(Model.)

2 Sheets—Sheet 1.

B. W. HAINES.

DENTAL PLUGGER.

No. 381,364. Patented Apr. 17, 1888.

Fig. 1.

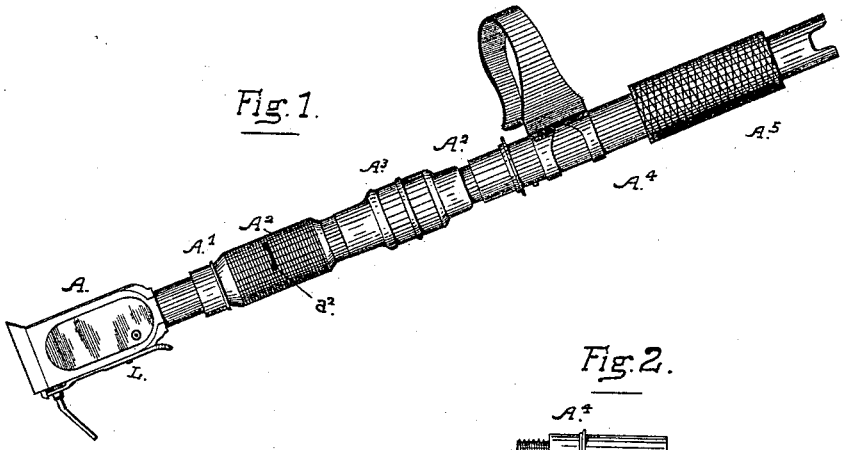


Fig. 2.

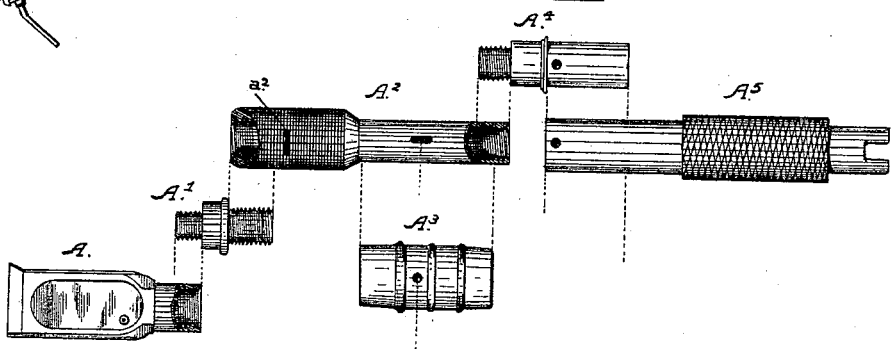
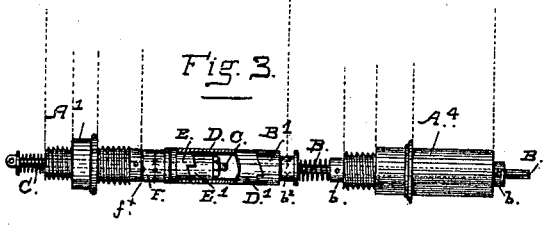


Fig. 3.



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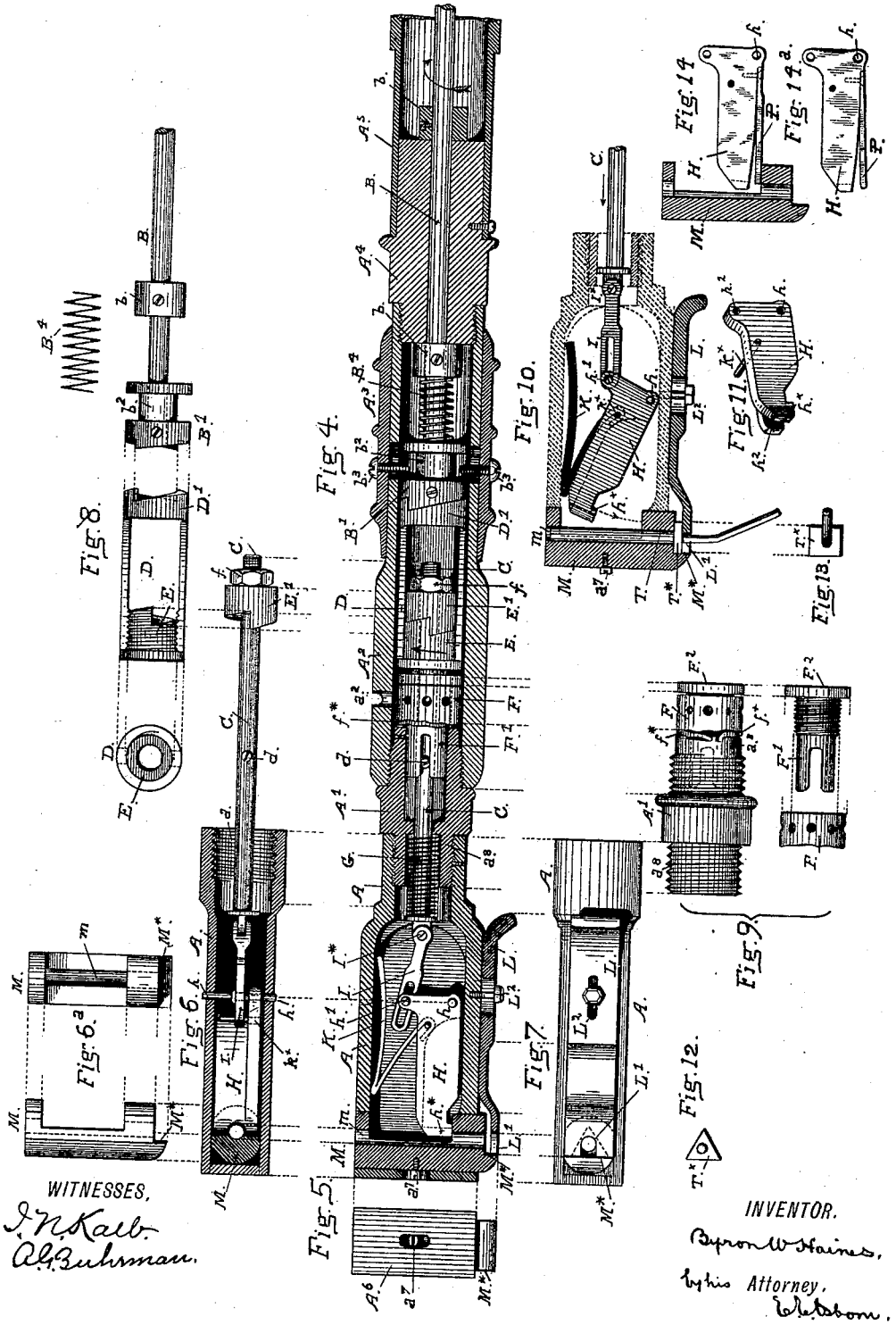
(Model.)

2 Sheets—Sheet 2.

B. W. HAINES.

DENTAL PLUGGER.

No. 381,364. Patented Apr. 17, 1888.



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UNITED STATES PATENT OFFICE.

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DENTAL PLUGGER.

SPECIFICATION forming part of Letters Patent No. 381,364, dated April 17, 1888.

Application filed September 2, 1886. Serial No. 212,484. (Model.)

To all whom it may concern:

Be it known that I, BYRON W. HAINES, a citizen of the United States, residing in the city and county of San Francisco, in the State of California, have invented certain new and useful Improvements in Dental Pluggers; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the drawings that accompany and form part of this specification.

My invention relates to improvements in dental pluggers of that class in which the plugging point or tool is operated by direct blows from a mechanically-vibrated hammer, as distinguished from other instruments of the kind wherein the point or tool, being a part of or attached to a rod or carrier mechanically reciprocated in a right line, is generally projected against the foil by the recoil of a spring. Instruments of the first-named class, to which my improvements belong, approach more nearly in their action upon the foil and in the character of work produced to the primitive hand-mallet in the hands of the experienced operator.

The object sought in my invention is to obtain in a mechanical plugging-instrument the characteristic blow or impact of the hand-mallet upon a plugging-tool, but under conditions of regularity in the strength or intensity of the blows and much greater rapidity than is practicable with the hand-mallet even in practiced hands.

My improvements consist in a novel construction and combination of vibrating hammer and mechanism by which the hammer is actuated from a revolving shaft or spindle; in a novel construction of hammer having a yielding face to regulate or modify the sharpness of the blow; in a novel construction and combination of tool-carrier, tool-holding spring, and hammer case or chamber; in novel means for regulating the vibrations and the strength of blows, and generally in an improved dental plugger embodying these features of construction and combination of mechanism and inclosing-case.

The following description fully explains the nature of these several improvements in dental pluggers and the manner in which I proceed to construct, produce, and apply the same, the accompanying drawings being referred to by figures and letters.

Figure 1 is a general outside view showing the form of the instrument and the position of the plugging point or tool in the stock. The end of a flexible shaft from a suitable engine is connected to the driving-spindle of the instrument on the upper end in the usual way. Fig. 2 shows in detail the parts composing the stock of the instrument. Fig. 3 shows the internal mechanism by which rectilinear vibratory movement is given to the hammer-actuating rod from a rotating spindle. Fig. 4 is an enlarged longitudinal section of the entire instrument. Fig. 5 is a left end view of the same. Fig. 6 is a section of the head portion of the instrument, taken at right angles to the section of Fig. 4. Fig. 6ª shows the tool-carrier in different positions. Fig. 7 is a side view of the head portion of the instrument, showing the clamp for holding the tool in proper position in the carrier. Figs. 8 and 9 are details of the inner mechanism of the device. Fig. 10 is a section of the head portion similar to that shown in Fig. 4, and illustrates the manner in which the hammer operates. Fig. 11 is a detail perspective view of the hammer. Figs. 12 and 13 are plan views of the different forms of the flange adjacent to the tool-carrier. Figs. 14 and 14ª illustrate a spring-faced hammer.

Like letters of reference denote corresponding parts in all the figures.

A A′ A^2 A^4 A^5 are the separate parts forming the hollow case or stock of the instrument. They receive and inclose, when joined together, all the working parts; and it will be seen by referring to the view Fig. 1 that with the exception of the spring finger-loop near the upper end there are no projecting parts to interfere with the free handling and movements of the instrument under all ranges of position or adjustment, even under extreme positions, as when filling cavities at the back of a tooth. The parts A′ A^4 carry the rod that draws back the hammer and the spindle B. The former has a peculiar rectilinear movement through part A′ and the latter a rapid rotary motion in the block A^4 by being coupled at the outer end to a driving-shaft. The tubular piece A^2 is united to these two parts by

screw-joints, and the hammer-chamber A is secured to the end of the part A′ by a joint of the same character.

The stock is thus readily separated at points that afford access to the working mechanism for cleaning and oiling, and without affecting the adjustment of the mechanism at such time.

The head A of the stock incloses the hammer and has a socket in the under side to hold the plugging point or tool at an angle with the stock. This brings the point into such position with relation to the stock that cavities at the back of teeth and other points difficult of access with the ordinary instrument can be reached and the foil thoroughly condensed. The hammer H is therefore pivoted at *h* to give a blow at a right angle to the axis of the stock.

K is a spring secured at the point *k** to the hammer, and having a bearing against the top of the chamber. The end of the rod C extending into the chamber is connected to the hammer at a point over its pivot *h* by a loosely-hinged link, I, having a long slot in the free end and attached by the loose joint I* to the rod. A stud, *h*′, in the hammer takes through the link and is fitted to slide freely in the slot. Retraction of the rod C draws back the link and raises the forward end, *h**, of the hammer, and when released, the link being quickly projected forward, allows the hammer to act; but this forward movement is made more rapidly than the backward movement, or more quickly than the spring K of the hammer can react, by which means the link is projected in advance of the movement of the hammer, and the stud *h* then slides freely along the slotted link as the spring K throws the hammer down. In this manner the hammer is drawn back clear of the anvil portion of the tool-carrier M, or that part which is immediately beneath the face *h**, and, being then released, is thrown down by its spring.

The forward movement of the rod C is produced by the coil-spring G, and its retraction or backward movement to compress the spring is obtained from a simple form of cam or wedge-shaped surfaces, of which one is lettered E and the other surface E′, which is fixed on the end of the rod C. The general form and relation of these parts are shown in Figs. 4, 6, and 8 of the drawings. The cam E is fixed in the end of the stirrup-piece D, to which the spindle B is connected by a coupling formed of the two parts—one, D′, on the stirrup and the other, B′, on a sliding collar that rotates with the spindle, but is movable longitudinally upon it. The spring B^4 holds the part B′ to its place and permits it to be drawn back when it is desired to stop the hammer, or to slip upon the part D′ when the spindle is accidentally rotated in the wrong direction.

To uncouple the spindle from the stirrup-piece D, the collar is moved by the ring-slide A^3 on the smooth portion of the part A^2 of the stock, the tube at this part having longitudinal slots b^2, through which screws b^3 b^3 project into the groove of the collar. Movement of the slide in one direction or the other separates or brings together the parts of the coupling. Such mechanism for producing the required rectilinear movement of the retracting-rod of the hammer and for throwing it into and out of operation without stopping the driving-power will be found both simple and compact. The principle and general combination of its parts are not claimed as a novel part of this invention, however, as the same are already found in instruments of the kind where the tool is reciprocated by a rotating shaft or spindle. I have described and shown such means in connection with the novel parts of my invention as being both efficient, compact, and durable. The parts most exposed to wear can be removed and replaced with new parts by the operator without requiring extraordinary skill in adjusting.

As will be seen in the drawings, and more particularly in Fig. 4, the hammer delivers the blows at a right angle to the line of the stock. The tool therefore sets into the side of the head A and stands substantially at a right angle; but by substituting curved or bent for straight points the blows can be transmitted in lines more or less inclined. The hammer does not act directly against the point or tool, but delivers the blows upon an anvil which is a part of the tool-carrier M.

A socket, *m*, for the shank of the tool T runs through the carrier, and at the inner side the block M is cut away for the greater portion of its length, leaving it of full size at the top and bottom ends to fit the slot formed for it through the top and bottom of the chamber. This cut-away portion allows the hammer to work close to the line of the tool and forms a face to receive the blows that is directly over the flange T* of the plugging-point. The nose of the hammer is also slotted, as seen at h^2, Fig. 11, to bring it as nearly as possible over the center.

The tool T is held against the end of the block M by the clamp L, the edge of the flange T* having three or more flat faces, as in Figs. 12 and 13, and the end of the block being finished flat with a square shoulder, M*, against which the flange of the tool is pressed by the end of the clamp. This part L slides on the screw L^2, and the end is finished square to fit against the shoulder M*. It is also slotted to embrace the point under the flange T*, and the bottom of the slot conforms to the shape of the body of the point. This end portion of the slide L is made suitably elastic to move with the block M as the latter moves under the hammer, for which purpose this portion of the slide is reduced in thickness and suitably tempered, the remaining portion being left of full thickness and bent down at the end to form a finger-piece.

The tool-carrier, against which the tool is held by the spring L, contains a mass of metal, that is set in motion by each blow of the hammer, the result of which is to produce a pecu-

liar blow or vibration of the plugging-point against the foil, approaching in quality that obtained from the hand-mallet and acting to rapidly condense the foil without cutting it. This manner of holding the tool and transmitting the blow also enables me to obtain the desired effect of the tool upon the material with a hammer of short movement, and as the arc of its vibration need not be large the hammer will work effectively in a small chamber, and the head A of the instrument is therefore brought into small compact form hardly exceeding in breadth the diameter of the stock and in thickness somewhat less.

The ability to work with a short plugging-tool and the close relation of the hammer to the acting point of the tool, as well as the peculiar position of the tool, enables the operator to reach all extreme points with ease to himself and comfort to the patient, as, the head of the instrument being readily taken into the mouth, the plugging-point can be brought to bear at various angles.

The angle of the tool is adjusted with reference to the line of the stock by drawing back the slide and partially rotating the tool in the carrier M until another face of the flange is set against the shoulder M*, and then pressing the slide forward into place.

In the case of some character of work, where it is found necessary to greatly soften or modify the sharpness of the blows, I provide a spring-face hammer, Figs. 14, 14a, in which the impact of the hammer against the block M is qualified by a spring-tongue, P, interposed between the two surfaces of contact. A hammer of this form can be substituted for a plain-face hammer and the instrument adjusted at any time for special work by simply removing the one from the chamber A and placing it in the other, where the expense of providing a separate instrument may not be desired. This yielding face P is a flat spring-tongue equal in width to the hammer and secured at one end against the hammer-face at or near the pivot *h*, while the remaining part out to the other end is detached. The hammer-face is beveled or rounded off from head to point, and the spring extending out to the nose may be more or less curved to stand away from the hammer. The amount of curvature and the degree of stiffness in the spring will be found to qualify the stroke against the block M, and the same being readily changed it enables the action of the tool to be adjusted with much delicacy.

The stroke of the hammer is regulated by the mechanism seen in detail in Fig. 9, that adjusts the relations of the two cam-surfaces E E′ sufficiently to vary the movements of the rod C. The part F′ is movable longitudinally in the part A′ of the stock, and its head F² by such adjustment is moved toward or away from the end of the stirrup-piece D, a thin washer being interposed between the two faces to take the wear of the revolving surface against the head F². The part F′ is moved by a capstan-nut, F, having holes in line with a slot, *a**, in the stock, through which a suitable hand-spike can be inserted and the nut turned from the outside. The bottom of the nut F is corrugated and bears against a corrugated spring-washer, *f**, on the end *a*³ of the part A′ to lock the nut in any position. As the head of the part F′ is set up toward or is drawn away from the end of the stirrup-piece, it will be seen that the stroke of the cam E against the cam-surface E′ is varied in degree accordingly. The spring B⁴ holds the parts of the clutch B′ D′ together under all such adjustment of the stirrup-piece. The rod C is held from rotating by the pin *d*, that plays in a slot in the part F′. (Seen in Figs. 4 and 9.)

In connection with the hammer H, I employ a flat spring, like the sear-spring or the hammer-spring of a gun-lock, to give the blow; but I do not limit myself to this particular form of spring, although it has the advantage of giving considerable force within small compass.

Fig. 10 of the drawings shows the position of the hammer and its spring, the rod, and the link at the time of greatest elevation of the hammer, while Fig. 4 shows the position at the end of the stroke.

The smoothness and uniform diameter of the stock and the absence of all projecting levers and other parts on the outside will be noticed by the practical workman as a feature of considerable advantage, the only moving part being the slide A³, by which the clutch B′ is controlled. This part is situated conveniently to the hand and can be worked by the fingers of the same hand that holds the instrument, a slight movement being sufficient to draw back the clutch. This part of the mechanism, consisting only of the sliding collar B′, the spring to hold it in position, and the external slide, A³, is simple and compact and is not readily deranged nor affected by wear. The same advantages are found, also, in the mechanism that produces rectilinear movement of the rod C from the rotation of a spindle, the same being composed of only the three parts D, E, and E′, and of these the two parts E E′, being the most exposed to wear, are readily replaced when their faces are badly worn.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a dental plugger, the combination of the tool-carrier M, pivoted hammer H, spring K, rod C, link I, loosely jointed to the end of the rod, spring G, and mechanism, substantially as described, for producing rectilinear movement of the rod from the motion of a rotary spindle.

2. In a dental plugger, a movable block, M, forming a carrier for the plugging point or tool, having a socket, *m*, and cut away on its inner side to form an anvil portion or surface to receive blows of a pivoted hammer vibrat-

ing in an arc, said anvil-surface being substantially at a right angle to the line of the plugging-point, substantially as described.

3. In a dental plugger, the combination of a hammer vibrating in an arc across the plugger-stock to operate a plugging point or tool at substantially a right angle to the line of the plugger, a spring to throw the hammer, and a rectilinearly-moving rod attached to the hammer by a stud and slotted link and having a movement backward to compress the hammer-spring and a quick movement forward in advance of the action of the hammer-spring, substantially as described, to operate as set forth.

4. In a dental plugger, the combination of the vibrating hammer H, tool-carrier M, and spring tool-locking clamp L, substantially as set forth.

5. In combination with the tool-carrying block M, having the tool-socket *m* and shoulder M*, the slotted spring-clamp L, substantially as set forth.

6. The combination, with the hammer H, of the spring-plate P, attached at one end to the face of the hammer near the center of movement and setting away from the face at the opposite end, substantially as described.

7. In a dental plugger, the combination of the rotating shaft B, stirrup-piece D, having the clutch D′ at one end and carrying the cam-surface E on the other end, the sliding clutch-collar B′, the spring B^4, slide A^3, the rod C, with cam-surface E′, engaging the cam E, and the spring G, applied to operate substantially as set forth.

8. In a dental plugger, the combination, with the revolving stirrup-piece connected to the rotary shaft B by a clutch which permits longitudinal adjustment of the stirrup-piece, of the screw-threaded sleeve F′, capstan-nut F, and spring locking-washer *f**, having a bearing on the end a^3 of the tubular coupling-piece A′, substantially as described, for operation as set forth.

9. In a dental plugger, the combination of the head A, having a hammer-chamber with a socket through the end thereof at a right angle to the line of the plugger-stock, the pivoted hammer vibrating in said chamber in an arc tangent to the line of the socket, tool-carrying block M, movable in said socket, and a tool-clamp, L, adapted to confine a plugging point or tool against the end of said block and to yield and follow the movement produced by the impact of the hammer, substantially as set forth.

10. In a dental plugger, the combination, in a suitable case having a socket to hold a movable tool-carrying block, as described, of the block M, having a tool-socket, *m*, and cut-away portion between the ends, and the spring-hammer H, provided with a slotted nose, h^2, substantially as set forth.

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