Oct. 13, 1942. J. M. SCHMIED 2,298,845

IMPACT HAMMER

Filed July 30, 1941 2 Sheets-Sheet 1

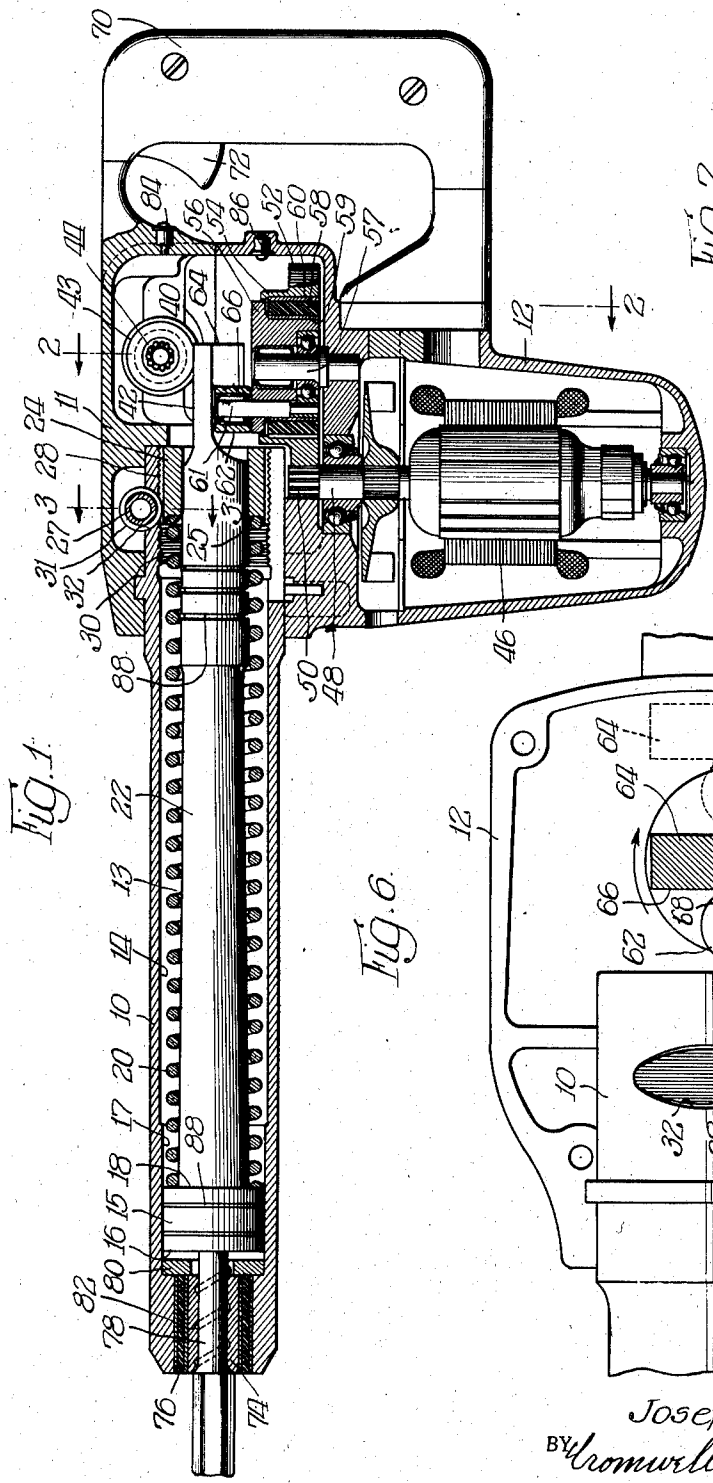


Fig. 1.

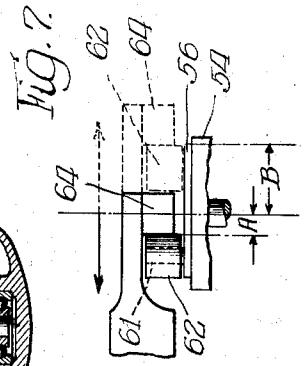


Fig. 7.

Fig. 6.

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Fig. 2

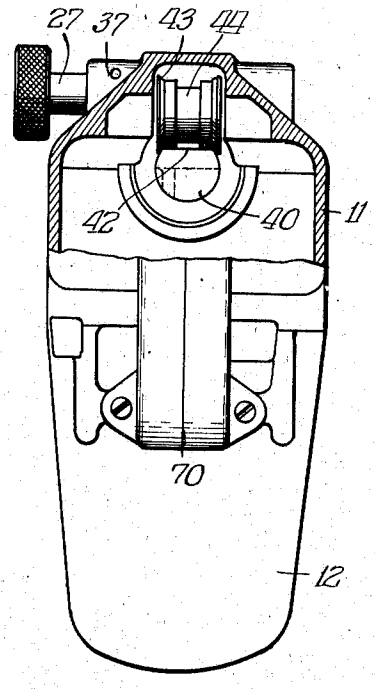


Fig. 3

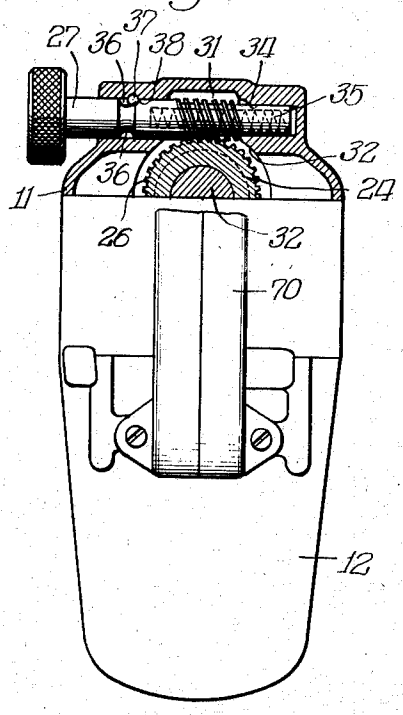


Fig. 4

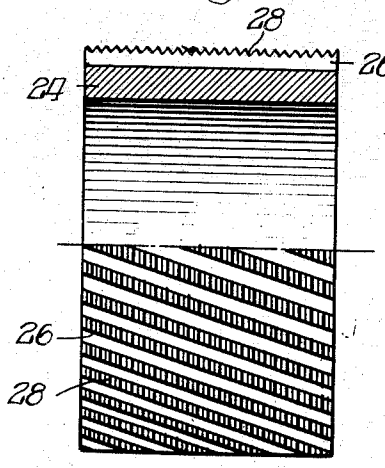
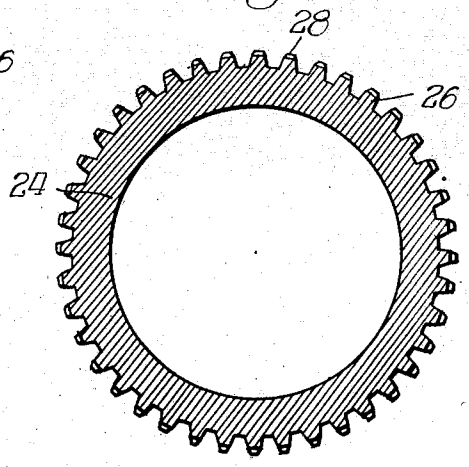


Fig. 5



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UNITED STATES PATENT OFFICE

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IMPACT HAMMER

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Application July 30, 1941, Serial No. 404,633

10 Claims. (Cl. 125—33)

The present invention relates to improvements in impact hammers and, more particularly, to power driven impact hammers having readily controllable speed and concussion variables.

Heretofore attempts have been made to vary the force of a blow given by an impact hammer and to vary the speed with which successive blows are struck. In heavy work, such as in drilling stone or concrete, or in steel riveting, a hard blow is desirable. For chipping or scaling, and in more accurate work, or when operating upon small copper rivets or spikes a light blow is necessary.

Pneumatic hammers generally are variable for these types of work by throttling down or increasing the air supply. However, with the more powerful blow, the speed of successive blows is increased while in light impact work the speed of successive blows is greatly decreased. This means a great loss of time in fragile long work performance, while the increased number of blows in heavy work causes undue wear to the tool and labor to the operator in handling it.

Most impact hammers fail because shocks and vibrations from the repeated impacts are transmitted to the motor windings, gears and antifriction bearings. This likewise tires the operator, and has become one of the problems in this type of implement. A further problem in these tools has been getting rid of the frictional heat generated by the rapidly moving parts that is otherwise destructive to the mechanism.

One object of the present invention is to provide a simple and effective means of varying the impact blow from one that is hard and slow to one that is fast and light.

Another object is to provide an impact hammer having a simple and effective compression movement that is easily regulable from heavy to light work.

A further object is to provide an impact hammer having improved shock absorbing means for the protection of the parts and of the operator.

A still further object is to provide an impact hammer with an improved cooling system that will tend to maintain the hammer in a relatively cool condition and prevent overheating.

A yet further object is to provide an impact hammer that is easily and readily assembled and disassembled, that may be adjusted without sacrifice of speed to various kinds of work, that is less wearing on the parts and operator, and will not overheat.

In the accompanying drawings one embodiment of the invention is shown and is described in the following specification for purposes of exemplification only. Various other modifications and adaptations will at once become apparent to one skilled in the art.

In the drawings

Fig. 1 is a view, partly in section, through a hammer embodying the present invention;

Fig. 2 is a view taken on the line 2—2 of Fig. 1, partly in section, looking in the direction of the arrows;

Fig. 3 is a view taken on the line 3—3 of Fig. 1, partly in section, looking in the direction of the arrows;

Fig. 4 is a view partly in section of a regulating collar and bearing usable with the invention;

Fig. 5 is a sectional view through the collar of Fig. 4;

Fig. 6 is a plan view of the hammer with the housing partially removed, showing the operation of the compression mechanism diagrammatically; and

Fig. 7 is a view diagrammatically showing certain of the parts of Fig. 6 in elevation.

In accomplishing the objects of this invention the body portion or housing of the hammer is made up of simple easily assembled parts. Briefly, a reciprocable impact hammer member is operated by a spring means that is compressed slowly at low spring pressure by a motor driven actuating means that provides an increase in speed of compression toward a maximum and then a lessening of the speed until the maximum compression is attained, when the spring is released to drive the impact member forward. A regulating or adjusting means is used to vary the compression of the spring means prior to its release for action on the hammer in giving an operative blow. As the spring compression is varied, a heavier or lighter load is added to the motor which increases or decreases the speed of consecutive blows accordingly.

Shock absorbing means is mounted adjacent the tool holding portion of the hammer to lessen the vibration and reactional shocks transmitted to the housing and hammer as a whole, and thus to the body of the operator. Other shock absorbing means is mounted in the impact member operating assembly to absorb shocks and vibrations between pinion and gear members, the antifriction bearings, motor windings, and other parts.

The rapidly moving impact member is used as a part of the cooling system to suck in outside air to flush the gears, bearings and entire hous-

ing and to force out heated air in combination with a novel valve and groove arrangement.

As shown, the impact hammer mechanism is mounted in a housing comprising a barrel portion 10, a gear housing 11 and a motor housing 12 all properly united into a ruggedly built and easily assembled whole through the use of bolts or other means not shown.

The barrel portion 10 includes a cylindrical bore 14 having a restricted bearing portion 17 in which an impact or hammer member 13 is reciprocally mounted. At the forward end of the impact member is an enlarged head member 15 having a tool driving face portion 16 and a shouldered portion 18 forming a bearing for one end of a hammer actuating spring means in the form of a compression spring member 20 that is coiled around the stem 22 of the impact member.

The enlarged head member 15 slidably fits the bearing portion 17 of the bore 14 in the manner of a piston and reciprocates along the surface of the bearing, serving to position and guide the impact member at that place.

Adjacent its rear, the stem 22 of the impact member extends through an annular collar 24 and is sildably mounted therein. This collar is adjustably secured to the bore 14 of the barrel and forms a rear bearing for the impact member and properly positions and guides it at that point. This adjustable collar at its forward end forms a stop or bearing 25 for the other end of the spring member 20.

The collar 24 is slightly spaced from the stem 22 of the impact member to form a stand-off thrust bearing and to afford a relatively loose fit between the stem and bearing at this point. This prevents any seizing or binding caused by the expansion of the parts from the heat created under the normal frictional engagement of the parts.

The collar 24 is adjustable axially of the stem 22 in the bore 14 to vary the compression of the spring 20 and thus to vary the force of the blow to be given by the hammer member 13. On the collar 24 a helical thread 26 is formed terminating in a flat top portion having screw threads 28 cut therein for purposes to be described hereinafter. At its rear portion, the bore 14 is screw threaded to form a nut portion 30 to engage screw threads 28 on the helix of the compression collar 24. A turning of the adjusting collar member in the nut portion 30 causes the collar to travel along the screw threaded portion of the bore to compress or release pressure on the spring member 20 and thereby adjust the force of the blow to be given by the impact member.

To obtain this turning movement for regulating and adjusting the spring pressure, an adjusting worm screw 27 may be used. As shown, screw or bolt 27 extends into housing 11 and has flights 31 arranged therearound to intermesh with helix 26 through a groove 32 in the barrel 10. A knurled cap on one end of the screw 27 and exterior to the housing may be used to obtain the desired tension on the spring.

A cylindrical bore 34 in the housing 11 accommodates the screw 27. This screw may be hollow or formed with a cylindrical housing to receive a small compression spring 35 resting against its inner end and extending outwardly beyond the same into contact with the inner end of bore 34. This spring tends to urge the bolt 27 out of the bore 34.

To counteract this pressure, the screw is annularly grooved as at 36 (Fig. 3) and a pin 37 extends through an opening in the housing 11 and rides in the groove to hold the bolt in place. In the periphery of the groove 36 a wider locking notch portion 38 is formed to cause the bolt to lock against turning by contact with pin 36 through pressure from spring 35. Other widened locking portions 38 may be inserted around the periphery of the screw 27, if desired. For further adjustment after the pin has locked in the portion 38, the bolt must be pressed inwardly against the pressure of spring 35, and it may then be turned easily as the pin 37 now rides in the main portion of annular groove 36. By this arrangement the bolt 27 is held in a predetermined adjusted position from which it cannot be dislodged by the vibration of the impact hammer. Only by manually adjusting the bolt can the compression of spring 20 be changed. If in adjusting the spring pressure, the operator does not lock the bolt in the nearest locking groove, vibration of the hammer member may loosen the bolt 27 only to a point where it will lock itself in the adjacent notch 38.

The return means for the hammer after an operative action by the spring means is simple and works smoothly and with less shock to the motor and gear members than that customarily in use. At its inner end the stem 22 is reduced in size and bent downwardly to form a hook-like projecting member 40. The upper portion of this projecting member is flattened at 42 to pass under, and to be received within guide flanges 43 of a roller bearing guide member 44 (Figs. 1 and 2) properly mounted in the housing 11. The purpose of this guide means is to position the impact member 13 with respect to the bore 14 and the operating mechanism to be described and to prevent the hammer member from turning or rotating in the barrel.

Within the motor housing 12 is a standard universal motor 46. A motor driven shaft 48 extends upwardly from the motor 46 into the gear housing 11 and carries a pinion 50 adjacent its upper end to mesh with teeth 52 on a gear assembly 54.

The gear assembly is formed to absorb shocks resulting from the vibration of the hammer, thereby preventing injury to the more delicate parts of the mechanism. It consists of several parts including an outer ring-like member provided with gear teeth 52 and an inner hub member 56 mounted on a spindle 57 in a ball bearing mounting. Between the ring-like member and the hub, and spacing them from one another, is an annular shock absorbing ring 58 of rubber, or other similar resilient material, inserted between the two with a press fit. The shock absorbing ring may be enclosed on either side by the two metal annular members 59 and 60. This shock absorbing means also acts to overcome inertia in the actuating mechanism and provides an easier starting action to the motor in overcoming the force of spring 20 at each operating contact of the mechanism with the hammer member 13.

For compactness of assembly the barrel 10 may extend rearwardly over pinion 50 and a portion of the gear assembly 54 that may be formed as shown for this purpose.

Mounted eccentrically on the hub 56 is a spindle 61 that carries a roller hammer actuating member 62 mounted thereon. This member 62, upon rotation of the gear assembly, acts on the downwardly hooked portion 64 of the projecting member 40 to urge the hammer 13 rear-

wardly against the action of the spring member 20.

From the diagrammatic views of Figs. 6 and 7 it will be seen that the roller actuating member 62 intermittently strikes the inner face 66 of the hook-like member adjacent one edge thereof, rolls across the face 66 during the rotation of the gear mechanism 54, rolls back along this face and off of it, permitting the action of compressed spring 20 to throw the hammer 15 forward. During this travel along the face 66, the radius of engagement, indicated by arrow A, from the point of contact with face 66 has increased to the radius of engagement indicated by the arrow B. This means that at the point of contact the roller member strikes the face 66 at an exceedingly acute angle and begins the compression of spring 20 at a relatively low speed and with relatively little contact shock. The speed of compression is greatly increased through an arc of substantially 90° and then, during the period of greatest compression, the speed gradually decreases to the point of departure or disengagement with face 66. This form of contact means, coupled with shock absorbing means 58, tends to give much longer life to the parts.

Preferably, the face 66 is bevelled off, as at 68, to permit a rapid actuation of the hammer at the point of departure and at the maximum compression of the spring by the actuating assembly.

The hub 56 and its gear assembly may be mounted so that its center is out of alignment with the center of the impact face 66. As shown, a diameter of the gear assembly will extend approximately through the points of engagement and disengagement of the roller member 62 with the face 66. With this arrangement, the roller 62 will have a longer operative rolling contact with the face 66 through a 180° rotation of the gear assembly, and the projecting member and its face 66 may be located centrally of the hammer member. The roller member may disengage the face 66 at the point of maximum compression of spring 20.

Were the gear assembly centered with the axis of the hammer member, the face portion 66 would have to be shortened or there would be a longer contact of the roller 62 with the projecting member at the point approximating maximum spring compression with consequent greater strain on the parts. The roller 62 would disengage from the face 66 after the point of maximum spring compression had been reached. The guide member 44 in cooperation with the flattened portion 42 provides means for maintaining the projecting member 40 and its hook-like member 64 in proper or operative position to be actuated by the crank roller 62.

It will be apparent that as the screw 27 is adjusted, compression of the spring 20 will be increased or decreased. This will have a direct relation on the motor assembly 46. By increasing the spring tension, the motor will be slowed under the heavier work given to it and the result will be a slower, harder blow by the hammer 10. By decreasing the spring tension the load on the motor will be lessened, permitting a rapid rotation and a resulting light, fast blow.

At the rear end of the hammer assembly, the gear housing 11 is formed with a handle portion 70 and a trigger switch arrangement 72 by which a proper electrical connection to the motor may be made or broken in any customary manner.

At its forward end the barrel 10 is provided with a tool-holding device and a further shock absorbing structure. At its mouth the barrel 10 is slightly constricted. In this constricted portion a grooved tool-holding member 74 is inserted, and is separated from the barrel member by a rubber annulus 76, or shock absorbing means, somewhat similar in structure to the shock absorbing member 58. Again, a press fit may be used for assembling these members.

A tool having a stem portion 78 may be inserted in the tool-holding member and frictionally held therein. A leather gasket or cushion 80 may lie against the inner side of the constricted portion of the mouth to receive the excess blow from the head 15 of the hammer if no tool shank is in the tool-holding member. Pressure of the tool on the work will slidably return the tool and its stem 78 into an operative position to receive a blow from the hammer 10. Direct vibration from the tool will be absorbed by resilient means 76 tending to prevent shocks from being transmitted to the barrel and to the operator's hands.

The tool holding member may be internally spirally grooved as at 82 to form a tortuous air passage for permitting ingress of cool outer air upon a backward air sucking movement of the hammer head 15 and egress to heated air upon a forward air pushing movement of this piston-like member. This interchange of air tends to maintain the parts of the hammer at its forward end in a relatively cool condition and prevents overheating.

For cooling the gears, and motor housing, the mechanisms therein, and the cylindrical bore, an air inlet valve shown as a ball sealed oiler 84 may be inserted in the housing 11. Upon an operative forward stroke of the hammer 10, outside air will be drawn into the housing 11 and pass around the various parts and into the bore 14, past the collar 24. Another ball sealed oiler 86 acting as an air outlet valve may be mounted in reverse in the housing 11 to permit heated air to be expelled from the housing by the reverse stroke of the hammer 10 caused by the roller 64. Oiler 84 may also be used for lubricating the moving parts.

Both the head 15 and the stem 20 are provided with lubricating grooves 88 to carry lubricating material in the bore 14 to their respective bearings.

The invention herein described may be incorporated into various other embodiments and modifications that will be apparent to those skilled in the art. All such embodiments coming within the spirit of the invention are intended to be included within the scope of the appended claims.

I claim:

1. An impact hammer, including a reciprocable hammer member, a barrel housing enclosing said hammer member and having a mouth portion, a tool holding member in said mouth portion, said tool holding member being separated from said mouth portion by a shock absorbing member.

2. An impact hammer, including a housing, a piston-like hammer member reciprocably mounted within said housing, an air inlet valve in said housing operable to admit air on movement of said member in one direction and an air outlet valve in said housing to permit egress of air

from the housing on movement of said member in the other direction.

3. An impact hammer as defined in claim 2, wherein the air inlet and outlet valves are ball sealed oiler members and the outlet valve is mounted to be operative from the interior only of said housing.

4. In an impact hammer having a housing and a reciprocable hammer member slidably mounted in said housing, means for varying the force of the blow to be given by said hammer member, said means including a compression spring operatively mounted at one end to said hammer member, a screw threaded portion in said housing adjacent the other end of said spring member, a threaded adjusting member for said spring mounted in said housing with its threads in operative engagement with the threaded portion of said housing and forming a stop member for the last mentioned end of said spring member, a helix on said adjusting member, and manual adjusting means meshing with said helix to turn said adjusting member along the screw threaded portion in said housing to compress or release tension on said spring member.

5. An impact hammer as defined in claim 4, wherein said adjusting member is formed as a collar around said hammer member and has a sliding engagement therewith.

6. An impact hammer, including a barrel housing having a mouth portion, a piston-like hammer member reciprocably mounted within said housing, a tool holding member in said mouth portion, and ventilating grooves tortuously formed in said tool holding member operable to permit tortuous ingress of air to said housing on movement of said hammer member in one direction and tortuous egress of air on movement of said hammer member in the other direction.

7. An impact hammer, including a barrel housing having a mouth portion, a piston-like hammer member reciprocably mounted within said housing, a tool holding member in said mouth portion, and ventilating grooves formed in said tool holding member operable to permit ingress of air to said housing on movement of said hammer member in one direction and egress of air on movement of said hammer member in the other direction, said grooves being formed spirally around the interior of said tool holding member adjacent any tool held therein.

8. An impact hammer member, including a housing, a hammer member reciprocably mounted in said housing, spring means for reciprocating said hammer for an operative blow in one direction, and return means for reciprocating said hammer in the other direction against the action of said spring means, said return means including a motor operated shaft having a pinion thereon, a rotatable gear wheel meshing with said pinion, a crank member eccentrically mounted on said gear wheel, and a projecting member on said hammer member for intermittent operative engagement by said crank member as it rotates in the orbit of said gear wheel, the radius of engagement of said crank member with said hook-like member from the center of said gear wheel increasing from the point of contact to the point of departure from said projecting member.

9. An impact hammer member, including a housing, a hammer member reciprocably mounted in said housing, spring means for reciprocating said hammer for an operative blow in one direction, and return means for reciprocating said hammer in the other direction against the action of said spring means, said return means including a motor operated shaft having a pinion thereon, a rotatable gear wheel meshing with said pinion, a crank member eccentrically mounted on said gear wheel, and a projecting member on said hammer member for intermittent operative engagement by said crank member as it rotates in the orbit of said gear wheel, said gear wheel being so mounted that a diameter therethrough will pass substantially through the point of engagement and disengagement of said crank member with said projecting member.

10. An impact hammer, including a housing, a hammer member reciprocably mounted in said housing ,means for reciprocating said hammer member for an operative blow in one direction, member in another direction to position the same return means for reciprocating said hammer for an operative blow, and guide means in said housing cooperating with said hammer member to maintain said hammer member in operative position to be actuated by said return means, said guide means including a flattened portion on said hammer member and a roller guide member mounted in said housing contacting said flattened portion to prevent rotation of said hammer in the housing.

JOSEPH M. SCHMIED.

CERTIFICATE OF CORRECTION.

Patent No. 2,298,845. October 13, 1942.

JOSEPH M. SCHMIED.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 26, for "sildably" read --slidably--; page 4, second column, line 40, claim 10, strike out "member in another direction to position the same" and insert the same after "hammer" in line 41, same claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of November, A. D. 1942.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)