April 19, 1932. L. F. KOTT 1,855,025

POWER HAMMER

Filed April 29, 1929 3 Sheets-Sheet 1

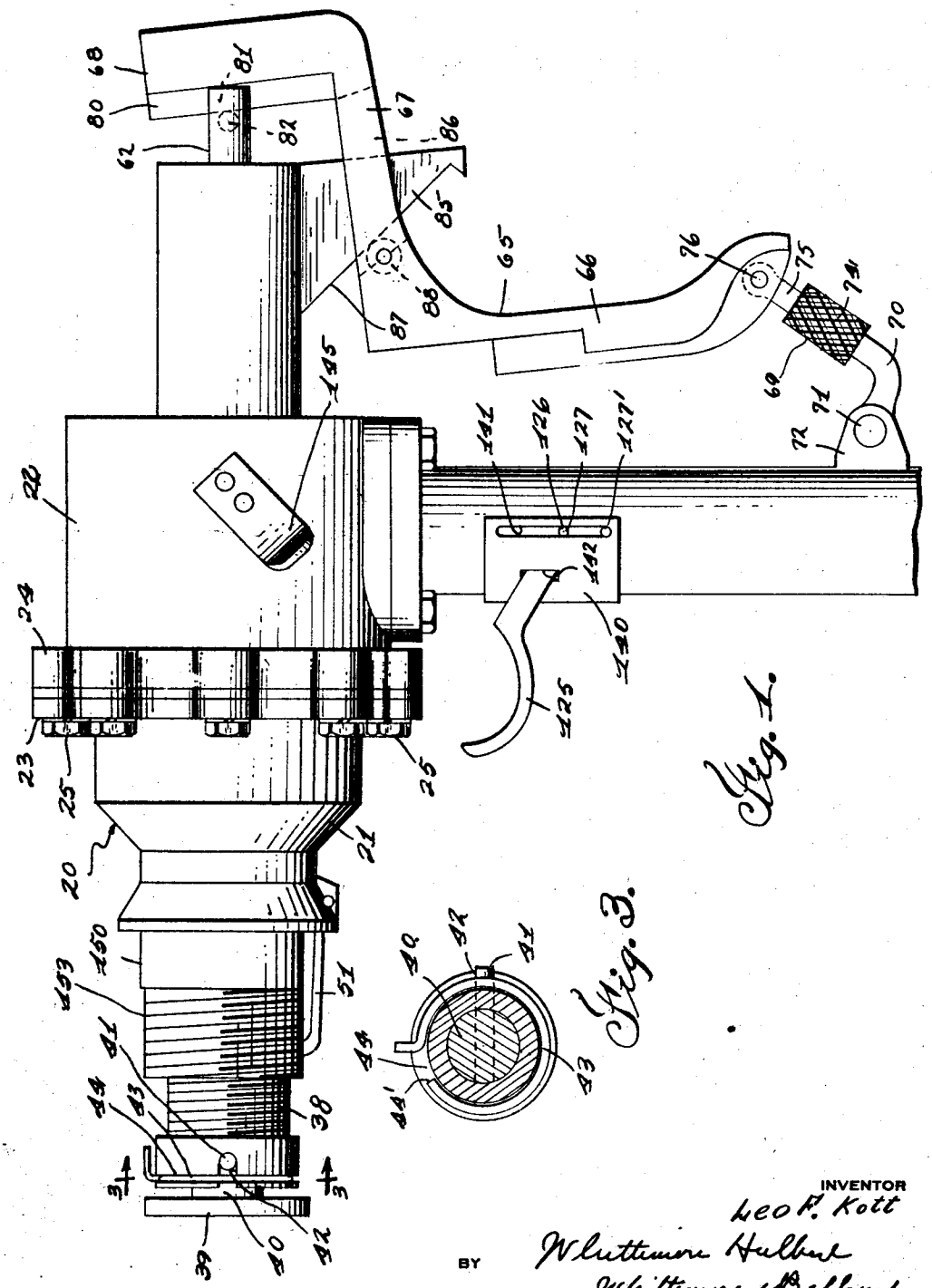

Fig. 1.

Fig. 2.

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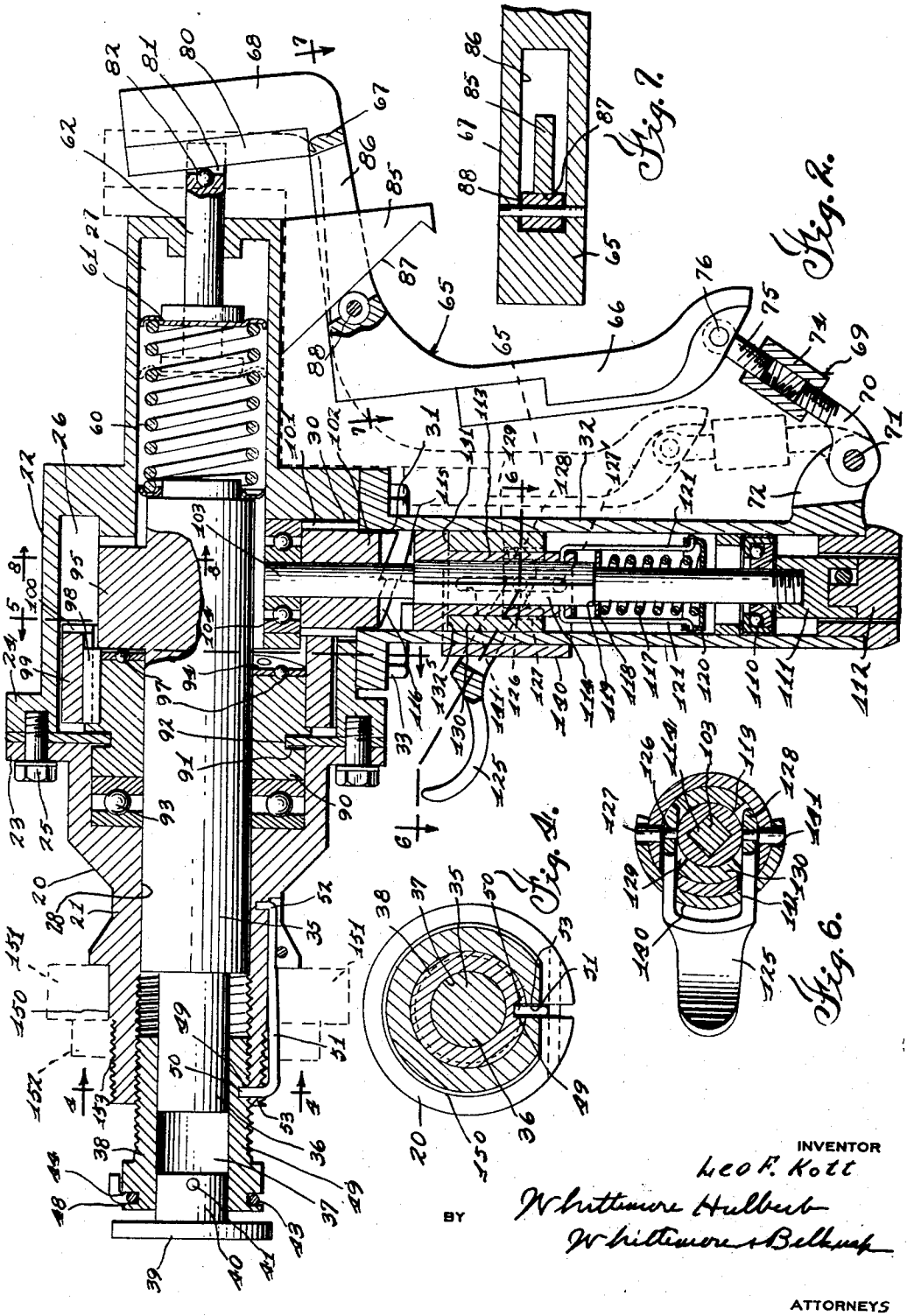

Fig. 2.

Fig. 4.

Fig. 6.

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Fig. 9.

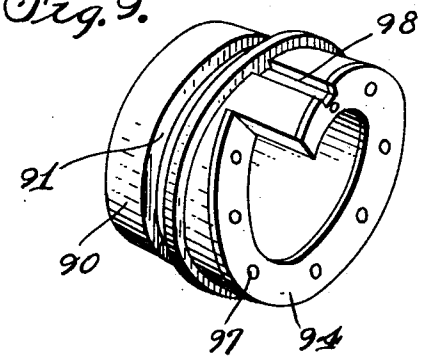


Fig. 5.

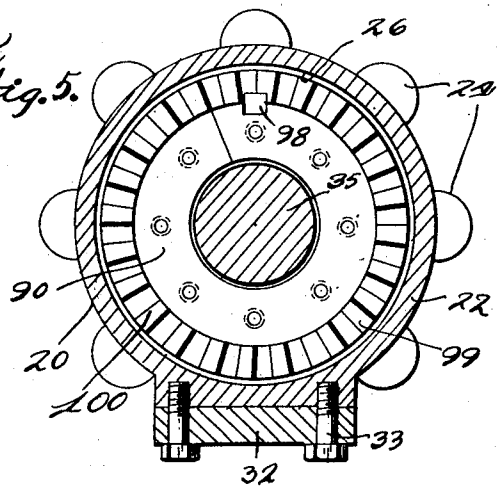


Fig. 8.

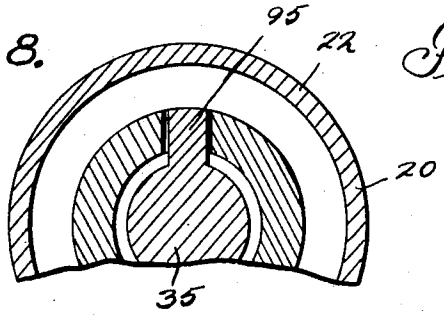


Fig. 10.

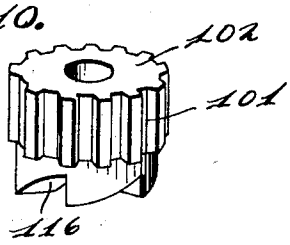
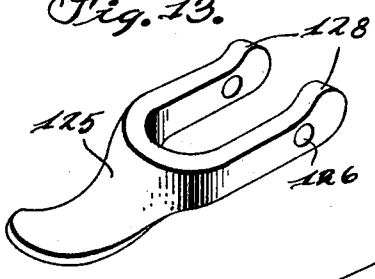


Fig. 13.



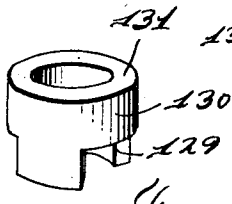


Fig. 12.

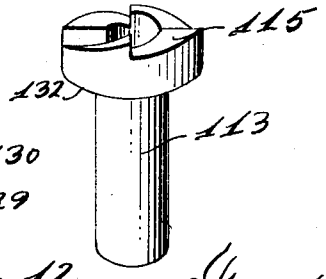


Fig. 11.

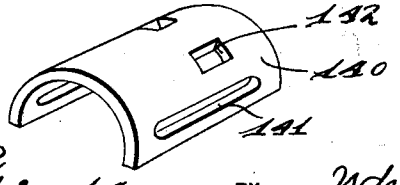


Fig. 14.

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Patented Apr. 19, 1932 1,855,025

UNITED STATES PATENT OFFICE

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POWER HAMMER

Application filed April 29, 1929. Serial No. 358,916.

This invention relates to power hammers and has particular reference to a power hammer of the character described in which the working stroke is imparted to the hammor by resilient means such as a spring or the like.

One of the primary objects of this invention is to provide a novel type of mechanism for intermittently moving the plunger of the power hammer in opposition to the force exerted by the resilient means which imparts the work stroke to the hammer.

A further object of this invention is to provide an improved mechanism for adjusting the force of the resilient means which imparts the working stroke to the hammer and to provide a mechanism of this character which may be actuated during operation of the hammer.

Other objects and advantages of the invention will become more apparent as the following description proceeds, particularly when reference is had to the accompanying drawings wherein:

Figure 1 is an elevational view of a power hammer constructed in accordance with the teachings of this invention;

Figure 2 is a longitudinal sectional view taken through the hammer shown in Figure 1;

Figure 3 is a transverse sectional view taken substantially on the line 3—3 of Figure 1;

Figure 4 is a transverse sectional view taken substantially on the line 4—4 of Figure 2;

Figure 5 is a transverse sectional view taken substantially on the line 5—5 of Figure 2;

Figure 6 is a sectional view taken substantially on the line 6—6 of Figure 2;

Figure 7 is a sectional view taken substantially on the line 7—7 of Figure 2;

Figure 8 is a sectional view taken substantially on the line 8—8 of Figure 2;

Figure 9 is a detail perspective view of the cam forming a part of the structure shown in Figure 2, and

Figures 10, 11, 12, 13 and 14 are perspective views of various elements of the construction.

Referring now particularly to the drawings wherein like reference characters designate corresponding parts throughout all views, it will be noted that the hammer includes an elongated casing designated generally by the reference character 20. This casing is formed of the complementary sections 21 and 22 having the abutting flanges 23 and 24 respectively, secured together by the bolts 25. The casing when assembled provides the enlarged substantially centrally arranged chamber 26 and the reduced cylindrical end chambers 27 and 28. The central chamber 26 is provided with the lateral opening 30 for communication with the open end 31 of a housing 32 which is bolted to the casing as at 33 and extends right angularly from the same as clearly illustrated in Figure 2 of the drawings.

Mounted for reciprocation within the casing and having a bearing in the chamber 28 is a plunger 35 having the reduced extension 36 which has a sliding bearing in the bore 37 of a sleeve 38 threaded in the end of the section 21 of the casing. A hammer head 39 is detachably mounted in the outer end of the sleeve 38 by means of the cylindrical stud 40 formed integral with the hammer head and adapted to project into the bore 37 of the sleeve. For holding the stud 40 in position within the sleeve, the stud is provided with a pin 41 which projects through a slot 42 formed in the end of the sleeve and this pin is adapted to be moved to a position in the slot in back of a ring 43 mounted in a groove 44 formed in the outer periphery of the sleeve and adjacent the end of the same. The ring 43 is cut away as at 44′ and is rotatable in the groove whereby the cut away portion may be registered with the slot 42 to permit withdrawal of the pin 41 from the slot. Obviously, when the pin is in the position shown in Figure 1 of the drawings, the ring 43 may be rotated to close the end of the slot to prevent withdrawal of the pin.

The stud 40 closing the end of the bore 37 is adapted to be struck by the reduced end of the plunger when the latter is reciprocated. The sleeve 38 being threaded in the end section 21 provides means for varying the stroke of the plunger since by threading the sleeve

inwardly of the chamber 28 the stud 40 is moved nearer the end of the plunger to thus decrease the stroke of the plunger. For limiting outward adjustment of the sleeve, for a purpose hereinafter to be described, the sleeve is provided with an aperture 49 adapted to be engaged by the free end 50 of a spring 51 secured to the section 21 of the casing as at 52 and projecting through an aperture in the casing as at 53. Obviously, when it is desired to adjust the sleeve 38 inwardly from its outermost position, it is only necessary to withdraw the end 50 of the spring from the aperture 49 whereupon the sleeve may be threaded inwardly of the casing to the desired point. Upon outward threading of the sleeve, however, the end 50 of the spring snaps into the aperture 49 when the latter registers with the aperture 53 to thus prevent further threading of the sleeve.

Arranged in the chamber 27 is a spring 60 which engages at its one end the end of the plunger and which engages at its other end an adjustable abutment plate 61 adapted to be adjusted longitudinally of the chamber 27 by an arm 62. The spring 60 constantly urges the plunger 35 in the direction of the hammer head 39 and by varying the position of the plate 61, the force with which the spring urges the plunger in this direction may be readily varied.

In order that the compression of the spring may be readily adjusted during operation of the hammer, there is provided a lever 65, this lever being movable from the position shown in full lines in Figure 2 of the drawings to the position shown in dotted lines in this figure. The lever is provided with a grip portion 66 which extends in the direction of the housing 32, a second portion 67 at right angles to the portion 66, the portion 67 extending in the general direction of the arm 62, and a third portion 68 extending at right angles to the portion 67 and across the end of the chamber 27. This lever is preferably pivotally secured to the housing 32 by the connection 69 which includes a rod 70 pivoted as at 71 between the ears 72 preferably cast integral with the housing 32. This rod has its free end threadedly engaging a sleeve 74 and this sleeve is threadedly connected to a rod 75 which is pivotally secured as at 76 to the free end of the grip portion 66 of the lever. The sleeve 74 cooperates with the rods 70 and 75 to produce a turn buckle whereby the distance of the free end of the lever from the housing 32 may be adjusted.

The end 68 of the lever is provided with the centrally arranged rib 80 adapted to engage in a slot 81 in the free end of the arm 62. A ball 82 mounted in the base of the slot permits the rib 80 to ride smoothly within the slot.

The lever is movable toward and away from the ends of the casing 20 and to guide the lever in its movement there is provided a lug 85 projecting from the lower face of the section 22 of the casing. This lug projects through a slot 86 in the portion 67 of the lever and is provided with a cam face 87 engageable with a roller 88 in the base of the slot 86.

Thus, when pressure is applied to the grip portion 66 of the lever the roller 88 rides downwardly on the cam face 87 and compels the end 68 of the lever to move toward the end of the chamber 27 and the arm 62.

In use the portion 66 of the lever cooperates with the housing 32 to form a grip for holding the hammer. The operator grasps the housing 32, with his hand extending around the grip portion 66 of the lever and as he holds the hammer head in engagement with the work, he draws the portion 66 of the lever toward the housing 32. This causes the end 68 of the lever to move toward the end of the chamber 27 and also across the end of this chamber so that the rib 80 moves transversely through the slot 81 as well as toward the end of the chamber. This movement of the lever moves the arm 62 longitudinally of the chamber 27 to thus compress the spring 60 to the desired degree. It will be noted that when the lever has been moved to its innermost position as shown in dotted lines in Figure 2 of the drawings, the rods 70 and 75 swing about their pivot points and to substantially the opposite sides of the same so that the spring 60 tends to hold the lever in its innermost position. Obviously, the lever may be released by moving the same slightly outwardly to swing the arm 70 past the center of the pivot 71.

For intermittently moving the plunger 35 against the force exerted by the spring 60 there is provided an annular member 90 journalled on the plunger 35 within one end of the chamber 26. The member 90 is provided on its outer periphery with a groove 91 adapted to be engaged by the inner periphery of an annular plate 92 clamped between the flanges 23 and 24 of the sections of the casing. The plate 92 prevents reciprocation of the annular member 90 upon reciprocation of the plunger 35.

The member 90 has a bearing at its one end on the thrust bearing 93 arranged in one end of the chamber 26 and is provided on its other end with a cam surface 94 as clearly illustrated in Figure 9 of the drawings. This cam surface is adapted for engagement with the projecting end of a lug 95 formed integral with and projecting from the upper face of the plunger 35. Suitable bearings 97 are preferably formed in the cam face for decreasing the friction between this cam face and the end of the lug 95.

The member 90 is keyed as at 98 to an annular member 99 provided on its one end with

the gear teeth 100 adapted for engagement with the teeth 101 of a pinion 102 rotatably mounted on a shaft 103, which shaft is journalled in a bearing 104 in the base of the chamber 26 and extends downwardly longitudinally of the housing 32. The arrangement is such that upon rotation of the pinion 102 the member 99 is rotated to rotate the member 90. The cam face 94 engaging the lug 95 periodically moves the plunger 35 to the right against the force of the spring 60 until the high point of the cam is passed whereupon the spring 60 moves the plunger to the left as shown in Figure 2 to cause the same to strike the stud 40 of the hammer head. The parts are so proportioned that the reduced end of the plunger first strikes the stud 40 and immediately thereafter the shoulder adjacent the reduced end of the plunger strikes the inner end of the sleeve 38. The engagement of the shoulder on the plunger with the end of the sleeve 38 prevents the lug from striking the low part of the cam surface 94, thus reducing wear on the cam and also prevents a breaking of the pin 41 by the reduced end of the plunger.

As brought out before, the shaft 103 has a bearing at its one end in the bearing 104 in the chamber 26. The other end of this shaft is journalled in a bearing 110 formed in the housing 32 at a point spaced from the casing 20. Beyond the bearing 110 the shaft 103 is connected to a socket member 111 adapted for detachable connection with a flexible drive shaft 112 deriving power from any suitable source, (not shown).

For clutching the pinion 102 to the shaft 103 there is provided a sleeve 113 slidably but non-rotatably mounted on a squared portion 114 of the shaft 103. The sleeve 113 is provided at its end with the clutch face 115 adapted for engagement with the clutch face 116 on the lower end of the pinion 102. A spring 117 is sleeved on the shaft 103 and engages at its one end a washer 118 abuttingly engaged with a shoulder 119 formed on the shaft 103 and engages at its other end a cup shaped washer 120 slidably mounted on the shaft 103. The washer 120 is connected by the rods 121 to the sleeve 113 whereby the spring 117 constantly urges the sleeve 113 downwardly away from clutching engagement with the pinion 102.

For moving the sleeve 113 into clutching engagement with the pinion 102 against the tension of the spring 117 there is provided a lever 125 pivoted as at 126 on pins 127 fixed in the walls of the housing 32. The lever 125 is provided with the cammed ends 128 engageable with the bases of recesses 129 formed on opposite sides of a sleeve 130, which sleeve is rotatably mounted on the sleeve 113. The upper edge 131 of the sleeve 130 is engageable with a shoulder 132 formed adjacent the upper end of the sleeve 113 whereby movement of the sleeve 130 upwardly will force the sleeve 113 upwardly to engage the clutch face 115 with the clutch face 116.

It is contemplated that the parts 113, 130 etc., will be lubricated and in order to prevent the lubricant from leaking out on to the hand of the operator, there is provided a semi-cylindrical cover 140 adapted to embrace the housing 32 adjacent the lever 125. The cover 140 is provided with the slots 141 for receiving the projecting ends of the pins 127 whereby the cover may be reciprocated if desired on the housing 32 and additional pins 127′ may be provided for more firmly guiding the slide in its reciprocation. The cover 140 is further provided with the spaced openings 142 through which the legs of the lever 125 project so that when the lever 125 is swung downwardly the cover is moved by the legs of the lever, being guided in its movement by engagement of the pins in the slots 141.

The operation of the clutching mechanism is as follows. The parts are normally in the position shown in Figure 2 of the drawings with the sleeve 113 in its lowermost position and the clutch faces 115 and 116 disengaged. In this position the shaft 103 rotates within the pinion 102, and the sleeve 113 rotates with the shaft 103 and within the sleeve 130. When it is desired to engage the clutch faces, the lever 125, which is provided with a finger portion for this purpose, is moved downwardly, whereupon the cammed ends 128 of the legs of the lever engage the bases of the recesses 129 to move the sleeve 130 upwardly and to force the sleeve 113 upwardly to engage the clutch face. Obviously, when the end of the lever is released the spring 117 will move the clutch faces out of engagement with each other.

If desired the casing 20 may be provided with the bearing portion 150 for swivel engagement with an arm 151 of any suitable anvil-supporting bracket, such for example as disclosed in my co-pending application, Serial No. 272,268, filed April 23, 1928 (Patent No. 1,798,379, dated March 31, 1931). For securing the arm 151 on the casing there may be provided a nut 152 which threadedly engages the casing as at 153 as clearly illustrated in Figure 2 of the drawings.

From the above it is believed that the structure and operation of the invention will be clearly apparent. The casing 20 is provided on its outer periphery with the finger grips 145 and in use the operator grasps the hammer with the palm of his hand engaging the grip portion 66 of the lever 65, with one of his fingers in engagement with the finger portion of the lever 125 and with the remainder of his hand partially surrounding the enlarged portion of the casing 20 and in engagement with the finger pieces 145. He then depresses the lever 125 to clutch the

pinion 102 to the driveshaft whereupon the cam member 90 is rotated to intermittently move the plunger 35 toward the right as viewed in Figure 2 and against the pressure of the spring 60. As the high portion of the cam passes the lug 95, the spring 60 rapidly moves the plunger to the left, causing the same to strike the hammer head in the manner above brought out. Thus the plunger is rapidly reciprocated to impart a plurality of blows to the hammer. As it is desired to vary the force of the blows, the lever 66 is moved to correspondingly compress or release the compression on the spring 60, the compression of the spring governing directly the force of the blows. The hammer head 39 may be easily removed and replaced and the sleeve 38 may be adjusted longitudinally of the chamber 28 to vary the stroke of the plunger.

While the invention has been described with considerable detail, it will be readily understood that the description is for the purposes of illustration only and that the right is reserved to make such changes in the details of construction and arrangement of parts as will fall within the purview of the attached claims.

What I claim as my invention is:

1. In a power hammer, a reciprocable plunger, a member journalled on said plunger for intermittently moving said plunger in one direction, means for constantly resiliently urging said plunger in the other direction, and means for varying the stroke of said plunger.

2. In a power hammer, a reciprocable plunger, a cam journalled on said plunger for intermittently moving said plunger in one direction, a spring for moving said plunger in the opposite direction, and means for varying the stroke of said plunger.

3. In a power hammer, a casing, a plunger reciprocable within said casing, a spring constantly urging said plunger in one direction, a lug projecting laterally from said plunger, a member journalled on said plunger and having a cam face engageable with said lug for intermittently moving said plunger in the opposite direction, and cooperating means upon said member and casing for securing said member against reciprocatory movement.

4. In a power hammer, a sectional casing, a plunger reciprocable within said casing, means constantly urging said plunger in one direction, a cam journalled on said plunger for intermittently moving said plunger in the opposite direction, and a member secured between the sections of said casing and engaging said cam for restraining the same from reciprocatory movement with said plunger.

5. In a power hammer, a casing, a plunger reciprocable within said casing, means constantly urging said plunger in one direction, a cam journalled on said plunger for intermittently moving said plunger in the opposite direction, said cam having an annular groove in its outer periphery, and an annular plate carried by said casing and engaging said groove for locking said cam against reciprocatory movement with said plunger.

6. In a power hammer, a casing, a plunger reciprocable within said casing, means for intermittently moving said plunger in one direction, a spring constantly urging said plunger in the other direction, and means for adjusting the force of said spring while the plunger is being reciprocated, said means including a member engageable with the free end of the spring, an arm for moving said member, a lever having a portion slidably engaging said arm to move the same, and a cam member upon said casing engageable by said lever.

7. In a power hammer, a casing, a plunger reciprocable within said casing, means for intermittently moving said plunger in one direction, a spring constantly urging said plunger in the other direction, and means for adjusting the compression of said spring, said means including an arm movable longitudinally of said casing, a lever engageable with said arm for moving the same, and a cam member upon said casing engageable by said lever.

8. In a power hammer, a casing, a plunger reciprocable within said casing, means for intermittently moving said plunger in one direction, a spring constantly urging said plunger in the other direction, and means for adjusting the compression of said spring, said means including an arm movable longitudinally of said casing, a lever slidably engaging said arm and movable toward and away from one end of said casing, and a lug upon said casing having a cam face engageable by said lever.

9. In a power hammer, a casing, a plunger reciprocable within said casing, means for intermittently moving said plunger in one direction, a spring constantly urging said plunger in the opposite direction, an arm carrying an abutment plate and adjustable longitudinally of said casing for adjusting the compression of said spring, and means for moving said arm, said means including a lever having an end portion movable across the end of said casing and slidably engageable with said arm, and means for varying the spaced relation of the end portion of the lever and the end of said casing upon movement of the end portion of the lever across the end of the casing, said last mentioned means including a lug carried by said casing, said lug having a cam face engageable with said lever.

10. In a power hammer, a plunger, a cam for reciprocating said plunger, a pinion for driving said cam, a clutch face on said pin-

ion, a drive shaft, a sleeve slidably but non-rotatably mounted on said drive shaft, said sleeve having a clutch face engageable with the clutch face on said pinion, and means for sliding said sleeve on said shaft to effect an engagement of said clutch faces, said means including a second sleeve journalled on said first mentioned sleeve, and a lever engaging said second sleeve to shift the same.

11. In a power hammer, a plunger, a cam for reciprocating said plunger, a pinion for rotating said cam, a clutch face on said pinion, a drive shaft, a housing for said drive shaft, a sleeve slidably but non-rotatably mounted on said drive shaft, a clutch face on said sleeve, a lever pivoted on said housing and projecting through openings in the same for sliding said sleeve on said shaft to effect an engagement of said clutch faces, and a plate slidably mounted on said housing and movable with said lever for covering the openings in said housing.

12. In a power hammer, a casing, a plunger reciprocable within said casing, means constantly urging said plunger in one direction, a rotatable cam in said casing for intermittently moving said plunger in the opposite direction, said cam having an annular groove in its outer periphery, and means carried by said casing and engaging said groove for locking said cam against reciprocatory movement.

13. In a power hammer, a casing, a plunger reciprocable within said casing, means constantly urging said plunger in one direction, a rotatable cam in said casing for intermittently moving said plunger in the opposite direction, and means adjustably threaded on said casing and adapted to be engaged by said plunger for varying the stroke of said plunger.

14. In a power hammer, a casing, a plunger reciprocable within said casing, means constantly urging said plunger in one direction, a rotatable cam in said casing for intermittently moving said plunger in the opposite direction and means carried by said casing and adapted to be engaged by said plunger for varying the stroke of said plunger, said means including a sleeve threadedly connected to the casing and adapted to be engaged by said plunger.

15. In a power hammer, a casing, a plunger reciprocable in said casing and having a shoulder, means constantly urging said plunger in one direction, a cam rotatably mounted in said casing for intermittently moving said plunger in the opposite direction, and means for limiting movement of said plunger under the influence of said first named means whereby the plunger is prevented from forcibly striking said cam.

16. In a power hammer, a casing, a plunger reciprocable in said casing and having a shoulder and lateral projection, spring means for constantly urging said plunger in one direction, a rotatable cam in said casing adapted to engage said lateral projection for intermittently moving said plunger in the opposite direction, and means adapted to be engaged by said shoulder for limiting movement of the plunger by said spring means whereby said projection is prevented from forcibly striking said cam.

17. In a power hammer, a reciprocable plunger, a spring constantly urging said plunger in one direction, and means for intermittently moving said plunger in the other direction against the tension of said spring, said means including a lug projecting laterally from said plunger, a combined gear and cam member journaled on said plunger but fixed against reciprocating movement therewith, said combined gear and cam member having a cam portion engaging the projection on said plunger and having gear teeth projecting beyond said cam portion and surrounding said projection, and a pinion gear engageable with the gear portion of said combined gear and cam member for rotating the latter.

In testimony whereof I affix my signature.

LEO F. KOTT.