No. 887,388. PATENTED MAY 12, 1908.

L. GOLLY.

VACUUM POWER HAMMER.

APPLICATION FILED APR. 16, 1907.

3 SHEETS—SHEET 1.

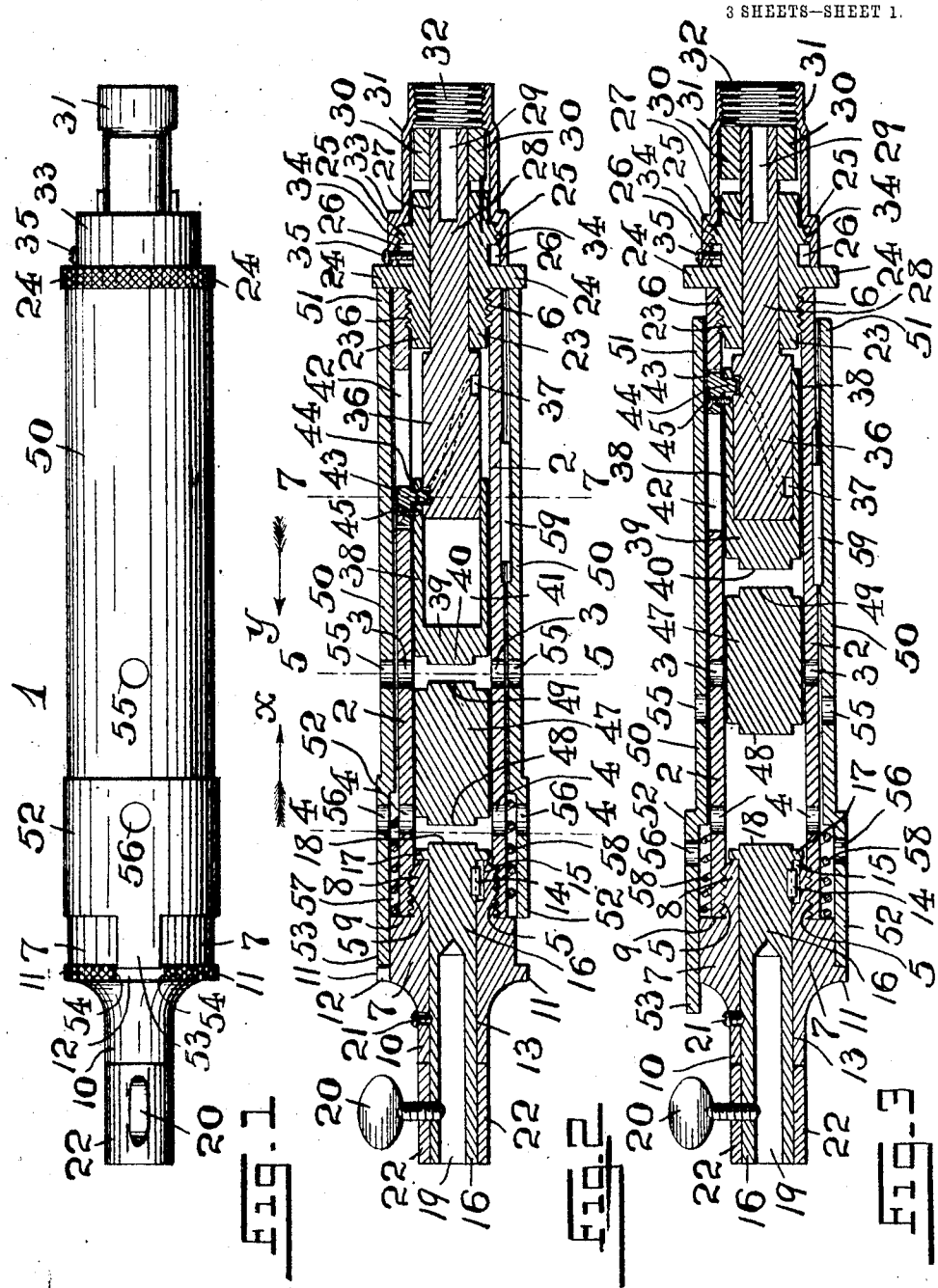


Fig. 1

Fig. 2

Fig. 3

WITNESSES:

F. H. W. Fraentzel

Frederick Jamison

INVENTOR:

Louis Golly.

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Fraentzel and Richards.

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3 SHEETS—SHEET 2

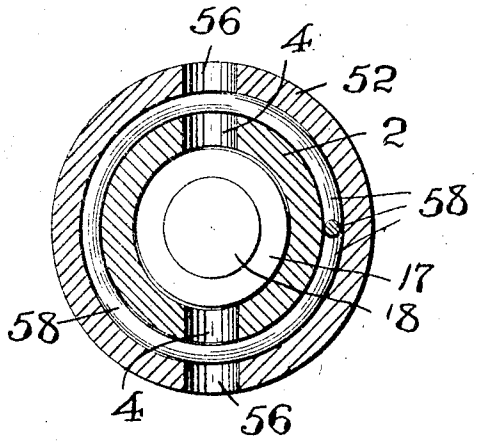


Fig. 4

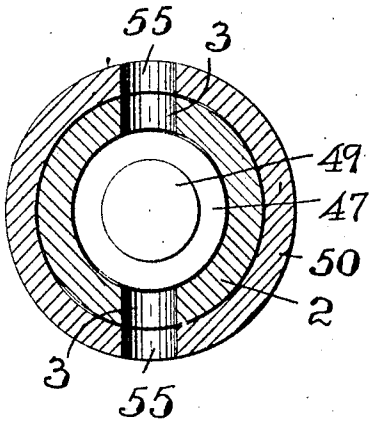


Fig. 5

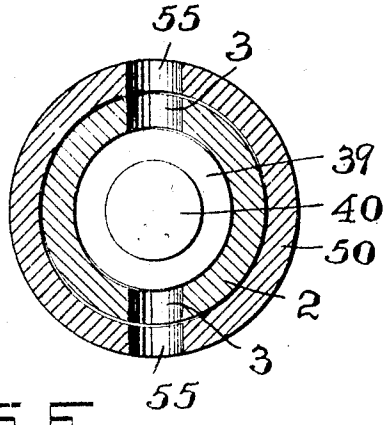


Fig. 6

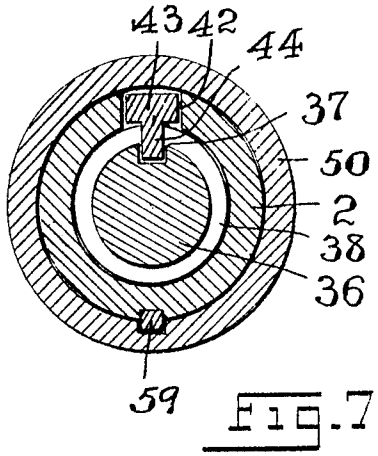


Fig. 7

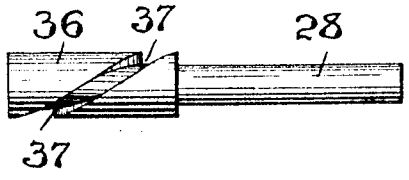


Fig. 8

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3 SHEETS—SHEET 3.

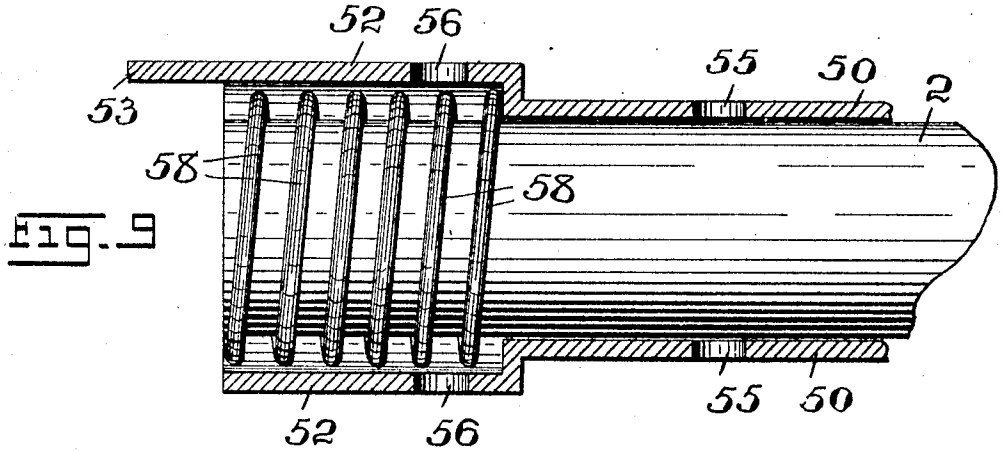


Fig. 9

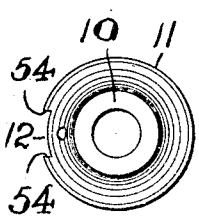


Fig. 11

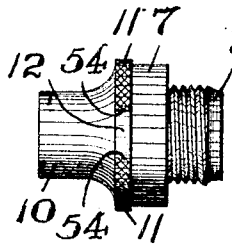


Fig. 10

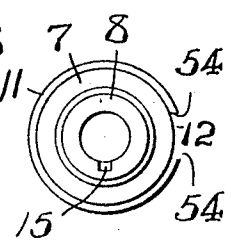


Fig. 12

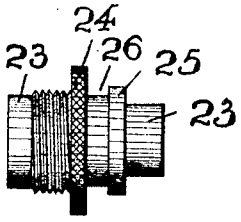


Fig. 13

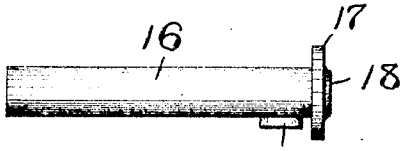


Fig. 15

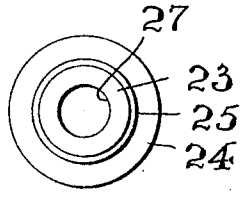


Fig. 14



Fig. 16

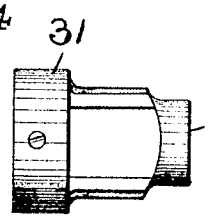


Fig. 17

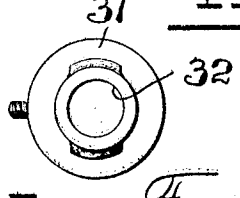


Fig. 18

WITNESSES:

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UNITED STATES PATENT OFFICE.

LOUIS GOLLY, OF EAST ORANGE, NEW JERSEY.

VACUUM POWER-HAMMER.

No. 887,388. Specification of Letters Patent. Patented May 12, 1908.

Application filed April 16, 1907. Serial No. 368,548.

To all whom it may concern:

Be it known that I, LOUIS GOLLY, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Vacuum Power-Hammers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings and to characters of reference marked thereon, which form a part of this specification.

The invention has reference, generally, to improvements in vibratory power-hammers; and the invention relates, more particularly, to a novel device or implement in the form of a power vacuum hammer which is provided at one end with a tool-holding means or a receiving socket, so as to connect with the tool, a chisel, drill, riveting, or hammering, or a plugging tool, the device or implement being readily held and carried in the hand for the proper manipulation of the device or implement with the work for which it is intended.

The present invention has for its principal object to provide a novel and simply constructed device or hammer of the general character hereinafter set forth, which is provided with a rapidly vibrating element or hammer, driven in a downward direction by means of a plunger against the tool-holder and returned in its opposite direction by the vacuum produced by the return-movement of the plunger.

With this end in view the present invention has for its main object to provide a power vacuum hammer or implement in contra-distinction to a pneumatic hammer in which a reciprocatory striking member is caused to be moved back and forth by means of the action of compressed air upon one or both sides of the striking member.

Other objects of this invention not at this time more particularly mentioned will be clearly understood from the following detailed description of the same.

The present invention consists, primarily, in the novel power vacuum hammer or implement hereinafter more fully set forth; and, this invention consists in the various arrangements and combinations of devices and parts, as well as in the details of the construction of the same, all of which will be hereinafter more fully described.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is an elevation of one form of power vacuum hammer or implement; Fig. 2 is a longitudinal vertical section of the device, said view illustrating the relative positions of the working parts of the device, when the device is not in use, although the power for driving the reciprocating plunger may not be shut off; and Fig. 3 is a similar section of the device, showing all of the parts in their operative positions, for rapidly reciprocating the hammer within the device to produce the vibrating action of the tool-holder. Fig. 4 is a transverse section, taken on line 4—4 in said Fig. 2; Fig 5 is a similar section, taken on line 5—5 in said Fig. 2, looking in the direction of the arrow *x;* Fig. 6 is a similar section, also taken on said line 5—5 in said Fig. 2, but looking in the direction of the arrow *y;* and Fig. 7 is a transverse section of the device, said section being taken on line 7—7 in said Fig. 2, all of said transverse sections being made on an enlarged scale. Fig. 8 is an elevation of a rotary power-driven shaft for operating the reciprocating plunger of the device or implement. Fig. 9 is a detail view, on an enlarged scale, of the tool-receiving end-portion of the device or implement, the tool-holder, however, having been omitted from said view. Figs. 10 and 11 are side and end views, respectively, of a sleeve for connecting the tool-holder to the inner cylinder of the device or implement; and Figs. 12 and 13 are end and side views, respectively, of another sleeve for operatively arranging an outer cylinder in a telescopic manner upon said inner or main cylinder, and for retaining the rotary shaft or spindle, which drives the plunger, in its operative position within the inner or main cylinder. Fig. 14 is a view of the opposite end of said sleeve. Fig. 15 is a side view and Fig. 16 an end view of the vibratory tool-holder; and Figs. 17 and 18 are an elevation and end view, respectively, of a connecting sleeve for attaching an end-portion of a flexible shaft to the end of the rotary power-driven shaft or spindle shown in Fig. 8.

Similar characters of reference are employed in all of the above described views, to indicate corresponding parts.

Referring now to the several figures of the drawings, the reference-character 1 indicates

the complete device or implement, the same comprising a main cylindrical body 2 of any suitable diameter and desirable length, the said tubular or cylindrical body being provided with suitably disposed openings or perforations 3 and 4 and being provided in its respective end-portions with the internally screw-threaded parts 5 and 6, substantially as illustrated in Figs. 2 and 3 of the drawings.

Suitably screwed into the screw-threaded end 5 of the said cylinder 2 is the reduced and externally screw-threaded portion 8 of a suitably constructed sleeve 7, the said sleeve being formed with the shoulder 9 and a reduced end-portion 10, substantially as shown. The said sleeve 7 is also preferably provided with an annular shoulder 11 which is formed with a cut-away or open portion 12, forming a suitable guide for the purposes to be presently more fully described. Suitably arranged within the tubular portion 13 of said sleeve 7, and prevented from turning therein by a key 14 which extends into a groove or channel 15 in the reduced portion 8 of the sleeve 7, is a tool-holder 16. This tool-holder is provided with an annular shoulder 17, which rests upon and against the end of the reduced portion 8 of the sleeve 7 within said cylinder 2, and directly back of said shoulder 17 the said tool-holder 16 is made with a striking end or anvil 18. In the opposite end-portion, said tool-holder 16 may be provided with a suitably formed receiving socket 19, in which the end-portion or shank of any suitable tool, such as a chisel, a riveting tool, or a plugging device for dental uses, may be arranged, and suitably held and secured therein by means of a set of thumb-screws 20, substantially as illustrated in the Figs. 1, 2 and 3 of the drawings. In addition to the key 14, a suitable set or binding screw 21 may also be employed in the manner shown in Figs. 2 and 3 of the drawings, and upon the free end-portion of said tool-holder there may be arranged a reinforcing ring or sleeve 22.

Suitably screwed into the internally screw-threaded end-portion 6 of the cylinder 2 is a sleeve 23, said sleeve being provided with an annular shoulder or projection 24, which is tightly screwed against the end of the said cylinder 2 as clearly shown. The said sleeve 23 is provided with another annular shoulder or projection 25, said shoulder 25 forming with the shoulder 24 an annular recess or groove 26, substantially as shown and for the purposes to be presently more fully described.

Rotatably arranged within the tubular portion 27 of said sleeve 23 is a shaft or spindle 28, said shaft or spindle being provided in its end-portion which extends beyond the said sleeve 23 with a receiving socket 29 in which is arranged and suitably secured the end-portion of a suitably constructed and well-known flexible shaft. A reinforcing ring or sleeve 30 may also be arranged upon the end-portion of the shaft or spindle 28 as shown, and the reference-character 31 indicates a sleeve or coupling which is provided with an internally screw-threaded part 32 for connection therewith of the usual fastening member or coupling of the flexible shaft. The said sleeve or coupling 31 may also be provided with an enlarged portion 33 which is arranged upon and abuts against the annular shoulder 25 of the ring 23, the free end portion of said enlargement 33 also tightly hugging the annular shoulder 24 of said ring 23, substantially as shown. The said enlarged portion 33 of the said coupling 31 is provided with an internal screw-thread 34 which can be screwed upon a correspondingly formed screw thread upon the annular shoulder 25 of the sleeve 23; and the said enlargement 33 is also provided with a screw 35 which is screwed through said enlargement and has its shank extending into the annular depression or groove 26, whereby all of the said parts are positively secured or connected in their operative relation, as will be clearly evident. The enlarged cylindrically formed forward end of the spindle 28 extends into the interior of the cylinder 2 and is provided in its surface with a helical or spiral groove 37. Slidably arranged within the said cylinder 2 is a cylindrically formed plunger 38 which is made with a closed part 39 having a striking end 40, said plunger being also provided with a chambered or socketed portion 41, so as to be fitted over and reciprocate upon the enlarged cylindrical portion 36 of the shaft 28. The said cylinder 2 is provided with a slot or elongated opening 42 forming a guide for a block or dog 43 which is made with a projection or teat 44 extending through a suitably formed opening in the plunger 38 and is secured to the said plunger by means of a tightening screw 45, or any other suitable fastening means. The free end-portion of said projection or teat 44 extends entirely through the opening or wall of said plunger 38 and into the said helical or spiral groove 37, and it will thus be clearly seen, that when the shaft or spindle 28 and its enlarged portion 36 are rotated by means of the usual flexible shaft, the said helical or spiral groove 37 will produce a reciprocatory sliding motion of the block 43 within said slot or elongated opening 42 in the cylinder 2, thus producing, at the same time, a reciprocatory and non-rotatable movement of the plunger 38 within said cylinder 2. Suitably disposed in the space within the said cylinder 2 between the striking ends or anvils 18 and 40, respectively, of the tool-holder 16 and the plunger 38 is a slidably mounted cylindrical hammer 47, said hammer being provided at its opposite ends, with the respective striking anvils 48 and 49. Suitably arranged upon and concentric with the said inner cyl-

inder 2 is an outer cylinder 50, the said cylinder 50 having its rear end-portion 51 under normal conditions, abutting or bearing against the annular shoulder 24 of the sleeve 23, and is provided at its opposite or forward end with a slightly enlarged portion 52 which is slidably mounted upon the outer cylindrical surface of the main body-portion of the sleeve or coupling 7, and has a longitudinal extension or tongue 53 adapted to be slid into the cut-away or open portion 12 of the annular shoulder 11, and adapted to be brought in holding engagement with the edge-portions 54 formed by the said open or cut-away portion in said annular shoulder 11, all of which will be clearly understood from an inspection of Figs. 1, 2 and 3 of the drawings.

As shown in the several figures of the drawings, a series of holes or perforations 55 are arranged in the said outer cylinder 50, the said holes, under normal conditions, corresponding to and registering with the holes or perforations 3 in the inner cylinder 2. A second series of holes or perforations 56 are arranged in the enlarged portion 52 of the outer cylinder 50, said holes or perforations, under normal conditions, corresponding to and registering with the holes or perforations 4 in the said inner cylinder 2. As shown in said Figs. 2 and 3 of the drawings, the said enlarged portion 52 of the cylinder 50 forms with the end-portion of the inner cylinder 2 an annular space or chamber 57, and suitably arranged within the said space is a coiled-spring 58 which acts as a cushion, as will be clearly evident from an inspection of said drawing and for the purposes to be more fully set forth.

Having thus in a general manner described the general arrangement and constructions of the various parts of the device or implement embodying the principles of the present invention, I will now set forth the use and manner of operating the same.

When the parts are in their normal or initial positions, shown in Figs. 1 and 2 of the drawings, with the holes or perforations 55 in the outer cylinder 50 registering with the holes or perforations 3 in the inner cylinder 2, it will be clearly evident, that the rotary motion of the shaft or spindle 28 and the reciprocatory sliding movement of the plunger 38, will have no effect, whatever upon the hammer 47, and the device or implement 1 can be placed upon the bench or other support without the necessity of shutting off the rotary power from the flexible shaft. When, however, it is desired to use the device or implement 1 with the tool which has been secured in the tool-holder, all that is necessary is to slide the outer cylinder 50 upon the inner cylinder 2, in the direction of the arrow y in said Fig. 2, so as to bring the extension or tongue 53 into its operative engagement with the open or cut-away portion 12 of the annular shoulder 11 formed upon the sleeve or coupling 7, so as to bring the various parts into their relative positions shown in Fig. 3 of the drawings. Having done this, the holes or perforations 55 no longer register with the holes or openings 3, and the rotary motion of the shaft or spindle causing a rearwardly sliding motion of the plunger 38, a vacuum is produced between said plunger and the hammer, and the influx of the air through the holes 56 and 4 causes the hammer to immediately slide in the direction of arrow x, so as to follow up the receding plunger, and when the latter is caused to return in the direction of the arrow y, its striking end or anvil 40, engages a striking end or anvil 49 of the hammer 47, and the striking end or anvil 48 of the hammer 47 is immediately brought or forced into its operative engagement or contact with the striking end or anvil 18 of the tool-holder 16. Of course, it will be understood that the shaft or spindle 28 and its parts are very rapidly rotated, whereby a quick or rapid reciprocatory action of both the plunger 38 and the hammer 47, in the opposite directions of the arrows x and y, will take place, thereby producing a rapid vibratory action of the tool-holder, so that the tool therein can be used for the various purposes for which it is intended. At the same time the arrangements of the holes or perforations 56 and 4 permit of an intermittent escape and influx of air between the tool-holder and the reciprocatory hammer 47, so as to act as a cushion, and the coils of the spring 58 serving to take up the shock due to the rapid vibratory movements of the parts. When it is desired to cease working with the tool, without arresting the rotary motion of the flexible shaft, all that is necessary is to return the sleeve 50 from the position indicated in Fig. 3 to that shown in Fig. 2 of the drawings, thereby bringing the holes or perforations 55 into their registering relation with the perforations or holes 3, so as to admit air between the plunger 38 and the hammer or element 47, and there will be no further movements of the latter. A key 59 may be employed, as shown to prevent the turning of the outer cylinder upon the inner cylinder.

From the foregoing description of my present invention it will be clearly seen that I have produced a simply constructed and effectively operating device or implement, the cylinder 50 of which serves as a hand-piece, and the tool-holder of which can be provided with any suitable tool, such as a chisel, a drill, a dental-plugger, a riveting shank, or the like.

Owing to the simplicity of the construction, and there being no air-valves as in the usual form of pneumatic hammers, there is no danger of the parts becoming inoperative with constant use. It will also be evident

that the device or implement may be made large or small according to the various uses to which it is to be put.

I claim:—

1. In an implement of the character set forth, the combination, with a cylinder, of a tool-holder connected with one end of said cylinder, a reciprocatory plunger in said cylinder, means for actuating said plunger, and a reciprocatory hammer movably arranged within said cylinder between the one end of said tool-holder and the end of said plunger, said cylinder being provided with means for producing a vacuum between the end of the hammer and the end of the plunger, when said plunger is moving in one direction and forcing said hammer against the end of the tool-holder when the plunger moves in the opposite direction, substantially as and for the purposes set forth.

2. In an implement of the character set forth, the combination, with a cylinder, of a tool-holder connected with one end of said cylinder, a rotary shaft within said cylinder and a reciprocatory plunger in said cylinder, adapted to be actuated from said shaft, said plunger being provided with a striking-end or anvil upon one end, and said tool-holder being provided with a striking end or anvil, a reciprocatory hammer movably arranged within said cylinder between the one end of said tool-holder and the end of said plunger, said hammer being formed with a striking-end or anvil upon each end of said hammer, and said cylinder being provided with means for producing a vacuum between the end of the hammer and the end of the plunger, when said plunger is moving in one direction and forcing said hammer against the end of the tool-holder when the plunger moves in the opposite direction, substantially as and for the purposes set forth.

3. In an implement of the character set forth, the combination, with a cylinder, of a tool-holder connected with one end of said cylinder, a reciprocatory plunger in said cylinder, means for actuating said plunger, and a reciprocatory hammer movably arranged within said cylinder between the one end of said tool-holder and the end of said plunger; said cylinder being provided with an opening or hole, a second or outer cylinder slidably mounted upon said first-mentioned cylinder, said outer cylinder being provided with an opening or hole normally corresponding to and registering with the hole in said first-mentioned cylinder, whereby a vacuum in the rear of the hammer is avoided and the hammer brought to rest, substantially as and for the purposes set forth.

4. In an implement of the character set forth, the combination, with a cylinder, said cylinder being provided with a longitudinally extending opening, of a tool-holder connected with one end of said cylinder, a chambered reciprocatory plunger in said cylinder, a block slidably arranged in said longitudinally extending opening of said cylinder, means for securing said block to said plunger, means for producing a reciprocatory movement of said plunger, and a reciprocatory hammer movably arranged within said cylinder between the one end of said tool-holder and the end of said plunger, said cylinder being provided with means for producing a vacuum between the end of the hammer and the end of the plunger, when said plunger is moving in one direction and forcing said hammer against the end of the tool-holder when the plunger moves in the opposite direction, substantially as and for the purposes set forth.

5. In an implement of the character set forth, the combination, with a cylinder, said cylinder being provided with a longitudinally extending opening, of a tool-holder connected with one end of said cylinder, a rotary shaft within said cylinder provided with a helically arranged groove, a chambered reciprocatory plunger in said cylinder, a block slidably arranged in said longitudinally extending opening of said cylinder, means for securing said block to said plunger, and a projection on said block extending into the helical groove of said shaft, whereby the rotary movement of said shaft will produce a non-rotative reciprocatory movement of said plunger, said plunger being provided with a striking-end or anvil upon one end, and said tool-holder being provided with a striking end or anvil, a reciprocatory hammer movably arranged within said cylinder between the one end of said tool-holder and the end of said plunger, said hammer being formed with a striking-end or anvil upon each end thereof, and said cylinder being provided with means for producing a vacuum between the end of the hammer and the end of the plunger, when said plunger is moving in one direction and forcing said hammer against the end of the tool-holder when the plunger moves in the opposite direction, substantially as and for the purposes set forth.

In testimony, that I claim the invention set forth above I have hereunto set my hand this 13th day of April, 1907.

LOUIS GOLLY.

Witnesses:

FREDK. C. FRAENTZEL,

F. H. W. FRAENTZEL.