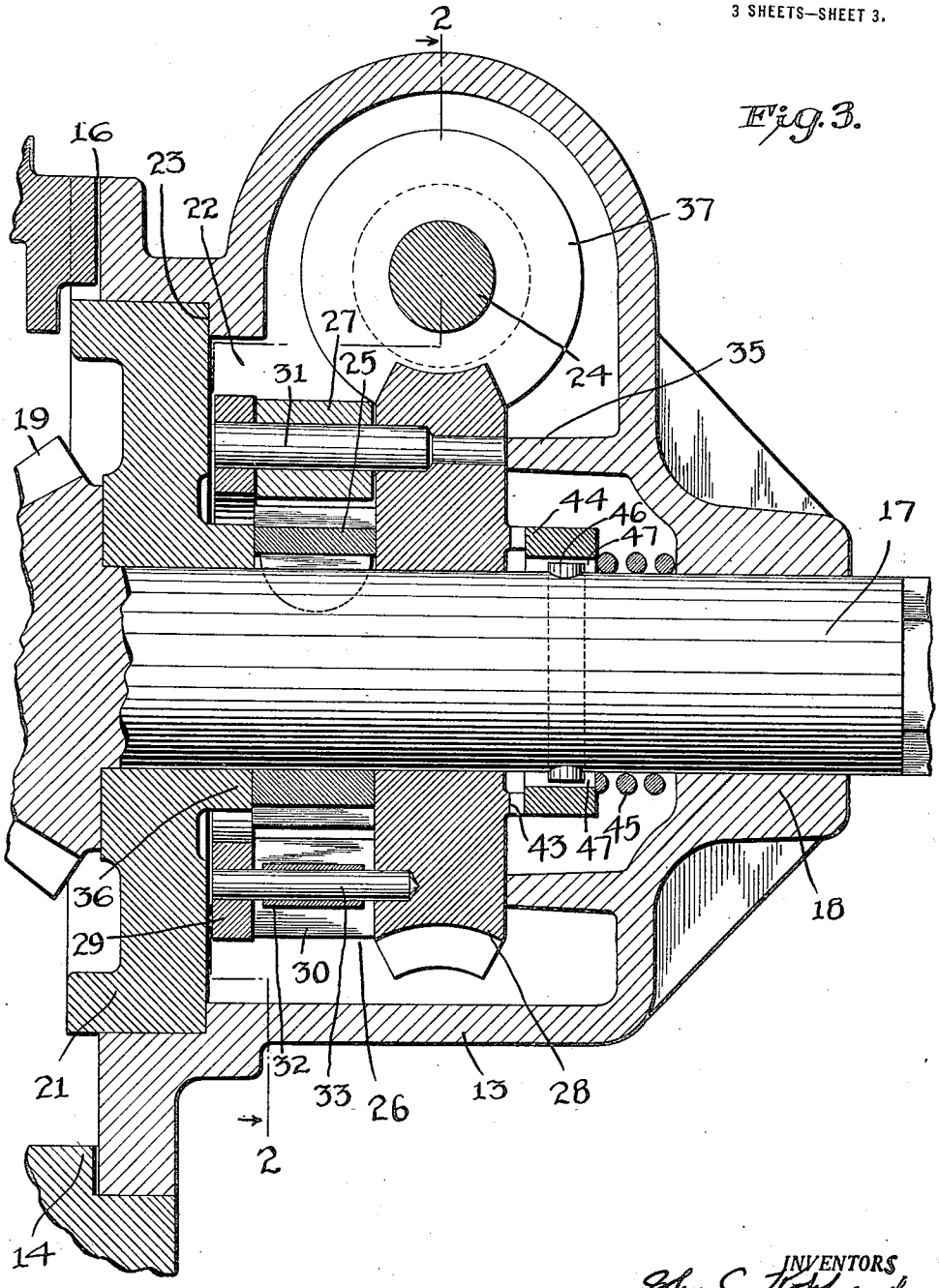
3 SHEETS—SHEET 3.

Fig. 3.



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HIGH-SPEED JACK.

1,410,577. Specification of Letters Patent. Patented Mar. 28, 1922.

Application filed August 2, 1920. Serial No. 400,803.

To all whom it may concern:

Be it known that we, JOHN C. KOPF and FRANK H. SCHWERIN, citizens of the United States, and residents, respectively, of the borough of Bellevue and of the borough of West View, both in the county of Allegheny and State of Pennsylvania, have invented a new and useful High-Speed Jack, of which the following is a specification.

This invention relates to high-speed screw-jacks, and is more particularly an improvement, in the nature of a simplification, upon and within our Patent 1,329,665, dated February 3, 1920. The invention also comprises an improvement in respect to means for driving the jack down when unloaded, applicable to high-speed jacks generally.

In the accompanying drawings:

Fig. 1 is a vertical sectional elevation of a jack embodying the invention, the section being taken in the plane of the axes of the lifting screw and lifting shaft, with the screw and parts on said shaft in elevation. The heavy arrow on the lifting shaft indicates the direction of rotation for lifting, while the light arrow on the worm-wheel indicates the direction of rotation for lowering.

Fig. 2 is an enlarged vertical cross-section through the annex taken on the line 2—2 of Fig. 3, showing in dot and dash line the circular outline of a part in front of the plane of section.

Fig. 3 is a vertical section on the line 3—3 of Fig. 2.

A high-speed jack, as understood in the art, is a high-lift, heavy-duty jack having a steep-pitch main screw, which permits of rapid lowering, and also, in one type, of quick raising to the load.

As in our prior patent, the jack has a hollow, closed supporting frame, comprising a broad base 1, with a standard 2 rising therefrom, and an annex chamber 3 at the back or side toward the bottom. A hollow, small-head ram 4, constituting the jacking member, slides in a rigid guide or bearing 5 in the upper end of the standard, and is held against rotation by a key 6 and keyway 7. In its lower portion the ram is formed or provided with a nut 8. An upright screw 9, the threads of which are beyond the angle of repose, is rotatably supported on the base by a ball-bearing 10, and rises through the nut 8 and thence freely upward within the ram. Furthermore, as in said patent, the enclosure frame is preferably formed of three separate sections, a bottom section 11, a standard section 12, and an annex section 13, bolted together, the bottom and standard sections having coaxial alining means 14, 15, and the annex section being applied to both sections so as to lock them against relative rotation and being further interlocked with the standard section by a lug and recess 16 at the top. In the annex of the base are the mechanisms for operating and controlling the steep-pitch screw.

A horizontal lifting shaft 17 passes through a support or bearing 18 in the outer end of the annex section 13, the external portion of said shaft being formed, as is well understood, for the reception of the customary ratchet and pawl rocker (not shown) for operation by a long bar handle. On the inner end of said shaft is a bevel pinion 19, which meshes with a bevel gear 20 on the lower part of the screw. The inner portion of the lifting shaft, behind the pinion 19, is rotatably supported in a central bearing in a removable member 21, which is secured to the interior opening 22 of the annex section, where it faces the interior of the body of the casing. Said member consists advantageously of a disk which is fitted tightly in a circular seat 23 formed in the annex section around its opening or mouth.

An auxiliary shaft 24, charged with the duty of holding and lowering the load, and also capable of other functions as will appear, is disposed transversely above the main or lifting shaft, in an arched top portion of the annex; this shaft being directly geared to the lifting shaft, through an overrunning clutch on the latter. Said clutch, as illustrated, comprises a ratchet wheel or fixed member 25 keyed to the lifting shaft and a "free" member,—that is to say free in respect to relative rotation in one direction,—in the form of a pawl cage 26 containing pawls 27 to engage the teeth of the ratchet. One of the side portions 28 of this pawl cage is in the nature of a worm-wheel, which may thus be said to be united with the clutch member, said worm-wheel

portion having a central opening which bears upon the intermediate portion of the shaft; while the other side portion 29 is supported in an overhanging fashion by connecting portions 30. The pawls 27 are pivoted on pins 31 extending across between the side portions, and are pressed by springs 32 sustained by other pins 33, 34. Details may, however, be varied.

The parts are preferably held endwise by bearing ribs 35 projecting inward from the closed outer end of the annex section to the side of the worm-wheel element 28, and an end bearing hub flange 36 on the disk 21 extending to the ratchet-wheel 25, which in turn is against the worm-wheel element. The removable disk 21 is larger than the clutch and gear member carried by the lifting shaft, as is also the opening 22; and the construction is such as to facilitate assembling, while affording rigid support and insuring alinement.

The holding and lowering means is preferably of the rotary gear-lock type, comprising a worm 37 fixed to the shaft 24 and meshing with the worm teeth on the member 28 loose on the lifting shaft, the angle of the coacting surfaces being within the angle of repose, so that the worm will drive the worm-wheel, but not vice-versa. One end of the shaft 24, behind the worm is journaled in a bearing 38 in the top portion of the annex section; and a journal portion at the opposite side of the worm is received in a bearing 39 in a gland 40. At this end the shaft is of polygonal formation 41 to receive the socket of a crank handle 42, which is inserted into the outer chamber of the gland, this operating handle being used in lowering, and also for running the jack up to the load in a more rapid and convenient manner than is possible with the main lifting lever.

It will be understood, therefore, that the worm, through the one-way-acting clutch, will hold the load on the ram at any point, and by turning the worm in the proper direction the load, continuously supported, will be permitted to descend. The inclination of the teeth of the overrunning clutch is of course such that the ratchet 25 turns with the lifting shaft freely within the stationary pawl case 26, in the lifting operation, and applies the load solidly to the cage and thence to the worm, where it is sustained, when the load tends to sink back at the end of each stroke.

In the lowering operation, when the shaft 24 is turned, the main overrunning clutch does not drive the screw, but merely permits it to follow the rotation of the free member 26. When the jack is unloaded, however, the weight of the ram may not be sufficient to cause it to descend of itself, and for that purpose it is desirable to provide means whereby the screw can be driven in the lowering direction from the crank-handle-operated shaft 24 of the auxiliary mechanism. In our prior patent we have disclosed a normally-disengaged clutch which can be operated to connect the lowering means, through the free member of a main overrunning clutch, with a shaft geared to the screw; and the construction employed herein is of this general character, but possesses the special novelty that the second clutch is normally engaged and consequently entirely automatic in its action. While normally engaged, however, it does not interfere with the lifting operation, being adapted to yield at such time, while holding with sufficient force to drive the ram down unloaded. In the particular construction illustrated, the outer side of the part 28 of the free member of the main clutch is formed with a crown of teeth 43, cooperating with similar reversed teeth on a collar 44, which is slidably keyed to the lifting shaft 17 and constantly urged into engagement by a spring 45, interposed between the collar and the outer end wall of the annex chamber. The sliding driving connection between said collar and the shaft may be advantageously secured by a pin 46 occupying a transverse hole in the shaft, with its ends projecting within slots 47 in the collar.

The cooperating working faces 48 of the teeth of this clutch are inclined, the angle being such that the collar yields readily away from the part 28 during lifting, but when the shaft 24 is turned in the lowering direction the frictional engagement turns the lifting shaft 17, and thereby the screw 9, so as to compel the ram to move downward when without load. The backs 49 of the teeth may be sloped, as shown, at a lower inclination than the working faces.

The operation will be briefly reviewed. The ram 4 can be raised quickly to the load by turning the crank 42 in the proper direction, causing the worm 37 and worm-wheel 28 to rotate the bevel gearing 19, 20, through the overrunning clutch 26, 25, acting as a positive connection, and the lifting shaft 17. Said lifting shaft is then ratcheted in the same direction, in the usual manner, to lift the load to the desired height, during which operation the member 25 of the overrunning clutch fast on the lifting shaft rotates idly with reference to the other part 26, which is held stationary by the self-locking worm-gearing. To lower the load the crank is turned in the reverse direction, thereby rotating the free member of the clutch so that it tends to retreat from the member fixed on the lifting shaft, which member, however, is caused to follow in sustained relation, by reason of the load driving the screw, bevel gearing and lifting shaft. At any point the load is stopped

dead by simply ceasing to turn the crank. When the load has been lowered to a support, the friction between the screw 9 and nut 8 might be sufficient to keep the ram and its connected parts from following the overrunning clutch as the crank continues to be turned in the lowering direction, were it not for the automatic yielding clutch 43, 44, the friction between the spring-pressed inclined working faces 48 of which, however, causes it to act for the time being as a positive driving connection to complete the lowering of the jacking member or ram.

What is claimed as new is:

1. A high-speed jack, comprising a hollow supporting frame including a base and standard and an annex chamber, a ram slidably guided in the standard, a steep-pitch screw rotatably supported on the base and rising within the ram, a horizontal lifting shaft in said annex chamber geared to the lower part of the screw, an overrunning clutch on said lifting shaft, a manually-operated holding, lowering and quick-raising shaft transversely above the lifting shaft, and self-locking worm and worm-wheel members united respectively with the second-named shaft and the overrunning clutch on the lifting shaft.

2. A high-speed jack, comprising a hollow supporting frame including a base and standard and a separate annex section, a ram slidably guided in the standard, a steep-pitch screw rotatably supported on the base and rising within the ram and having a bevel gear on its lower portion, a horizontal lifting shaft having an outer support in said annex section and a bevel pinion on its inner end meshing said bevel gear, an overrunning clutch and gear member on the lifting shaft behind said bevel pinion, an auxiliary shaft in the annex section transverse to the lifting shaft and having a gear member meshing with the gear member of the overrunning clutch, and a removable inner support for the lifting shaft carried by the open inner portion of the annex section behind the bevel pinion and permitting the introduction of said overrunning clutch and gear member.

3. A high-speed jack, comprising a hollow frame including a base and hollow standard and a separate annex section having a wide circular seat in its interior opening, a ram slidably guided in the standard, a steep-pitch screw rotatably supported on the base and rising within the ram and having a bevel gear on its lower portion, a horizontal lifting shaft having an outer support in said annex section and a bevel pinion on its inner end meshing said bevel gear, an overrunning clutch and gear member on the lifting shaft behind said bevel pinion, an auxiliary shaft in the annex section transverse to the lifting shaft and having a gear member meshing with the gear member of the overrunning clutch, and a removable disk in said circular seat, of greater diameter than the overrunning clutch and gear member, forming an inner support for the lifting shaft.

4. In a high-speed jack, the combination with a hollow supporting frame including a base and standard and an annex chamber, a ram slidably guided in the standard, and a steep-pitch screw rotatably supported on the base and rising within the ram, of a horizontal lifting shaft in the annex chamber geared to the lower part of the screw, an overrunning clutch comprising fixed and free members on the lifting shaft formed to catch in respect to relative action in one direction, auxiliary holding, lowering and quick-raising means geared to the free member of said clutch, said free member having an additional clutch portion, a co-operative clutch member slidably keyed on the lifting shaft, and a spring constantly urging the collar into engagement with the free member, the collar being adapted to yield during lifting and to hold with sufficient frictional force to enable the auxiliary means to drive the ram down unloaded.

5. In a high-speed jack, a steep-pitch lifting screw, operating means connected therewith for lifting, a second operating means, and a main one-way-acting clutch connection between said second operating means and the screw, in combination with a second clutch normally in engagement between the second operating means and the screw, adapted to yield during lifting, and to hold with sufficient force to enable the second operating means to drive the screw in the lowering direction in the unloaded condition of the jack.

6. In a high-speed jack, a steep-pitch lifting screw, operating means connected therewith for lifting, a second operating means, and a main one-way-acting clutch connection between said second operating means and the screw, in combination with a second clutch normally in engagement between the second operating means and the screw, said clutch comprising cooperating toothed members with a spring urging them in engagement, the working faces of the teeth having an angle which enables the clutch to act as a driving connection for lowering in the absence of load, while permitting it to yield during lifting.

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