No. 734,387. PATENTED JULY 21, 1903.

A. J. WOODWORTH.

ELECTRIC HAMMER.

APPLICATION FILED NOV. 6, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

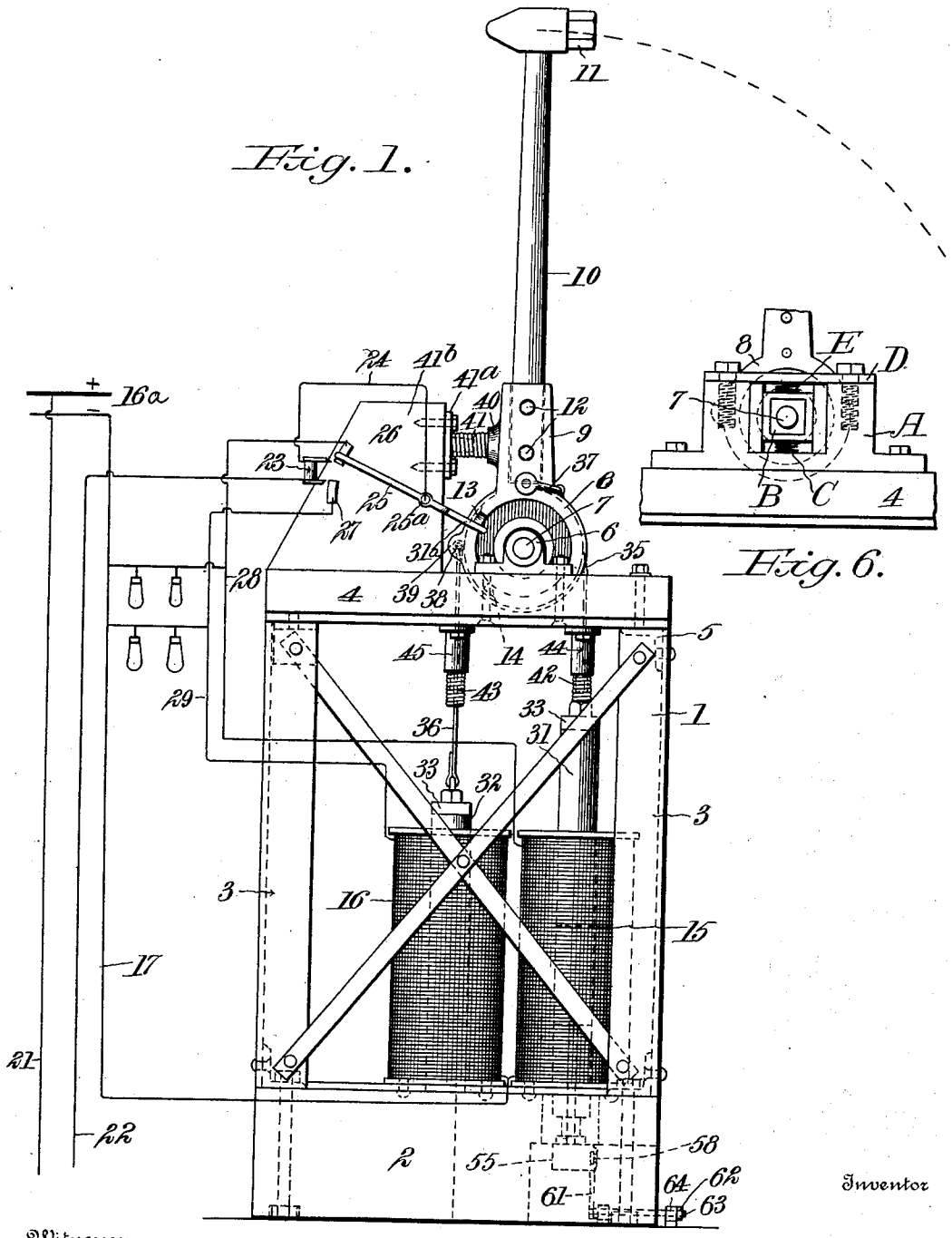


Fig. 6.

Witnesses

C. H. Walker.

Frank L. Appleman.

By

Inventor

Albert J. Woodworth

Henry T. Bright

Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

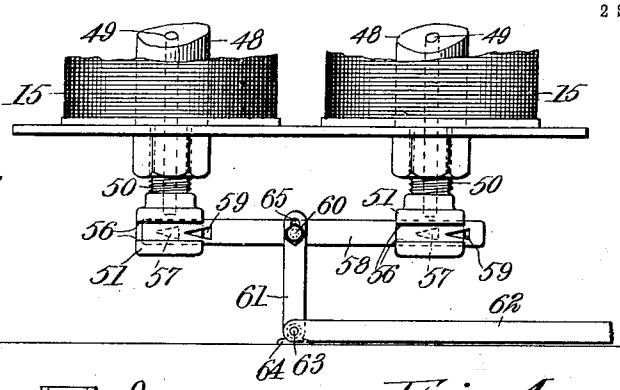


Fig. 4.

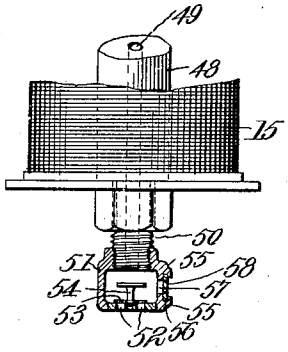


Fig. 5.

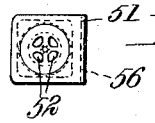


Fig. 2.

Witnesses

C. H. Walker.

Frank A. Ackerman

By

Inventor

Albert J. Woodworth

Henry T. Bright

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 734,387. Patented July 21, 1903.

UNITED STATES PATENT OFFICE.

ALBERT J. WOODWORTH, OF SPARROWS POINT, MARYLAND.

ELECTRIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 734,387, dated July 21, 1903.

Application filed November 6, 1902. Serial No. 130,268. (No model.)

To all whom it may concern:

Be it known that I, ALBERT J. WOODWORTH, a citizen of the United States, residing at Sparrows Point, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Electric 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.

This invention relates to power-hammers, and is designed to be operated electrically.

The objects of the invention are, first, to produce a hammer in which a circuit for energizing the hammer-operating means is automatically controlled; second, to provide means for utilizing the momentum of the hammer on its upward stroke to produce the initial motion of the hammer on its downward stroke, said arrangement coöperating with the electrically-controlled hammer-operating means to accelerate the hammer and increase the rapidity and force of the blows; furthermore, to produce, in combination therewith, an arrangement whereby the momentum of the electrically-controlled hammer-operating means is utilized to impel the same when under electrical or magnetic influence; third, to produce means for regulating the force of the blow of the hammer through the control of the action of the hammer-operating means, it being the purpose to govern the force of the blow, which, as is well known, in practice often requires rapid changes in the stroke of the hammer.

Furthermore, the object of the invention is to produce a hammer in which the operating parts will prove strong and durable in construction, efficient in use, and comparatively inexpensive to manufacture.

With the foregoing and other objects in view the invention consists in the details of construction and in the arrangement and combination of parts to be hereinafter more fully set forth and claimed.

In describing the invention one embodiment of same will be found in the accompanying drawings, forming part of this specification, and wherein like characters denote corresponding parts in the several views, it being understood that many of the details which I shall describe can be variously modified in carrying the invention into practice. Hence I do not want to be understood as limiting myself to such details.

Figure 1 illustrates a side elevation of a machine embodying one form of the invention. Fig. 2 illustrates an end view thereof. Figs. 3, 4, and 5 are detail views showing the controlling device. Fig. 6 is a view showing a modified form of journal-bearing for the drum.

In the drawings, 1 denotes a frame supported on a suitable base 2, said frame comprising corner-supports 3, of angle-iron, which converge toward the top. Beams 4 extend longitudinally of the frame and are secured to the supports 3. Pieces 5 are interposed between the upper ends of the end beams and act as a brace therefor. Journal-boxes 6 are secured to the beams 4 and receive the trunnion 7 of the drum 8, said drum carrying a socket 9 for the reception of the handle 10 of the hammer 11, the said handle being secured in the socket by the bolts 12. The drum is provided with lugs 13 and 14, which project from one side, functions of which will be presently described.

On the upper surface of the base 2 are two sets of solenoids 15 and 16, one set being stationed to one side of the axis of the drum and the other set being stationed on the opposite side of said axis. Each set of solenoids has a circuit to a generative source of electricity 16^a, by which they are energized. In the arrangement disclosed the return-conductor 17 is common to both sets of solenoids, while the circuits to the solenoids are controlled by a lever 18, acting as a cut-out arm between the contacts 19 and 20, the contact 20 having its circuit 21 leading from the electrical source 16^a, and the conductor 22 from the contact 19 leading to the blow-out coil 23, and the blow-out coil in turn having a conductor 24 terminating in the pivot 25^a of the switch-arm 25. The switch-arm is designed to make and break circuits through the contacts 26 and 27, contact 26 having a conductor 28 in circuit with the solenoids 15 and the contact 27 having a conductor 29 in circuit with the solenoids 16. The blow-out coil is so arranged in relation to the contacts 26 and 27 as to prevent arcing through said contacts and the

switch-arm 25 when the same is traveling between the contacts.

The end 31ª of the switch-arm 25 has a portion bent approximately at right angles to the contacting portion, and it terminates in a portion bent at right angles thereto. The end 31ª lies in the path of travel of the lugs 13 and 14, by which the switch-arm is swung on its pivot to alternately engage the contacts 26 and 27, thereby alternately magnetizing and demagnetizing the solenoids 15 and 16. The pairs of solenoid-cores 31 and 32 are alternately attracted by the solenoids 15 and 16, and each pair of solenoid-cores is connected by a yoke 33, and the yokes in turn have shackles 34, to which are connected the straps 35 and 36, respectively. The strap 35 has its upper end connected to a link 37, which is pivoted to the drum in such manner as to allow the strap 35 to operate over the surface of the drum as said drum oscillates. The strap 36 has its upper end secured by a cross-pin 38, run through the ears 39 of the drum, and the said strap 36 is designed to operate over the surface of the drum during its oscillation, acting counter to that of the strap 35.

The socket 9 is provided with a boss 40, which contacts with a buffer-spring 41 upon the elevation of the hammer, said spring 41 being compressed by the momentum of the hammer and serving to impart the initial motion to the hammer on its descent, it being apparent that considerable force will be gathered and imparted by the spring by reason of the arrangement shown. The spring 41 is secured to the plate 41ª, and the plate in turn is attached to a backing-block 41ᵇ, said block being anchored on the beam 4 in any suitable manner. To further utilize the power which would ordinarily be lost, buffer-springs 42 and 43 are provided for the solenoid-cores 31 and 32, respectively, and hence when said cores have traveled out of the solenoids with considerable momentum and contact with the buffer-springs the tendency will be to produce a prompt return within the solenoid, since the said cores would be under the magnetic influence of the coils and the influence of the buffer-springs simultaneously and under the influence of the buffer-springs when the least area of the cores is under magnetic influence. Hence the presence of the buffer-springs increases the efficiency and rapidity of the stroke. The springs 42 and 43 are guided by the housings 44 and 45.

The base 2 has a recess 46 at its bottom and a series of apertures 47 extending through the top. The solenoids are fitted on the base with their core-openings registering with the apertures 47. A casing 48 is provided for each aperture, each casing having an opening 49, communicating with the core-openings of the solenoids. The upper end of the casing receives the impact of the solenoid-core and limits its downward movement. The downward movement of the solenoid-core is also controlled by the air compressed by it in its descent. The casing terminates at its bottom in the nipple 50, to which is threaded a valve-casing 51. Said valve-casing having orifices 52 in its bottom permits the ingress of air with the ascent of the solenoid-cores, the said orifices being closed by a valve 53 on the descent of the core. A guide-post 54 is secured to the valve-casing, and the valve 53 slides thereon and is guided thereby. Each valve-casing has flanges 55 with ways 56 formed therein, and an aperture 57 is provided in the valve-casing between the flanges for the escapement of air compressed by the core. The aperture 57 is preferably triangular. A plate 58 is slidable in the ways 56, said plate having triangular apertures 59, which may be thrown into registry with the apertures 57, or the said plate may be adjusted so that only a portion of the apertures register, and by this arrangement the escape of air compressed by the core is regulated. It is by this controlling means that the cushioning of the core is effected and the force of the descent of the core varied and the blow of the hammer in turn regulated. In applying the regulating device to the cores of the solenoids, heretofore described, it is only necessary to employ it in connection with the solenoids 15 or those which exert influence to actuate the hammer in its descent, and in Fig. 2 the solenoids 15 are supplied with valve-casings 51, as heretofore described, and the apertured plate 58 is mounted to slide in the ways. A pin 60 approximately centrally of the plate is acted on by the short arm 61, which is oscillated through the medium of a lever 62, having one end connected to a shaft 63, said shaft being mounted in bearings 64, which are suitably supported. The upper end of the arm 61 is provided with a slot 65, in which the pin 60 reciprocates. The outer end of the arm 62 is joined with a pin-and-slot connection to the end of the lever 18, which has been heretofore described in detail. A block 66, to which the lever 18 is pivoted, is provided with a gage-plate 67, said gage-plate having a series of stops 68 for arresting said lever 18, it being apparent from the illustration in Fig. 2 that the escapement of air from the valve-chamber 51 will be greater as the outer end of the lever 18 is depressed. Hence said lever performs the dual function of completing the circuit through the solenoids and regulating the force of the blow through the mechanism and in the manner just described.

In the modification shown in Fig. 6 I provide a journal-box A, in which the journal-bearing B is supported on a cushion C, here shown in the form of a spring, though any yielding support may be employed. A plate D is bolted to the upper surface of the boxing, and a cushion E is interposed between this plate and the journal-bearing B, so that said journal-bearing is yieldingly suspended between the boxing and the plate. This ar-