No. 776,466. PATENTED NOV. 29, 1904.

F. K. HESSE.

HANDPIECE FOR DENTAL ENGINES.

APPLICATION FILED AUG. 16, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

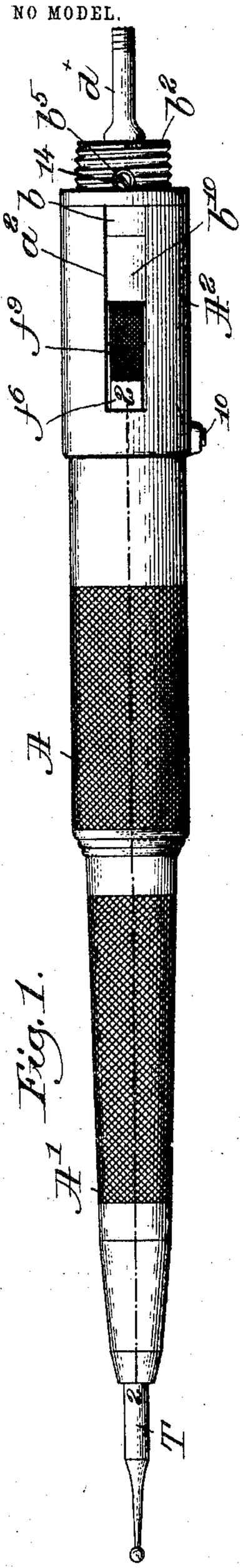

Fig. 2.

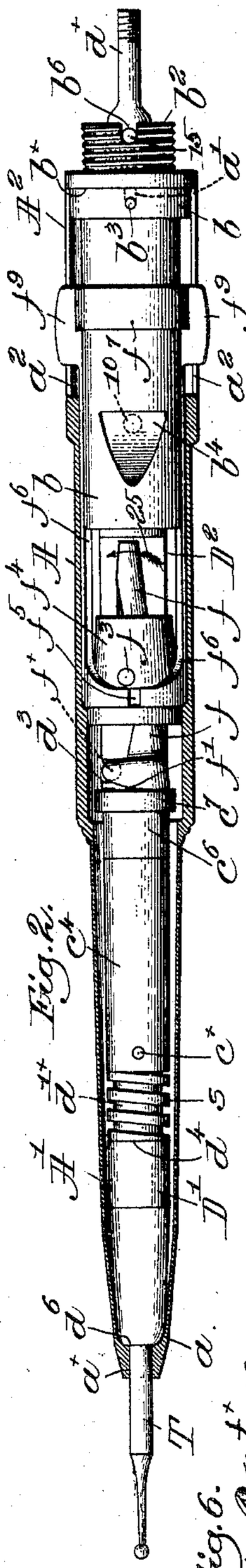

Fig. 3.

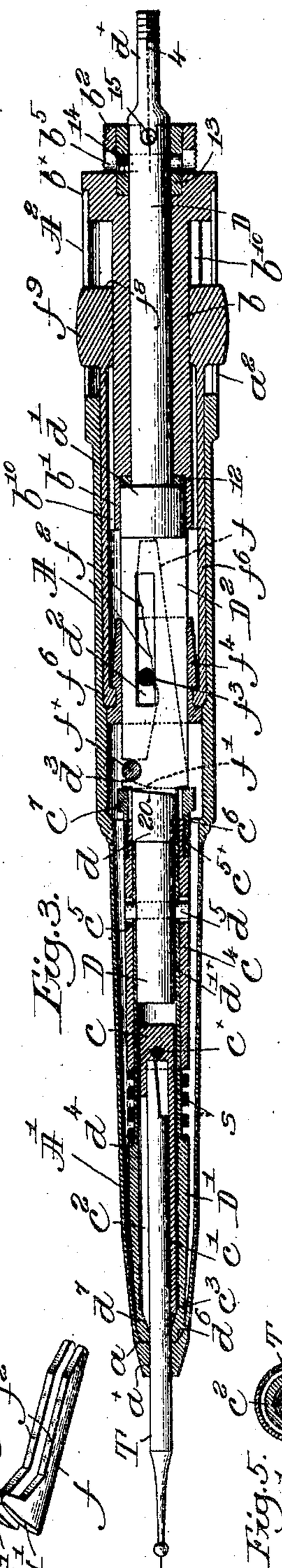

Fig. 4.

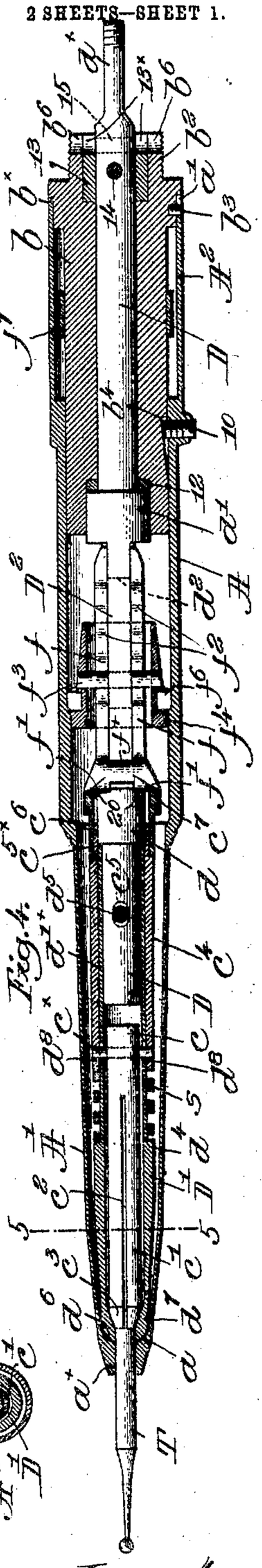

Fig. 6.

Fig. 5.

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NO MODEL. 2 SHEETS—SHEET 2.

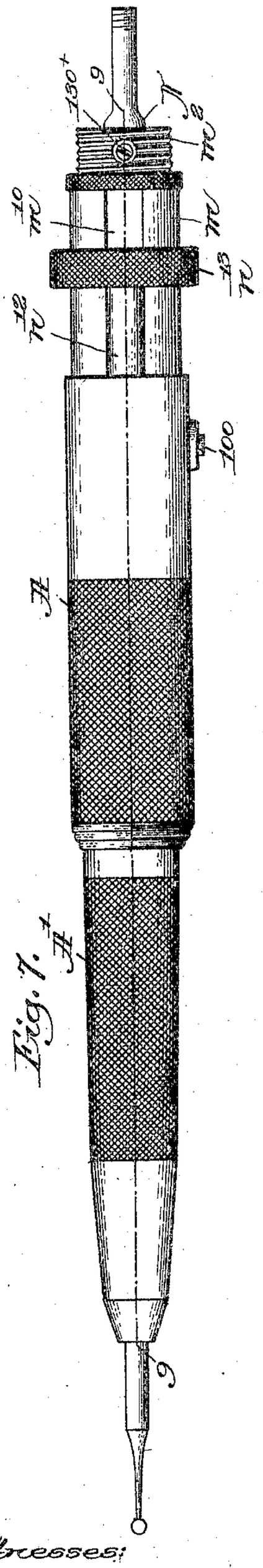

Fig. 7.

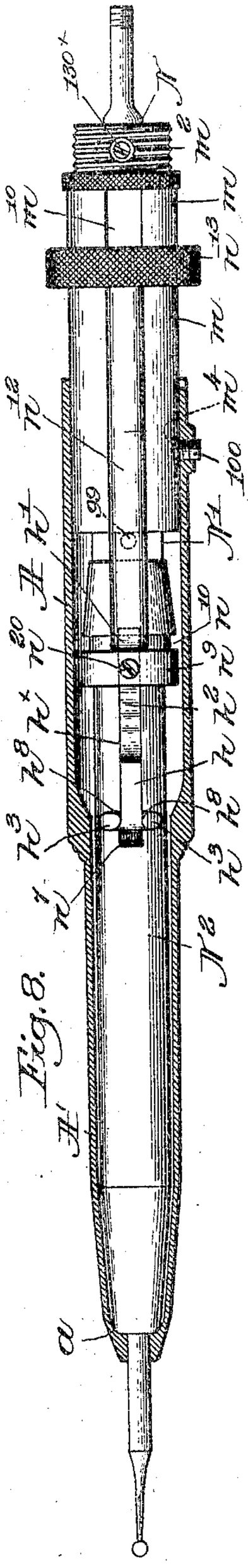

Fig. 8.

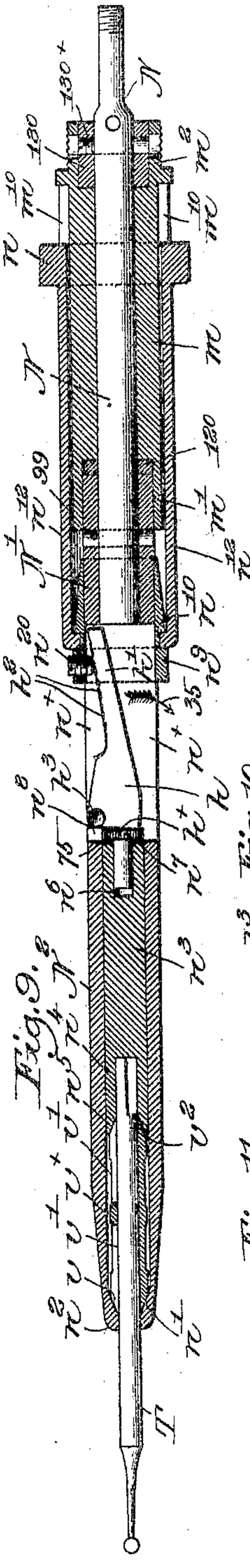

Fig. 9.

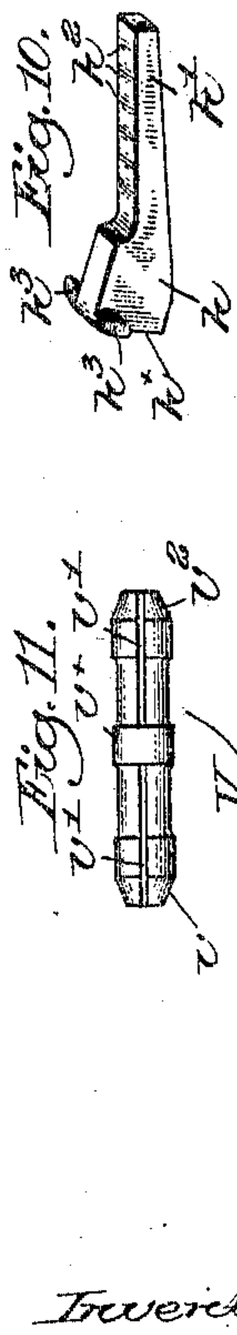

Fig. 10.

Fig. 11.

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No. 776,466. Patented November 29, 1904.

UNITED STATES PATENT OFFICE.

FRANK K. HESSE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO ASAHEL M. SHURTLEFF, OF BOSTON, MASSACHUSETTS.

HANDPIECE FOR DENTAL ENGINES.

SPECIFICATION forming part of Letters Patent No. 776,466, dated November 29, 1904.

Application filed August 16, 1902. Serial No. 119,853. (No model.)

To all whom it may concern:

Be it known that I, FRANK K. HESSE, a citizen of the United States, residing at Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Handpieces for Dental Engines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to handpieces for dental engines of the type wherein the shank of the drill or other tool is firmly secured in operative position in a rotatable tool-carrier driven in any suitable manner, the device being provided with means for readily and quickly securing or releasing the tool.

One of the objects of my present invention is the production of means for affording an extended bearing for the rotatable tool-carrier, whereby the tool is accurately centered in operation and lateral vibration prevented, with a reduction of wear of the parts of the apparatus.

Another object of the invention is the simplification and strengthening of the apparatus in various particulars with a very direct connection between the tool-carrier and the driving-shaft of the motor.

I have also provided convenient and effective means for controlling the chuck which directly engages and holds the shank of the tool and which forms a part of the tool-carrier, a ready adjustment of the chuck-controller being provided to take up wear and to adapt the chuck to tool-shanks which differ slightly in size.

These and other novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

The accompanying drawings are on a considerably enlarged scale in order that the details of construction may be more readily comprehended.

Figure 1 is a side elevation of a handpiece embodying one form of my present invention, showing the inclosing case in position and with a tool in operative position. Fig. 2 is a longitudinal section on the line 2 2, Fig. 1; but the parts of the apparatus within the case are shown in elevation. Fig. 3 is a similar view; but in this instance the majority of the parts are in section, the rotatable spindle forming a part of the tool-carrier and which extends longitudinally of the case being in elevation. Fig. 4 is a longitudinal section on the line 4 4, Fig. 3, with the parts correspondingly shown in section and elevation. Fig. 5 is a transverse section on the line 5 5, Fig. 4. Fig. 6 is a perspective detail of the cam or locking member of the chuck-controller detached. Fig. 7 is an elevation of another embodiment of my invention with the case in position. Fig. 8 is a plan view of the parts within the case in the relative position illustrated in Fig. 7, but with the case in section. Fig. 9 is a longitudinal sectional view of the apparatus on the line 9 9, Fig. 7. Fig. 10 is a perspective view of the cam or locking member of the chuck-controller detached, and Fig. 11 is a side elevation of the chuck shown in section in Fig. 9.

Reference will first be had to the apparatus illustrated in Figs. 1 to 6, inclusive, the case of the handpiece comprising a body portion A, an elongated nose A′, tapered toward its extremity and internally shaped to present an extended tapering bearing *a*, Figs. 2, 3, and 4, which serves as a lateral and also an end-thrust bearing for the outer end of the tool-carrier. The tool T is extended through the tubular hole $a^{\times}$ in the end of the nose in usual manner, and the case at the rear end of the body portion has a sleeve-like extension A^2, herein shown as provided with diametrically opposite longitudinal slots a^2 and a notch a' (see dotted lines, Fig. 2) for purposes to be described.

An elongated sleeve-bearing *b*, preferably of hardened steel, having a counterbore b' at its inner end and an extension b^2, also counterbored, at its outer end, is of such external diameter as to enter with a snug fit the parts A A^2 of the case, the end of the part A^2 abutting against an external annular shoulder $b^{\times}$ on the bearing, and the notch a' is entered by a pin b^3, Figs. 2 and 4, to position the case, the latter being rigidly secured to the bearing by a set-screw 10, which enters a seat b^4 in the said bearing *b*. The bore of the latter is in

axial alinement with the bearing $a^{\times}$ in the nose of the case, and these two bearings sustain the tool-carrier, which comprehends a rotatable spindle or shaft, a tool-holding chuck, and its cap or casing secured to or forming a part of the spindle, the tool-carrier having mounted upon it a chuck-controller to be described and operative from the exterior of the case of the handpiece when the parts of the apparatus are assembled.

Referring to Figs. 3 and 4, the spindle D is provided with two annular enlargements d and d', the latter being adapted to enter the counterbore b' with a running fit, and preferably a steel washer 12 is interposed between the bottom of the counterbore and the enlargement d'. On the end of the spindle projecting through the extension b^2 a metallic collar 13 is secured by a screw-stud 14, so that relative longitudinal movement of the spindle and its bearing b is effectually prevented, the extension b^2 having a hole b^5, through which the screw-stud can be inserted or removed, the sleeve-like bearing b thus presenting lateral and end-thrust bearing-surfaces for the spindle. The extremity of the latter is reduced at $d^{\times}$ and threaded for attachment in any suitable or well-known manner to the flexible shaft of the dental engine or motor, and in order to conveniently hold the tool-carrier from rotation when attaching or detaching the driving-shaft I have shown a hole 15 in the spindle to receive a suitable holding-pin, the hole being located to register with notches b^6 in the extension b^2 of the bearing and a diametral recess $13^{\times}$ in the collar 13. (See Fig. 4.) Between the enlargements d and d' the spindle is cut away to leave an elongated parallel-sided portion D^2, rectangular in cross-section and having a longitudinal slot d^2, and a transverse notch d^3 is made in its upper edge near the end of the annular enlargement d, Figs. 2 and 3. A tubular chuck cap or casing D', reduced in external diameter at $d'^{\times}$ to leave an external annular shoulder d^4, is slipped onto the outer end of the spindle and butted against the shoulder formed by the enlargement d, and the reduced portion is rigidly secured to the spindle, as herein shown, by a pin d^5, the ends of which project radially beyond the spindle, as clearly shown in Fig. 3. The outer extremity of the chuck-cap is shaped at d^6 to seat in the bearing a, and, as shown in Figs. 3 and 4, the cap is internally coned at d^7 to form a closing-surface for the chuck, which is contained within the cap, the shank of the tool passing through the open end of the cap into the chuck.

The tubular chuck (shown in longitudinal section in Fig. 3 and in elevation in Fig. 4) may be of substantially usual construction, comprising a solid cylindrical inner end c, a tubular shank-receiving portion c', having longitudinal slits c^2 therein, and an externally-conical tip c^3 to coöperate with the closing-surface d^7 of the cap. A pin $c^{\times}$ is driven through the solid end c and projects radially beyond it, the end of the pin passing through longitudinal slots d^8 in the part $d'^{\times}$ of the chuck-cap and tightly entering holes in a sleeve c^4, mounted to slide longitudinally upon the reduced portion of the cap. This sleeve has longitudinal slots c^5 to receive the projecting ends of the pin d^5, before referred to, and a coiled spring s is interposed between the shoulder d^4 of the chuck-cap and the adjacent end of the sleeve, the spring tending to retract the chuck and permit it to open to receive or release the tool-shank. The inner end of the sleeve c^4 is externally screw-threaded at $c^{5\times}$, Figs. 3 and 4, to take an internally-threaded collar c^6, the annular enlarged head c^7 thereof forming an adjustable abutment which coöperates with the cam or locking member of the chuck-controller.

By rotating the collar c^6 in one or the other direction the distance between the abutment-face and the tip of the chuck can be varied to thereby adjust the latter for tool-shanks of different diameters and to take up wear, the operative movement of the chuck-controller remaining the same.

Referring more especially to Figs. 4 and 6, the cam or locking member of the said controller is shown as two parallel connected arms f, laterally thickened and enlarged at one end to present two cam-faces f', the arms being connected by a transverse round fulcrum-bar $f^{\times}$, which is seated in the notch d^3 of the part D^2 of the spindle, the two arms f straddling such part, so that the locking member can rock on its fulcrum-bar as a center, but without lateral motion. The cam-faces f' bear against the face of the abutment c^7, and the enlargement d of the spindle is slabbed off at 20, opposite the cam-faces, to provide a clearance and prevent engagement of such faces with the enlargement.

I prefer to serrate or notch the upper edges of the arms, as at f^2, Fig. 3, and in said figure the cam member is shown as having closed the chuck on the tool T, which has a relatively large shank.

With a smaller shank the arms f would be swung down a greater distance than that shown in Fig. 3, such movement being effected by the action of a pin f^3, extended through the slot d^2 above the serrated edges of the arms and secured at its ends in an annularly-grooved collar f^4, slidably mounted on the part D^2 of the spindle. The groove f^5 therein is engaged by yoke-arms f^6, which enter longitudinal guideways b^{10} in the sleeve-bearing b and are attached to a ring f^7, mounted on the bearing and having internal lugs f^8, Fig. 3, which enter the guideways, and roughened or milled finger-pieces f^9 on the ring pass through the slots a^2 of the case portion A^2.

By reference to Figs. 1, 2, and 3 it will be seen that the finger-pieces f^9 are readily accessi-

ble to the operator from the exterior of the case, and from an inspection of the drawings and the foregoing description it will be manifest that if the collar f^4 be moved to the left from the position shown in the drawings the pin f^3 will thereby be moved toward the fulcrum of the cam member, and the expansive action of the spring s will operate to slide the sleeve c^4 to the right, the rocking movement of the cam member in the direction of the arrow 25, Fig. 2, permitting such movement of the sleeve. Inasmuch as the sleeve is connected by the pin $c^\times$ with the chuck, the latter will be drawn inwardly and will open and release the tool. On the other hand, when the collar f^4 is moved from the open chuck position to the right the pin f^3 will slide along the inclined upper edges of the arms f^2 of the cam member, depressing such member on its fulcrum $f^\times$ oppositely to the arrow 25, and its cam-faces f' will press against the abutment d^7, forcing it and its connected sleeve and the chuck to the left, bringing the conical end c^3 of the chuck into engagement with the closing cone-surface d^7 of the chuck-cap, and thereby closing the chuck tightly upon the shank of the tool. The serrations or notches f^2 in the tops of the arms f engage the pin f^3 when the chuck is closed and prevent accidental opening of the chuck.

It will be readily understood that the movement of the collar f^4 to open or close the chuck is effected by sliding movement of the ring f^7 by or through the engagement of the finger-pieces f^9 by the operator. As soon as the cam member is released by a releasing movement of the chuck-controller the spring s operates to retract the clutch and permit it to open, freeing the tool.

The chuck-controller comprises the sliding collar f^4, with its pin f^3, the yoke-arms f^6, and the ring f^7, provided with the finger-pieces.

A very direct connection is effected between the chuck and the spindle of the tool-carrier by the construction herein shown, and by the bearings which I have provided for the tool-carrier, both lateral and end thrust, a very accurate support is provided therefor, so that notwithstanding the length of the tool-carrier no chattering or vibration is possible.

By means of the adjustable abutment c^7 the apparatus can be instantly adapted to tools with shanks of slightly-different diameters, and wear of the abutment or of the cam-faces f' of the cam member is provided for. The slots c^5 and d^8 in the sleeve c^4 and the tubular part $d'^\times$ of the chuck-cap, respectively, permit the relative longitudinal movement of the spindle and chuck required to open and close the latter.

In Figs. 7 to 11, inclusive, I have shown another embodiment of my invention, the parts A and A′ of the case being substantially as hereinbefore described; but the chuck is of a different construction, and the chuck-controlling device is different in its details.

By reference to Fig. 9 it will be seen that the sleeve-bearing m, which is mounted in the part A of the case and which is firmly held in place by means of a screw 100, which enters a seat m^4, is substantially like the sleeve-bearing b, (shown in Figs. 2, 3, and 4,) the bearing m being counterbored at its inner end at m' and having at its opposite end an externally-threaded extension m^2, also counterbored to receive a collar 130, which is pinned to the spindle N by a screw stud or pin $130^\times$. Preferably a steel washer 120 is bottomed in the counterbore m', and the tubular part N′ of the chuck-cap N^2 is inserted in the counterbore with a running fit and against the washer 120, said tubular part N′ receiving the forward end of the spindle N and being rigidly secured to it by a pin 99. The spindle and its rigidly-attached chuck-cap are thus held from longitudinal movement relatively to the sleeve-bearing, and the outer end of the cap is provided with a cone-like bearing-surface n^2 to coöperate with the end-thrust bearing a of the nose A′ of the case, as shown in Fig. 8. The chuck-cap is provided with an internal cone-bearing n' to coöperate with the correspondingly-tapered or coned end v of the chuck V, (shown separately in elevation in Fig. 11,) said chuck being a double-ender and having longitudinal slots v' extended oppositely from a central enlarged portion $v^\times$ to the opposite ends of the chuck, the inner end of the latter being also coned or tapered, as at v^2. In this embodiment of my invention the spring or resiliency of the chuck, with the external taper of the ends, operates to release the tool when the means for effecting closure of the chuck is in operation. The chuck-controller comprises a longitudinally-movable closer, a cam or locking member, and a device operated from the exterior of the case to move the cam or locking member, as desired. The closing member is shown in Fig. 9 as a plunger n^3, slidably mounted in the chuck-cap N^2 and having its outer end provided with a longitudinal seat n^4 to receive the shank of the tool T when the latter is inserted in the chuck, the seat being countersunk at n^5 on a taper corresponding to the adjacent tapered end v^2 of the chuck. At its opposite inner end the plunger is provided with an axial socket n^6 to receive the shank of a headed abutment-stud n^7, the face of which coöperates with the cam-face of the cam or locking member.

In Fig. 9 I have shown a washer 75, interposed between the end of the plunger and the head of the abutment-stud, and it will be manifest that by using washers of different thickness the face of the stud will be adjusted relative to the cam member to govern the closing movement of the chuck. Between the forward end N^2 of the chuck-cap and the

part N′ thereof the chuck-cap is slotted longitudinally, as at $n^{\times}$, it being understood that the chuck-cap as a whole is tubular from end to end, but the parts N′ N² thereof are unslotted. Within the slotted portion I have mounted the cam member, which comprises a body portion h, having a cam-face $h^{\times}$, an oppositely-extended elongated arm h', preferably provided on its upper face with transverse serrations or notches h^{2}, and lateral fulcrum-ears h^{3}, located at the upper part of the body portion. These fulcrum-ears are seated in notches n^{8} transverse to the slot $n^{\times}$, so that the cam member is inclosed within the slotted part of the chuck-cap, the cam-face $h^{\times}$ of said member bearing against the abutment-stud n^{7}. A collar n^{9} is slidably mounted on the part N′ and the adjacent slotted part of the chuck-cap and provided with an annular groove n^{10} to receive yoke-arms n^{12}, which at their opposite ends are secured to or form part of a ring n^{13}, preferably externally milled or roughened and mounted to slide longitudinally on the sleeve-bearing m. The yoke-arms n^{12} are seated and slide in longitudinal and diametrical opposite guideways m^{10} in the sleeve-bearing, so that rotative movement of the ring n^{13} is prevented and the yoke-arms are housed when the case is applied. The sleeve n^{9} is provided with a threaded stud n^{20}, which extends through one of the slots $n^{\times}$ and engages the upper face of the arm h' of the cam member, so that movement of the collar n^{9} to the right viewing Figs. 8 and 9 will act through the engagement of the stud n^{20} and the arm h' to turn the cam member on its fulcrum in the direction of the arrow 35, Fig. 9, thereby forcing the chuck-closer or plunger n^{3} to the left. The countersunk end n^{5} of the plunger operates to close the end v^{2} of the chuck upon the tool-shank and also to force the chuck to the left, so that the closing-surface n' of the chuck-cap will operate to close the end v of the chuck. The notched or serrated surface of the arm h' engages the stud n^{20} and prevents accidental release of the chuck. By moving the ring n^{13} to the left the yoke-arms n^{12} will slide the collar n^{9} in the same direction and the cam member will be released, so that the resiliency or spring of the chuck will operate to release its hold upon the shank of the tool, and there will be a slight movement of the plunger n^{3} to the right, effecting a corresponding slight swinging movement of the cam member on its fulcrum opposite to the arrow 35. By a very slight adjustment of the screw-stud n^{20} in or out the closing of the chuck can be regulated to accommodate tool-shanks of different diameter, thus forming a very simple adjustment to regulate the capacity of the chuck.

The construction is strong, durable, and simple, and by merely withdrawing the screw 100 the case can instantly be removed from the operative parts of the handpiece, so that all that is necessary to adjust the chuck is to effect such removal and turn the screw-stud n^{20} in one direction or the other.

In the embodiment of my invention just described it will be manifest that the support and bearings, both lateral and end-thrust, for the spindle and for the tool-carrier as a whole are substantially as described in the first embodiment of the invention.

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

1. The combination with the case of a dental-engine handpiece, of a rotatable spindle therein, an elongated sleeve-bearing for the spindle, means coöperating with said bearing to take up end thrust and prevent longitudinal movement of the spindle in said bearing, a chuck for the tool, chuck-controlling means, and an actuator therefor mounted upon and longitudinally slidable on the sleeve-bearing.

2. The combination with the case of a dental-engine handpiece, of a rotatable spindle therein, a sleeve-bearing for the spindle, having a longitudinal, external guideway, means rigid with the spindle to coöperate with the opposite ends of the bearing to take up end thrust, a chuck for the tool, chuck-controlling means rotatable with the spindle, and an actuator for said means, mounted on the bearing and slidable in the guideway thereof.

3. The combination with an elongated bearing, of a spindle rotatably mounted therein and extended through it, the outer end of the spindle being adapted to be connected with a driving-shaft, means to prevent longitudinal movement of the spindle in the bearing, a chuck-cap rigidly connected with the other end of the spindle and having an external shoulder, a chuck in the cap, a rocking cam member supported by the spindle, a longitudinally-rigid transmitting member directly interposed between the chuck and cam member and slidably mounted on the cap, means to rock the cam member to close the chuck, and a spring surrounding the chuck-cap between its shoulder and the outer end of the slidable member, to move the said slidable member when said cam member is released.

4. The combination with a spindle fitted to rotate in bearings, of a chuck, a rocking cam or locking member, and a sliding member between it and the chuck, all supported by the spindle, one end of the sliding member coöperating with the chuck and the other end with the cam member, means to rock the cam member and act through the slidable member to close the chuck, and a spring wholly independent of the chuck to move the slidable member in the opposite direction when the cam or locking member is released.

5. In a handpiece for dental engines, a spindle fitted to rotate in bearings, a chuck-cap having a tubular end to receive and secured to the inner end of the spindle, a sleeve slidably mounted on the tubular end of the cap,

the latter having an external shoulder beyond the sleeve, a spring interposed between the shoulder and sleeve, to move the latter inward, a chuck within the cap and positively connected with the sleeve, and means mounted on the spindle to move the sleeve against the stress of the spring and close the chuck.

6. The combination, with a rotatable spindle provided with annular enlargements, of a sleeve-bearing counterbored to receive one of the enlargements, an externally-shouldered chuck-cap having a tubular end to receive the end of the spindle beyond the other enlargement and secured to the spindle, a sleeve longitudinally slidable on said tubular portion of the cap, a spring interposed between the cap-shoulder and the adjacent end of the sleeve, an adjustable abutment rigidly secured to the inner end of the sleeve, a chuck connected with the latter and inclosed by the cap, and means, including a bifurcated rocking cam member mounted on and straddling the spindle between the enlargements thereof, to engage the abutment and move the sleeve in opposition to the spring, to close the chuck.

7. The combination with a rotatable tool-carrier, including a spindle and a rigidly-attached chuck-cap, of a chuck within the cap, a rocking cam member mounted on the tool-carrier, intermediate devices to close the chuck when said member is rocked, a slidable, manually-operated collar to engage and rock said cam member, and an adjustable device on said collar to regulate the closure of the chuck when said cam member is rocked.

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

FRANK K. HESSE.

Witnesses:

JOHN C. EDWARDS,

EMILY C. HODGES.