No. 606,755. Patented July 5, 1898.

A. W. BROWNE.

DENTAL ENGINE HANDPIECE.

(Application filed Mar. 9, 1898.)

(No Model.)

FIG. 1.

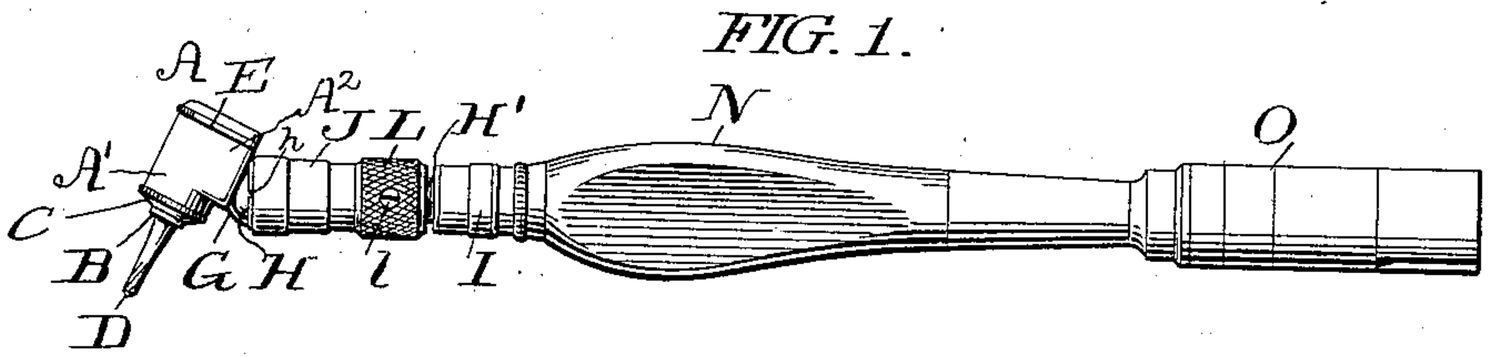


FIG. 2.

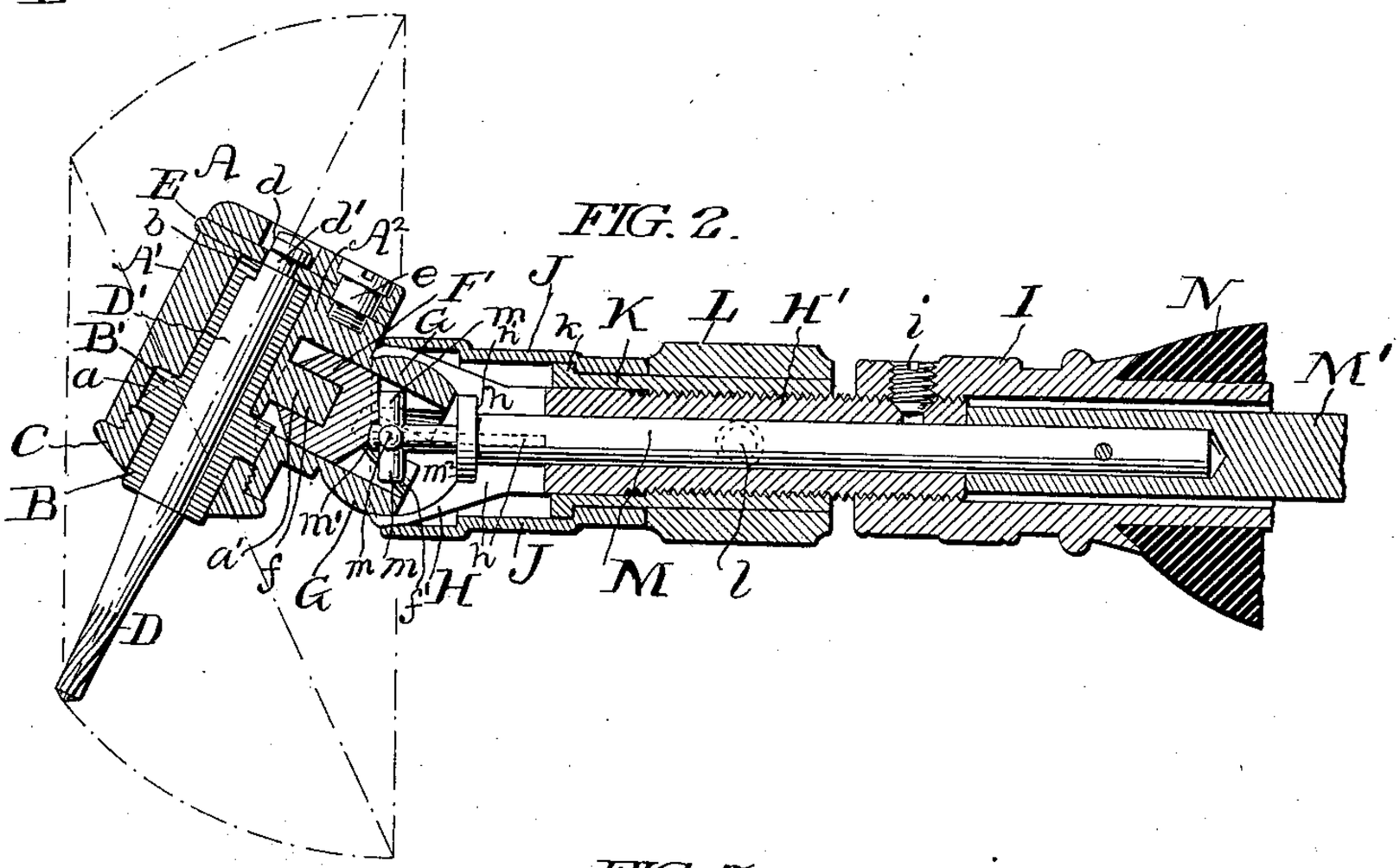


FIG. 3.

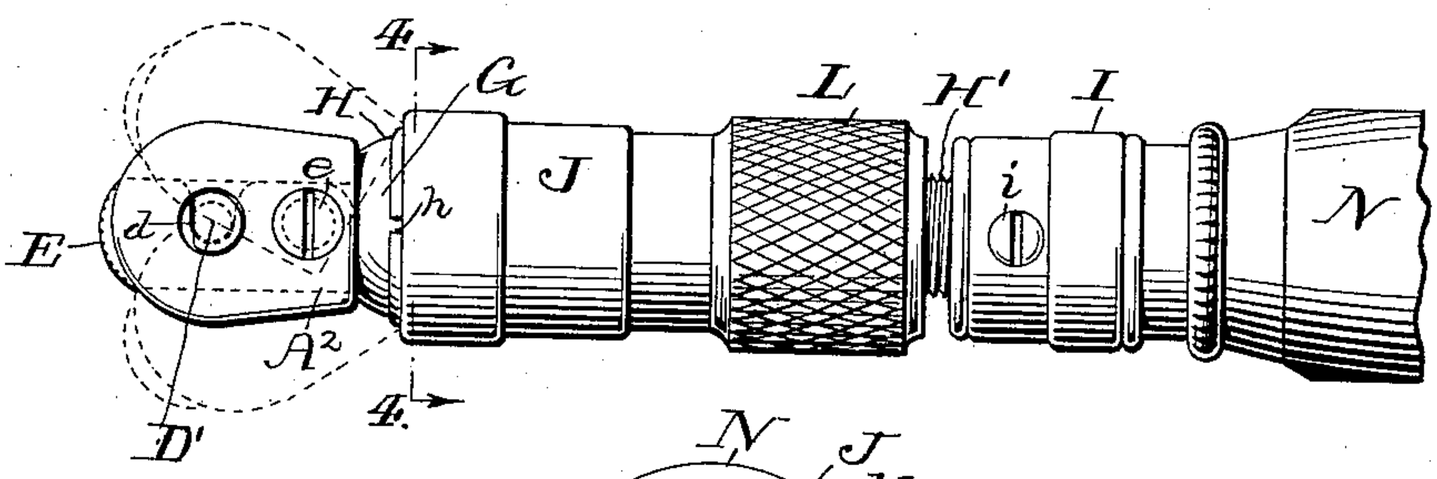
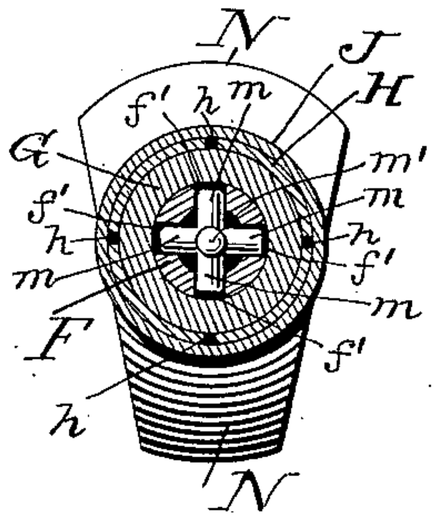


FIG. 4.



WITNESSES:

Theodore D. Vaill.

Robinson L. Vaill

INVENTOR:

Arthur W. Browne,

by Edw. F. Simpson, Jr.

Attorney.

UNITED STATES PATENT OFFICE.

ARTHUR W. BROWNE, OF PRINCE'S BAY, NEW YORK, ASSIGNOR TO THE S. S. WHITE DENTAL MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA.

DENTAL-ENGINE HANDPIECE.

SPECIFICATION forming part of Letters Patent No. 606,755, dated July 5, 1898.

Application filed March 9, 1898. Serial No. 673,192. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR W. BROWNE, a citizen of the United States, residing at Prince's Bay, in the county of Richmond and State of New York, have invented certain new and useful Improvements in Dental-Engine Handpieces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to handpieces for dental engines; and it consists of certain improvements, hereinafter claimed, applicable to that class of handpieces in which the tools carried thereby may be operated at various angles relatively to the handle or body of the handpiece.

The object of my invention is to provide a handpiece of this class of simple and comparatively durable construction and in which the tools carried by it may be quickly and easily adjusted to any angle within certain limits relatively to the handle portion, the tool firmly locked in any position to which it may be adjusted or yieldingly held in any position of angular adjustment, and possessing other advantages, all of which will hereinafter be more fully explained.

In the accompanying drawings, Figure 1 is a view in side elevation of a handpiece made in accordance with my invention. Fig. 2 is a sectional longitudinal central view of the front portion of said handpiece on an enlarged scale. Fig. 3 is a view in elevation of the front portion of the handpiece shown in Fig. 2 and turned at a right angle thereto. Fig. 4 is a cross-sectional view of the handpiece on the line 4 4 of Fig. 3.

The head or tool-holding portion of the handpiece consists of a tubular elbow A, composed of two members A′ and A^2, arranged, preferably, at a right angle relatively to each other. Fitted in the bore of the member A′ of the head and having bearing therein is a rotary socket or tool-holder B, provided with a gear B′, which rotates with the tool-holder in an enlarged portion *a* of the bore of the member A′ of the head. A perforated nose-piece C, having screw-threaded connection with the member A′, serves to hold the socket or tool-holder in place in the head. Suitable operating-tools, such as the bur D, are adapted to be fitted in the tool-holder by way of the shank D′, which is inserted in the socket of the tool-holder, and a flattened portion *d* on the inner end of the shank engaging a corresponding flattened projection *b* in the inner end of the socket of the tool-holder serves to cause the operating-tool to rotate with the tool-holder. In the end of the tool-shank is an annular groove *d*′, adapted to be engaged by a notched swing-slide E, pivoted by a screw *e* within a slot in the head A. The outer end of the swing-slide is rounded and milled and projects slightly beyond the front of the head A in order that it may be readily swung by the thumb or finger into operative position to cause its notch to engage the groove of the operating-tool and securely hold the same in position in the tool-holder without interfering with its rotary motion or be swung out of engagement with said operating-tool to permit the same to be withdrawn from the holder. Fitted in the bore of the member A^2 of the head is a gear F, a socket-bearing *f* in the front end of which fits and rotates upon a journal *a*′, projecting from the partition between the bores of the respective members of the head. The front end of the gear F engages the gear of the tool-holder B, which projects through an opening in said partition, as will be seen by reference to Fig. 2, whereby when the gear F is rotated, as will later on be explained, rotary motion is imparted to the tool-holder and the tool carried thereby.

For the purpose of making suitable supporting connection between the above-described head or tool-holding portion of the handpiece and the handle portion or body, farther on to be described, in such a way that it may be adjusted to any angle within certain limits relatively to said handle portion and at the same time provide a suitable driving connection between the gear F of the head and the driving-spindle of the handpiece, which driving connection will be freely operative in whatever position of angular adjustment the head may occupy relatively to the handle portion, I have provided mechan-

ism as follows: On the exposed end of the member A^2 of the handpiece-head is a rounded or ball-like projection G, constituting one member of a universal or ball-and-socket supporting connection between the head and handle portions of the handpiece, the other member of this connection being formed by a spring-jawed socket II, split at *h* and provided with a tubular exteriorly-threaded extension II′, which screws into the front interiorly-threaded end of a tubular metallic handle-section I of the handle portion. The connection between the socket extension II′ and the handle-section I is preferably by means of left-handed screw-threads, and the socket member II may be securely held in the handle-section I by means of a set-screw *i*, passing through an opening in said handle-section and into an indentation on the extension II′ of the socket member. The ball member of the supporting connection fits in the socket member and may be freely moved about therein in any direction, and consequently the handpiece-head may be moved or adjusted to any angular position relatively to the handle portion, the extent of this universal movement of the head being limited by the head coming in contact with the outer end of the socket member II. Surrounding the spring-jawed socket member II is a clamp-sleeve J, having a cone-shaped socket corresponding with the exterior cone shape of the socket member II. The inner end of this sleeve, which is reduced in diameter, surrounds and freely turns upon one end of a long nut K, screwing upon the threaded socket extension II′, and a flange or annular shoulder *k* on the forward end of said long nut and bearing against a shoulder on the interior of the clamp-sleeve, and a collar L, secured to the long nut by means of a set-screw *l*, serve to hold the clamp-sleeve upon the long nut and cause said sleeve to move endwise with the nut, while leaving said nut free to be turned without turning said sleeve. The collar L is preferably roughened or serrated upon its outer surface and provides ready means for turning the long nut in opposite directions. Turning of the nut in one direction by means of its serrated collar moves the clamp-sleeve forward to cause the spring-jaws of the socket II to grip and hold the ball member G with more or less tightness, according to the amount of pressure brought to bear by the clamp-sleeve, while turning of the nut in the opposite direction releases the ball member from pressure of the socket member and leaves it free to be moved in all directions.

The front section M of a rotary driving-spindle has bearing in the tubular extension II′ of the socket member II of the said universal supporting connection and is connected at its rear end with the main section M′ of said driving-spindle, which is mounted in bearings in the handle portion of the handpiece. Near the front end of the spindle M is an annular flange m^2, which abuts against a shoulder *h*′ on the inside of the socket member II and serves to prevent inward movement of the driving-spindle, outward movement of this spindle being prevented by the end of the main section M′ of the spindle abutting against the inner end of the socket-member extension II′.

The universal driving connection between the gear F of the handpiece-head and the driving-spindle M is shown as consisting of four lateral projections *m* on the end of the driving-spindle M and which are adapted to engage with as many longitudinal slots or notches *f*′ in the end of the gear F opposite to the end thereof provided with the gear-teeth. The extremity of the driving-shaft, at the center or junction of the lateral projections, is formed with a slightly-rounded projection *m*′, adapted to fit in a corresponding concaved seat in the bottom of a socket in the gear F, into which socket the slots or notches *f*′ open. It will be seen that the gear F may be freely rocked in all directions about the projection *m*′ as a center without interfering with the driving connection between said gear F and driving-spindle even while the parts are being operated. It will further be seen that the projection *m*′, about which the universal driving connection turns, is also the center of the univeral or ball-and-socket supporting connection and that when the handpiece-head is rocked in any direction about said universal supporting connection the said universal driving connection permits of the gear F moving correspondingly.

A hard-rubber handle-section N, preferably flat-sided or triangular in cross-section, may be fitted upon the metal handle-section I and prevented from turning thereon in any suitable way. A metal ferrule O, screwed upon the rear end of the handle-section I, and a dog (not shown) on the rear end of the driving-spindle M′ form part of a "slip-joint" connection of well-known construction for making a readily-detachable connection with a flexible driving-shaft and sheath of a dental engine.

The operation of my improved handpiece is as follows: With the handpiece suitably connected to a dental engine and an instrument or operating-tool of the desired size and shape, as the bur D, locked in the tool-holder B, rotary motion may be imparted to the driving-spindle M by the operation of the engine and this rotary motion communicated to the tool-holder and tool carried thereby by means of the universal driving connection between said driving-shaft and the gear F and the angle-gearing between the gear F and the gear B′ of the tool-holder B. By relieving the ball member G of the universal supporting connection between the head and handle portions of the handpiece from pressure of the spring-jawed socket member II by turning of the collar L the head may be moved in any direction whatever to vary the angular position of

the operating-tool relatively to the longitudinal axis of the handpiece, the universal driving connection moving with and accommodating itself to the movement of the universal supporting connection. After the head and tool have been adjusted to the proper position they may be firmly clamped and retained in such position by turning of the collar L in the proper direction, or any desired degree of frictional tension may be brought to bear upon the head by means of the collar.

In a handpiece constructed according to my invention the operating-tool, it will be seen, is susceptible of a very wide range of adjustment in all directions. It can be moved in the arc of a circle in the plane of the longitudinal axis of the handpiece from its extreme obtuse angle of, say, one hundred and fifteen degrees to its extreme acute angle of, say, sixty-three degrees, these extreme positions being indicated by dotted lines, Fig. 2. When in either of these extreme positions or in any intermediate position between them, the operating-tool may be moved in a complete circle about the longitudinal axis of the handpiece. It will further be seen that the handpiece-head may be moved laterally to adjust the longitudinal axis of the operating-tool to one side or the other of the longitudinal axis of the handle portion, such positions being indicated by dotted lines, Fig. 3. When in either of these positions, the operating-tool may be adjusted to various angles relatively to the handpiece, approximately the same as when the longitudinal axis of the operating-tool and the handpiece lie in the same plane. In fact, the operating-tool, owing to the universal connections, may be adjusted, within certain limits, in any direction to occupy any angular position with reference to the handpiece. The construction is such that the operating-tool may be locked in any position whatever to which it may be adjusted, which is not true of adjustable-angle handpieces as heretofore constructed and in which detent devices are employed to lock the operating-tool in certain determined positions. The clamping device for the universal or ball-and-socket supporting connection between the handpiece-head and handle portions may be readily actuated to firmly lock the head in any position to which it may be adjusted, so that the position of the operating-tool cannot be altered without first releasing the clamping device, or said clamping device may be adjusted or set to apply just so much pressure upon the supporting connection as is necessary to hold the operating-tool against ordinary working pressure applied to it in operation, while leaving it free to be readily adjusted to any position by the thumb or finger without the necessity of actuating the clamping device, or just so much pressure may be applied to the supporting connection by the clamping device as will permit the operating-tool to yield under excessive working pressure in operation, while holding it with sufficient force to prevent its yielding to ordinary or light pressure in operation, this latter adjustment being particularly advantageous when the instrument is being operated upon frail teeth in the human mouth—a function unique in this class of devices. One advantage of the capability of the operating-tool being turned in a circle about the longitudinal axis of the handpiece is that when, as shown, the finger-grasping portion of the handpiece, as N, is flattened or triangular in cross-section the dentist may turn the operating-tool about the handpiece without changing the position of the same in his hand. By this means the operating-tool may be readily adjusted, so that it may be operated when downward, upward, or sidewise pressure is applied to it without turning the handpiece to accommodate the changed direction in which the operating-tool is to be operated.

It should be observed that my present invention consists of a compound universal connection—that is to say, a universal or ball-and-socket supporting connection between the handpiece-head and the handle portion and a universal driving connection between the tool-holder of said head and the driving-spindle of the handle portion, together with the means for clamping the same. As to this compound universal connection and its clamping device, it is obvious that the detailed construction herein shown and described may be varied or modified while keeping within the spirit and scope of my invention, and I therefore do not wish to confine myself to said detailed construction. As to the other features of the handpiece herein shown and described, I desire it to be understood that I do not claim them herein as of my present invention and also that my present improvements may be applied to adjustable-angle handpieces differing in construction from the one shown and described. For example, the handpiece-head and the tool-holder, the handle portion, and the ferrule of the slip-joint connection may be of any well-known or suitable construction. Instead of applying my improvements to a handpiece of the slip-joint variety it is obvious that they may be used with any other style of adjustable-angle handpiece—such as the ordinary "angle attachment," which is adapted to be fitted upon a handpiece, or with a handpiece that is connected directly to an engine-arm or flexible shaft—nor is it necessary that the handle portion of the handpiece should be flattened or triangular in cross-section. It will also be obvious that that part of my improvements which provides for yieldingly or frictionally clamping the adjustable handpiece-head is not confined to a handpiece in which the head is capable of being adjusted in all directions, for I believe myself to be the first to provide means for yieldingly holding the head of adjustable-angle dental-engine handpieces.

I claim as my invention—

1. The combination, in a dental-engine adjustable-angle handpiece, of the handle portion, the head, a ball-and-socket supporting connection between said handle portion and said head, a driving-spindle mounted in said handle portion, a tool-holder mounted in said head at an angle to said handle portion, and a universal driving connection between said driving-spindle and said tool-holder, the said universal supporting and driving connections having a common center, substantially as and for the purposes hereinbefore described.

2. The combination, in a dental-engine adjustable-angle handpiece, of the handle portion, the head, a ball-and-socket supporting connection between said handle portion and said head, a driving-spindle mounted in said handle portion, a tool-holder mounted in said head, a universal driving connection between said driving-spindle and said tool-holder, and an adjustable clamping device for frictionally clamping said ball-and-socket supporting connection between the handle portion and the head, whereby any desired degree of frictional tension may be applied to said supporting connection, substantially as and for the purposes hereinbefore described.

3. The combination, in a dental-engine adjustable-angle handpiece, of the handle portion, a head having ball-and-socket supporting connection therewith, a tool-holder mounted in said head at an angle to said handle portion, and provided with gear-teeth, a gear mounted in said head at an angle to said tool-holder and meshing with the gear-teeth thereof, and a rotary driving-spindle mounted in said handle portion and having universal driving connection with said gear, substantially as and for the purposes hereinbefore described.

4. The combination, in a dental-engine adjustable-angle handpiece, of the handle portion provided with a split socket, a head provided with a ball fitted in said split socket, an endwise-movable sleeve surrounding said split socket for causing the same to frictionally clamp the ball on said head, means for adjusting said sleeve, a tool-holder mounted in said head, a driving-spindle mounted in said handle portion, and a universal driving connection between said tool-holder and said driving-spindle, substantially as and for the purposes hereinbefore described.

5. The combination, in a dental-engine adjustable-angle handpiece, of the handle portion, a head having ball-and-socket supporting connection therewith, a tool-holder mounted in said head at an angle to said handle portion and provided with gear-teeth, a gear mounted in said head at an angle to said tool-holder and meshing with the gear-teeth thereof, said gear being provided with a socket, and a concave seat in the bottom of said socket, and also with slots in the side of said gear and which open into said socket, a rotary driving-spindle mounted in the handle portion and provided with a rounded extremity having bearing in the seat in said gear and also with lateral projections which engage the slots in said gear, substantially as and for the purposes hereinbefore described.

6. The combination, in a dental-engine adjustable-angle handpiece, of the handle portion, a spring-jawed socket provided with a tubular externally-threaded extension connected to said handle portion, a clamp-sleeve surrounding said spring-jawed socket, a nut screwing upon the threaded extension of said socket and having swiveling connection with said sleeve, a collar secured to said nut, a driving-spindle having bearing in said handle portion and passing through said tubular socket extension and projecting into said socket, a head provided with a ball seated in said socket, a tool-holder mounted in said head at an angle to said handle portion and provided with gear-teeth, a gear also mounted in said head at an angle to said tool-holder and meshing with the gear-teeth thereof, and a universal driving connection between said gear and the driving-spindle of the handle portion, substantially as and for the purposes hereinbefore described.

7. The combination, in an adjustable-angle handpiece for dental engines, of the handle portion, the driving-spindle mounted therein, the head provided with a tool-holder arranged at an angle relatively to said handle portion, said head and tool-holder being adjustably connected to said handle portion and said driving-spindle, respectively, and an adjustable clamping device for frictionally clamping said head, whereby it may be either firmly held in any position whatever to which it may be adjusted or yieldingly held against working pressure while in operation, but free to be angularly adjusted without operating the clamping mechanism, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR W. BROWNE.

Witnesses:
SEYMOUR CASE,
M. A. COLE.