July 5, 1927. 1,634,623

H. H. MILLER

POWER HAMMER

Filed Feb. 10, 1925 2 Sheets-Sheet 1

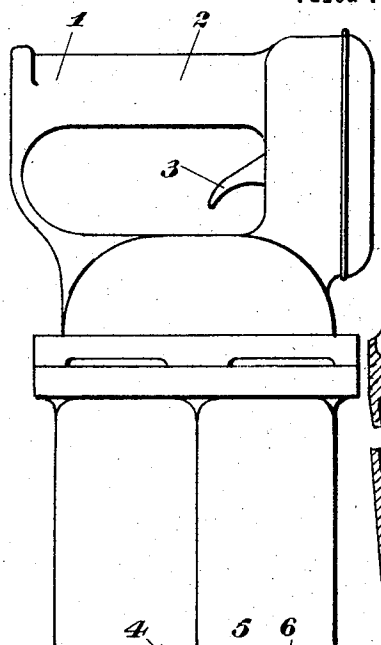


Fig. 2.

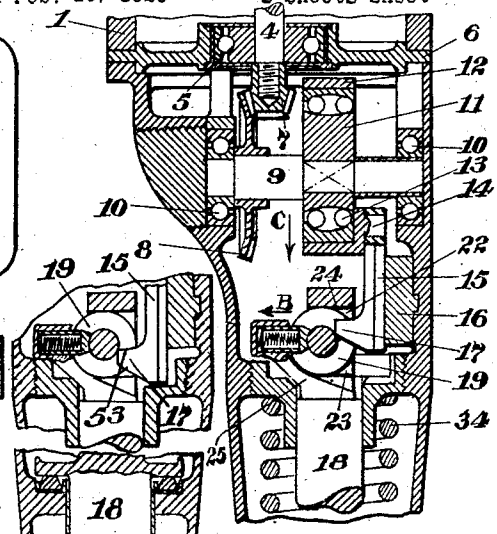


Fig. 2A

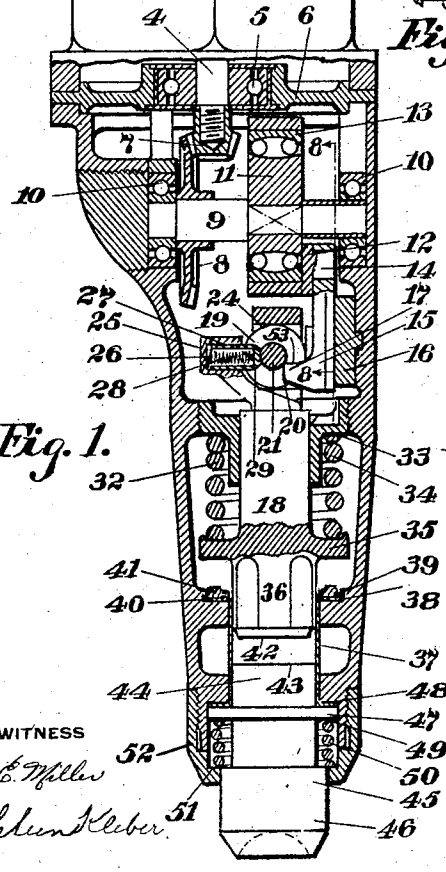


Fig. 1.

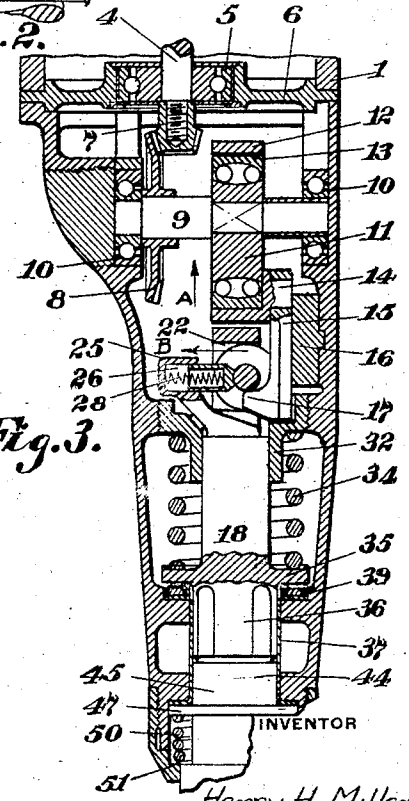


Fig. 3.

WITNESS

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POWER HAMMER

Filed Feb. 10, 1925 2 Sheets-Sheet 2

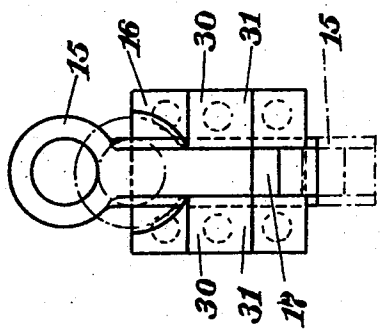


Fig. 6.

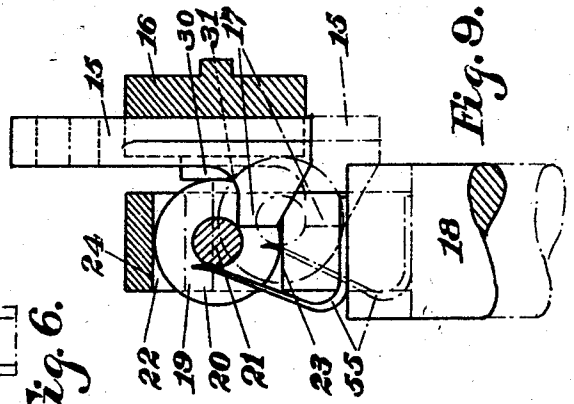


Fig. 9.

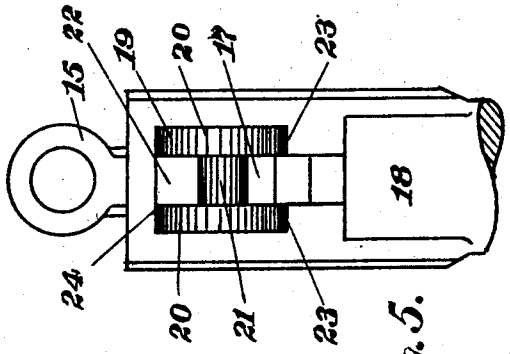


Fig. 5.

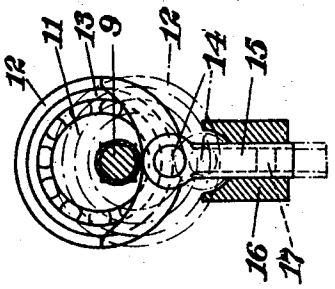


Fig. 8.

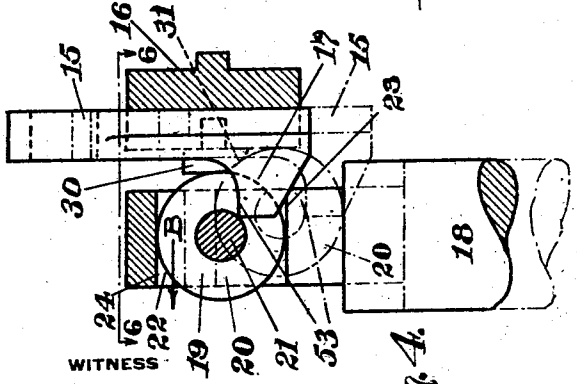


Fig. 4.

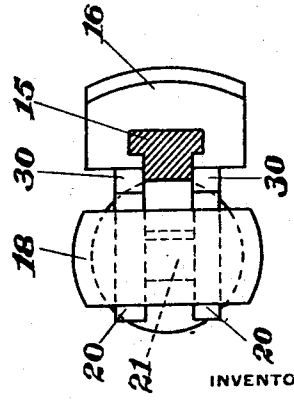


Fig. 7.

WITNESS

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Patented July 5, 1927. 1,634,623

UNITED STATES PATENT OFFICE.

HARRY H. MILLER, OF YOUNGSTOWN, OHIO, ASSIGNOR TO MILLER-SMYTHE ELECTRIC COMPANY, OF YOUNGSTOWN, OHIO.

POWER HAMMER.

Application filed February 10, 1925. Serial No. 8,164.

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 becomes 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 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 a bodily movable member.

Another object of my invention is to provide a power hammer in which the drive mechanism will automatically and operatively engage the percussion member when the hammer is pressed by the operator against the object to be operated on and when such pressure is relieved the drive mechanism continues to operate but is automatically disconnected from the percussion member.

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. 2^{A} is a similar sectional view of a portion of the hammer showing the percussion member in its position when pressed against the work to be operated on; 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 position as shown in Fig. 2^{A}; Fig. 4 is an enlarged sectional view, showing the percussion member and a portion of the mechanism for operating it in one of its extreme positions in full lines and its other extreme position in dot and dash lines, other parts of the tool being omitted to more clearly illustrate this portion of the invention; Fig. 5 is a face view of this portion of the percussion member and operating mechanism; Fig. 6 is a like view with the percussion member removed; Fig. 7 is a cross sectional view taken on the line 6—6 of Fig. 4; Fig. 8 is a sectional view taken on the lines 8—8 of Fig. 1, and Fig. 9 is a sectional view similar to Fig. 4 of a modification 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 is provided with a gear wheel 7, the teeth of which mesh with the teeth of a gear wheel 8 secured to a rotatable shaft 9 which extends in a direction across the casing 1 and having its ends mounted in anti-friction bearings 10 suitably mounted within the casing 1. Intermediate its ends there is mounted on this shaft an eccentric disc 11 which is rotatable with the shaft. This disc is surrounded by an eccentric strap 12 which is operatively connected with the disc 11 through the medium of an anti-friction bearing 13 or any other suitable bearing. The strap 12 is provided with a trunnion 14 upon which one end of a member 15 is loosely mounted. Beyond the trunnion 14 the member 15 is preferably of T form in cross section and is slidably mounted in a T-shaped slot formed in a bearing member 16 which is suitably secured in the casing against movement. The lower end portion of this member is provided with an inwardly extending projection 17, the purpose of which will hereinafter be more fully set forth.

Beyond the eccentric a percussion member 18 is provided which is preferably arranged centrally of one of the end portions of the casing 1. One end of this percussion member and the member 15 are operatively connected and disconnected through the medium of a bodily movable member which, in the present embodiment of the invention is in the form of a roller 19. This roller is preferably in the form of a spool having spaced enlarged circular end portions 20, one of which is mounted on each end of a circular cross piece 21 of less diameter than the end portions. The inner portion of the percussion member has formed therein an opening 22 in which the spool 19 is mounted, such opening being slightly wider than the width of the spool. The sides of the opening are provided with ways or bearing surfaces 23 upon which the periphery of the end portions 20 of the rollers are adapted to roll or slide. The surface 24 formed on the percussion member above the surfaces 23 constitute a bearing surface upon which the peripheries of the end portions 20 of the spools are adapted to roll or slide. It will here be noted that the distance between the surfaces 23 and 24 is slightly greater than the diameter of the end portions 20 of the spool so that the spool is freely movable in a direction across the percussion member and at the same time is prevented from moving in any other direction relative to the percussion member. Beyond the roller 19 the opening 22 is restricted in width and within such portion a bracket 25 is mounted on the percussion member. The outer end portion of this bracket is provided with a socket 26 in which a member 27 is mounted to slide in directions across the percussion member, there being a resilient member 28 interposed between the bracket and the member 27 which is adapted to move the member 27 in one direction. The end portion 29 of the member 27 engages the cross piece 21 of the roller and this member is adapted to move the roller in one direction.

The projection 17 extends into the opening 22 and is adapted to engage with the cross piece 21 of the roller to move the percussion member in one direction longitudinally of the casing 1. On each side of the member 15 there is provided a block 30 which is secured to the bearing member 16 and with which one of the end portions 20 of the roller is adapted to engage to move the roller across the percussion member in the direction of the arrow in Fig. 3. The face portions 31 of these blocks 30 are curved or tapered for a portion of their length so that as the percussion member is moved in one direction the end portions 20 of the roller will engage this surface and will be gradually forced across the percussion member until such time as the roller has been moved over this surface a sufficient distance that the dead center of the cross piece 21 has been moved beyond the end of the projection 17 of the member 15 to the position as illustrated in Fig. 1 of the drawings.

Beyond the roller 20, the percussion member 18 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. By turning the screw threaded member 32 forward or backward the initial amount of compression on the spring 34 may be increased or decreased. Beyond the spring seat 35 the end portion 36 of the percussion member is slidably mounted in a tubular member 37 which is secured within the end portion of the casing 1. This 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 member 37 is less than the

diameter of the portion that surrounds the spring seat 35, thus providing an annular shoulder 38 on which is mounted a stop or rest means 39, which may be in the form of a metal ring 40 mounted in the casing, such ring having a fiber ring 41 mounted therein with which the undersurface of the spring seat 35 of the percussion member is adapted to engage, it being understood, however, that any other suitable stop means may be employed.

The forward end of the percussion member 18 is provided with a striking face 42 which is adapted to engage a striking face 43 formed on the inner end portion 44 of a tool 45 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 46 such die projecting outwardly beyond the forward end of the casing 1. The end portion 44 of the tool is slidably mounted in the casing and in advance of this portion is provided with a spring seat 47, one side of which is adapted to engage a shoulder 48 formed in the casing and the opposite side forms a spring seat 49 for one end of a spring 50, the opposite end of such spring seating on the inner surface 51 of a member 52 which is secured to the forward end of the casing 1 through the medium of screw threads or any other suitable means.

Assuming the mechanism of the invention to be in the position as shown in Fig. 3 of the drawings, i. e., the tool 45 pressed against the work to be operated on, 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 7, gear wheel 8 and shaft 9 to revolve. It will here be noted that the diameter of the gear wheel 8 is greater than the diameter of the pinion 7, thus causing the gear wheel and shaft 9 to revolve at less speed than the speed of the shaft 4 and pinion 7. As the shaft 9 revolves the eccentric disc 11 is revolved with it, which causes the eccentric strap 12 to rotate and at the same time move in the direction of the length of the casing as indicated by the arrow A in Fig. 3, thus causing the member 15, which is loosely connected with the strap 12, to move with it. It will also be noted that when the mechanism is in the position as shown in Fig. 3, the cross piece 21 of the roller 19 rests upon the surface 53 of the projection 17 of the member 15 in such a position that the dead center thereof is some distance back of the front edge of such projection, thus preventing accidental separation of the roller and member 15. In this position the peripheries of the end members 20 are in engagement with the surface 24 of the percussion member 18 while other portions of the peripheries are in engagement with surfaces 54 on the member 16, as illustrated in Fig. 4 of the drawings. As the member 15 is moved in the direction of the arrow A the roller 19 and percussion member 18 will be moved in the same direction and as they are thus moved the end portions 20 of the roller will engage the curved or tapered portions of the surfaces 31 of the members 30 which engagement and continued movement of the member 15 causes the roller to be moved in a direction across the percussion member as indicated by the arrow B in Figs. 3 and 4 until the roller has been moved to such a position that the dead center of the cross piece 21 is just beyond the end of the projection 17, as shown in Figs. 1 and 4. At this time the spring 34 which has been compressed will force the percussion member forward and the striking face 42 thereof will strike the inner end of the tool 46 with great force, thus delivering a heavy blow through the tool to the material worked on. As the roller is being moved bodily from the projection 17 the member 28 is being moved in the same direction causing the resilient member 27 to become compressed, which spring, so compressed, will when the percussion member has been released, tend to force the member 28 and roller against the end of the projection 17 as shown in Fig. 2A of the drawings. As the shaft 9 and other parts of the drive mechanism continue to operate, the eccentric strap 12 will force the member 15 in the direction as indicated by the arrow C in Fig. 2A and as the surface 53 of the projection 17 passes the cross piece 21 of the roller, the spring 27, through the medium of the member 28 will force the roller in a direction across the percussion member a sufficient distance that the cross piece will again rest on the surface 53 of the projection 17, as shown in Fig. 3, in which position the mechanisms will now repeat the operation hereinbefore described. When the operator moves the power hammer from one part of the work being operated on to another part and it is undesirable to shut off the electric current and stop the motor, the relieving of the pressure on the tool 45 will permit the percussion member 18 and tool 45 to move forward a sufficient distance, so that the cross piece 21 of the roller will be in such a position that the member 15 will continue to reciprocate, but the position of the cross piece 21 is such that the surface 53 of the portion 17 cannot engage therewith, until the tool 45 is pressed against the work being operated on, which causes the tool 45 and percussion member 18 to be moved inwardly a sufficient distance so that the underside of the cross piece 21 will be in substantially the same plane as the surface 53, when the spring 28 and member 29 will move the cross piece 21 until it rests on the

surface 53 as shown in Fig. 3 of the drawings, at which time the tool will continue to operate as hereinbefore described.

The spring 50 which passes around 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 position that it will receive the full force of the impact of the percussion member. The combination of tool 45, spring 50, spring seat 47, and threaded end member 52 is such as to prevent the tool from being accidentally shot out from the hammer at such times as the tool is not in contact with the work to be operated on.

In Fig. 9 of the drawings a modification of the invention has been illustrated in which a flat spring 55 is employed for engaging and moving the roller. The operation of this modification is substantially the same as described in connection with the preferred form hereinbefore described.

It will be understood that the member 19 which has been described as a roller or spool may be of any other suitable form so long as it may slide or roll bodily to connect and disconnect the percussion member 18 and member 15.

It will be apparent to 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. In a power hammer, a percussion member, a reciprocating drive mechanism, and bodily movable means for alternately connecting and disconnecting said member and mechanism, said means being out of operative connection with said drive mechanism when said percussion member and mechanism are disconnected.

2. In a power hammer, a percussion member, a reciprocating drive mechanism, and bodily movable means in said percussion member for alternately engaging and disengaging with said mechanism, said means being movable in a direction through said percussion member.

3. In a power hammer, a percussion member, a reciprocating drive mechanism, means mounted in said percussion member but not secured thereto for alternately connecting and disconnecting said member and mechanism.

4. In a power hammer, a percussion member, a reciprocating drive mechanism and means for automatically and alternately connecting and disconnecting said member and mechanism, said means comprising a member movable bodily across said percussion member.

5. In a power hammer, a percussion member, a drive mechanism comprising a member movable in the direction of its length and means on said percussion member, movable relative to said percussion member into and out of engagement with the last mentioned member for alternately connecting and disconnecting said percussion member and drive mechanism.

6. In a power hammer, a percussion member, a reciprocating drive mechanism, and a roller mounted in and movable across the percussion member for alternately and directly connecting and disconnecting said percussion member and mechanism.

7. In a power hammer, a percussion member, a reciprocating drive mechanism, a bodily movable member in said percussion member for alternately and directly connecting and disconnecting said percussion member and mechanism, and means for automatically moving said bodily movable member.

8. In a power hammer, a percussion member, a drive mechanism comprising a slidable member, and means carried by said percussion member movable relative to said percussion member alternately into and out of engagement with said slidable member.

9. In a power hammer, a percussion member movable in the direction of its length, a drive mechanism having a portion movable in the direction of its length, and means mounted in the percussion member movable in a direction at an angle to the direction of movement of said percussion member and said portion of said mechanism to alternately connect and disconnect said percussion member and mechanism.

10. In a power hammer, a percussion member, a drive mechanism comprising a reciprocating member, a member on said percussion member movable into and out of engagement with said reciprocating member, means on said percussion member for moving the member on said percussion member in one direction and means adjacent said reciprocating member for moving said member in the opposite direction.

11. In a power hammer, a percussion member, a drive mechanism comprising a reciprocating member, a roller on said percussion member movable into and out of engagement with said reciprocating member for alternately connecting and disconnecting said percussion member and reciprocating member, and means for moving said roller.

12. In a power hammer, a percussion member movable in the direction of its length, a drive mechanism comprising a reciprocating member movable in the direction of its length and a member on said percussion member movable in a direction at an angle to the direction of movement of said percussion member and reciprocating member for alternately connecting and discon-

necting said percussion member and reciprocating member.

13. In a power hammer, a percussion member movable back and forth in the direction of its length, a drive member movable back and forth in the direction of its length, and means mounted in said percussion member and movable across the path of travel of said drive member for alternately connecting and disconnecting said percussion member and drive member.

14. In a power hammer, a percussion member movable in the direction of its length, a drive member movable in the direction of its length, and a bodily movable member mounted in said percussion member for alternately connecting and disconnecting said percussion member and drive member.

15. In a power hammer, a percussion member movable in the direction of its length, a drive member movable in the direction of its length, and a member movably mounted on said percussion member for alternately connecting and disconnecting said percussion member and drive member.

16. In a power hammer, a percussion member, a reciprocating drive member, and a spool shaped member mounted in said percussion member and movable in a direction thereacross for alternately connecting and disconnecting said percussion member and drive member.

17. In a power hammer, a percussion member, a drive member, and a member having cylindrical portions of different diameters for engaging and disengaging said percussion member and drive member, one of said portions being engaged by said percussion member and the other of said portions being adapted to be engaged by said drive member.

18. In a power hammer, a percussion member, a reciprocating drive member, a spool shaped member loosely mounted in said percussion member and movable into and out of engagement with said drive member for alternately connecting and disconnecting said percussion member and drive member.

19. In a power hammer, a tool, a percussion member, a drive mechanism, and tool actuated means for effecting the connecting and disconnecting of said member and mechanism.

20. In a power hammer, a tool, a percussion member, a drive mechanism, means for connecting and disconnecting said member and mechanism, said connecting and disconnecting being controlled by said tool.

21. In a power hammer, a percussion member, a drive mechanism, means for connecting and disconnecting said member and mechanism as the hammer is applied to or moved from the work being operated upon.

22. In a power hammer, a percussion member, drive mechanism means for connecting and disconnecting said member and mechanism while pressure is exerted longitudinally of said hammer, and for disconnecting said member and mechanism when the pressure is released.

23. In a power hammer, a reciprocating percussion member, a mechanism for driving said percussion member, and means controlled by pressure through said percussion member for operatively connecting and disconnecting said member and mechanism.

In testimony whereof I affix my signature.

HARRY H. MILLER.