

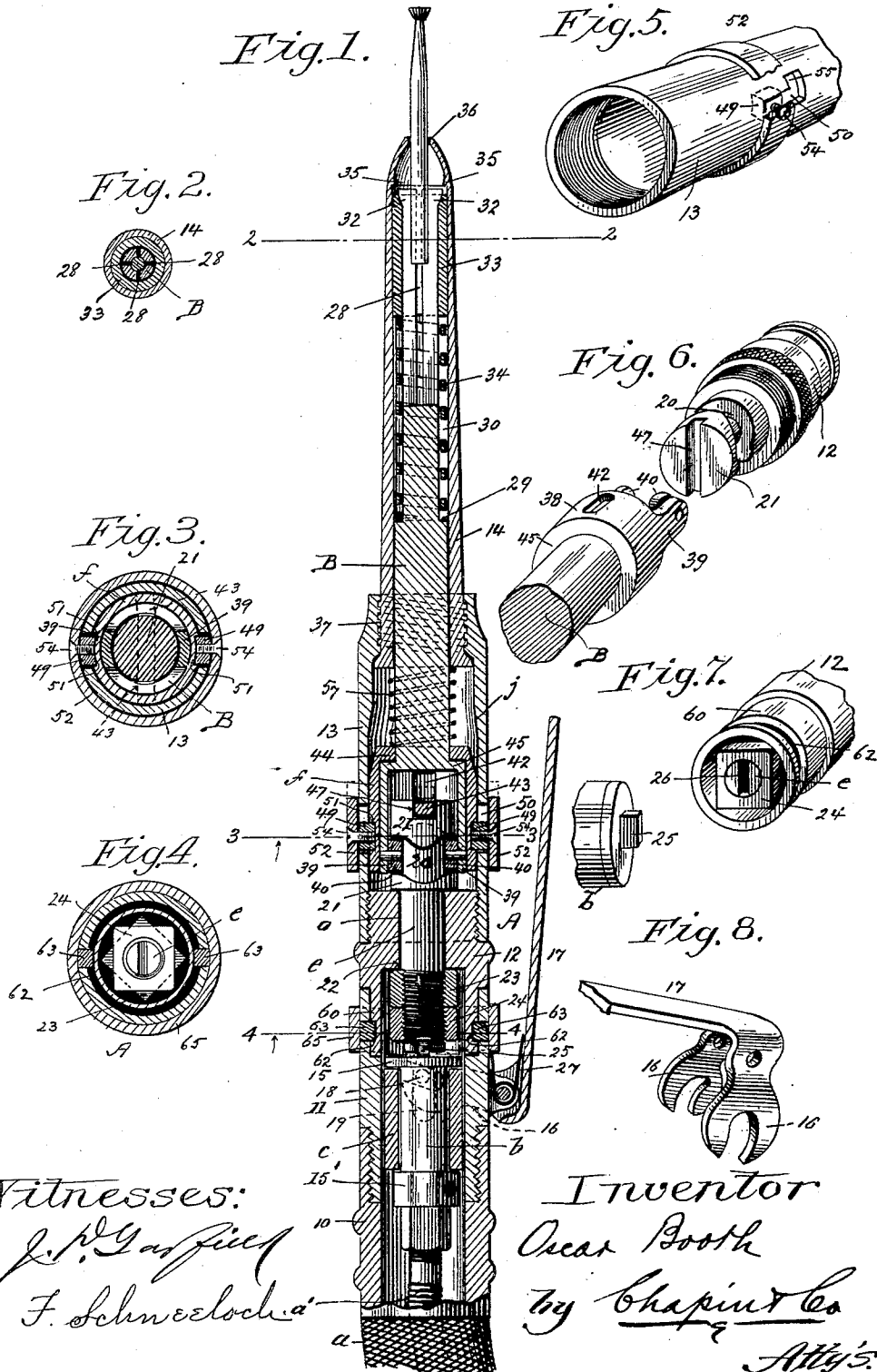
(No Model.)

2 Sheets—Sheet 1.

O. BOOTH.
HAND PIECE FOR DENTAL ENGINES.

No. 462,530.

Patented Nov. 3, 1891.



(No Model.)

2 Sheets—Sheet 2.

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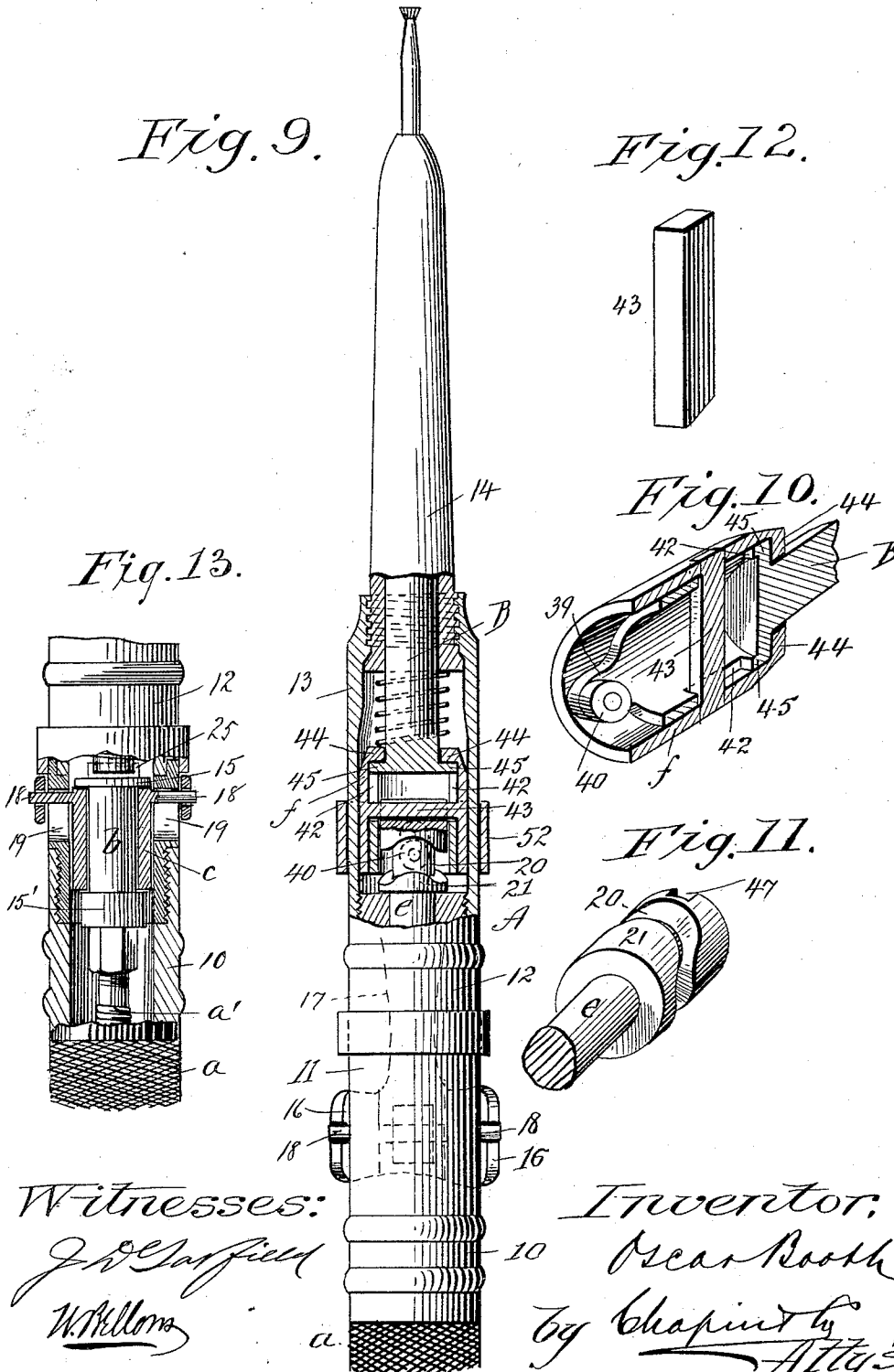
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Fig. 9.

Fig. 12.

Fig. 13.



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UNITED STATES PATENT OFFICE.

OSCAR BOOTH, OF CRESTON, IOWA.

HAND-PIECE FOR DENTAL ENGINES.

SPECIFICATION forming part of Letters Patent No. 462,530, dated November 3, 1891.

Application filed July 5, 1890. Serial No. 357,899. (No model.)

To all whom it may concern:

Be it known that I, OSCAR BOOTH, a citizen of the United States, residing at Creston, in the county of Union and State of Iowa, have invented new and useful Improvements in Hand-Pieces for Dental Engines, of which the following is a specification.

This invention relates to that class of dental instruments known as "engine-pluggers" and "burring hand-pieces;" and the objects of the invention are to combine in one instrument mechanism capable of action both as a plugger for condensing or packing gold or other filling material into cavities in the teeth and a burring-instrument for excavating and shaping cavities for filling and for finishing the fillings and for other similar work; to provide an instrument which when used as a plugger strikes rapid accelerated or pushing blows with very slight noise; to afford facilities for instantly changing the instrument from a plugger to a burring hand-piece, and to embody capabilities whereby the connection of the driving-shaft with the instrument may be readily broken.

The invention consists in the construction and combination of parts, substantially as will hereinafter be fully described, and set forth in the claims.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a central longitudinal section of the instrument. Figs. 2, 3, and 4 are cross-sections of the same, respectively, on the lines 2 2, 3 3, and 4 4 of Fig. 1. Figs. 5, 6, 7, and 8 are perspective views of details in illustration of constructions to be hereinafter referred to. Fig. 9 is an elevation and central longitudinal section of the hand-piece, shown as in a position at right angles to Fig. 1. Figs. 10, 11, and 12 are further perspective and sectional views of details of constructions, hereinafter particularly referred to. Fig. 13 is a longitudinal sectional elevation of parts of the instrument as seen at right angles to the position shown in Fig. 1.

All the views are drawn on a considerably enlarged scale.

In the drawings, A represents the stock of the instrument, which is formed tubular and is carried at the free end of the flexible tube

α , which incloses the flexible shaft α' . The said stock A comprises sections 10, 11, 12, and 13, the one having a screw-socket engagement with the other, and the sheath 14 is connected by a screw-engagement with the forward section 13 of the stock, as shown. Within the rear portion of the tubular stock is the shaft b , which is connected with said flexible driving-shaft α' , and said shaft has a bearing for rotation within a sleeve c , which fits within the tubular stock for a slight longitudinal slide, the said shaft b being movable endwise with said sleeve by the engagement of the flanges 15 and 15', which are formed on or affixed to the shaft outside of the ends of the sleeve. A longitudinal slide is imparted to the said shaft b and sleeve-bearing therefor by the connection of the slotted arms 16 16 of the spring-pressed lever 17 with the pins 18 18, (shown in dotted lines in Fig. 1,) which project radially from the sides of said sleeve through longitudinal slots 19 in the stock-section 11. The diameter of the tubular stock-section 12 at the forward portion thereof is contracted, as at d , to form a bearing for the shaft e , which at its forward end is provided with the cylindrical enlargement 21, in which is provided the peripheral cam groove or path 20. The rear end of the said cylindrical head 21 bears upon the end of the stock-section 12, and the portion of the shaft e which is at the rear of the shoulder 22 is screw-threaded and is provided with a nut 23 for taking up wear, and another nut 24, which serves as a lock-nut, all to the end of insuring a steady rotational movement of the shaft e with its cam-head without any lash or axial motion. Substantially a clutch engagement is had between the rear end of the shaft e and the forward end of the shaft b . As particularly shown, the rib or squared stud 25, Figs. 1 and 7, is formed on the forward end of the shaft b , while the groove or socket 26 for the reception of the stud is provided in the rear end of the shaft e , although of course the positions of the stud and its socket may be reversed.

It will of course be understood that by pressing inwardly on the long arm of the angular lever, through the connection described, the engagement between the cam-shaft e and the shaft b will be broken, and the rotation of the

former shaft will cease, but on the releasing of the lever to the action of its spring 27 the said engagement will be automatically resumed. The slight endwise motion of the shaft *b*, necessary to break the engagement between it and the cam-shaft, is readily permitted on account of the flexibility of the spiral driving-shaft *a'*, the latter being capable of a slight compression endwise, and also on being forced endwise is capable of shortening the distance between two points in the length thereof by having a bend within and independent of the larger flexible tube *a*.

B represents a plunger, which has a bearing both for rotation and a longitudinal reciprocatory movement within the stock-section 13 and the sheath 14, the said plunger at its rear end having an engagement with the cam-groove 20; and its forward portion is formed to constitute a chuck for the plugger, burr, drill, or other tool to be used. As preferably constructed the jaws of the chuck are formed by boring the plunger extremity axially for a suitable distance and then making in said extremity comparatively wide kerfs 28, which are angular to each other, intersecting the axis of the plunger. The forward half of the plunger is necked down, as shown, forming the shoulder 29 and the annular space 30 between the attenuated portion and the inner wall of the sheath, the extremity of the plunger being, however, expanded, as seen at 32. A sleeve 33 surrounds the chuck portion of the plunger at the rear of said expanded extremity 32, a stiff spiral spring 34 being placed in the annular space 30 and bearing by its ends between the shoulder 29 and the rear end of said sleeve 33. This spring acts to normally press the sleeve 33 outwardly for the contraction of the chuck. The chuck is opened by means of the slight shoulder or abutment 35 on the inner wall of the sheath just inside of its orifice 36, being brought to a bearing and rearward forcing action upon the said sleeve 33 to move it longitudinally inward against its spring. The endwise and backward movement of the sheath is secured by the turning thereof, so that the same backs into the stock-section 13, with which it has the screw-thread engagement, as shown at 37.

The rear portion of the plunger *B* is formed cylindrical, as shown at 38, Figs. 1, 6, 9, and 10, and has at opposite sides thereof the arms 39 39, each of which carries on its inner side a friction-roller 40, which enters the cam-groove at opposite sides of the cam-head 21. The sinuous path of the cam comprises such a number of bends as, acting in conjunction with two opposing rollers on the plunger, to insure two reciprocations of the plunger at every rotation of the cam-shaft. The rear portion of the plunger is shown as provided with a longitudinal slideway, here constituted by opposing longitudinal slots 42 through the sides of the cylindrically-formed rear extremity thereof. (See Figs. 1, 6, 9, and 10.)

f, Figs. 1, 3, 9, and 10, represents a thimble or yoke which incloses the said cylindrical extremity of the plunger and by an internal annular flange 44 engages the shoulder 45, formed at the junction of the spindle proper *B* and the cylindrical portion 38 thereof. This thimble has formed as an integral part thereof or to move as one therewith a transverse member or bar 43, passing across same and through the said slideway formed by the slots 42. This transverse bar 43, rigidly carried on the thimble *f*, when the thimble is in its rear-most position, as shown in Figs. 1 and 9, enters a socket-slot 47 in the forward end of the cam-head 21, Figs. 1, 9, and 11, and therefore said bar 43, passing through the slots 42 in the rear plunger extremity 38 and engaging said rotatable cam-head, serves as a clutch whereby the rotation of the cam effects the rotation of the plunger, as well as imparts thereto its reciprocatory motion, for it is to be understood that as specifically constructed the plunger-shaft may have merely a reciprocatory motion or it may have, at will, a reciprocatory and at the same time a rotary motion. The thimble *f* may, however, be moved forward within the chamber of the stock-section 13 to carry its bar 43 out of engagement with the cam-head, whereby then the rotation of the cam will only insure the reciprocatory movement of the plunger. As a means for so moving the thimble I provide lugs 49 on the side thereof, which project through the opposing angular slots 50 in the sides of the stock-section 13, said lugs being also connected to a ring 52, which fits and is adapted to slide longitudinally on said section 13, all as is clearly shown in Figs. 1 and 3. As an expedient for practical construction, the said lugs 49 are constituted by small rectangular blocks, as shown in Fig. 1, 3, and 5, which bear in an annular groove 51 in the sides of the thimble, and are secured to the ring 52 by the screws 54. Now it will be plain that by sliding the ring forward until the lugs 49 come opposite the angularly-extended slot areas 55 and then giving the ring a slight turn the ring and thimble will be held in their forward dispositions and the engagement for rotation between the cam-head and the plunger will be broken. The forward portion of the thimble is tapered, while a part *j* of the inner wall of the stock-section 13, in advance of the normal position of the thimble extremity, is also tapered, and at the time the thimble is forced forward and confined by what is substantially the bayonet-joint connection with the said section 13 the bind between the tapered surfaces of the thimble and section prevents any shaking or rattling of the parts which might otherwise ensue, due to any play or wear between the ring, lugs 49, and said angular slot, and the bind insured by the engagement of the tapered surfaces of the thimble and section 13 mentioned also prevents any rotation which might otherwise occur, due to the friction between

the plunger-rolls and the camway. The thimble is normally maintained in its rearmost position by the spring 57.

As well known in the class of instruments 5 to which this invention appertains, it is frequently desirable or necessary to employ a tool which has its extremity bent or angularly disposed with relation to the axial line of the hand-piece, and therefore, in order that the 10 presentation of this tool may be properly made for the most effective use thereof, it is desirable that some forward portion of the hand-piece may be rotated without twisting the flexible shaft-inclosing tube and without 15 interfering with the most efficient running and operation of the parts and mechanism described, and to this end I form the joint between the stock-sections 11 and 12 by forming an annular rabbet within the forward end 20 of the section 11 and an annular tongue 60 in the rear end of the section 12 to fit said annular rabbet. The said tongue 60 is peripherally grooved at its outer side, (represented by 62, Figs. 1 and 4,) and small blocks or studs 25 63, which are formed on or engaged with and project inwardly from the wall of said section 11 at its rabbeted portion, enter the said peripheral groove 62, formed on the section 12. Said blocks, as shown, are held against displacement by the ring 65.

In this kind of instrument a short sharp cutting blow is very undesirable and disagreeable. In the instrument constructed as described the blow is made wholly by the cam 35 with an undulating peripheral groove, which gives a soft pushing blow or accelerating movement.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, 40 is—

1. In a hand-piece for a dental engine, the combination, with a stock or sheath, of a shaft having bearings for rotation therein, and a plunger-shaft having bearings in said stock 45 for a longitudinal movement therein, and one of said shafts being provided with a peripheral cam having an undulating double-walled path, and the other shaft being provided with one or more studs or members which enter the said cam-groove, whereby as the one shaft is 50 rotated the plunger will be given a reciprocating motion entirely as to its movement in both directions by said cam engagement, substantially as and for the purpose set forth.

2. In a hand-piece for a dental engine, a tool-carrying plunger-shaft adapted for rotation and longitudinal movement therein, another shaft rotatable in the said hand-piece, 5 one of said shafts having a cam-head with a peripheral and double-walled groove therein, and the other shaft being provided with one or more members or studs which have engagement with said cam-groove, whereby as the 10 one shaft is rotated the plunger will be given a reciprocatory movement entirely in both directions by said cam, and a medium of connection between the said first-named shaft 15

and the plunger-shaft, whereby at will, in addition to its vibratory movement, the latter may have a rotary movement, substantially 70 as and for the purpose set forth.

3. In a hand-piece for a dental engine, the combination, with a chambered stock having a longitudinal slot 19 through its side, and the cam-shaft *e*, having a bearing therein for 75 rotation, and means for confining the cam-shaft against endwise movement, of the shaft *b*, located within said stock at the rear of said cam-shaft and having a clutch connection with said cam-shaft, the sleeve *c* within the 80 chambered stock and within which said shaft *b* freely rotates, and means for confining said shaft against endwise movement relative to the sleeve, and said sleeve being provided with a pin 18, extending radially through the 85 said slot 19, and the angular and spring-constrained lever 17, having an arm thereof in engagement with said pin, for the purpose set forth.

4. In a hand-piece for a dental engine, the 90 combination, with a tubular stock, the opening therein at one portion having a contracted diameter, of a shaft *e*, having a bearing for rotation in said contracted part of the stock-chamber and having a screw-threaded 95 portion projected to the rear of said bearing and having in advance of said bearing the enlarged cam-head with the peripheral cam-groove, and the nut 23, and lock-nut 24, engaging said screw-threaded rear extremity of 100 the cam-shaft, and the plunger-shaft *B*, with cam-rollers which engage the slotted cam-head, substantially as described, for the purpose set forth.

5. In a hand-piece for a dental engine, the 105 combination, with the rotatable head having the peripheral cam and provided with the transverse slot or socket, of the tool-carrying plunger having an engagement with said cam, a sliding yoke or thimble longitudinally movable in relation to the said plunger, and having a member or part which has a sliding 110 engagement with said plunger and adapted to be forced within or removed from said slot or socket, and a spring for exerting a rearward 115 force on said thimble, for the purpose set forth.

6. In a hand-piece for a dental engine, the combination, with the tubular stock having through its side an angular slot 50, and a rotatable head having the peripheral camway, 120 of the tool-carrying plunger having at its rear end the cylindrical portion 38, provided with the longitudinal slots 42 and with arms carrying the rollers which engage said camway, 125 the yoke or thimble *f*, having the cross member 43 playing in said slots and adapted to be interlocked with or released from said cam-head, a ring surrounding the stock and adapted to slide thereon and provided with a 130 lug which has an engagement with said groove of the thimble, substantially as and for the purpose set forth.

7. In a hand-piece for a dental engine, the

combination, with a tubular stock or sheath having a tapered portion, as *j*, and the rotatable head having a camway therein, of the plunger having an engagement with said camway for its reciprocation and having a longitudinal slot, as 42, a yoke or thimble having a transverse member playing in said slot, and means for moving said sleeve endwise into or out of engagement with said rotatable cam-head and on the forward movement of the sleeve into a bind with said inner tapered wall of the stock, for the purpose set forth.

8. In a hand-piece for a dental engine, a tubular sheath-stock, and the tool-carrying plunger inclosed therein, and the reciprocating mechanism therefor formed in sections, one of which is rotatable on the other, whereby the forward portion of the hand-piece may

be turned to properly present an angularly-formed tool without turning the rear portion of the hand-piece, as set forth.

9. In a hand-piece for a dental engine, a tubular sheath-stock, and the tool-carrying plunger inclosed therein, and the reciprocating mechanism therefor comprising sections, as 11 and 12, united by an annular rabbet and annular tongue-joint, the tongue having an annular groove, there being an opening through the wall surrounding the said annular rabbet, a block placed in said opening and engaging the groove in said annular tongue, and the ring 65, substantially as described and shown.

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