June 28, 1927. 1,633,995

H. H. MILLER

POWER HAMMER

Filed Sept. 15, 1924 3 Sheets-Sheet 1

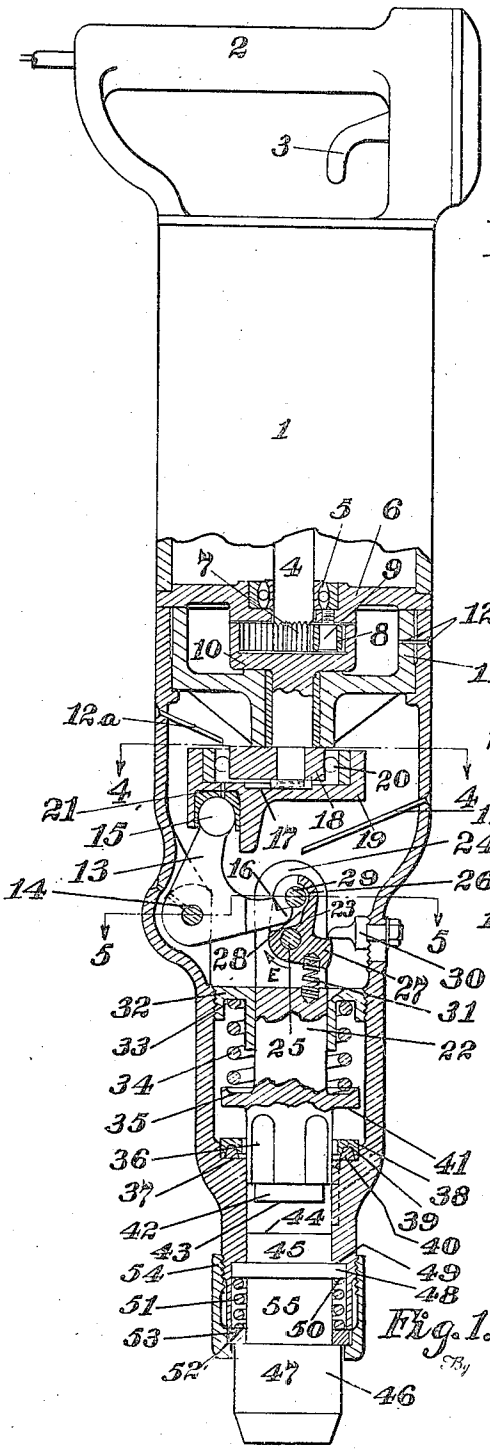


Fig. 1.

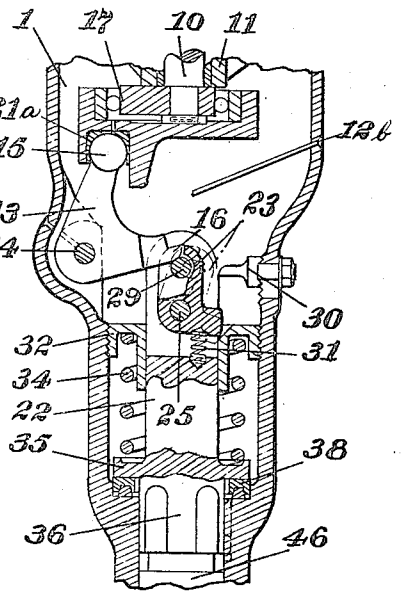


Fig. 2.

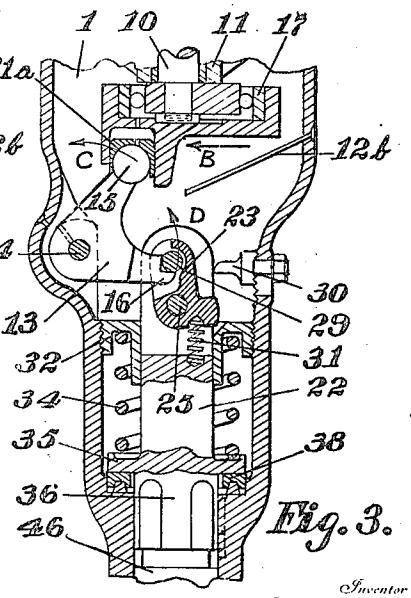


Fig. 3.

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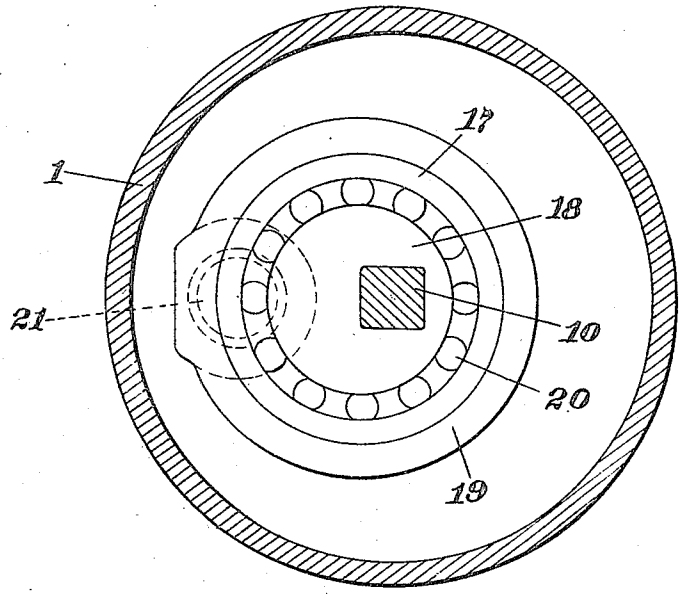


Fig. 4.

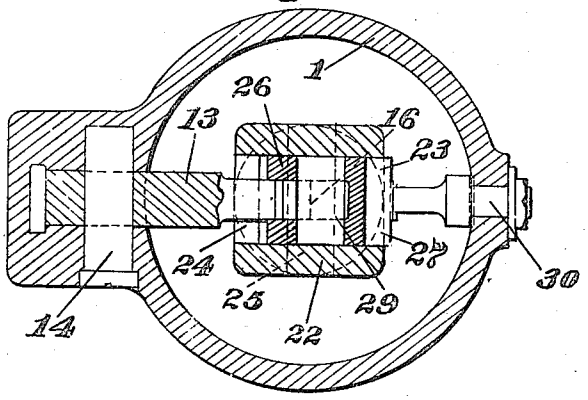


Fig. 5.

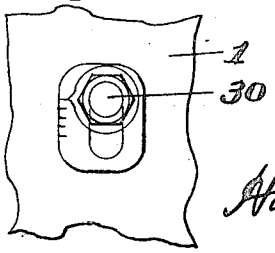


Fig. 6.

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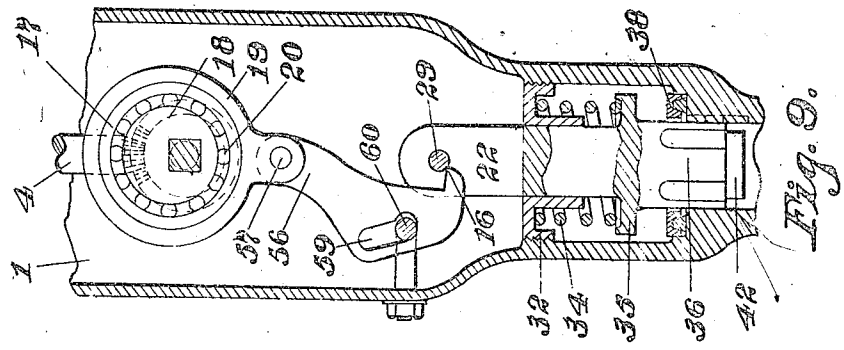


Fig. 9.

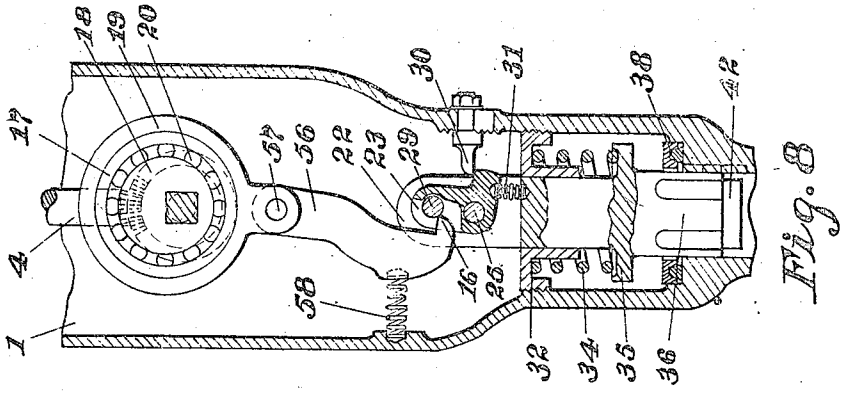


Fig. 8

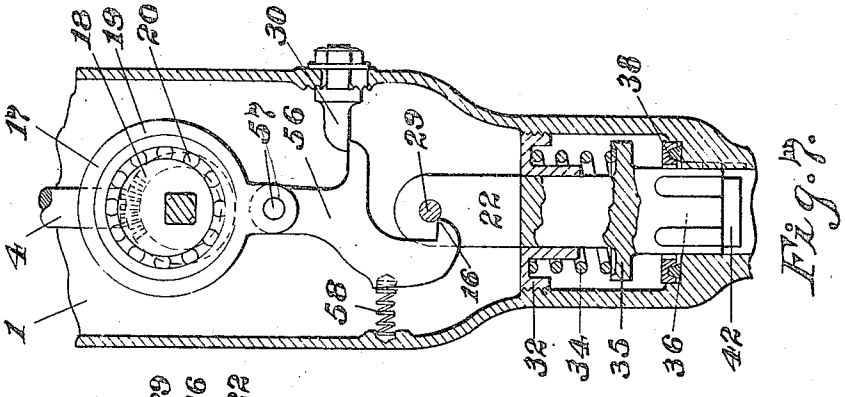


Fig. 7.

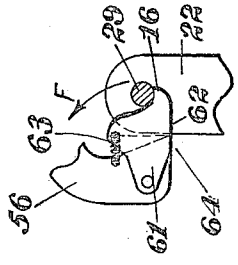


Fig. 10.

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Patented June 28, 1927. 1,633,995

UNITED STATES PATENT OFFICE.

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POWER HAMMER.

Application filed September 15, 1924. Serial No. 737,728.

My invention relates to power hammers of what are known as the percussion type, operated preferably, though not necessarily, by an electric motor as the prime mover, and adapted for the purposes of riveting, chipping, drilling, tamping or similar purposes by means of rivet set, chisel, drill, tamper bar or the like, to one end of which the percussion member of the power hammer delivers its blow.

The object of my invention is to provide a tool of the character above referred to, which is simple, light, compact and well balanced, and which, whilst giving the greatest efficiency possible, may be cheaply constructed.

Another object of my invention is to provide a structure of such character, having the parts so arranged as to permit of ready repair or replacement in case such repairs or replacement become necessary.

A further object of my invention is to provide a device of this character which, whilst simple and efficient, will be reliable and not liable to get out of order, and this object I attain not only by the reduction of the number of parts, but also in the simplicity of the parts and the combination thereof.

Another object of my invention is whilst delivering the hardest blows possible, to increase the number of blows per unit of time to the utmost, and in this way obtain from the hammer the maximum duty in a given time.

Another object of my invention is to provide means by which the length of stroke of the percussion member may be varied or adjusted, and in this way regulate the strength of blow of the hammer as may be desired according to the class of work being operated upon.

Another object of my invention is to provide a portable power hammer having a percussion member which is movable by power devices, one of which is adapted to be automatically and alternately connected and disconnected with the percussion member.

Another object of my invention is to provide a portable power hammer having a percussion member and a driving gear, which are alternately connected and disconnected through the medium of an eccentric driven trip mechanism.

Other objects and advantages of my invention will be apparent to those skilled in the art, from the description hereinafter following.

Referring to the drawings in which like reference characters refer to like parts; Fig. 1 is a longitudinal part sectional view of the hammer, portions of the mechanism being shown in section to more clearly illustrate the invention; in this view the percussion member of the hammer is illustrated in its extreme inward position. Fig. 2 is a similar sectional view of a portion of the hammer showing the percussion member in its extreme outward position; Fig. 3 is also a similar view of a portion of the hammer showing the mechanism as it is about to move the percussion member from its extreme outward position; Figs. 4 and 5 are enlarged cross sectional views taken on the lines 4—4 and 5—5 respectively of Fig. 1; Fig. 6 is an enlarged outside view of the means for adjusting the length of the stroke of the percussion member; and Figs. 7, 8, 9 and 10 are longitudinal sectional views of modifications of the invention.

Referring now in detail to the drawings, the reference character 1 indicates the casing of the hammer, which casing may be of any suitable shape and may be of any suitable construction. In the present embodiment of the invention an operator's handle 2 is formed at one end of the casing, but it will be understood that this handle may be provided at any other suitable place on the casing. Within the casing 1 and at one end thereof, a motor or other suitable power developing or transmitting device is provided which may be controlled by suitable means adjacent the operator's handle 2. In the present embodiment of the invention an electric motor, (not shown in the drawings) is employed, which is controlled by a switch having an operating button or lever 3 located adjacent the operator's handle, it being understood that a relay may be substituted for the switch for use in such cases as distant control of the tool is desired.

The armature shaft of the motor (not shown in the drawings) is suitably journalled within the casing 1, and at one end has attached thereto a short shaft 4 which is preferably mounted in an anti-friction bearing 5 mounted in a member 6 secured in the casing. This shaft 4 extends from the end of the armature shaft through the

bearing 5, and at its end 7 is provided with gear teeth which mesh with the teeth of a pinion 8, which pinion is operatively mounted on a pin 9 secured to the member 6. The teeth of this pinion in turn mesh with the teeth of a gear wheel member 10, which member is journalled in a bearing member 11 mounted within the casing 1. It will here be noted that the members 6 and 11 form a space for a suitable lubricating medium, which may be inserted through the openings 12 formed in the casing 1 and the member 11, and that provision for lubricating other parts of the mechanism is provided, in the shape of oil ducts 12^a and 12^b, which pass through the casing 1. A portion of the gear wheel member 10 extends through and beyond the member 11, and some distance beyond the projecting end of this member a lever 13 is provided, which is pivoted intermediate its ends to the casing 1 through the medium of a pin 14. The end 15 of this lever is operatively connected with the gear wheel member 10 by means whereby the rotary movement of the member 10 will cause the end portion 15 of the lever to reciprocate in a direction across the casing and cause the end portion 16 of the lever 13 to reciprocate in the direction of the length of the casing. In the present embodiment of the invention the means for operatively connecting the lever 13 and the gear wheel member 10 is an eccentric mechanism 17, which comprises a disk 18 that is secured eccentrically to the projecting end of the gear wheel member 10. This disk is surrounded by the eccentric strap 19 which is operatively connected with the disk 18 by means of a ball bearing 20 or any other suitable bearing. This strap is provided with a socket 21 which receives and engages the end 15 of the lever 13, which end is preferably of spherical form, there being a suitable anti-friction bearing 21^A arranged slidably in the socket 21, which bearing is of such shape that the eccentric strap 19 and the end 15 of the lever will be permitted to move freely relative to each other. It will be noted that as the gear wheel member 10 is rotated the eccentric strap 19 and the end 15 of the lever will be reciprocated in a direction across the casing. Beyond the eccentric mechanism 17, a percussion member 22 is provided, which is preferably arranged centrally of the casing 1. One end of this percussion member 22 and the eccentric strap 19 are operatively connected and disconnected through the medium of a trip mechanism which comprises a trigger member 23 and the lever 13. The trigger member 23 is pivotally mounted in a slot 24 formed in one end of the percussion member 22, through the medium of a pin 25 which passes through the trigger and the percussion member. The trigger 23 is made in the form of a lever which is fulcrumed on the pin 25 and has arms 26 and 27 which extend in different directions. The arm 26 has formed therein a slot 28 across which a roller 29 extends, the ends of such roller being loosely mounted in the parts of the arm which form the slot. As the width of the trigger 23 is slightly less than the width of the slot 24 in the percussion member, excessive movement of the roller in the direction of its length will be prevented by the engagement of the ends thereof with the inner surfaces of the end portions of the percussion member. The arm 27 of this trigger member 23 extends in a direction across the casing and is adapted to engage a stop or trigger operating member 30 adjustably secured to and projecting inwardly from the casing. Between the arm 27 and the percussion member 22, a spring 31 is provided one end of which engages the arm 27 and the opposite end engages the percussion member 22, which spring at all times tends to force the arm 27 in one direction.

Beyond the trigger member 23, the percussion member 22 is slidably mounted in a member 32 secured within the casing 1, which member not only forms a bearing for the percussion member, but also forms a spring seat 33 for one end of a spring 34, the opposite end of this spring being seated on a spring seat 35 formed on or secured to the percussion member. It will be understood that when the spring 34 is mounted on the percussion member and the percussion member is in its forward operative position, a predetermined amount of compression is preferably placed upon the spring which enables a maximum strength of blow to be struck with a minimum amount of movement of the percussion member; the amount of initial compression referred to being obtained by turning the screw threaded member 32, either forwardly or backwardly to increase or decrease the initial compression. Adjacent its lower end, as indicated by the reference character 36, the percussion member is slidably mounted in the casing 1. The portion 36 of the percussion member is of less diameter than the spring seat 35, and the diameter of the portion of the casing which surrounds the part 36 is less than the diameter of the portion that surrounds the spring seat 35, thus providing an annular shoulder 37 on which is mounted a shock absorbing or cushioning means 38, which may be in the form of a metal ring 39 mounted on a resilient ring 40, it being understood, however, that any other suitable cushioning means may be employed. This cushioning means is adapted to be engaged by the surface 41 of the spring seat 35 when the percussion member is operated.

The forward end portion 42 of the percussion member is provided with a striking

face 43, which is adapted to engage the striking face 44 formed on the end portion 45 of a tool 46 mounted in the casing in advance of the percussion member. This tool may be in the form of a drill, chipper, tamper, etc., but as shown in the drawings, comprises a rivet die 47, such die projecting beyond the end of the casing 1. The end portion 45 of the tool is slidably mounted in the casing and in advance of this portion is provided with a spring seat 48, one side of which is adapted to engage a shoulder 49 formed in the casing, and the opposite side forms a spring seat 50 for one end of a spring 51, the opposite end of such spring seating on the inner surface 52 of a two-part ring or spring seat 53 which is connected with the forward end of the casing through the medium of a threaded collar member 54. The die 47 is of greater diameter than the intermediate portion 55 of the tool around which the spring 51 passes and thus forms a shoulder 56 which engages the outside surface of the ring or spring seat 53.

Assuming the mechanism of the invention to be in the position as shown in Fig. 3 of the drawings and it is desired to operate the hammer, the operator presses the lever or button 3 which closes the electric circuit between the electrical source of supply and the motor, causing the armature shaft and shaft 4, the pinion 8 and gear wheel member 10 to revolve. It will here be noted that the diameter of the gear wheel member 10 is greater than the diameter of the pinion 8, thus causing the gear wheel member to revolve at less speed than the speed of the shaft 4 and pinion 8. As the gear wheel member 10 revolves the eccentric disk 18 is revolved with it, which causes the eccentric strap 19 to rotate and at the same time move in a direction across the casing as indicated by the arrow B in Fig. 3, thus causing the ends 15 and 16 of the lever 13 to move in the directions as indicated by the arrows C and D respectively of Fig. 3. As the end 15 of the lever 13 is thus moved, the end 16 thereof will engage the roller 29 which is mounted in the trigger member 23, and a continued operation of the mechanism above referred to will cause the lever 13 to move the percussion member 22 longitudinally in one direction, causing the spring 34 to be compressed to its maximum and until such time as the end or arm 27 of the trigger member 23 engages with the stop or trigger operating member 30, after which a continued movement of the percussion member and continued contact with the member 30 will cause the trigger member 23 to move in the direction as indicated by the arrow E in Fig. 1 a sufficient distance so that the roller 29 thereof will be moved out of supporting engagement with the end 16 of the lever 13 and free the percussion member so that the spring 34, which has been compressed, will force the percussion member outwardly so that the striking face 43 thereof will strike the striking face 44 of the tool 46 with great force thus delivering a heavy blow through the tool to the material worked on. In the present embodiment of the invention excessive rotation of the trigger member 23 by the spring 31, which has been compressed, is prevented by the roller 29 contacting with the underside of the end portion 16 of the lever 13 as shown in Fig. 2, but it will be understood that other suitable stop means may be employed. By its engagement with the stop or trigger operating member 30, the trigger 23 is moved to such a position that the roller 29 will be moved to the end of the lever 13, at which time the end of the lever engages the roller at one side of the center thereof so that the force of the spring 34 acting upon the percussion member 22 will force the trigger member 23 and roller 29 further in the direction of the arrow E in Fig. 1, to a position where the end 16 of the lever will not support the percussion member 22, thus permitting the percussion member to be forced forward by the spring 34 and deliver its blow to the tool as shown in Fig. 2. A continued operation of the eccentric mechanism 17 causes the end 15 of the lever 13 to move in a direction opposite to that indicated by the arrow C in Fig. 3, and the end 16 of the lever 13 as it moves, forces the trigger 23, as shown in dot and dash lines in Fig. 2, a sufficient distance so that the end 16 of the lever will be moved to a position below the roller 29 at which time the spring 31 will force the trigger member 23 toward the end 16 of the lever a sufficient distance so that the roller 29 will move over the top of the end 16 of the lever to the position as shown in Fig. 3, in which position the mechanism will now repeat the operations hereinbefore described. As the percussion member 22 strikes the tool 46, the surface 41 of the spring seat 35 engages the cushioning means 38, thus taking up any excessive shocks which might otherwise come upon the casing or upon the hammer as a whole.

The spring 51 which passes around the portion 55 of the tool is for the purpose of retaining the tool in its extreme inward position in the casing, so that the inner end of the tool is, before it is struck by the percussion member, in such inward position that it will receive the full force of the impact of the percussion member. The combination of tool 46, spring 51, spring seat 50, ring 53 and threaded collar member 54 is such as also to prevent the tool from being accidentally shot out from the hammer at such times as the tool is not in contact with work to be operated on.

The major portion of the mechanism described is arranged centrally of the casing thus making a compact and well balanced hammer which is free of troublesome projections.

In Figs. 7, 8, 9 and 10 of the drawings modifications of my invention are illustrated, in which the eccentric mechanism 17 is placed in a position at right angles to that shown in Figs. 1 to 5 inclusive, and the member 56 is pivotally connected directly to the eccentric strap through the medium of a pin 57. In Figs 7 and 8 the member 56 is forced toward the roller 29 and into roller supporting position, by means of the spring 58, and the release of the percussion member is caused in substantially the same manner as in Figs. 1 to 5 inclusive.

In Fig. 9 the member 56 is forced toward the roller 29 and into roller supporting position by means of the engagement of the inclined slot 59 in the member 56, with a member 60, which is secured to the casing 1.

In Fig. 10 the member 56 has a member 61 pivotally mounted thereon, the end portion 16 of which being adapted to engage the roller 29 until such time as the percussion member is released at which time the roller will move beyond the member 61 and as the member 56 is being moved in the direction that the member 61 will again engage the roller, the surface 62 of such member will engage the roller and the member 61 will be caused to move in the direction as indicated by the arrow F in this figure until the end 16 thereof passes over the roller at which time the spring 63, between the members 56 and 61, which has been compressed, will force the member 61 in the direction opposite to that indicated by the arrow F until the surface 62 thereof engages a stop 64 formed on the member 56 which prevents further movement of the member 61 in this direction. When the member 61 is in engagement with the stop 64, the end 16 of the member is in engagement with the roller, as shown in this figure, to again move the percussion member.

It will be understood by those skilled in the art, that changes may be made in the details and arrangement of the several parts forming the invention without departing from the spirit and scope of the appended claims.

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

1. A power hammer comprising a percussion member, a drive gear, a pivoted member having one end at all times connected with said gear, the other end being adapted to alternately engage and disengage with said percussion member.

2. A power hammer comprising a percussion member, a drive gear, a lever, one end of which is connected with said drive gear at all times, the other end being adapted to engage and disengage with said percussion member.

3. A power hammer comprising a percussion member, a drive gear, trip mechanism for alternately connecting and disconnecting said percussion member and drive gear, said trip mechanism comprising a trigger member loosely connected with said percussion member and a lever movable alternately into and out of engagement with said trigger member.

4. A power hammer comprising a percussion member, a drive gear, means for moving said percussion member in one direction, and means between said percussion member and drive gear for moving said member in the opposite direction, said means comprising a plurality of levers adapted to disconnect said percussion member and drive gear, one of said levers being pivotally carried by said percussion member.

5. A power hammer comprising a percussion member, a drive gear, means between said member and gear for alternately connecting and disconnecting said member and gear, said means comprising a plurality of levers, one of which is pivotally mounted in said percussion member.

6. A power hammer comprising a percussion member, a drive gear, means between said member and gear for alternately connecting and disconnecting said member and gear, said means comprising a trigger member and a lever adapted to alternately engage and disengage with said trigger member.

7. A power hammer comprising a percussion member, a drive gear, means between said member and gear for alternately connecting and disconnecting said member and gear, said means comprising a lever member and a pivoted trigger member carried by said percussion member.

8. A power hammer comprising a percussion member, means for moving said percussion member in one direction, means for moving said percussion member in the opposite direction, a trip mechanism for alternately connecting and disconnecting said last mentioned means and percussion member, said trip mechanism comprising a plurality of pivotally mounted members, one of said members being carried by said percussion member.

9. A power hammer comprising a percussion member, a drive gear, means for alternately connecting and disconnecting said member and gear, said means comprising a pivoted member continuously connected with said gear and adapted to be moved alternately into and out of engagement with said percussion member.

10. A power hammer comprising a percus-

sion member, a drive gear, a connection between said percussion member and gear, said connection comprising a lever, a device for reciprocating one end of said lever, a trigger member on said percussion member adapted to be engaged by the other end of said lever, and means for disengaging said lever and trigger member.

11. A power hammer comprising a percussion member, a drive gear, an eccentric and eccentric strap connected to said drive gear, and means comprising a trip device for alternately connecting and disconnecting said percussion member and eccentric strap, said trip device comprising a stationary part and a part movably mounted on said percussion member.

12. A power hammer comprising a tool, a percussion member for delivering a blow to said tool, a trip mechanism for said percussion member, said trip mechanism comprising a lever pivotally mounted on said percussion member, and means for operating said lever, said means being adjustable whereby the force of said blow can be varied.

13. A power hammer comprising a tool, a percussion member for delivering a blow to said tool, a trip mechanism for said percussion member comprising a lever mounted on said percussion member, and an adjustable stop adapted to be engaged by said lever to operate said trip mechanism.

14. A power hammer comprising a tool, a percussion member, means for moving said member in one direction, means for moving said member in the opposite direction to deliver a blow to said tool, a trip mechanism for said percussion member comprising a plurality of pivotally mounted members, one of said members being carried by said percussion member, and a stop member adapted to be engaged by the lever carried by said percussion member, said stop being adjustable for varying the length of the stroke of the percussion member.

15. A power hammer comprising a percussion member, an operating spring therefor, a drive gear, means between said percussion member and drive gear for compressing said spring, said means comprising an eccentric and strap, and a lever operatively connected with said strap, and means for alternately connecting and disconnecting said percussion member and lever, the last mentioned means comprising a member pivotally carried by said percussion member.

16. A power hammer comprising a percussion member, an operating spring therefor, a drive gear, means for compressing said spring comprising an eccentric and strap for actuating a spring compression lever, and means for alternately connecting and disconnecting said lever and percussion member, the last mentioned means comprising a lever mounted in said percussion member and movable into and out of operative engagement with said spring compressing lever.

17. A power hammer comprising a percussion member, an operating spring therefor, a drive gear, a member for actuating said percussion member to compress said spring, said drive gear comprising an eccentric gear for operating said actuating member, and means for alternately connecting and disconnecting said actuating member and percussion member, said means comprising a member carried by said percussion member and movable into and out of operative engagement with said actuating member.

18. A power hammer comprising a percussion member, an operating spring therefor, a drive gear, means for compressing said spring comprising an eccentric and strap for actuating a reciprocating spring compressing member, and means for alternately connecting and disconnecting said reciprocating member and percussion member, the last mentioned means comprising a member pivotally carried by said percussion member.

19. A power hammer comprising a percussion member, an operating spring therefor, a drive gear, means for compressing said spring comprising an eccentric gear actuating a reciprocating spring compressing lever, and means for alternately connecting and disconnecting said recpirocating lever and percussion member, the last mentioned means comprising a member pivotally carried by said percussion member.

20. In a power hammer, a percussion member, a drive mechanism comprising an eccentric and strap, and a member engaging with said strap and movable into and out of engagement with said percussion member.

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