

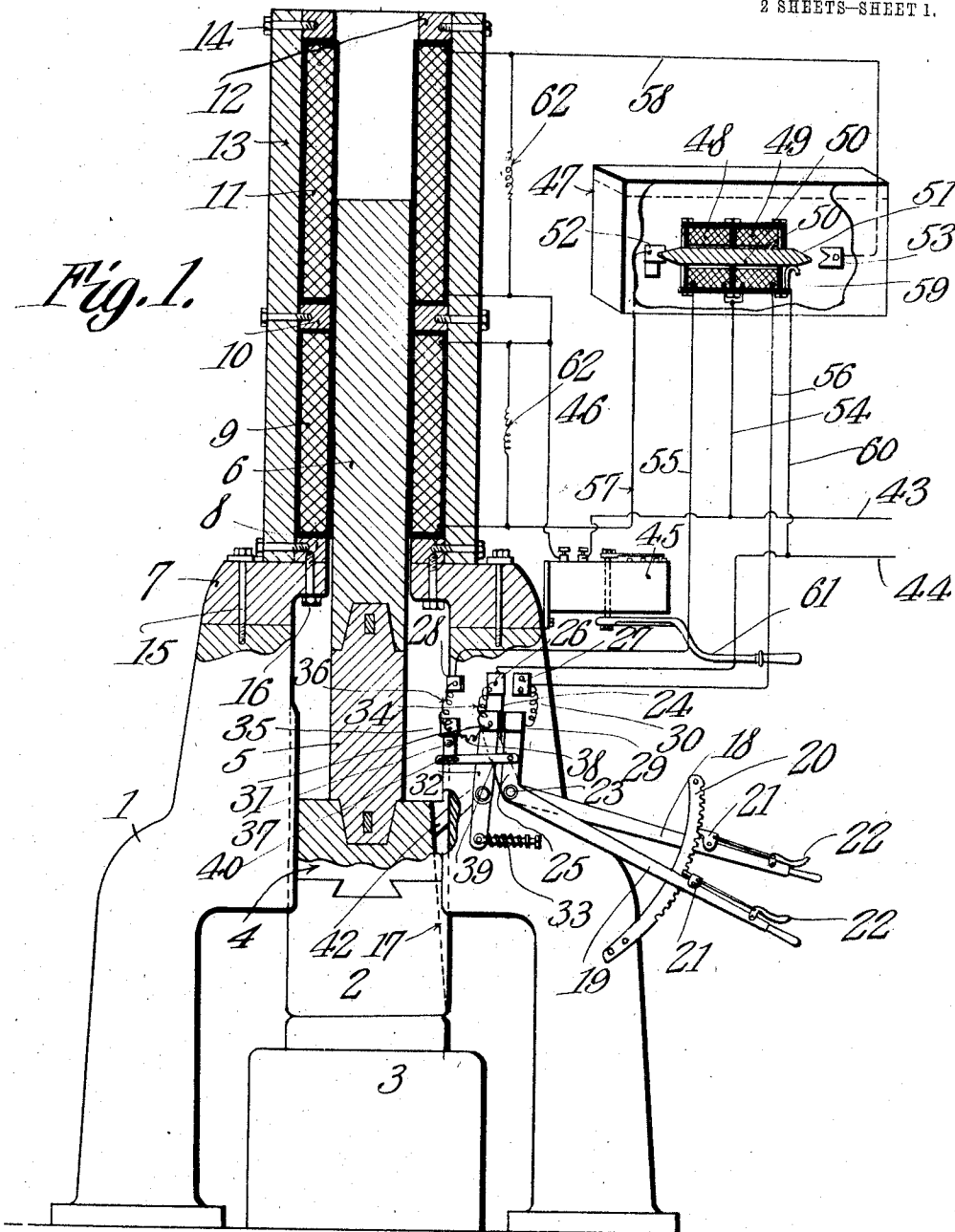
R. S. SMITH.
ELECTRIC HAMMER.

APPLICATION FILED JULY 28, 1909.

983,943.

Patented Feb. 14, 1911.

2 SHEETS—SHEET 1.



Reuben S. Smith. ^{Inventor}

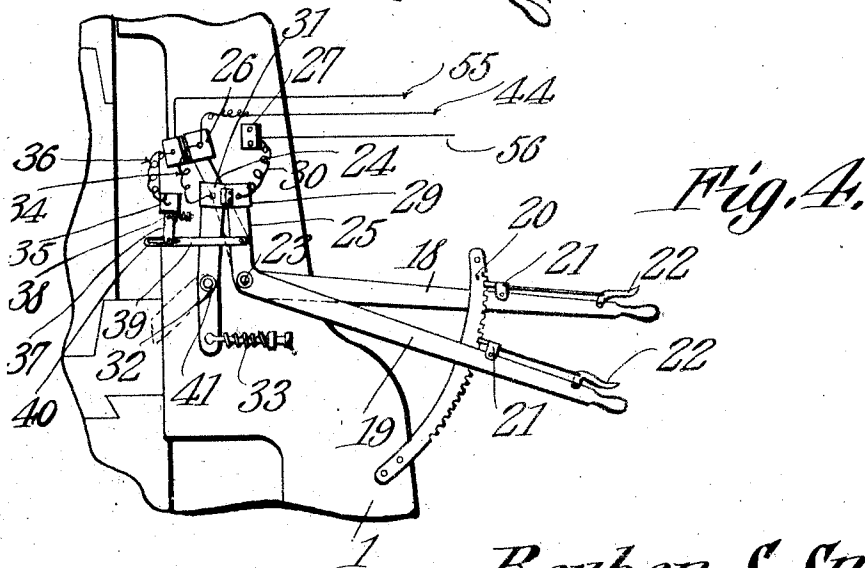
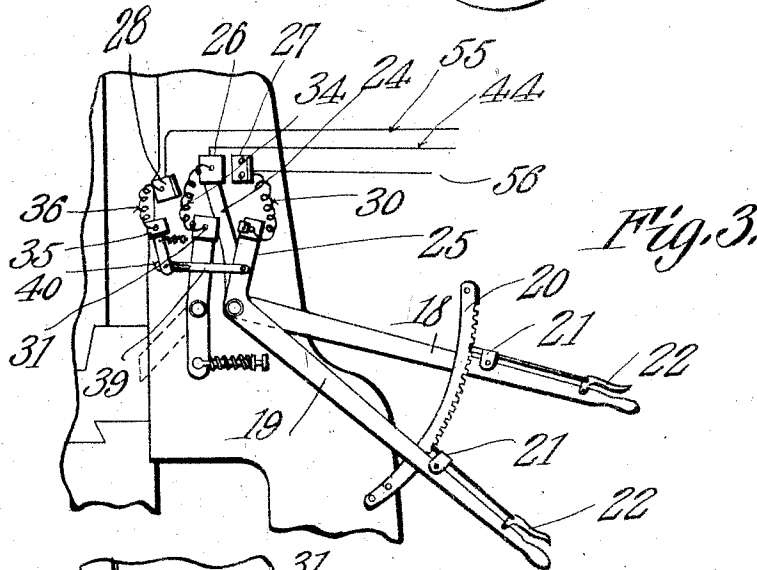
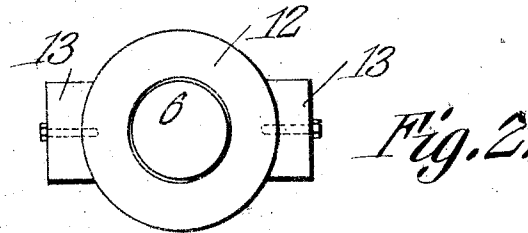
Witnesses
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

REUBEN S. SMITH, OF MARSHALL, TEXAS.

ELECTRIC HAMMER.

283,943.

Specification of Letters Patent.

Patented Feb. 14, 1911.

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To all whom it may concern:

Be it known that I, REUBEN S. SMITH, a citizen of the United States, residing at Marshall, in the county of Harrison and State of Texas, have invented a new and useful Electric Hammer, of which the following is a specification.

This invention has reference to improvements in electric hammers wherein the hammer head is elevated by magnetic pull and the hammer blow is caused by the action of gravity augmented by magnetic pull in the same direction.

In accordance with the present invention provision is made for setting the hammer in motion and permitting the hammer blows to be given in succession with any degree of force up to the full capacity of the apparatus, the action of the hammer being either automatic with the force of the blow under the control of an operator or the hammer blows may be given one at a time at the will of an operator.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, in which drawings—

Figure 1 is a structural diagram partly in elevation and partly in section, of an electric hammer embodying the present invention. Fig. 2 is a top plan view of the upper end of the solenoid part of the structure. Figs. 3 and 4 are views of the controlling mechanism showing the same in different phases of operation.

Referring to the drawings and more particularly to Fig. 1, there is shown a hammer structure comprising a frame 1 having guides for a hammer head 2 in the path of which latter there is located an anvil 3, the several parts being generally similar to like parts of an ordinary steam hammer. The active end of the hammer is secured in the usual manner to a block 4 and this block is made fast to a bar 5 of some non-magnetic material, such, for instance, as brass. At the end of the bar 5 remote from that connected to the block 4, the said bar is made fast to a suitable armature or core 6 of magnetic metal such, for instance, as iron. The framework 1 is made up of two oppositely disposed legs connected together at the upper end by a crown or yoke 7 made of some non-magnetic material such, for instance, as brass and this yoke has a central passage for

the core 6. Immediately surrounding the passage through the yoke 7 and secured on top the latter is an iron ring 8 on which is supported a solenoid coil 9 surmounted by another iron ring 10 and on this latter there is mounted another solenoid coil 11 in turn surmounted by an iron ring 12. The several rings 8, 10 and 12 are connected together outside the coils 9 and 11 by diametrically disposed strips 13 which, like the rings 8, 10 and 12 are made of iron or other suitable magnetic material. The rings and strips are firmly secured together in any suitable manner, as by screws 14, the strips 13 acting as yokes for the rings 8, 10 and 12. In order to reduce to a minimum magnetic leakage screws 16—15 of brass or other non-magnetic material are employed to secure the ring 8 to the yoke 7 and the said yoke 7 to the frame 1.

The showing of the drawings is not to be taken as limiting the embodiment of the invention to the exact structures shown since it will be found necessary in practice to modify the structures described in various ways to meet various contingencies.

Along one side of the hammer head 2 and of the block 4 there is formed an inclined recess 17 said recess 17 widening in an upward direction, for a purpose which will hereinafter appear.

By properly energizing the solenoids 9 and 11 the core 6 is drawn into said solenoids and the hammer head 2 is elevated correspondingly. Now by again suitably energizing the solenoids the hammer head is released to the action of gravity and this action may be augmented by a pull of the solenoids in a direction to cause the movement of the head 2 toward the anvil 3. By a proper control of the energization of the solenoids the action of the hammer may be controlled to a nicety.

Mounted upon the frame 1 are two levers 18—19 in operative relation to a rack 20, the levers being provided with latches 21 to engage the teeth of the rack and these latches are under the control of levers 22 at the handle end of the levers 18 and 19. The levers 18 and 19 may be mounted upon the same pivot stud 23 and the lever 18 is provided with a shorter arm 24 while the lever 19 is provided with a shorter arm 25 of less length than the short arm 24. At the outer end of the arm 24 is a contact 26 and on either side of this contact in the path

thereof but normally spaced therefrom are other contacts 27 and 28 made fast to the frame 1. At the outer end of the shorter arm 25 of the lever 19 there is secured a contact 29 and this contact is connected to the fixed contact 27 by a flexible conductor 30. In the path of the contact 29 is another contact 31 on one end of a lever 32 pivoted to the frame 1 adjacent to the pivot point 23 and the other end of this lever beyond the pivot point is under the control of a spring 33. The contact 31 is connected to the contact 26 by a flexible conductor 34. In the path of the contact 31 but on the side thereof remote from the contact 29 is another contact 35 connected by a flexible conductor 36 to the contact 28. The contact 35 is fast on one end of a short lever 37 having a tendency to carry the contact 35 toward the contact 31 by means of a spring 38. The end of the lever 37 remote from that carrying the contact 35 is connected to the short arm 25 of the lever 19 by a link 39 which, however, at the point of connection with the lever 37 is provided with an elongated slot 40 so that either the lever arm 25 or the lever 37 may have an extent of independent movement without causing movement of the other. The lever 32 is made fast to the pivot pin 41 and this in turn carries an arm 42 having its free end entering the recess 17 in the hammer head 2 and block 4.

Coming from a suitable source of electric current are two conductors 43—44. The conductor 44 is connected to the contact 26 on the end of the lever arm 24. The conductor 43 leads to one side of a rheostat 45 of any suitable type and the other side of this rheostat is connected by a conductor 46 to adjacent ends of the two coils 9 and 11.

At any convenient point there is located a box or receptacle 47 in which are housed two coils 48—49 in tandem with a movable core 50 extending through them and provided with end terminals 51 of suitable shape to engage respective fixed terminals 52—53 in the path of the ends of the core 50, all these parts being immersed in a suitable non-conducting fluid such as transformer oil within the box or container 47. Adjacent ends of the coils 48—49 are connected by a common conductor 54 through the main line conductor 43. The other end of the coil 48 is connected by a conductor 55 to the contact 28 and the corresponding other end of the coil 49 is connected by a conductor 56 to the contact 27. The fixed contact 52 within the box 47 is connected by a conductor 57 to the end of the coil 9 remote from that connected to the rheostat 45. The fixed contact 53 within the box 47 is connected by a conductor 58 to the end of the coil 11 remote from that connected to the rheostat 45. The core 50 is arranged to be in constant electrical contact with a brush 59

or other suitable means, which in turn is connected by a conductor 60 to the main line conductor 44 before referred to.

The rheostat 45 is controllable through a suitable or manipulating lever 61 after the usual practice.

Let it be assumed that the parts are in the position shown in Fig. 1 and that the circuit is completed to the main line conductors 43—44 by means of a suitable main line switch, which latter is not shown in the drawings but is, of course, assumed to be present after the usual practice. Assuming that the current enters by the conductor 44 then it will pass to the contact 26 and by way of the conductor 34 to the contact 31, thence to the contact 29, which latter is under the conditions assumed in engagement with the contact 31; thence by the conductor 30 to the contact 27 and by conductor 56 to one side of the coil 49 from whence the current passes by the conductor 54 to the other main conductor 43. This causes the energization of the coil 49 and the attraction of the core 50 in a direction to bring it into engagement with the contact 53. There is now established a circuit from the conductor 44 by way of the conductor 60 to the brush 59, thence to the core 50 and from the latter to the contact 53 and conductor 58 to one end of the solenoid 11 and from the latter by way of the conductor 46 through the resistance or rheostat 45 to the other conductor 43. This causes the energization of the solenoid 11 and the attraction thereto of the core 6 thus causing the lifting of the hammer head 2 away from the anvil 3. This movement, however, has caused the inclined bottom wall of the recess 17 to engage the arm 42 and turn the pivot pin or stud 41 about its axis, thus causing the lever 32 to move in a direction against the action of the spring 33, which movement will carry the contact 31 out of engagement with the contact 29, thus breaking the circuit established through the coil 49. When the hammer head has been lifted to a sufficient height then the rocking of the arm 42 and the consequent movement of the lever 32 is sufficient to carry the contact 31 into engagement with the contact 35, thus establishing a circuit from the conductor 44 to the contact 26 and thence by way of the conductor 34 to the contact 31 and from the latter to the contact 35 and by way of the conductor 36 to the contact 28 and from the latter by the conductor 55 to one side of the coil 48, returning to the other main conductor 43 through the common return conductor 54. Now the core 50 is attracted away from the contact 53 until it moves into engagement with the contact 52 thus establishing a circuit from the conductor 44 by way of the conductor 60 to the contact brush 59, thence by way

of the core 50 to the contact 52, thence by the conductor 57 to one end of the solenoid coil 9 and from the other end of the latter by way of conductor 46 and adjustable rheostat 45 to the other main conductor 43, the circuit through the solenoid 11 being broken by the movement of the core 50 away from the contact 53. The hammer head 2 is thus released from the attractive force generated by the coil 11 since such coil is now deenergized and the hammer head falls under the action of gravity, but this action is augmented by the attractive force of the now energized solenoid coil 9 and the blow delivered by the hammer head is commensurate with these combined forces. The downward movement of the hammer head brings the deeper portion of the recess 17 into coincidence with the arm 42 and the spring 33 therefore moves the lever 32 into position whereby the contact 31 is brought again into engagement with the contact 29 and the circuit is established through the coil 49 thus once more actuating the core 50 in a direction to close the circuit at the contact 53 and cut out the coil 9 and energizing coil 11 whereby the core 6 is attracted into the coil 11 and the hammer is lifted. This cycle of operations continues as long as the conditions mentioned are present and the hammer delivers a succession of blows upon any object sustained by the anvil. Such blows may be delivered with the full force of the apparatus or the strength of the blows may be regulated by a suitable adjustment of the rheostat 45 controlling the flow of current to the solenoids, thus not only lightening the blows but slowing up the speed of the hammer. Assuming that the levers 18—19 remain untouched the automatic action of the hammer will continue as long as current is permitted to reach the mains 43 and 44.

Suppose that a comparatively thick piece of metal is resting on the anvil, then it is desirable that the reversal of the hammer should take place at an earlier period than under the conditions first assumed. For this purpose the lever 19 is moved upward on the rack segment 20 and there locked. This will cause the closing of the circuit at the contacts 31 and 29 at an earlier period than before and a consequent earlier energization of the solenoid 11 in the cycle of operations. By means of the adjustment of the lever 19 very sensitive control is had over the extent of downward movement of the hammer 2 from the minimum to the maximum stroke of the hammer.

Let it be assumed that it is not desirable to produce a succession of blows of the hammer automatically but that it is desirable that the operator have full control over the time periods of the hammer blows. By moving the lever 19 to its lowermost

position the contact 29 is moved entirely out of the path of the contact 31 and this movement is transmitted through the link 39 to the lever 37 and the latter is also moved away from the extreme limit of the movement of the contact 31 toward the contact 35. Under these circumstances no extent of movement of the hammer head 2 and block 4 as transmitted through the arm 42 to the lever 32 will cause engagement between the contact 31 and either contact 29 or 35. If now the operator wishes to cause the actuation of the hammer entirely at will or the virtual locking of the hammer out of action then it is only necessary to cause the operation by a suitable manipulation of the lever 18. The operator by depressing the lever 18 causes the engagement of the contact 26 with the contact 27 and thus establishes a circuit from the main line conductor 44 to the contact 26, thence to the contact 27 and by way of the conductor 56 to the coil 49, the latter being connected on the other side to the main line conductor 43. The energization of the coil 49 causes the movement of the core 50 into engagement with the contact 53 and the consequent energization of the solenoid 11 in the manner before described. This will lift the hammer 2 to the highest point and the hammer will there remain suspended so long as current flows through the coil 11, and assuming that the source of current remains active and the conductors 43 and 44 remain charged, then the hammer is held in the elevated position so long as the lever 18 remains in the position stated. If the operator now desires to cause the downward movement of the hammer, the lever 18 is moved upward until the contact 26 is brought into engagement with the contact 28 when the other coil 48 is energized and the core 50 is moved into engagement with the contact 52 and this deenergizes the coil 11 and energizes the coil 9 in the manner already stated, thus causing the downward movement of the hammer and the delivery of a blow as before. By this means the operator has under absolute control the movement of the hammer and the time intervals of the blows delivered by the hammer or the maintaining of the hammer in the elevated position for as long a period as desired. When it is desirable to deliver either a heavy or a light blow the operator will manipulate the rheostat 45 in the required direction.

It will be understood that the levers 18 and 19 need not be approximately horizontal as indicated but may be located in any position desired to be most convenient for manipulation.

To prevent the formation of extra currents which might be generated in the coils 9—11 on the breaking of the circuit thereto

high resistance bridges 62 are connected across the terminals of the solenoid coils 9 and 11.

It will be understood of course that with the lever 18 in an intermediate position and the lever 19 in the inactive position, both coils 9 and 11 are deenergized and the hammer will remain upon the anvil 3 or upon an object supported by the anvil even though the main line switch remain closed.

What is claimed is:

1. In an electric hammer, two solenoids in axial alinement and having magnetic heads at the outer ends and between the contiguous ends, and diametrically located magnetic yokes connecting the heads and extending longitudinally of the solenoids.

2. In an electric hammer, two solenoids in axial alinement and having magnetic heads at the outer ends and between the contiguous ends, diametrically located magnetic yokes connecting the heads and extending longitudinally of the solenoids, a support for the solenoids having non-magnetic material next to the ends of the solenoids resting on the support, a magnetic core, a hammer head, and non-magnetic connections between the hammer head and the core.

3. In an electric hammer, electric circuit terminals under the control of a movable element of the hammer, circuit controlling means in turn controlled by the circuit terminals acted on by the movable element of the hammer and means under the control of an operator for determining the active stroke of the hammer.

4. In an electric hammer, an oscillatory lever, a contact carried thereby, connections

between the lever and the movable element of the hammer for causing the oscillation of the lever by the movement of the movable element of the hammer, a manually controlled lever carrying a contact movable by the lever into and out of the path of the contact on the oscillatory lever, and another contact also movable into and out of the path of the contact on the oscillatory lever and connected to and controlled by the manually operable lever.

5. In an electric hammer, a manually operable lever and a contact carried thereby, another lever having a contact and controlled by a movable element of the hammer, another contact controlled by the first-named lever and located on the side of the second-named contact remote from that carried by the manually operable lever, other contacts in the same circuit, and another manually operable lever carrying a contact movable thereby into and out of engagement with the last-named contacts.

6. In an electric hammer, an electrically operated reversing switch for the hammer, a hammer-operated reversing switch for the said electric switch, manually operable means for controlling the last-named reversing switch, another manually operable reversing switch in the same circuit connections, and current controlling means under the control of an operator.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

REUBEN S. SMITH.

Witnesses:

FLORENCE MARNEY,
B. A. CORGILL.