Feb. 21, 1933. E. W. TSCHUDI 1,898,069

HAMMER

Filed June 14, 1929 3 Sheets-Sheet 1

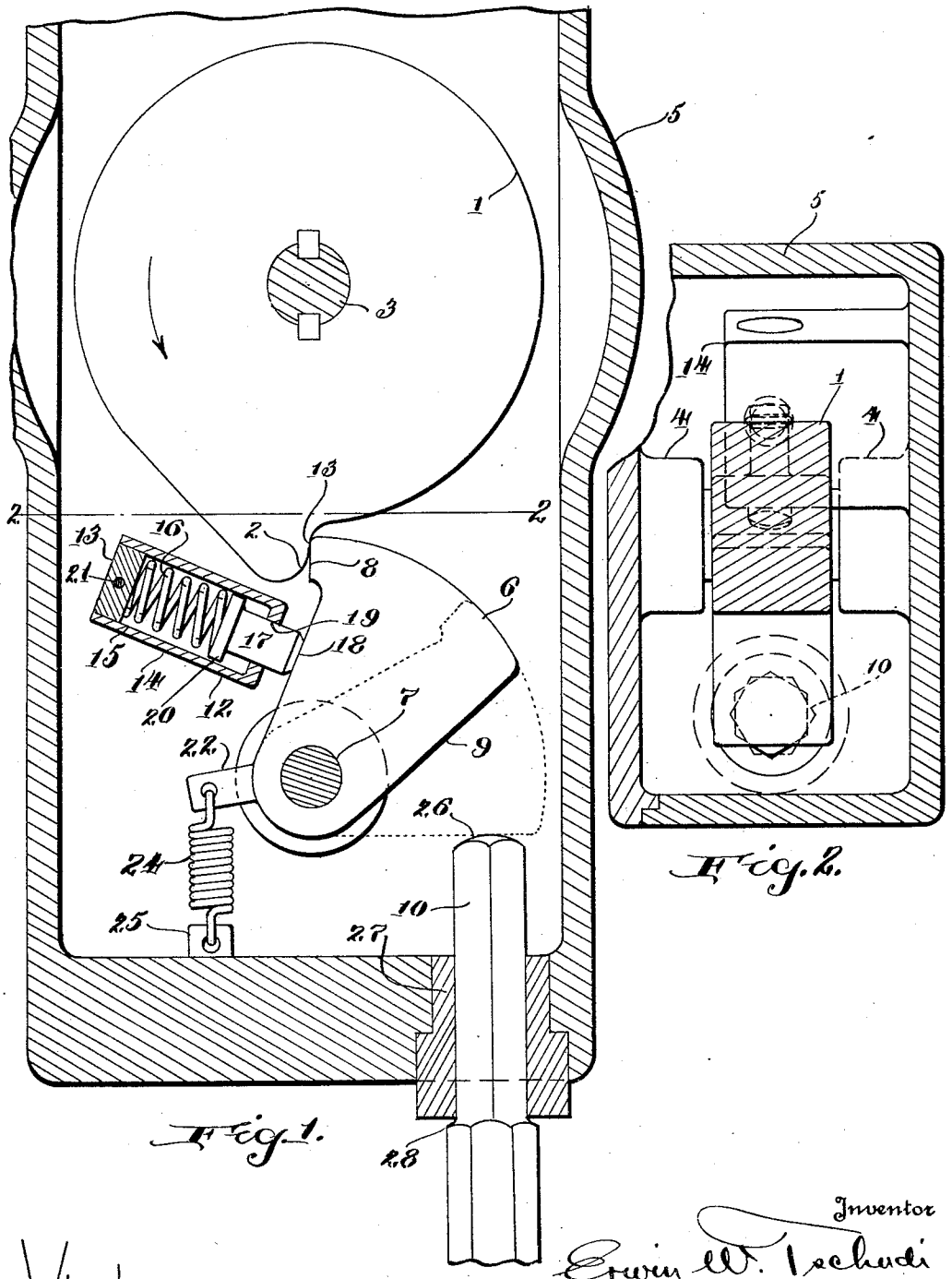


Fig. 1.

Fig. 2.

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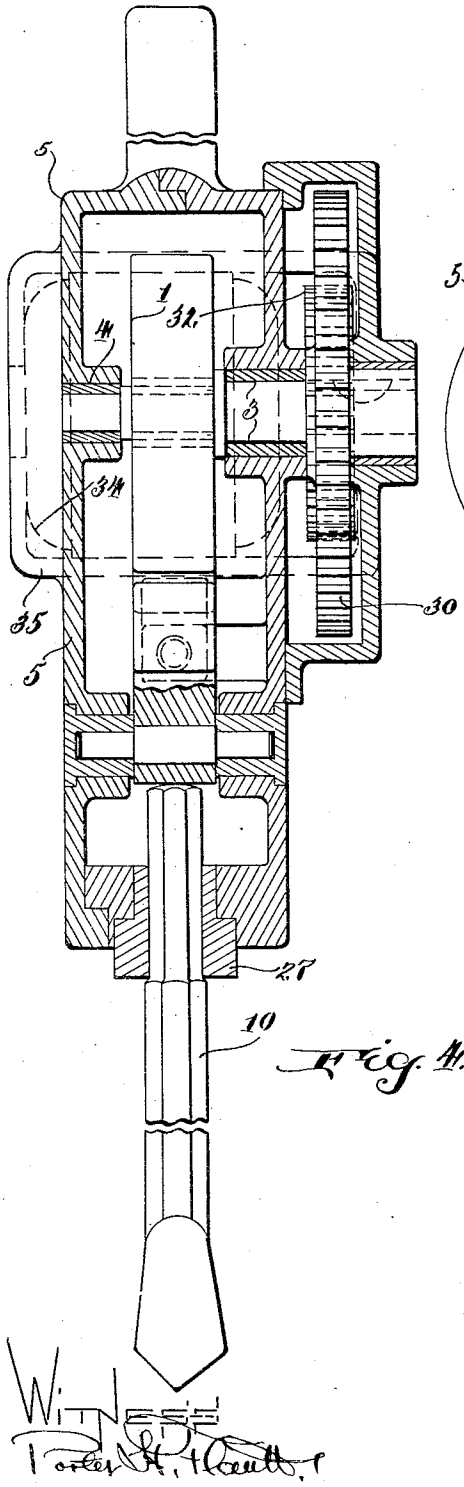


Fig. 4.

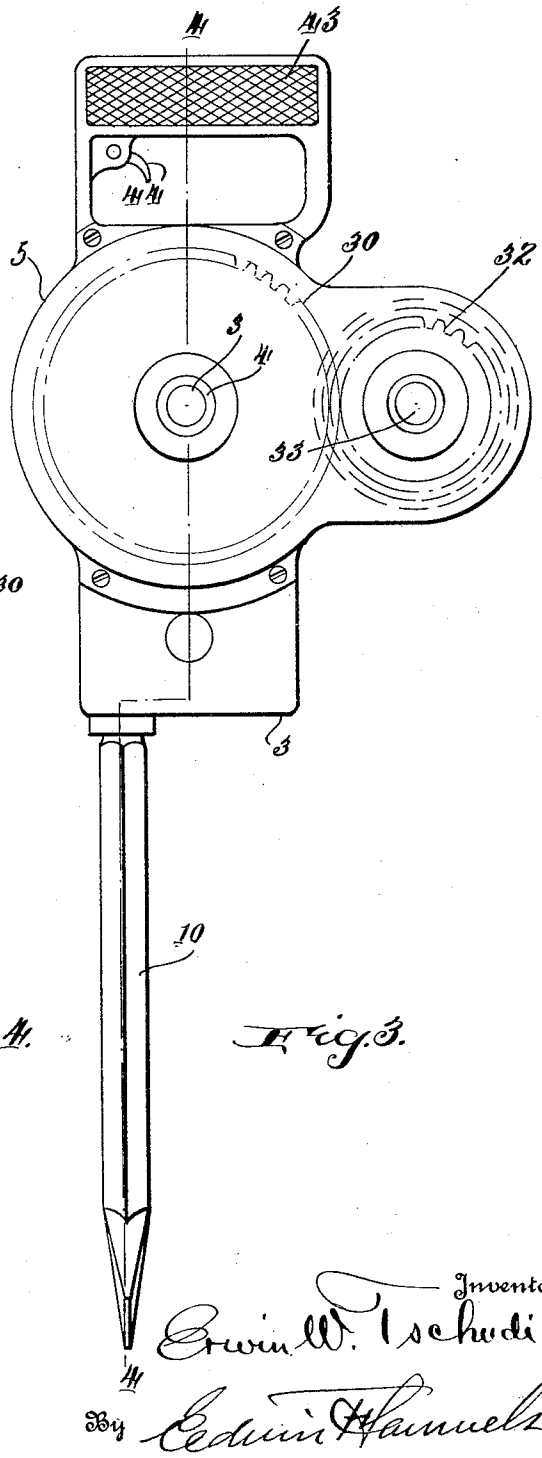


Fig. 3.

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Filed June 14, 1929 3 Sheets-Sheet 3

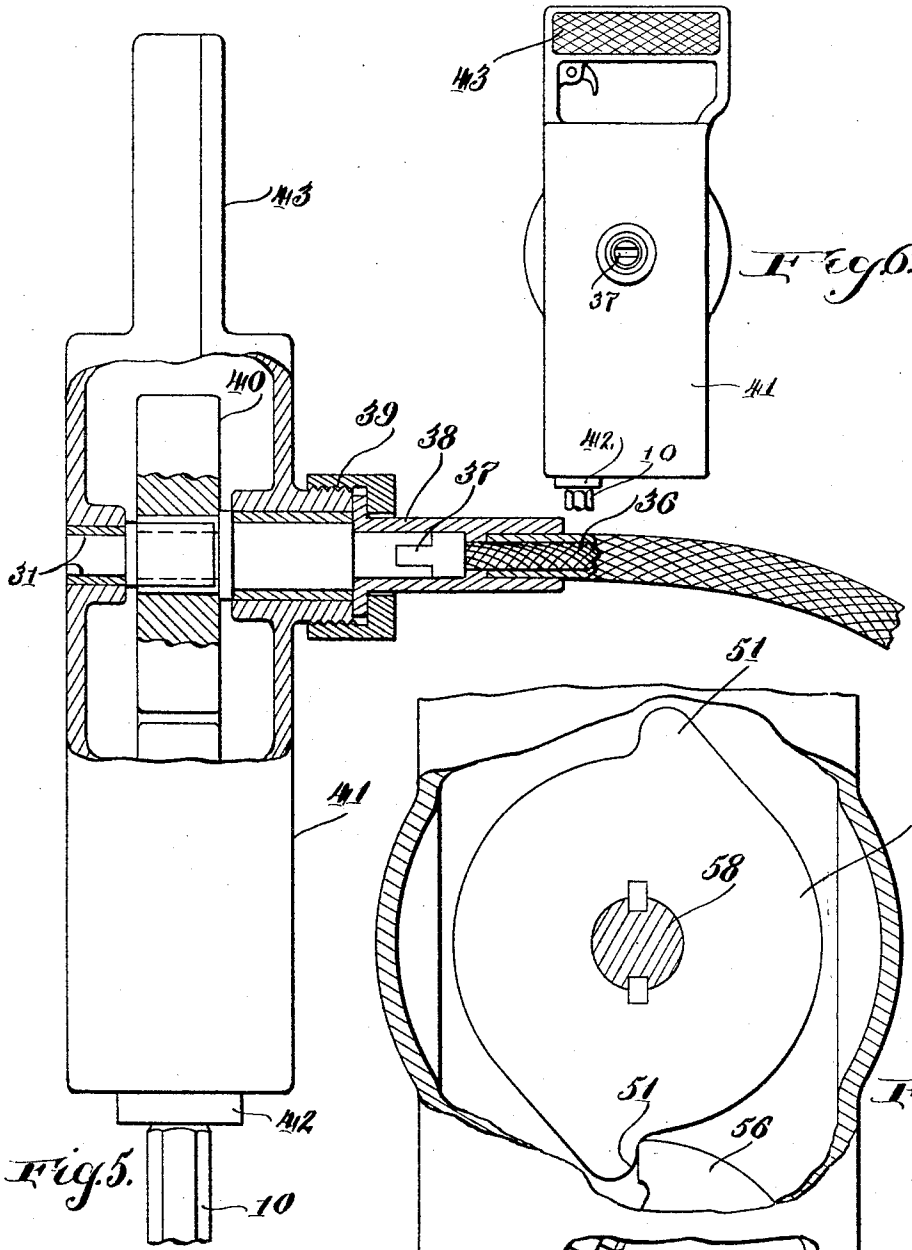


Fig. 6.

Fig. 5.

Fig. 7.

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UNITED STATES PATENT OFFICE

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HAMMER

Application filed June 14, 1929. Serial No. 370,796.

The invention relates to a power hammer of a positive type whereby repeated blows of any desired force and frequency may be delivered for any purpose, as chipping metal, riveting, drilling concrete or stone and other hammering operations. While the type of hammer illustrated is in portable form, it is understood that the principles involved may be otherwise applied.

The device in the preferred form shown consists of a swinging hammer which is actuated by a rotating wheel, the hammer being struck successive blows by a projection on the wheel, and being returned after each stroke by its rebound or by means of a spring which moves it into the path of the projection to receive the next blow. The tool which is being operated by the hammer is placed in the path of the swing of the hammer at any predetermined distance from the center of the hammer's swing and has its end so located that the striking surface of the hammer is at the instant of the blow in a position substantially at right angles to the axis of the tool.

In the preferred form illustrated there is a spring stop to locate the hammer in the path of the projecting striker on the wheel and a spring to hold the hammer in contact with this stop for the initial operation, the rebound being sufficient to return it on subsequent operations.

In the accompanying drawings I have illustrated a percussive tool or hammer in several different forms intended to illustrate the possibility of varying the structure to suit different operating conditions and different sources of power.

In the drawings:

Figure 1 is a vertical central section on a plane at right angles to the striker and hammer shafts showing what may be considered the preferred form of the invention, the upper portion of the tool being broken away for convenience of illustration.

Figure 2 is a horizontal section on the line 2—2 of Figure 1.

Figure 3 is a side elevation on a smaller scale of a portable tool of this type equipped with an electric motor by which the hammer is driven.

Figure 4 is a section on the line 4—4 of Figure 3 looking to the right and on a larger scale.

Figure 5 is an elevation, partly in section, corresponding to Figure 4, of a modified form of tool but adapted to be driven by a flexible shaft.

Figure 6 is an elevation on a reduced scale of the tool shown in Figure 5 looking at the same from the right, the flexible shaft being disconnected at the coupling.

Figure 7 is a fragmentary elevation corresponding to Figure 1, of a modified form of tool in which the striking wheel has a plurality of striking projections.

Referring to the drawings by numerals, each of which is used to indicate the same or similar parts in the different figures, the machine as shown comprises a rotary striking wheel 1, see Figure 1, having any suitable number of strikers or striking projections 2, the structure, Figure 1, being shown as having a single striker only. This striking wheel 1, in accordance with the illustration, is mounted on a shaft 3, supported in suitable bearings 4 in a casing 5, which also encloses the hammer 6, which is mounted on and preferably secured to shaft 7, to oscillate or swing about the center of said shaft which is parallel to the striking wheel shaft 3, and in the form of the invention shown immediately below the same. While the hammer 6 is shown and is most conveniently made in the form of a sector, it is understood that the hammer may be of any preferred shape, mounted to swing or oscillate substantially as described.

In the form illustrated, the hammer 6 is formed with a substantially radial striker surface 8 projecting in a circumferential direction from the body of the sector and cooperating with a substantially radial striker surface 13 on the wheel 1. The hammer 6 is provided with a striking surface 9 on the opposite side of the sector from the striker surface 8. This striking surface 9 is so arranged and positioned and the bit 10 is likewise so arranged and positioned that at the time of the blow of the hammer on the bit the striking surface 9 is at right angles to the axis of the bit.

In order to arrest the rebound stroke of the hammer with the striker surface 8 in the desired position as illustrated in Figure 1, in the path of and in the desired relation to the striker 2, a spring stop 12 is provided. This stop 12, as shown in Figure 1, may be constructed in any desired manner. As shown, it consists of a spring barrel 14, supported on the tool casing or frame. This barrel 14 has a bore 15 closed at the rear end remote from the handle by means of a plug 13, held in any suitable manner as by means of a transverse pin or screw 21. Barrel 14 contains a coil spring 16, which actuates any suitable plunger 17, the nose of which at 18 projects through a suitable opening 19 at the forward end of the casing, the plunger being retained in the casing by means of a flange 20 at the rear end which is larger than the opening 19. The opening 19 also serves as a guide for the plunger. This stop 14, more particularly the plunger 17, is preferably so located, as already pointed out, that it meets the hammer on the rebound, permitting the recoil or the action of the spring 24 to be described to move it on the return stroke to a position in the path of the striker 2, the striker surface 8 being in the preferred form radially located regarding the striker wheel 1. While the rebound of the hammer is sufficient when the tool is in full operation to return the hammer to the position illustrated in Figure 1, in which it receives the blow of the striker 2 on the wheel, it is desirable under certain circumstances, particularly in starting, to have the hammer withdrawn to initial position, as illustrated in Figure 1, by other means in order that the operative motion of the hammer may be initiated. Otherwise, it would rest by gravity on the tool out of the path of the striker.

To this end the impact member or swinging hammer 6 is provided with a rearwardly projecting arm 22 located on the side of the shaft 7 opposite to the striking surface 9. This arm 22 is connected by means of a coil tension spring 24 to any suitable support as a lug 25 on the casing, applying the tension of the spring to the hammer in the direction of left handed rotation whereby the hammer is held normally in retracted position in contact with the nose 18 of the stop plunger and in the preferred form with the striker surface 8 located in a radial plane of both shafts 3 and 7, which plane in the form of the construction shown connects the axes of said shafts, the shafts being preferably parallel. The hammer 6 is shown in Figure 1 in full lines in retracted position and in dotted lines in the advanced position in which the striking surface 9 is in contact with the top of or butt end 26 of the bit 10.

This bit is shown as mounted to slide in a bushing 27, seated in a suitable opening in the bottom of the casing and the bit is provided with a shoulder 28, which is so placed in relation to the bushing 27 that the butt end 26 of the bit is engaged by the hammer when the striking surface 9 is at right angles to the axis of the bit.

The location of the bit as shown may be considered the preferred location for general operation, but the distance from the center of the hammer shaft 7 is capable of considerable variation in the construction of these hammers, the lightest blow being obtained by spacing the bit outward radially from the shaft 7, the most powerful blows due to the short leverage about shaft 7 being obtained by moving the bit to the left toward the center of the shaft. It is of interest to note as affecting the operation of the device and producing a sudden forceful tangential blow of the striker projection 2 upon the oscillating member 6, that the shafts 3 and 7 are substantially parallel and are spaced apart by a distance which is substantially equal to the sum of the radii at the centers of the contacting surfaces 2 and 8. Owing to this arrangement, the blow of the striking abutment 2 upon the hammer member 6 is applied in a tangential direction transferring to the hammer member almost the entire momentum of the striking wheel or other rotary member carrying the striking abutment. This relation of the parts is fully brought out in Figures 1 and 7.

Referring now to Figures 3 and 4, it will be noted that in accordance with the illustration the striker wheel 1 mounted on the shaft 3, is driven by means of a toothed gear 30 mounted on and secured to said shaft 3, the toothed gear 30 being in turn driven by a toothed pinion 32 mounted on the shaft 33 of an electric motor 34, in the casing 35, which is secured to the hammer casing 5 in any suitable manner.

Figures 5 and 6 show the striker wheel shaft 31 driven directly from or by a flexible shaft 36 to which it is connected by a suitable coupling 37, enclosed in a flanged sleeve 38, which is secured to the hammer casing by a hollow nut 39, the construction shown being merely suggestive of a possible variation of the form shown in Figures 1 to 4, there being no intention to limit the flexible shaft drive to the direct drive shown or to any particular details or form, and while the illustration includes only the flexible shaft and the electric motor drive, it is obvious that any type of motor or other form of drive may be used.

In Figure 5 the striker wheel is indicated by reference character 40, the parts are enclosed in a casing 41 provided with a bushing 42, in which is mounted a bit 10. All of the tools illustrated are provided with a suitable grip 43, and the tool, Figure 3, is shown as provided with a trigger 44 for actuating an electric switch not shown.

Figure 7 shows a further modification in

which the striker wheel 50 is provided with a plurality of striker projections 51, spaced apart by an angle of 180 degrees. These strikers or striker projections 51 cooperate with a hammer 56, corresponding to the hammer 6, Figure 1, the plurality of striker projections being used to give twice the number of blows with the same speed of revolution of the striker wheel or an increased number of blows in proportion to the speed of the wheel which latter may, if desired, be increased or reduced.

In this connection it will be understood that the rate of rotation of the hammer 56 about its shaft 57 may be greater than that of the striker wheel 50 about its shaft 58. Consequently, the time required for the hammer to execute one complete oscillation will be short enough to permit the use of a striker wheel or driver 50 with more than one projection. If, however, a relatively small number of powerful blows per minute is desired, it is necessary or desirable to have a striker wheel 1, as in Figure 1, with but one striker projection 2 operated at a relatively low speed, and that the moment of inertia of the striker wheel be considerably greater than the moment of inertia of the hammer 6.

On the other hand, if a large number of relatively light blows is sought, it is desirable that the striker as in 50, have two or more striker projections 51 and/or that it be driven at a high rate of speed and that the hammer have a relatively small moment of inertia, the striker wheel having nearly the same moment of inertia as that of the hammer 56.

It will also be noted that a further element of flexibility of the device as described results from the ability to locate the bit 10 at any desired distance from the line of centers of the shafts 307, Figure 1. According to the lever principle, the closer the tool or bit 10 is to the line of the axis of shaft 3–7, the more forceful will be the blow of the hammer on the tool, but if the tool is removed from the axis, the force of the blow will be less.

I have thus described specifically and in detail a power operated hammer embodying the principles of my invention in a preferred and various modified forms in order that the nature and operation and the manner of applying and using the same may be fully understood. However, the specific terms herein are used descriptively rather than in a limiting sense, the scope of the invention being defined in the claims.

What I claim as new and desire to secure by Letters Patent is:

1. A power hammer including the combination of two parallel spaced axes, a rotating actuator on one axis and an oscillating hammer on the other axis constructed to travel on a predetermined arc from a point in line with the centers of the two axes to a point at which it delivers its blow, means for normally urging the hammer toward its first mentioned limit, a stop for limiting such movement whereby the hammer portion is normally situated between the two axes on a line with the center thereof, said actuator having an outwardly projecting abutment so constructed that when rotated it will project into the path of said portion only at the above mentioned normal position of the same whereby said actuator through its abutment when rotated will deliver a tangential blow to said hammer, which hammer travels the remainder of its arc under the momentum of such blow, the abutment immediately travelling out of contact therewith, and an anvil situated in the path of the hammer to receive the momentum from said hammer.

2. A power hammer including the combination of two parallel spaced axes, a rotary actuator on one axis and an oscillating hammer on the other axis constructed to travel on a predetermined path from a point substantially in line with the centers of the two axes to a point at which it delivers its blow, a stop for limiting said travel whereby a hammer portion is located substantially on said line between said axes, said actuator having a projecting abutment so constructed that it will project into the path of said portion only at and immediately beyond said limited position of the said hammer portion whereby said actuator through its abutment when rotated will deliver a tangential blow to said hammer, which hammer travels the remainder of its path under the momentum of such blow, the abutment immediately passing out of contact therewith and an anvil situated in the path of the hammer to receive the momentum from said hammer.

3. A power hammer having in combination a rotary actuator with driving means therefor, a stop adjacent the path of rotation of said actuator and on a line with a predetermined radius thereof, a hammer element mounted to move from a position adjacent said radius and slightly within the path of movement of said actuator away from said position and away from the axis of said actuator and transversely to said radius to a point at which it delivers its blow, said construction being such that said actuator when rotated will deliver a tangential blow to said hammer, which hammer travels the remainder of its path under the momentum of said blow, the actuator passing immediately out of contact therewith, and an anvil situated in the path of the hammer to receive the momentum from said hammer.

Signed by me at Towson, Baltimore County, Maryland, this 11th day of June, 1929.

ERWIN W. TSCHUDI.