(No Model.) 4 Sheets—Sheet 1.

F. K. HESSE.

DENTAL ENGINE.

No. 489,416. Patented Jan. 3, 1893.

Fig. 1.

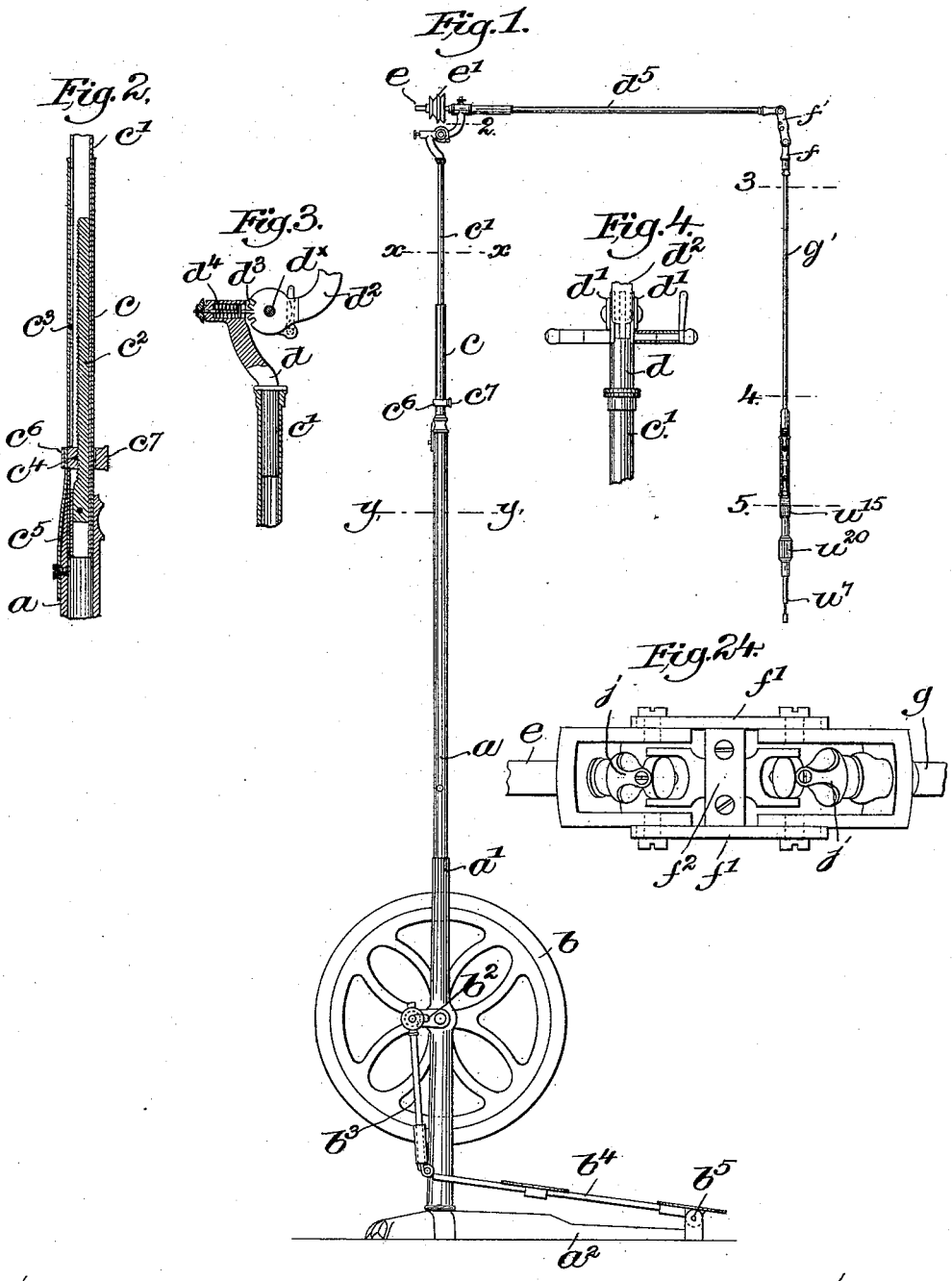

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 2a.

Witnesses.
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DENTAL ENGINE.

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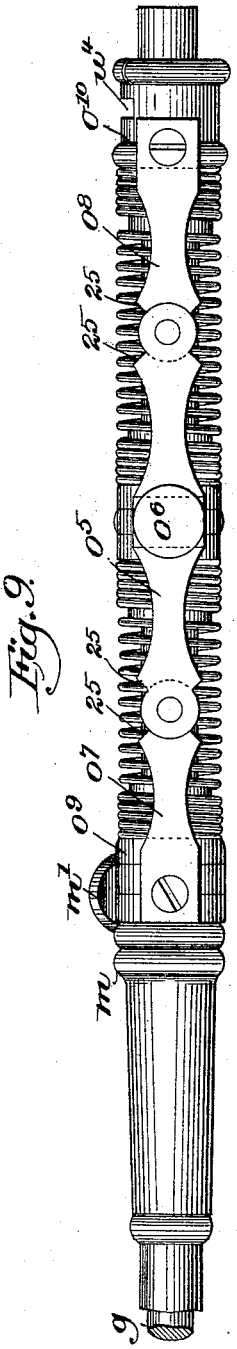

Fig. 9.

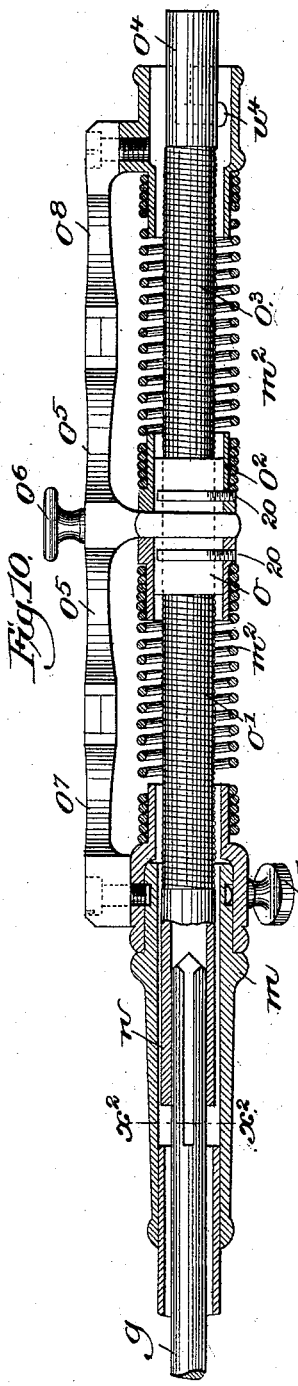

Fig. 10.

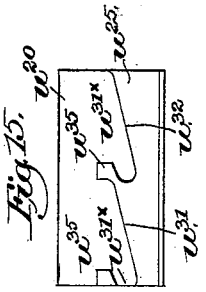

Fig. 15.

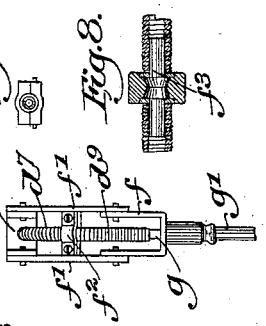

Fig. 7.

Fig. 8.

Fig. 6.

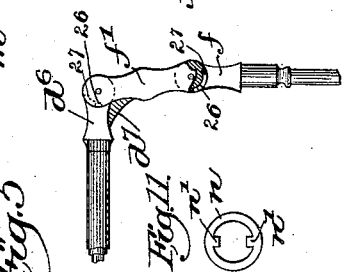

Fig. 5.

Fig. 11.

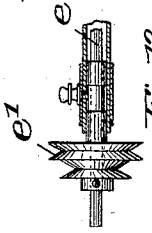

Fig. 12.

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DENTAL ENGINE.

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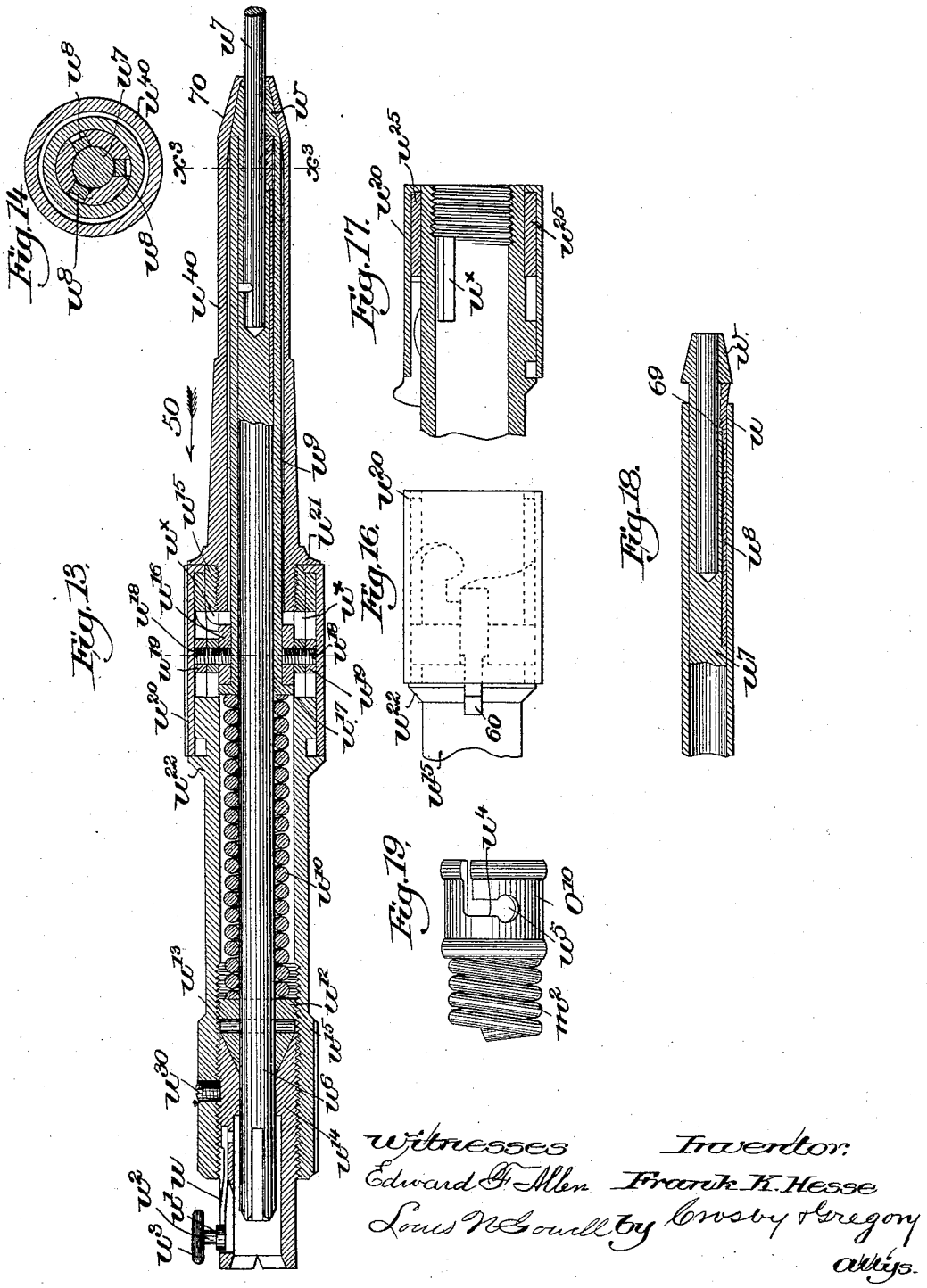

Witnesses
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(No Model.) 4 Sheets—Sheet 4.

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DENTAL ENGINE.

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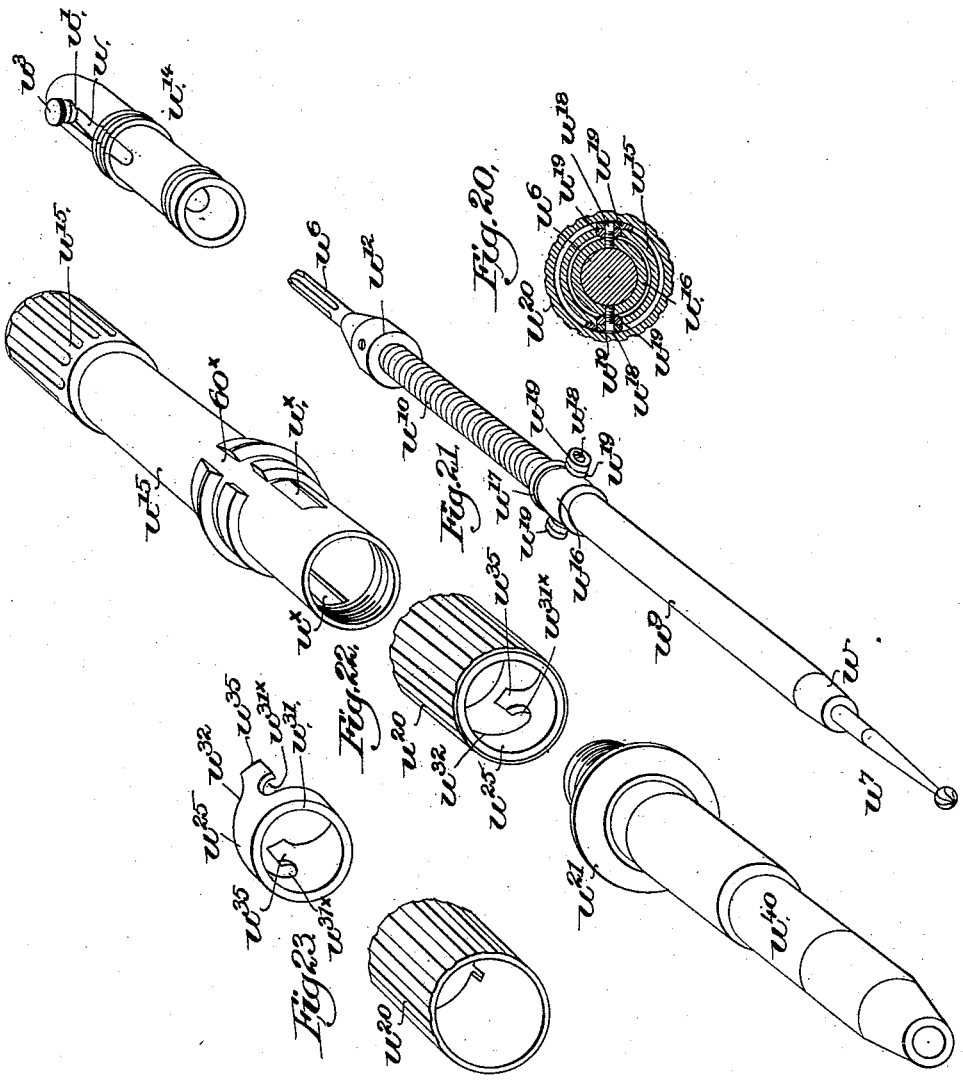

Witnesses:
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Louis N. Gouell

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UNITED STATES PATENT OFFICE.

FRANK K. HESSE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO CODMAN & SHURTLEFF, OF SAME PLACE.

DENTAL ENGINE.

SPECIFICATION forming part of Letters Patent No. 489,416, dated January 3, 1893.

Application filed June 9, 1892. Serial No. 436,095. (No model.)

To all whom it may concern:

Be it known that I, FRANK K. HESSE, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Dental Engines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to dental engines, and has for its object to improve and simplify the same as will be hereinafter described and set forth in the claims.

Figure 1 shows in side elevation a dental engine embodying this invention. Fig. 2, a vertical section of a portion of the apparatus shown in Fig. 1, taken between the dotted lines x—x and y—y on an enlarged scale. Fig. 3, a vertical section of a portion of the device taken between the dotted line x—x and the dotted line 2, Fig. 1. Fig. 4, a right-hand side view of the parts shown in Fig. 3. Fig. 5, an enlarged detail of a portion of the apparatus shown in Fig. 1, taken between the dotted line 2, and the dotted line 3. Fig. 6, a right-hand side view of the parts shown in Fig. 5. Figs. 7 and 8, details to be referred to. Fig. 9, an enlarge detail of a portion of the apparatus shown in Fig. 1, taken between the dotted line 4 and the dotted line 5. Fig. 10, a longitudinal section of the parts shown in Fig. 9. Fig. 11, an end view of the collar n. Fig. 12, a cross section taken on the dotted line x^2—x^2, Fig. 10. Fig. 13, an enlarged longitudinal section of the hand-piece shown in Fig. 1. Fig. 14, a cross-sectional detail of the hand-piece taken on the dotted line x^3—x^3, Fig. 13. Fig. 15 a developed detail of the cam to be referred to. Fig. 16 and 17 details showing the locking device for the cam to be referred to. Fig. 18, a longitudinal section of a portion of the hand-piece to more fully show the clutch for the tool. Fig. 19, a detail showing part of the bayonet joint connection by which the hand-piece is attached to the operating parts of the engine. Fig. 20, a cross section taken on the dotted line z—z, Fig. 16. Fig. 21, a perspective view showing the block u^{14}, spindle u^6, and parts thereon. Fig. 22 shows in perspective the shell u^{15}, collar u^{20}, and tube u^{40}, all arranged in the same relative positions that they occupy when assembled. Fig. 23, shows the collar u^{20}, with its cam ring u^{25} withdrawn at one end. Fig. 24, a modification to be described.

The column a, of any suitable length and made tubular is screwed or otherwise attached to a yoke a' on the base or foot a^2, the drive wheel or pulley b having its bearings in the said yoke a driving belt or endless band being passed about the said pulley as understood. A crank arm b^2 is secured to the shaft of the drive wheel or pulley b and is adjustably connected by a rod b^3 to a treadle b^4 pivoted at b^5 to the base a^2.

The column a, as shown, is tubular, and has secured to its upper end a tubular rod c which in turn receives telescopically a tubular rod c' having secured within it a ratchet toothed bar c^2, the said rod c' on that side adjacent the teeth of said bar having a slot c^3 of a length substantially equal to the length of the toothed bar. A ratchet toothed block c^4 is attached to a spring c^5 which in turn is secured to the column a, said block passing through a hole in the rod c, and also through the slot c^3 and the action of the spring tending to cause the teeth of the block to normally engage the teeth of the bar c' at any point desired. An oval-shaped ring c^6 encircling the rod c, secured to the said block c^4 is provided with thumb piece c^7 by which the ring may be moved bodily back or to the left to disengage the toothed block c^4 from the toothed bar c^2 to permit the rod c' to be moved vertically for adjustment.

At the upper end of the tubular rod c', which it will be understood may, if desired, be simply a continuation of the column a, is secured a head d which is slightly bent or offset as best shown in Fig. 3, said head having at its upper end two ears d' between which is pivoted at $d^\times$ an upwardly bent arm d^2. The arm d^2 at its pivotal end is provided with a series of notches d^3, into one or another of which may enter a spring actuated pin d^4 to lock the arm d^2 at any desired angle. To release said arm, that it may be turned on its pivot, the pin d^4 must be withdrawn against the tension of its actuating spring, such construction providing against all danger of accidental release of the arm. The arm d^2 at its upper end supports a tubular rod d^5 of

any suitable length, and within said tubular rod d^5, a rod e is adapted to rotate, said rod at one end having secured to it one or more pulleys as e' arranged substantially in line with the pivotal point $d^\times$ of the arm d^2 and the center of the pulley b. The rod e has its bearings at one end of the rod d^5, in the yoke d^6, and projecting through the crown or arch thereof has attached to it, a short spiral spring or coil d^7, see Figs. 5 and 6.

The arms of the yoke d^6 are connected with the arms of a yoke f by two links f', of any suitable length, holding between them a cross piece or support f^2, see Figs. 7 and 8, in which a short shaft or spindle f^3 has its bearings, one end of the shaft or spindle f^3 being connected to the spring or coil d^7 the other end being connected by a short spring or coil d^9, with a rod or shaft g, having its bearings in the yoke f, and contained within the suitable rod g' to which the yoke is attached.

By means of the support or bearing f^2, located midway between the rotatable shafts e and g, and the spindle f^3 held in said support or bearing f^2, I am enabled to use two short coils or springs as d^7 d^9, by which the tendency of buckling or warping which is common to a long spring is obviated, the links f' f' constituting a supporting frame for the bearing of the spindle, the said frame being pivoted, it will be noticed, at points midway between the ends of the springs or coils, compelling the latter to bend or curve properly at their middles so that the two rotatable parts may be rotated in parallelism with each other if desired.

The springs or coils d^7, d^9 constitute yielding connections between the shafts e, g, and the intermediate spindle f^3. I do not desire to limit my invention to the particular shape of these parts, as it is obvious that the same may be varied.

Stops 26 are formed on the yokes d^6 and f which co-operate with grooves 27 in the ends of the links f', see Fig. 5, to prevent the links and yokes being turned the one upon another through more than ninety degrees, so that the yielding connections between the spindles and shafts cannot be bent or turned through an angle greater than ninety degrees, thus avoiding liability of kinking. Of course these grooves may be of any desired length to permit any degree of bending of the yielding connections which the practice may require, but I prefer that the same should permit bending through substantially ninety degrees. The opposite end of the shaft g is provided with a series of grooves, best shown in Fig. 12, and a socket n placed within a tube m, has one or more internal projections or ribs n', which enter the grooves in the shaft g, such form of connection permitting the socket to move longitudinally with relation to the shaft g. The socket n, is connected with a spindle o, by a spiral spring or coil o', said spindle o having its bearings in the short cylindrical frame o^2, the opposite end of said spindle o being connected by a short spiral spring or coil o^3 with a socket or short tube o^4. The spindle or bearing o, is restrained from longitudinal movement by set screws 20, entering annular grooves formed therein. The frame o^2 is carried by a link o^5 to which it is secured by a thumb screw o^6 or otherwise, said link being pivotally connected at each end with links as o^7, o^8, which are respectively fixed to the supports or shell-like bearings o^9, o^{10}, the part o^9 being secured to the member m by a set screw m' or otherwise. Spiral springs m^2 or other suitable means may connect the part o^9 with the part o^2, and also the part o^2 with the part o^{10} to conceal and protect the rotating coils o', o^3. This form of connection is quite similar to that shown and described in Figs. 5 and 6, and operates in substantially the same manner and is for substantially the same purpose. Stops 25 are formed on the links o^5, o^7 and o^8, which co-operate to prevent the links being turned the one upon another through more than ninety degrees to prevent kinking of the yielding connections.

The hand piece shown on an enlarged scale in Fig. 13 is provided at one end with a flat spring u, having a circular portion or disk u' at its end, upon which is erected a shank portion u^2 quite small in diameter, on which a head or disk u^3 is placed, and the portion or bearing o^{10}, see Fig. 9, is provided with an angular slot u^4, which terminates in an enlarged circular opening u^5, see Fig. 19. This form of bayonet joint connection by which the hand piece may be connected to the part o^{10},—operates as follows:—As the shank u^2 follows along the slot u^4, the disk u' follows along the interior of the part o^{10}, and as soon as said disk arrives at the circular opening u^5, it is moved into said opening u^5 by its supporting spring, thereby locking the parts in position.

The socket o^4 has within it one or more ribs or projections similar to the ribs n', shown in Fig. 11, which engage the grooved end of a spindle u^6, which spindle is socketed at its other end to receive a drill or other tool u^7. As a clutch to hold the drill or other tool u^7 in place I have provided the forward end of the spindle u^6 with several external longitudinally arranged grooves, there being three herein shown, and at the forward end of each groove a hole 69, see Fig. 18, is made which communicates with the socket containing the tool. The tool holding jaws u^8 are composed of slender spring-acting arms provided with hardened blocks on their ends, and said jaws are fitted in said grooves so that the hardened blocks enter the holes 69 which communicate with the tool holding socket. The tendency is for the spring-acting arms to normally throw the blocks outwardly and thereby release any tool which may be placed in the socket, as shown in Fig. 18, but when compressed by sliding the sleeve u^9, to be described, over the spring-acting arms of the jaws, the said jaws will engage frictionally the shank of the tool and firmly hold it in place. The sleeve u^9 is

mounted on the spindle u^6 inclosing the jaws u^8 and is held pressed forward against a shoulder on the tapered end w of the spindle to thereby compress the jaws by means of a spiral spring u^{10} which incloses the spindle u^6, one end of said spring bearing against the flange u^{17} on the sleeve and the other end bearing against the cone bearing block u^{12} which is secured to said spindle u^6 by a pin u^{13} or otherwise. The cone bearing block u^{12} enters a conical recess in a block u^{14} screwed into the shell u^{15} and held in fixed position by a set screw u^{30}, thereby furnishing an adjustable cone bearing for one end of the spindle u^6. The conical end w at the opposite end of the spindle u^6 bears against the interior of the tapered or conical end 70 of the outer shell u^{40}. Cone bearings are thus provided for the spindle u^6 at each end.

A collar u^{16} is placed on the sleeve u^9 and bears against the flange u^{17} thereon, see Figs. 13 and 21, said collar having at one preferably both sides outwardly projecting pins u^{18}, upon each of which is placed two friction-rollers u^{19}. The pins u^{18} project through slots $u^{\times}$ in the tubular shell u^{15}, see Figs. 20 and 22, to thereby permit only longitudinal movement of the collar u^{16} to move the sleeve u^9 back against the tension of the spring u^{10}, and thereby release the jaws u^8 which hold the tool, or to permit said sleeve to return to its normal position forcing the jaws u^8 into engagement with the tool. The inner rolls u^{19} co-operate with the walls of the slots $u^{\times}$ to guide the collar in its longitudinal movement. The tube or shell u^{40} is screwed into the end of the tube or shell u^{15} and the shell u^{40} has on it a flange u^{21}, and the shell u^{15} has on it a flange u^{22}, between which is placed a rotatable shell or collar u^{20}. The rotatable shell u^{20} is provided internally with a short cam tube u^{25} shown withdrawn from the shell in Fig. 23, one end of said cam tube being flush with the end of the shell u^{20}, as shown in Fig. 23, and the other end has formed on it two inclined cam surfaces u^{31}, u^{32}, Fig. 23, also shown in dotted lines Fig. 16, and as developed in Fig. 15, said inclined surfaces serving as cams, upon or against which the outer friction rolls u^{19} bear, and as the said rolls are placed on the pins connected with the collar u^{16}, the said collar will be moved longitudinally in one or the other direction as said shell u^{20} is rotated in one or the other direction, thereby moving the sleeve u^9 to release or lock the tube. Projections u^{35} are formed on the cam ring at the termination of the cam surfaces u^{31}, u^{32}, and a pin 60, see Figs. 16 and 17 is provided which moves in guideways $60^{\times}$ on the shell u^{15}, and when pressed inwardly will engage one of said projections u^{35} as shown in Fig. 16, dotted lines, to thereby prevent the shell u^{20} from rotating. The cam surfaces u^{31}, u^{32} are so formed adjacent the projections u^{35} as to present recesses $u^{31\times}$ which are adapted to receive the outer rolls u^{19}, and when the shell u^{20} is locked in position by the pin 60 engaging one of said projections the said rolls u^{19} will occupy the said recesses, and thereby operate in conjunction with the said pin which lies upon the opposite side of the projections to hold the collar u^{16} in fixed position. It will be seen that when the pin 60 is pressed inwardly, the shell u^{20} is locked in position. Also by means of the recesses back of the projections u^{35} the collar u^{16} is locked in position, thereby holding the sleeve u^9 in fixed position to rigidly lock the tube, and the parts when so positioned cannot be released until the pin 60 is withdrawn, hence the tool will not easily become loosened.

To remove the tool u^7 the pin 60 is withdrawn, the shell u^{20} turned about one-half a revolution thereby moving the sleeve u^9 in the direction of the arrow 50 Fig. 14, against the spring u^{10}, permitting the jaws u^8 to release the tool.

Fig. 24, illustrates a yielding connection differing from, but which may be used instead of the springs or coils connecting the rotatable shafts. In said figure the shafts e and g are operatively connected by a yielding connection consisting of a universal joint j of usual or desired construction, the operation of the joint being in effect the same as though a spring were used, the joint, however, being more powerful.

This invention is not limited to the particular shape and construction of the various parts herein shown and described and the same may be varied without departing from the spirit and scope of the invention.

I claim—

1. In a dental engine, two telescoping tubular members, one having a longitudinal slot, and a ratchet toothed bar within said member, combined with a standard supporting the other member, a spring secured to said standard, a ratchet toothed block supported by the spring and normally extending through said slot and engaging the toothed bar, a band c^6 secured to the protruding end of the block and encircling the slotted member, and a knob on said band opposite the spring, substantially as described.

2. In a dental engine, the vertically adjustable stand, comprising a stationary tubular rod, a tubular rod movable telescopically within it, and slotted at one side, and a ratchet toothed bar located in said movable tubular rod and accessible through the slot, combined with the movable block c^4 connected to said stationary rod, and entering the slot to engage the ratchet toothed bar, preventing rotation yet permitting vertical movement of said movable rod, and means to move said block to disengage it from the bar, substantially as described.

3. In a dental engine, a vertical column, a driving pulley journaled therein at or near its lower end, and a supporting arm d at its upper end, combined with a shaft e provided at one end with a pulley e', a shaft carrying-arm d^2 pivoted to said supporting arm with

its pivotal point in line with the axis of the driving pulley and the center of the pulley e', a series of circumferential notches in the hub of said shaft carrying-arm, and a longitudinally movable spring-actuated pin on the said supporting arm adapted to spring into and engage one or another of the said notches to lock the hub when the said hub and its shaft supporting-arm have been turned into one or another position to vary the inclination of the shaft e, substantially as described.

4. In a dental engine, two rotatable shafts e, g, and bearings therefor, a frame pivotally connected at each end to the bearings of the shafts e, g, combined with an intermediate spindle as f^3, a bearing for the same mounted in said pivotally connected frame, and flexible connections joining the opposite ends of the said intermediate spindle f^3 to the said shafts e and g, respectively, substantially as described.

5. In a dental engine, two rotatable parts, an independent spindle between and connected with said parts respectively by yielding connections, combined with a bearing for the said independent spindle, and pivots for the bearing located at substantially the center of the length of each yielding connection, substantially as described.

6. In a dental engine, the hand piece having the spring u, disk u', and shank u^2, combined with the co-operating member o^{10}, having the entrance slot u^4 for the shank u^2 terminating in the circular opening u^5 to receive the disk u', substantially as described.

7. In a dental engine, the hand-piece comprising the spindle u^6 having longitudinal grooves arranged on its exterior with holes communicating with the tool holding socket, jaws u^8 consisting of slender spring-acting shanks and adapted to enter said grooves and having hardened blocks on their ends which are adapted to project through the holes and frictionally engage the shank of the tool, and the spring-pressed sleeve u^9 which controls the action of said jaws, combined with the rotatable shell u^{20} having cam surfaces by which said sleeve is moved against the tension of its spring to release the tool, substantially as described.

8. In a dental engine, the hand-piece comprising the tool carrying spindle u^6 provided with the tapered or conical end portion w at one end and having a shoulder, and the cone bearing block u^{12} at the opposite end, a clutch to retain a tool in the said spindle, the shell u^{40} having the tapered end portion 70 and the bearing block u^{14} made adjustable, the clutch controlling sleeve surrounding said spindle and bearing against the shoulder on the end w, and spring for pressing said sleeve forward to actuate the clutch and retain the same in its position holding a tool and to maintain the conical end w in continuous engagement with the bearing 70, substantially as described.

9. In a dental engine, the hand-piece comprising the shell or case, the tool carrying spindle u^6 and bearings therefor, longitudinal grooves formed on the exterior of said spindle having holes which communicate with the tool holding socket jaws u^8 consisting of slender spring-acting shanks having on their ends hardened blocks adapted to frictionally engage the shank of the tool, combined with the sleeve u^9, spring u^{10}, means for moving said sleeve to release the spring-acting jaws, and a locking device, whereby the sleeve may be held in fixed position, substantially as described.

10. In a dental engine, a hand-piece comprising a shell or case, the tool carrying spindle u^6 and bearings therefor, independent jaws u^8 to hold the tool in place by frictional engagement therewith, the movable sleeve u^9 to control said jaws, and spring u^{10}, combined with the collar u^{16} on the sleeve and abutting against the flange u^{17} thereon, pins each bearing two friction rolls projecting from said collar u^{18}, guide slots for the inner pair of rolls formed in the shell or case, a rotatable shell u^{20} having cam surfaces u^{31}, u^{32}, formed on it interiorly against which the outer pair of friction rolls bear, rotation of the shell acting through the cam surfaces and the said rolls to move said sleeve, substantially as described.

11. In a dental engine, a hand-piece comprising a shell or case, the tool carrying spindle u^6 and bearings therefor, independent jaws u^8 to hold the tool in place by frictional engagement therewith, the movable sleeve u^9 to control said jaws, and spring u^{10}, combined with the collar u^{16} on the sleeve, and abutting against the flange u^{17} thereon, pins each bearing two friction rolls projecting from said collar u^{18}, guide slots for the inner pair of rolls formed in the shell or case, a rotatable shell u^{20} having cam surfaces u^{31}, u^{32}, formed on it interiorly against which the outer pair of friction rolls bear, movement of the shell acting through the rolls to move said sleeve, and projections u^{35} also formed on the interior of said shell u^{20}, and the pin 60 movable into and out of engagement with said pin, substantially as described.

12. In a dental engine, a hand-piece comprising a shell or case, a tool carrying spindle u^6 and bearings therefor, independent jaws u^8 to hold the tool in place by frictional engagement therewith, the movable sleeve u^9 to control said jaws, and spring u^{10}, combined with the collar u^{16} on the sleeve and abutting against the flange u^{17} thereon, pins each bearing two friction rolls projecting from said collar u^{18}, guide slots for the inner pair of rolls formed in the case or shell, a rotatable shell u^{20} having cam surfaces u^{31}, u^{32}, formed on it interiorly against which the outer pair of friction rolls bear, movement of the shell acting through said rolls to move said sleeve, and projections u^{35} also formed on the interior of said shell u^{20}, and the pin 60 movable into and out of engagement with said projections, and roller receiving recesses just back of said

projections u^{35} which receive the rolls and thereby lock the collar u^{16} in fixed position when the shell u^{20} is locked in fixed position, substantially as described.

13. In a dental engine, two shafts e and g and bearings therefor, an independent spindle f^3 connected with the said shafts repectively by flexible connections, combined with the links f' pivoted to the bearings for the said shafts, and supporting a bearing for the said intermediate spindle f^3, and limiting stops on the said links, to operate, substantially as described.

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

FRANK K. HESSE.

Witnesses:

FREDERICK L. EMERY,

EMMA J. BENNETT.