G. CROSTON.

AUTOMATIC MALLET OR PLUGGER.

APPLICATION FILED JULY 23, 1914.

1,164,475.

Patented Dec. 14, 1915.

2 SHEETS—SHEET 1.

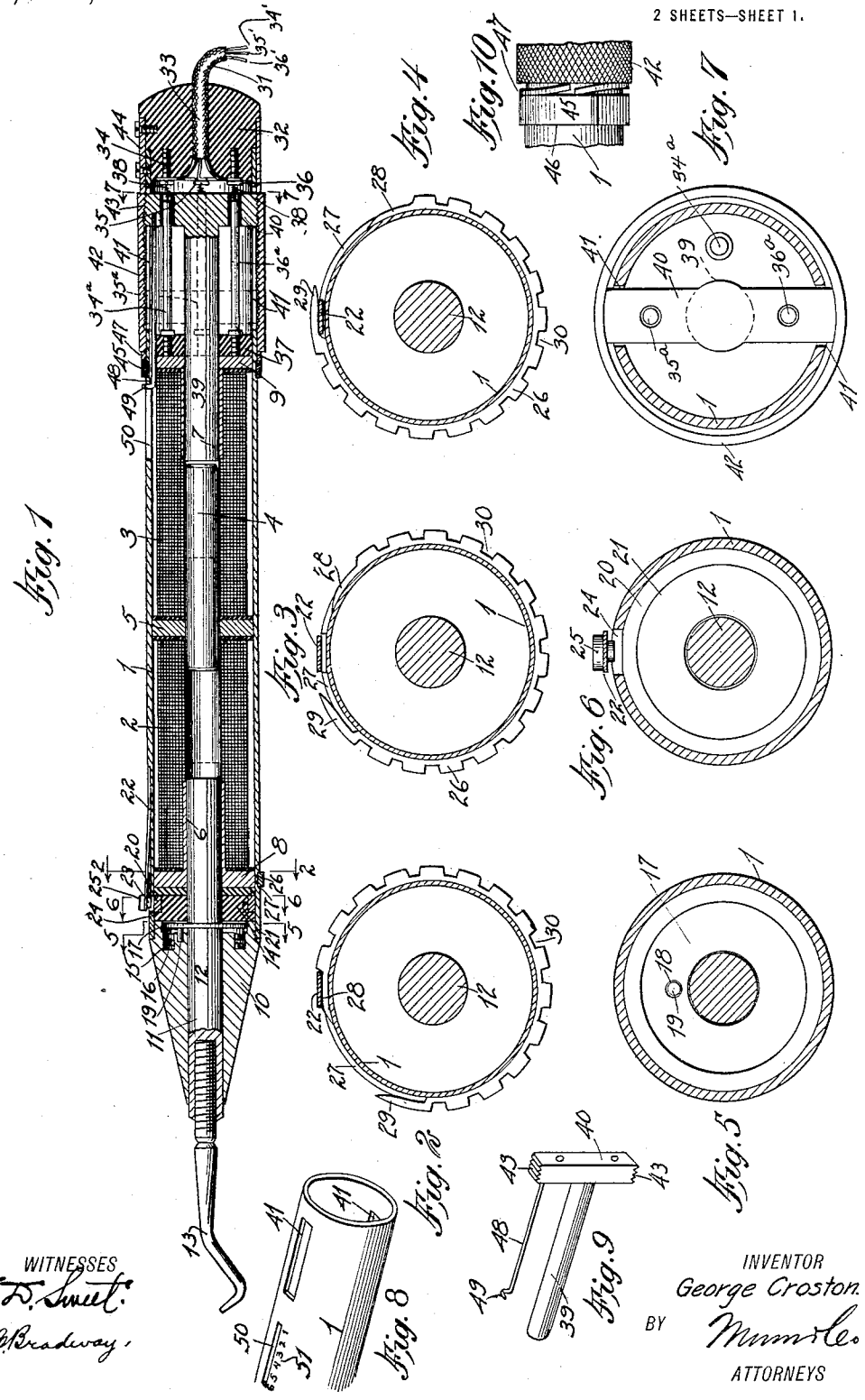


Fig. 1

Fig. 4

Fig. 10

Fig. 7

Fig. 3

Fig. 6

Fig. 2

Fig. 5

Fig. 8

Fig. 9

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 11

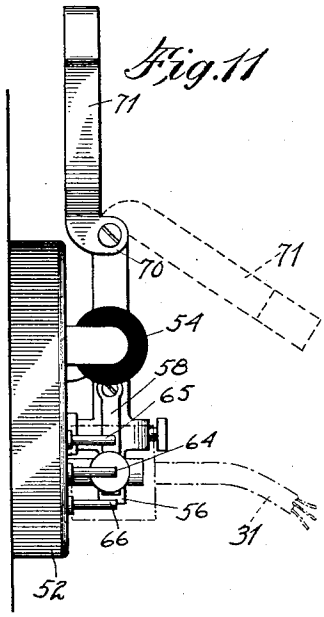


Fig. 12

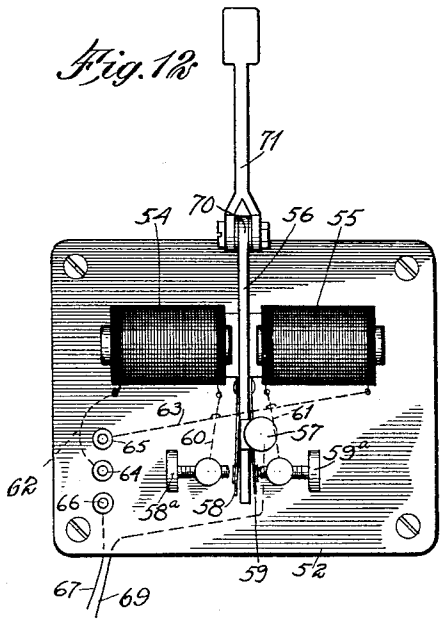


Fig. 13

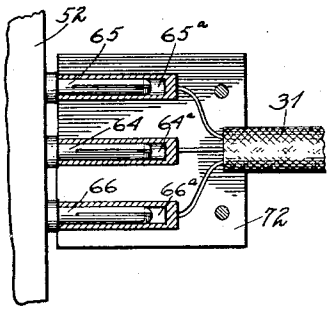
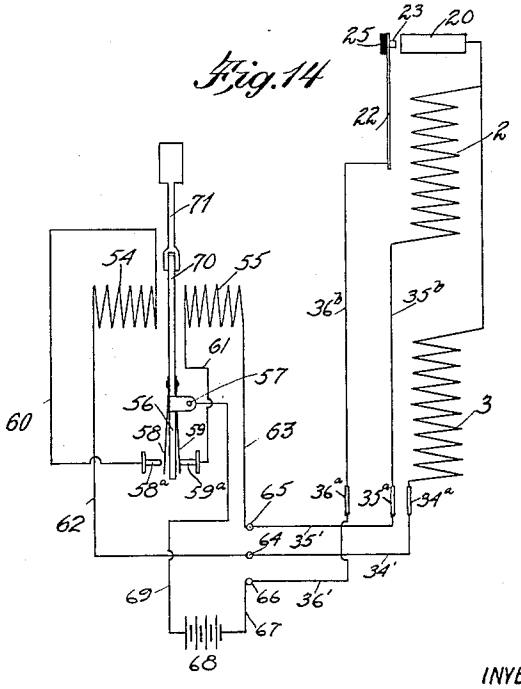


Fig. 14



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AUTOMATIC MALLET OR PLUGGER.

1,164,475. Specification of Letters Patent. Patented Dec. 14, 1915.

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To all whom it may concern:

Be it known that I, GEORGE CROSTON, a citizen of the United States, and a resident of Hoquiam, in the county of Chehalis and State of Washington, have invented a new and Improved Automatic Mallet or Plugger, of which the following is a full, clear, and exact description.

This invention relates to magnetic hammers especially adapted for use as dentists' pluggers, although it is not necessarily limited to this particular application.

The invention has for its general objects to improve and simplify the construction and operation of devices of the character referred to so as to be reliable and efficient in use, comparatively inexpensive to manufacture and keep in operative condition, and so designed that it can be easily and conveniently manipulated.

A further object of the invention is the provision of a tool of the character referred to in which the impacts on the plugger or other implement are produced by a bodily movable element which is reciprocated by the alternate energizing of separate coils which are contained in the body of the tool, there being means for varying the force of the impact by adjusting the stroke of the said element.

Another object of the invention is the provision of an electro-magnetically operated hammer or plugger having an improved form of switch whereby the circuit of the coils can be locked open or closed or whereby the operator can control the circuits manually.

Still another object of the invention is the employment of simple, novel and effective means for adjusting the stroke of the impact elements, in combination with an indicating means for determining the stroke.

The invention has as a further object the provision of an automatic circuit make-and-break device whereby the coils of the hammer are alternately energized, this circuit make-and-break device including means capable of ready adjustment for varying the rate at which the circuits of the coils are opened and closed, so as to thereby vary the rate of reciprocation of the impact element of the hammer.

With such objects in view, and others which will appear as the description proceeds, the invention comprises various novel features of construction and arrangement of parts which will be set forth with particularity in the following description and claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention, and wherein similar characters of reference indicate corresponding parts in all the views, Figure 1 is a longitudinal section of the tool; Fig. 2 is a section on the line 2—2, Fig. 1, showing the pushbutton switch in open circuit position; Fig. 3 is a similar view showing the push button locked in central or disengaged position for permitting the pushbutton to be manually controlled; Fig. 4 is a similar view showing the pushbutton locked in closed circuit position; Fig. 5 is a sectional view on the line 5—5, Fig. 1; Fig. 6 is a sectional view on the line 6—6, Fig. 1; Fig. 7 is a sectional view on the line 7—7, Fig. 1; Fig. 8 is a detail perspective view of the rear end of the casing of the tool; Fig. 9 is a perspective view of the stroke adjusting device for the impact element of the hammer; Fig. 10 is a fragmentary side view of the hammer of the tool adjacent the rear end; Fig. 11 is a side view of the circuit make-and-break device; Fig. 12 is a front view thereof; Fig. 13 is a sectional view of the connector between the conductor cord leading from the circuit make-and-break device and hammer; and Fig. 14 is a diagrammatic view of the circuit connections.

Referring to the drawings, 1 designates a tubular casing that constitutes the handle of the hammer, and within this casing, which is of steel or other magnetic material, are co-axial coils 2 and 3 which operate on an impact element 4 which is reciprocated by the alternate energizing of the coils 2 and 3. Separating the coils is a washer 5 of magnetic material, and in the outer ends of the coils are magnetic sleeves 6 and 7, respectively, which are integral or otherwise connected with the rings 8 and 9 that have their peripheries in contact with the casing 1, as does the ring 5, so that each coil is equivalent to a steel or iron-clad magnet. Fastened in one end of the casing is a conical piece 10 that has a central bore 11 in which is slidingly fitted a spindle or stem 12 into which is screwed the mallet, plugger or other implement 13. Interposed between the head or ring 8 and the finger-piece 10

is a ring of insulation 14, and through this ring extends the stem 12 of the implement 13. The end-piece 10 has a chamber 15 in which is disposed a helical spring 16 that presses on a ring or collar 17 fixed on the stem 12, and when an impact is given to the stem 12 the spring 16 yields, and when the impact is over the spring expands and returns the stem 12. The fixed collar 17 on the stem 12 is limited in its movement by the insulation ring 14 and the adjacent wall of the end piece 10. To prevent the stem 12 from turning when the implement 13 is screwed into or out of it the collar 17 has an opening 18, as shown in Figs. 1 and 5, and into this opening engages a projection or pin 19 fastened to the piece 10. This pin does not interfere with the reciprocating movement of the stem 12.

The user is enabled to control the circuits of the coil by means of a pushbutton or other switch arranged at that end of the handle nearest to the implement 13. In the present instance this switch includes a metallic ring 20 which surrounds the insulation ring 14 and is set in a groove 21 thereof, and on the casing 1 is a spring 22 which has a contact 23 fastened through an opening 24 in the casing 1, so that by pressing a button 25 the contact 23 can be engaged with the contact 20.

Sometimes it is desirable to use the implement 13 without imparting impacts thereto, and hence means is provided to lock the pushbutton in open circuit position, so that the coils cannot be energized, and then again it is desirable to enable the hammer to be used without the necessity of the operator maintaining the pushbutton manually closed, so that a lock is provided to lock the pushbutton open, but this lock is so arranged that it can occupy a neutral or central position whereby the operator can have full control of the pushbutton. The locking device for the switch button comprises a ring-like element 26 which surrounds the casing 1 and sets into an annular groove 27 thereof, so that it can be turned around in one direction or the other. One end of the element 26 is provided with an underrunning cam 28, and the other end is provided with an overrunning cam 29, respectively engaged under and over the spring 22 of the pushbutton or switch, and consequently, when the element 26 is in the position shown in Fig. 2, the pushbutton is locked in open circuit position, and when in the position shown in Fig. 4 it is locked in closed circuit position, while in the position shown in Fig. 3 the locking element 26 permits the pushbutton to be manually controlled. The exterior surface of the element 26 is formed with recesses 30 or equivalent means to enable the same to be more tightly gripped by the fingers for turning. The frictional engagement between the spring 22 and the cams 28 and 29 serves to hold the element 26 in either locking or unlocking position.

The rear end of the tool accommodates the means for adjusting the stroke of the impact element 4, and the means for effecting the electrical connections between the coils 1 and 2 and the conductor cord 31. The shell or casing 1 has fitted into it and securely fastened, a bushing of insulation 32 that has a central bore 33 into which the conductor cord extends, and this bushing has three screws 34, 35 and 36, and to these screws are connected respectively wires 34′, 35′ and 36′ of the conductor cord 31. Within the casing 1 is an insulation bushing or ring 37 in which are fastened rods 34^a, 35^a and 36^a, which form parts of the circuit connections of the coils 2 and 3, and these conductors have yielding terminal pieces 38 which press against the screws 34, 35 and 36, respectively, in order to insure good electrical contacts. Extending into the outer end of the coil 3 is an adjustable bumper or stop 39 which is formed at its outer end with a cross-bar 40, whereby a T-shaped element is formed, as shown in Fig. 9. The extremities of the head or bar 40 engage in longitudinal slots 41 of the casing 1, so that the stop 39 can have longitudinal movement within the casing so as to change the length of stroke of the impact element 4, which latter is of steel or other magnetic material, so as to be acted on by the coils. The adjustment of the element 39 is effected by a rotatable sleeve 42 which is internally threaded and engages the threads 43 on the ends of the head 40, so that by the turning of the sleeve, which is held against longitudinal movement, the stop element 39 is moved longitudinally, according to the direction of rotation of the sleeve 42. This sleeve is confined between a ring 44 fastened to the rear end of the tool and a stop ring 45 set in a groove 46 in the casing 1, and disposed between this ring 45 and adjacent end of the sleeve 42 is a spring washer 47 which constantly presses on the sleeve so that the latter will not rattle during the operation of the tool.

As the stroke determining device 39 is located within the body of the tool it is desirable to have some means to indicate its position, and therefore an indicator in the form of a wire-like member 48 is connected with the part 40 and one end of the wire is formed into an index 49 which extends out of a slot 50 in the casing, and adjacent this slot are division marks which form a scale 51 whereby the position of the inner end of the element 39 can be determined.

In use with a tool of the nature illustrated and described, a special form of circuit controlling means must be employed to alternately energize the coils 2 and 3, and the

periodicity of the alternations must be capable of variation so as to increase or diminish the rate of reciprocation of the impact element, and hence of the implement 13. This circuit make-and-break device is shown in Figs. 11 and 12 by itself, and in Fig. 14 in connection with the hammer. The circuit controlling device comprises a base 52 which is adapted to be fastened to a wall or other support, and mounted thereon are oppositely disposed electro-magnets 54 and 55 which operate on an armature 56 disposed between them, such armature being in the form of a bar and pivoted adjacent its lower end at 57, but the axis of the pivot is located at one side of the plane of the armature so that the latter will by its own weight be biased to a position to hold the magnet 55 normally in closed circuit condition. The armature 56 carries spring contacts 58 and 59 which cooperate respectively with adjustable contacts 58^a and 59^a, the contacts 59 and 59^a being normally in engagement. The contacts 58^a and 59^a are connected respectively by wires 60 and 61 with the magnets 54 and 55, and these magnets are also connected respectively by wires 62 and 63 with connector plugs 64 and 65 fastened on the base 52. Another plug 66 is associated with the plugs 64 and 65, and a wire 67 connects these plugs with a source of current 68, as shown in Fig. 14, and extending from this source of current is a wire 69 which connects with the armature 56 and through the latter with the spring contacts 58 and 59. In order to vary the rate of vibration of the armature the upper extremity 70 thereof has pivotally or otherwise movably attached a weight-carrying arm 71, which by being thrown from the full-line position, Fig. 11, to the dotted line or any other position, varies the effective length of the armature and hence the rate of vibration, as it will be understood that the longer the effective length of the armature the slower will be the rate of vibration, and the shorter the armature the quicker will be the rate of vibration. By equipping the armature with this hinged element 71 the rapidity of impacts by the tool is readily controlled merely by swinging the element 71 up or down.

When the tool is in use and the pushbutton 25 is pressed so that the contact 23 will engage the contact 20, current flows through the electrical circuits, which will be described in connection with Fig. 14. Current flows from the battery through the wires 67, 36′, conductor 36^a, wire 36^b, spring 22, contacts 23 and 20, solenoid coil 2, wire 35^b, conductor 35^a, wires 35′, 35^c, magnet 55, wire 55^a, contacts 59^a and 59, wire 69 and battery 68. The magnet 55 is energized so that the armature 56 is attracted thereby to cause an immediate breaking of the circuit just described of the contacts 59 and 59^a, and this movement of the armature closes another circuit by the contacts 58 and 58^a. While the coil 2 is energized a magnetic flux is generated thereby which causes the impact element 4 to move to the left, Fig. 1, and impart a blow to the plugger or implement 13. When, however, the other circuit is closed, current flows from the battery 68 through wires 67 and 36′, conductor 36^a, wire 36^b, spring 22, contacts 23 and 20, coil 3, conductor 34^a, wire 34′, magnet 54, wire 54^a, contacts 58^a and 58, wire 69, and battery 68. As a consequence the windings 3 and 54 are energized, whereby they respectively attract the impact element to the right, Fig. 1, and the armature 56 to the left, Fig. 14, whereby the circuit just described is opened and the circuit previously described closed, so that there is an opening and closing of the circuits which causes the coils 2 and 3 to be alternately energized to effect the rapid reciprocation of the impact element 4. The rapidity of movement of this element depends upon the rate of vibration of the armature 56, which is controlled by the adjustment of the member 71. The conductor cord 31 is adapted to be detachably connected with the circuit make-and-break device which is fastened to the wall, and for this purpose the cord conductor has a connector socket 72 provided with a plurality of metal sockets 64^a, 65^a and 66^a, as shown in Fig. 13, and these are adapted to engage the plugs 64, 65 and 66, respectively.

From the foregoing description taken in connection with the accompanying drawings, the advantages of the construction and method of operation will be readily understood by those skilled in the art to which the invention appertains, and while I have described the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative and that such changes may be made when desired as are within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A tool of the class described comprising a casing having a slotted portion, an armature in the casing, magnetic means for reciprocating the armature, a device in the casing for determining the length of stroke of the armature, said device including members extending out of the casing through the slots thereof, a sleeve rotatably mounted on the casing and connected with the members for adjusting the device longitudinally of the casing, and an indicator connected with one of the members and extending out of the casing for indicating the position of adjustment of the said device.

2. A tool of the class described comprising a tubular casing, an armature therein, mag-

netic means for reciprocating the armature, a device in the casing for determining the length of stroke of the armature, a sleeve rotatably mounted on the casing and operatively connected with the device for adjusting the position thereof, said casing having a slot inwardly from the sleeve, an indicator connected with the device and extending out of the slot, and an index arranged on the casing along the slot in coöperative relation with the indicator for determining the position of the said device.

3. A tool of the class described comprising a tubular casing of magnetic material, alining solenoid coils therein, a magnetic ring disposed between the coils, magnetic sleeves disposed within the coils and having heads whereby the coils are incased in magnetic material, an implement-carrying element extending into one coil, a spring pressing on the element, a slidable impact armature disposed within the coil to impart an impact to the said element and adapted to be reciprocated by the alternate energizing of the coils, means for controlling the circuits of the coils for energizing the same alternately, and means for adjusting the stroke of the said armature.

4. A tool of the class described comprising a handle, magnetic coils therein, an armature reciprocated by the alternate energizing of the coils, an implement-carrying element receiving impact from the armature, a T-shaped member disposed in the casing and arranged to vary the length of stroke of the armature, the casing having a slot and the said member having a portion extending out of the slot, and means carried by and rotatable on the casing and engaged with the portion of the member that extends out of the latter for adjusting the position of the member.

5. A tool of the class described comprising a casing, solenoid coils therein, an armature movable longitudinally of the coils and actuated by the alternate energizing thereof. said casing having longitudinal slots, a T-shaped element having one member disposed to engage the armature to adjust the length of stroke thereof and having members extending out of the slots of the casing, threads on the latter member and a rotatable internally-threaded sleeve mounted on the casing and engaging the last-mentioned members for longitudinally adjusting the element.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE CROSTON.

Witnesses:
GEO. H. SHAW,
ESTHER E. LUNDIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."