No. 756,336. PATENTED APR. 5, 1904.

L. H. CRAWFORD.

DENTAL HANDPIECE.

APPLICATION FILED JUNE 15, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

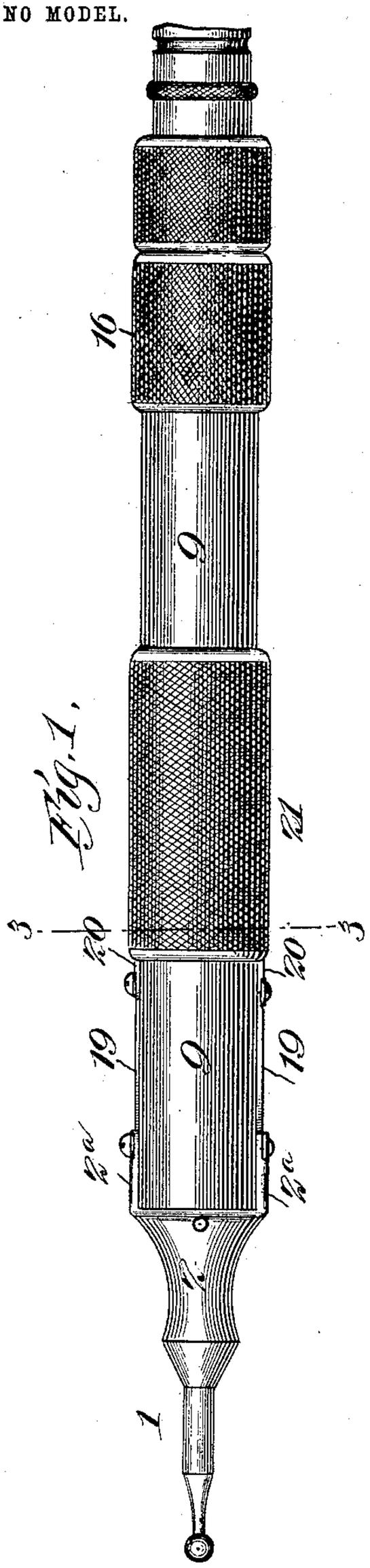


Fig. 2.

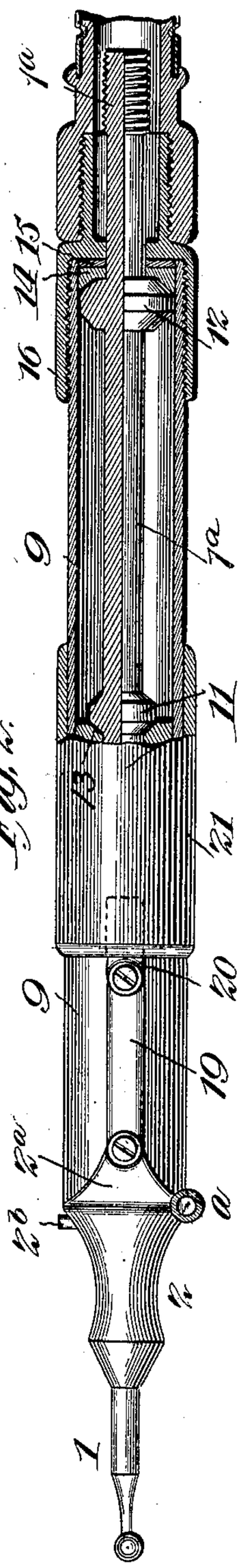
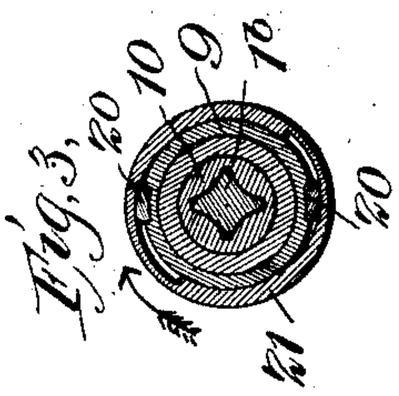


Fig. 3.



WITNESSES:

G. P. Kingsbury.

Amos W. Hart

INVENTOR

Lyter H. Crawford.

BY Munn & Co.

ATTORNEYS.

No. 756,336. PATENTED APR. 5, 1904.

L. H. CRAWFORD.

DENTAL HANDPIECE.

APPLICATION FILED JUNE 15, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

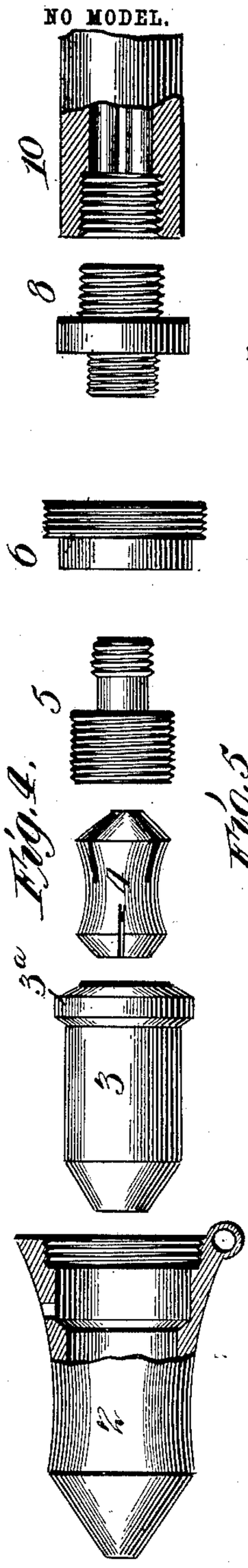


Fig. 4.

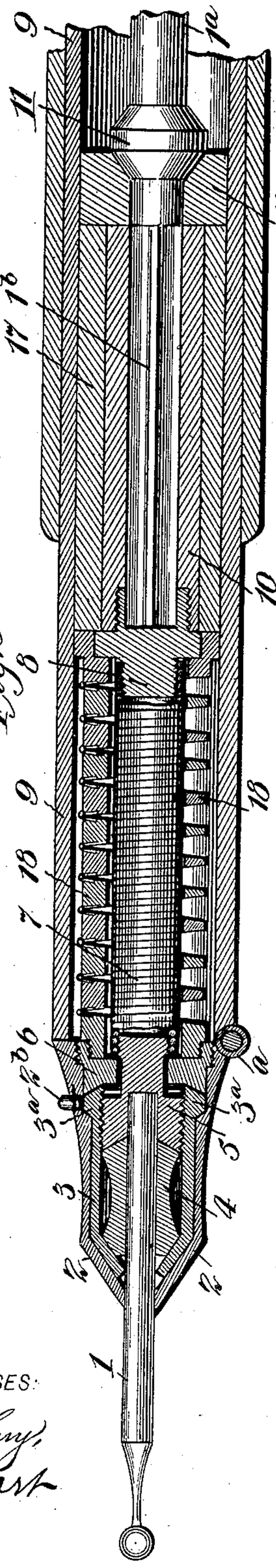


Fig. 5.

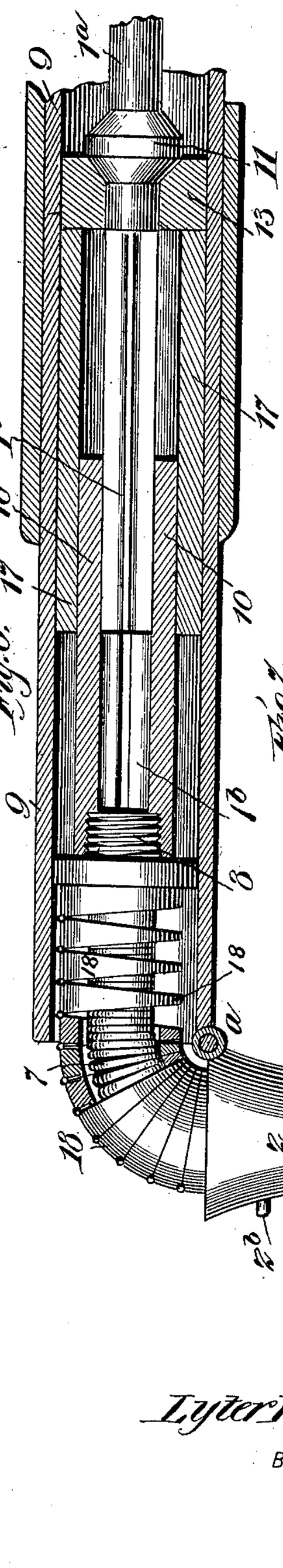


Fig. 6.

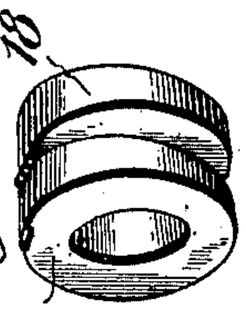


Fig. 7.

WITNESSES:

G. P. Kingsbury,

Amos Arthur Hart

INVENTOR

Lyter H. Crawford;

BY Munn & Co.,

ATTORNEYS.

No. 756,336. Patented April 5, 1904.

UNITED STATES PATENT OFFICE.

LYTER H. CRAWFORD, OF DALLAS, TEXAS.

DENTAL HANDPIECE.

SPECIFICATION forming part of Letters Patent No. 756,336, dated April 5, 1904.

Application filed June 15, 1903. Serial No. 161,419. (No model.)

To all whom it may concern:

Be it known that I, LYTER H. CRAWFORD, a citizen of the United States, and a resident of Dallas, in the county of Dallas and State of Texas, have made certain new and useful Improvements in Dental Handpieces, of which the following is a specification.

My invention is an improvement in handpieces adapted for holding a bur or other form of abrading-tool for preparing teeth for fillings, crowns, &c., the same being so constructed that the bur may be adjusted at various angles ranging from naught to one hundred degrees and still work steadily. The adjustment for this purpose may be easily and quickly made, and the instrument may be clamped for holding the bur fixed at the desired angle. In providing for such adjustment I have sought to simplify the construction and lessen the cost of the instrument as much as possible as well as reduce friction and wear.

The details of construction, arrangement, and operation of parts are as hereinafter described, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of the handpiece. Fig. 2 is in part a view of another side and in part a longitudinal section of the handpiece. Fig. 3 is a cross-section on the line 3 3 of Fig. 1. Fig. 4 represents several portions or parts of the instrument detached from each other. Fig. 5 is a longitudinal section of the instrument. Fig. 6 is another longitudinal section showing the holder for the bur arranged at a right angle to the body of the instrument. Fig. 7 is a detail perspective view of a portion of the sectional guard and holder for the duplex spring which operatively connects the boring-shaft proper and the parts immediately connected with the bur.

The bur or boring-tool 1 is operatively connected, by means hereinafter described, with the rotatable rigid shaft 1^a, the latter being in turn suitably connected with the flexible shaft connected with a dental engine. The bur 1 is held in a chuck 4, which is inclosed in a conical thimble 3, and the latter is in turn arranged within what may be termed the "nozzle" 2. The latter is hinged at *a* to adapt it to be turned at any suitable angle to the body-case 9 of the instrument at any angle varying from naught to one hundred degrees. The chuck 4 is split longitudinally and is conical at each end. Its vertical or outer end abuts a similar conical portion of the thimble 3, and the latter in turn conforms to the conical head of the nozzle 2. The rear or inner end of the thimble 3 is provided with a rib 3^a, (see Figs. 4 and 5,) extending around it and abutting the corresponding beveled portion or shoulder formed in the nozzle 2. A nut 5 connects the thimble 3 with the duplex wire coil, constituting a flexible shaft 7, the same having a reduced portion that enters the duplex coil and an enlarged portion that enters the thimble. By adjustment of this nut or screw any required pressure may be applied to the adjacent conical end of the chuck 4, whereby the latter will be caused to compress or grip the bur 1 to any required degree.

Adjacent to and abutting the rear ribbed end 3^a of the thimble 3 is an annular nut 6, which is preferably called the "thimble-cup." The same is screwed into the inner end of the nozzle 2, and the stem or reduced portion of the screw 5 passes through the same, as shown, while a small space is provided between the enlarged portion of said screw and the said thimble-cup 6 to permit adjustment of the screw 5 as required for tightening and loosening the chuck 4 to cause it to clamp or release the bur 1 correspondingly. The duplex coil 7 is connected at its inner end with a form of screw which is further connected on the other side with a sleeve or bushing 10, that is adapted to slide on a polygonal portion 1^b of the rigid shaft 1^a. By reference to Fig. 2 it will be seen that the said shaft 1^a is provided with two fixed cones 11 and 12 and that the front cone 11 is seated in a corresponding cup-bearing 13, that is fixed in the body-case 9. The rear cone 12 seats in a bearing or back cup 14, to which a jam-nut 15 is adjacent. Both the said cup 14 and jam-nut 15 screw into the barrel or case 9 of the instrument and are seated together upon the back cap forming a screw attachment of the case 9. By means of the back cup 14 and jam-nut 15 it is obvious that accurate adjustment may be made

for holding the shaft steady for taking up wear at any time that it may be necessary. I prefer that the portion 1^b of the shaft 1^a shall have the form indicated in Fig. 3—that is to say, four equidistant ribs with intermediate longitudinal grooves; but I desire it to be understood that any form may be adopted which will secure an equivalent result—that is to say, which will enable the sleeve or bushing 10 to slide freely on the part 1^b while being caused to rotate therewith. The sleeve or bushing 10 is fitted neatly within a fixed sleeve or bushing 17 and is adapted to slide therein toward and from the fixed shaft-bearing 13. It will thus be seen that the bearing 13 and the bushing 17 are fixed with relation to the body-case 9 and that the rear bearing 14 of the shaft is also practically fixed save at such times as it may be required to be adjusted to take up wear. It will be further apparent that by rotation of the rigid shaft 1^a, which is effected in the usual manner by due connection with the flexible shaft of a dental engine, rotation will be imparted to the slidable sleeve 10, and thus to the duplex coil 7, which will in turn communicate the same to the screw 5, and thereby to the thimble 3 and chuck 4, holding the bur 1. This operation occurs not only when the bur or drill is in exact alinement with the rigid shaft 1^a and the flexible one, 7, as shown in Figs. 1 to 5, but also when the bur is adjusted at any angle from naught to one hundred degrees, as will now be further explained. The flexible shaft 7 is composed of two spiral coils of steel wire, one screwed into the other, and its ends are so constructed as to receive the shanks or reduced portions of the respective screws 5 and 8 and operatively connect the two, so that all rotate together. This shaft obviously allows rotary motion to be transmitted to the parts holding the bur at whatever angle the latter may be set. When the nozzle 2 is turned at an angle to the body-case—say at a right angle, as indicated in Fig. 6—the shaft 7 makes a corresponding curve, as there illustrated.

In order to render the operation of the bur as steady as possible while being held at an angle, it is necessary that the shaft 7 be supported at its curve and that, too, in such manner as to involve minimum friction and wear. I have succeeded in devising a guard and holder 18 for the duplex coil or flexible shaft which fulfils the desired requirements. As indicated in Figs. 6 and 7, it is constructed of hollow wedge or sector shaped sections of a cylinder, the same being hinged together at the point where they are thickest. As shown in Fig. 5, the front one of the several sections has a screw connection with the annular nut or thimble-cup, thus forming an attachment of the thimble 3, while the section at the opposite or inner end abuts and is rabbeted to receive the circular shoulder of the screw 8, which connects the slidable bushing 10 with the flexible shaft 7. As shown in Fig. 5, when the bur 1 is alined with the flexible and rigid shafts the sectional guard and holder 18 also assume a straight line, its several sections being then separated save at their hinged portions and arranged concentrically with the shaft 7, which they surround; but when the nozzle 2 is adjusted at an angle—say a right angle, as in Fig. 6—to the shaft 1 those sections of the guard 18 which are drawn out of the body-case 9 close upon each other, the lines of contact being radial to the hinge *a*, as shown. By this closure the several sections of the guard form practically a close curved cylinder, which constitutes a firm support for the flexible shaft 7, and thereby enables the same to rotate the bur with extreme steadiness. It will be further seen that the same result is practically obtained whatever be the angle of adjustment of the bur to the shaft or body of the instrument.

It is obviously necessary to provide efficient means for holding the nozzle 2 locked rigidly at any angle at which the bur 1 may be placed relative to the shaft or body-case of the instrument. For this purpose I have adopted a simple construction and combination of parts which will be understood by reference to Figs. 1, 2, 3. The thimble is provided with parallel base ears or flanges 2^a, which extend over the adjacent end of the body-case 9. To these ears 2^a are pivoted two bars 19, to which other bars 20 (see Fig. 2) are also jointed, the same extending inward beneath the rotatable sleeve 21, as indicated in Fig. 3. It will be seen that the body-case has longitudinal recesses on opposite sides adapted to receive a portion of the bars 20 and that the sleeve 21 is recessed at opposite points interiorly, so as to form inclines or cam-surfaces which work in frictional contact with the bars 20. It will now be understood that when the bur is alined with the shaft, as indicated in Figs. 1, 2, upon rotating the outer sleeve 21 in the direction of the arrow, Fig. 3, the bars 20 will be clamped tightly, and thus the nozzle 2 will be held locked firmly in the position required to duly support the bur. On the other hand, by rotating the sleeve 21 in the opposite direction the bars 20 will be released from friction and compression, so that the nozzle 2 may be swung on its pivot *a*, whereby the bars 19 will draw out the slidable cam-bars 20 to a corresponding degree, and then by again rotating the sleeve 21 in the direction of the arrow the bars 20 will be clamped, and thus the nozzle and bur will be locked firmly at the angle assumed.

As indicated best in Fig. 5, I provide a slidable pin or thumb-piece 2^b, which is adapted to work through the thimble 2 and to bear directly upon the circumferential rib 3^a of the thimble 3. It is provided with a spring which holds it normally out of contact with the thimble; but when pressed laterally inward, and thereby held in firm contact with the

thimble-rib, the thimble is prevented from rotating, and the rotation of the rigid shaft 1ª being then reversed the screw 5 may be turned back, so as to relieve pressure upon the chuck 4, and thereby release the bur 1. On the other hand, when the bur is inserted in the chuck and pressure is applied to the thumb-piece 19, as before, and the engine started the thimble 3 will be held from rotation and the screw 5 rotated within the same so as to advance the chuck and compress and jam it within the thimble, so as to grip the bur with the required force. By adjustment of the thimble-cup or annular nut 6 the thimble 3 will be held within the nozzle 2 in such manner as to adapt it to rotate freely and at the same time prevent even the slightest endwise motion. As before described, it also forms the means of connection between the nozzle 2 and the sectional guard and holder of the duplex 7.

By the above-described construction and arrangement of parts I produce a superior instrument capable of use with the drill in alinement with the shaft or at any angle thereto which may be required in practical dental operations, and I have accomplished this with a comparatively small number of parts, so that the cost of the instrument and its durability and strength compare favorably with the best of its class.

What I claim is—

1. In a dental handpiece, the combination, with rigid casing, a nozzle which is flexibly connected therewith, and thus adapted to be flexed laterally, a rotatable driving-shaft, and devices arranged in the nozzle for holding an abrading-tool, of the flexible shaft interposed between and operatively connecting said devices and the driving-shaft, all arranged to cooperate substantially as described.

2. In a dental handpiece, the combination with a nozzle and rotatable rigid shaft and devices for holding an abrading-tool, of a flexible shaft which permits lateral flexure of the abrading-tool and means for operatively connecting such shaft with the tool-holding devices and a bushing connected therewith and adapted to slide on the rigid shaft with which it is rotatably connected substantially as described.

3. In a dental handpiece the combination with a nozzle, a rotatable rigid shaft having a polygonal portion extending beyond its upper bearing of a slidable bushing conforming to such polygonal portion of the shaft, a flexible shaft connected with said bushing, devices for gripping the abrading-tool and means for operatively connecting the flexible shaft with said devices substantially as described.

4. In a dental handpiece the combination with a hinged nozzle and devices contained therein for holding an abrading-tool and a rigid rotatable shaft having a polygonal extension, of a flexible shaft and a bushing adapted to slide on the said polygonal portion of the shaft and means for operatively connecting the flexible shaft with the tool-holding devices substantially as shown and described.

5. In a dental handpiece the combination with a body-case, a nozzle hinged to the body-case and adapted to be turned at an angle thereto and a rigid rotatable shaft arranged centrally in the body-case, of devices for holding an abrading-tool, and a flexible shaft connected with said devices, and means for connecting the same with the flexible shaft whereby it is caused to rotate therewith at whatever angle the abrading-tool may be adjusted substantially as described.

6. In a dental handpiece the combination with the body-case having a fixed bushing and shaft-bearing, and a rigid rotatable shaft having a polygonal extension adjacent to said bearing, a nozzle hinged to the body-case, devices arranged in the latter for gripping the abrading-tool, a bushing arranged slidably and rotatably within the fixed bushing and engaging the polygonal portion of the shaft, and a flexible rotatable device connecting the gripping devices and the slidable bushing substantially as shown and described.

7. In a dental handpiece the combination with the body-case the hinged nozzle devices arranged therein for gripping the abrading-tool and a rotatable shaft having a polygonal extension, of a bushing fitting said extension and adapted to rotate therewith and slide thereon, a flexible shaft interposed between said bushing and the tool-gripping devices and operatively connected thereto, and a screw interposed between and connecting the bushing and said flexible shaft substantially as shown and described.

8. In a dental handpiece the combination with the body-case, and nozzle, a rigid rotatable shaft and devices for gripping the abrading-tool, of a flexible shaft, and a device connecting the same rotatably with the rigid shaft, the said flexible shaft having a screw connection with said device and the gripping devices substantially as and for the purpose specified.

9. The combination with a nozzle, the body-case and rotatable shaft of tool-gripping devices arranged within the nozzle, a rotatable device interposed between said devices and the shaft and having a screw connection with each, and a brake adapted to bear upon the outer member of the tool-gripping devices, for the purpose of locking the same and preventing rotation as and for the purpose specified.

10. In a dental handpiece, the combination with the body-case, a rotatable shaft and nozzle attached to the body-case and tool-gripping devices arranged in said nozzle and comprising a chuck, a surrounding thimble and a screw, of rotatable devices connecting said screw with the shaft, and a brake member arranged in the nozzle and adapted to be pressed inward for engagement with the thimble substantially as shown and described.

11. In a dental handpiece the combination with the body-case and rotatable shaft, a conical nozzle and tool-gripping devices arranged in the latter and comprising a chuck, a conical thimble surrounding the same and threaded internally, a screw entering said thimble and adapted to bear upon the chuck, a thimble-cup arranged in rear of the thimble and screwing into the nozzle, the aforesaid screw which enters the thimble being adjustable relative to said thimble-cup, means for connecting the screw with the shaft whereby it may be rotated in either direction for gripping the abrading-tool or releasing the same, and a friction-brake arranged in the nozzle and adapted to bear upon the aforesaid thimble in the manner described.

12. In a dental handpiece the combination with a body-case and conical nozzle and a rotatable shaft having an internal shoulder as described, of two gripping devices arranged within the nozzle and comprising a chuck, a conical thimble surrounding the same and having a circumferential rib adapted to engage the said shoulder of the nozzle, a thimble-cup in the form of an annular screw-nut which enters the base of the said nozzle and is in contact with the base of the conical thimble, and means for operatively connecting the aforesaid devices with the shaft substantially as shown and described.

13. In a dental handpiece the combination with a body-case, a nozzle, a rigid rotatable shaft and devices for gripping the abrading-tool which are arranged within the nozzle, means for connecting said devices with the shaft, said means including a flexible shaft, and a flexible inclosing guard and holder for said flexible shaft and arranged within but adapted to be drawn out of the case when flexed substantially as shown and described.

14. In a dental handpiece the combination with the body-case, a nozzle hinged thereto and adapted to be set at various angles, tool-gripping devices arranged within the nozzle and a rotatable shaft, of means for operatively connecting said devices with the shaft, the same comprising a flexible shaft, and a flexible guard and inclosure for said shaft, the said guard being adapted to be flexed and hold the shaft and allow rotation of the same at any angle at which the nozzle may be set substantially as described.

15. In a dental handpiece the combination with the body-case, a rotatable shaft and a nozzle hinged to the body-case and adapted to be turned laterally, of tool-holding devices arranged within the nozzle, means for connecting said devices with the shaft, the same including a flexible shaft, and a guard-holder for said flexible shaft, the same being composed of wedge-shaped sections which are hinged together substantially as shown and described.

16. In a dental handpiece the combination with the body-case, a nozzle hinged thereto and a rotatable shaft, of tool-gripping devices arranged in the nozzle and means for operatively connecting said devices with the shaft in the manner that allows longitudinal adjustment while preserving rotation, said means including a flexible shaft, and a guard and holder for said flexible shaft, the same comprising a series of wedge-shaped sections surrounding the said flexible shaft and hinged together at the outer extremity of their thickest portions, the lines of division between the said sections being radial to the pivot or hinge of the nozzle when the latter is adjusted at an angle substantially as described.

17. In a dental handpiece the combination of the body-case, a rigid rotatable shaft having front and rear bearings and a polygonal portion between said bearings, a nozzle hinged to the body-case, tool-holding devices arranged within the same, a flexible shaft connected with said devices and a bushing connected with the flexible shaft and adapted to slide upon and rotate with the polygonal portion of the shaft, and the flexible guard and holder for the flexible shaft the same being composed of a series of wedge-shaped sections inclosing the flexible shaft and hinged together and connected at its respective ends with the nozzle and the slidable bushing substantially as described.

18. The combination with the body-case and rotatable shaft, a nozzle hinged to the body-case and tool-gripping devices arranged therein and means connecting said devices with the shaft for rotation in the manner described and devices connected with the nozzle and extending backward along the body-case, and a gripping device substantially as described whereby the nozzle may he held locked rigidly in any lateral adjustment substantially as specified.

19. The combination with the body-case and rotatable shaft, a nozzle hinged to the body-case, tool-gripping devices arranged within the nozzle and means connecting said devices with the shaft whereby rotation of the said devices may be produced at any angle at which the nozzle may be set, of bars pivotally connected with the nozzle and extending rearward along the body-case, and a rotatable sleeve having an inner cam-surface for engaging said bars and clamping the same for holding the nozzle fixed in any desired adjustment, substantially as described.

20. The combination with the body-case and a rotatable shaft, a nozzle hinged to the body-case and tool-holding devices arranged therein and operatively connected with the shaft, of bars connected with the nozzle and extending along the body-case, the latter being provided with lengthwise grooves to receive the same, and a rotatable sleeve having inner interior cam-surfaces for engaging the said bars, substantially as shown and described.

21. The combination with a body-case and

rotatable shaft, a nozzle hinged to the body-case, tool-holding devices arranged in the nozzle and means for operatively connecting them with the said shaft, of a pair of bars hinged to the nozzle on opposite sides, and a second set of bars pivoted to the first-named ones and extending inward in longitudinal grooves formed in the body-case, and a rotatable sleeve having interior cam-surfaces for locking the bars and holding the nozzle in any required adjustment substantially as shown and described.

LYTER H. CRAWFORD.

Witnesses:
AMOS W. HART,
SOLON C. KEMON.