O. H. & A. F. PIEPER.

DENTAL ENGINE.

APPLICATION FILED MAR. 2, 1910.

1,040,576.

Patented Oct. 8, 1912.

2 SHEETS—SHEET 1.

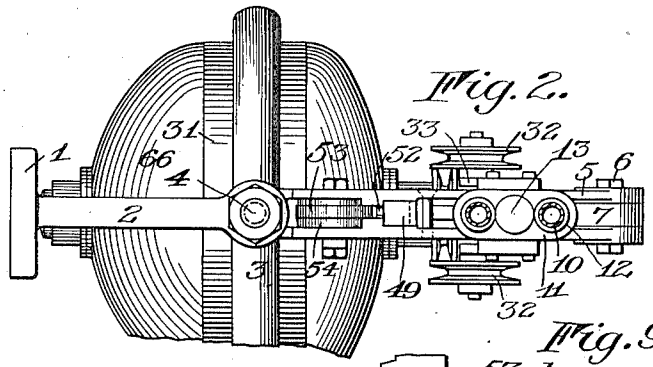

Fig. 2.

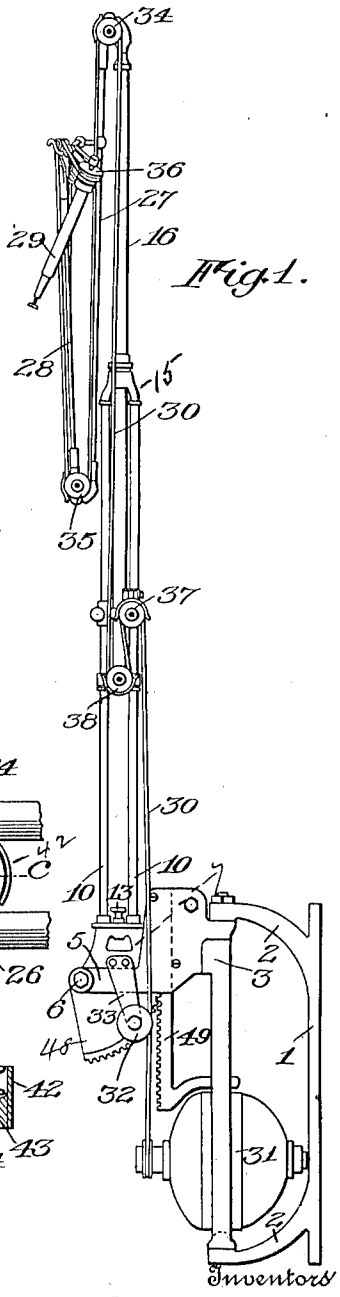

Fig. 1.

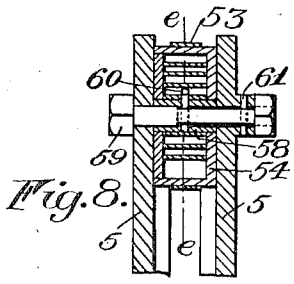

Fig. 8.

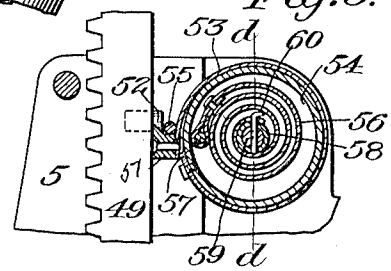

Fig. 9.

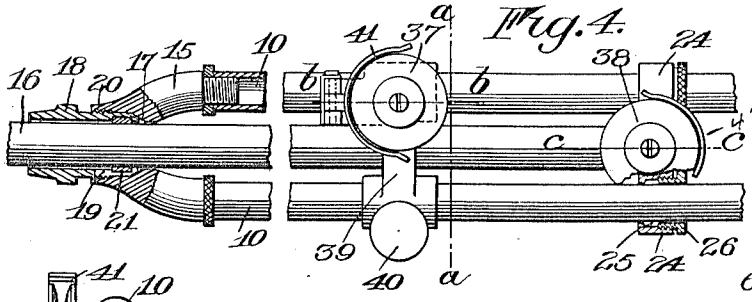

Fig. 4.

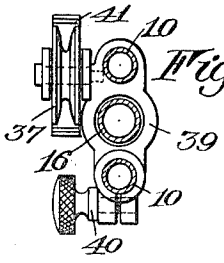

Fig. 5.

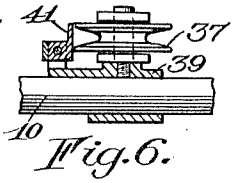

Fig. 6.

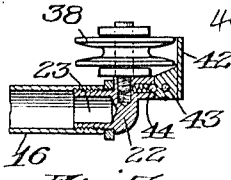

Fig. 7.

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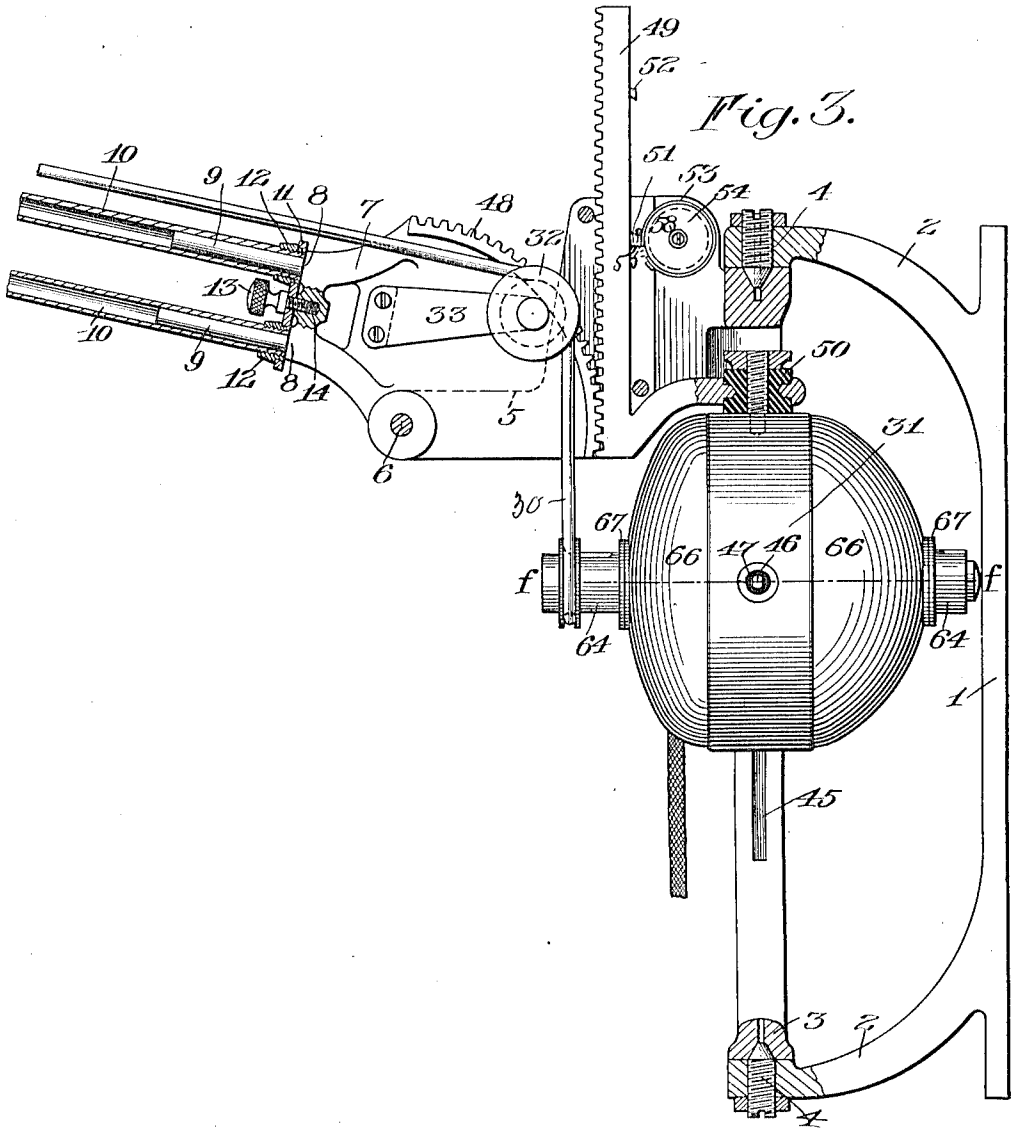
Fig. 3.



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DENTAL ENGINE.

1,040,576. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed March 2, 1910. Serial No. 546,768.

To all whom it may concern:

Be it known that we, OSCAR H. PIEPER and ALPHONSE F. PIEPER, both of the city of Rochester, county of Monroe, and State of New York, have invented certain new and useful Improvements in Dental Engines; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

The present invention relates to dental engines and it has for an object to provide a construction in which the motor is so arranged that it acts as a counterbalance for the supporting arm, while at the same time its weight is so disposed that it does not interfere with the turning of the supporting arm about a vertical axis.

Another object of the invention is to provide an improved supporting arm formed of telescoping members so constructed that binding action between the members, interfering with their free operation, is obviated.

To these and other ends the invention consists in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings: Figure 1 is a side view of the engine with the supporting arm thereof raised to its uppermost position; Fig. 2 is a detail top view of the engine with the supporting arm partially broken away; Fig. 3 is an enlarged side view of the engine with parts in vertical section, a part of the supporting arm being removed; Fig. 4 is a detail view of the supporting arm in proximity to the joint between its members; Fig. 5 is a section on the line *a*—*a* of Fig. 4; Fig. 6 is a section on the line *b*—*b* of Fig. 4; Fig. 7 is a section on the line *c*—*c* of Fig. 4; Figs. 8 and 9 are vertical sections of the buffer employed for retarding the motor or counterbalance near the latter part of its movement; Fig. 8 being a section on the line *d*—*d* of Fig. 9, and Fig. 9 being a section on the line *e*—*e* of Fig. 8.

In the embodiment of the invention herein illustrated there is employed an attaching member or bracket 1 having upper and lower arms 2 on which turns a frame 3, removable bearings 4 for this purpose being provided on the arms 2 to coöperate with bearing recesses in the frame 3 so that the latter may swing about the vertical axis. The frame 3 is provided with a pair of parallel arms 5 between which is pivoted at 6 on a horizontal axis the supporting arm or member of the engine. The supporting arm in this instance comprises a pivot member 7 formed of a single casting and provided at one side with a shoulder 8 from which projects integral pins or projections 9. These pins or projections are detachably engaged by the inner end of the inner member of the supporting arm, the latter preferably comprising two tubular rods 10 fitted over the projections 9 and connected at their inner ends by a member or plate 11 which has two hollow bosses 12 secured thereto and to the tubular rods 10. The plate 11 rests against the shoulder 8 and is held in such a position by any suitable means. In the present instance a thumb screw 13 passes through the plate 11 and engages screw threads on the walls of the opening 14 in the pivot member 7.

The outer ends of the tubular rods 10 are preferably connected by a member 15 in the form of a yoke provided with a guide having tapering walls 17 and its axis extending in a line between the rods 10 to receive the outer member 16 of the supporting arm. Fitted within this opening and about the member or rod 16 is a sleeve 18 split at 19 and having its inner ends tapered to coöperate with the tapered portion 17 of the opening, screw threaded connection 20 being provided between the exterior wall of the sleeve and the interior wall of the opening so that the tapered portion of the sleeve may be forced into engagement with the tapered wall of the opening to compress a packing ring 21 into engagement with the tubular rod 16. The inner diameter of the sleeve 18 is much larger than the external diameter of the tubular rod 16 so that the latter lies in spaced relation to the inner walls of the sleeve and the nickle plating or other polished surface of the tubular rod is not affected by the telescoping movement. Arranged to engage the end of the tubular rod 16, there is provided a member 22 hav-

ing an exteriorly threaded boss 23 fitting the rod 16. This member may carry two guides 24 through which the rods 10 travel, and the guides 24 are provided with pockets 25 to receive packing which prevents the abrasion of the surface of the tubes 10, jam nuts or bushings 26 holding the packing in position.

At the outer end of the member 16 is provided a pendant arm 27 carrying a hand-piece connecting-arm 28 which has at its outer end the hand-piece 29. The latter is driven by an endless cable 30 which passes from a pulley on the shaft of the motor 31, (supported in a manner to be hereinafter described) over pulleys 32 supported in rear of the turning axis 6 on arms 33 lying on the outside of the frame arms 5; one strand of the cable passing directly to one of the pulleys 34 at the outer end of the supporting arm, thence to one of the pulleys 35 to the tool pulley 36; the other strand passing about a pulley 37 on the inner member 10, thence about a pulley 38 on the inner end of rod 16 and then successively to the pulley 34, the pulley 35 and the pulley 36, this arrangement permitting the telescoping of the supporting arm while maintaining the driven cable taut. The pulley 37 is preferably supported on one side of the bracket 39 which surrounds the rods 10 and 16 and is held to the rods 10 by a clamping screw 40, a retaining device 41 being provided on the bracket 39 to prevent the cable leaving the pulley. The pulley 38 is supported on one side of the rod supporting member 22, the cable being retained on the latter by a guard 42 pivoted at 43 and yieldingly held in either of two positions by a spring pressed ball 44 entering notches in the guard 42.

The motor for driving the hand piece is preferably movable vertically and to this end the frame 3, on which the motor is supported, is of yoke formation, its arms being provided on their opposed faces with guideways 45 receiving guide projections 46 which, in this instance, are resiliently supported in soft rubber cups 47 from the motor, the resilient cups acting as insulators and preventing the vibrations of the motor being transmitted to the frame 3.

In order that the motor may counterbalance the supporting arm connection between the latter and said motor is provided. Preferably this connection is in the form of a sector-shaped or segmental rack 48 formed integral with the pivot member 7 and meshing with a straight rack 49 which is resiliently connected to the motor 31 by a soft rubber thimble 50, also serving as an insulator between these parts. As the supporting arm approaches a vertical position, shown in Fig. 1, it exerts a constantly decreasing resistance to the action of the counterbalance or motor, and after it has passed a certain point, such resistance becomes so small that the arm moves with considerably greater rapidity under the influence of the counter-balance or motor, and in order to overcome any tendency to jar, due to the action described, as the arm reaches a vertical position there is employed a buffer or retarding means comprising in this instance an abutment 51 adapted to be engaged by an abutment 52 on the rack 49 and preferably secured to the free end of a flexible member 53 which is passed about a drum 54 located on the swinging frame 3 between the arms 5 of the latter. The abutment 51 normally lies in engagement with the stop 55 being held thereagainst by a spring which, in this instance, is in the form of a true spiral 56 arranged within the drum 54 and having one end secured at 57 to the drum and the other end secured to the sleeve 58. The latter is rotatable in the side walls of the drum and is supported upon a pin or bolt 59 which connects the arms 5 of the frame 3. The bolt 59 is preferably provided with a longitudinal slot receiving a pin 60 in the sleeve 58 to hold the latter against rotation, the bolt in turn being held against rotation by a pin 61 secured to the frame 3 and received also within the slot. It is apparent that the bolt 59 may be withdrawn out of engagement with the pin 61 and rotated to turn the sleeve 59 in order that the tension of the spring 56 may be varied, the pin 61 serving to hold the bolt in its adjusted position.

The operation of the engine will be apparent to those familiar with these machines, but it may be stated generally that the lowering of the supporting arm effects, through the racks 48 and 49, the elevation of the motor 31 which so acts on the arm to counterbalance the latter. Of course, when the supporting arm is lowered the hand piece, through the arms 27 and 28, may assume any position, the turning of the frame 3 also assisting in the positioning. When the supporting arm is again moved upwardly, the abutment 52, toward the latter part of the downward movement of the motor, engages the abutment 51 on the retarding device or buffer, thus preventing the arm being moved suddenly to an upright position, it being apparent that the lighter becomes the effect of the arm the greater becomes the cushioning effect of the buffer so that the counterbalancing effect is still maintained.

From the foregoing it will be seen that there has been provided a supporting arm in which the frictional contact between the two telescoping members has been reduced to a minimum so that the chances of binding have also been reduced. The motor is so positioned that the machine does not require a great deal of space for installation and the weight of the motor is so disposed that it does not materially affect the turning of the

supporting arm about the vertical axis. The connection between the motor and the supporting frame prevents the vibrations of the motor being transmitted to the supporting arm.

We claim as our invention:

1. In a dental engine, the combination with a frame mounted to turn about a vertical axis, of a supporting arm mounted to turn on the frame about a horizontal axis, a hand piece carried by the supporting arm, a counter-balance mounted in said frame, means carried by the counter-balance having positive engagement with the supporting arm, and means for guiding the counterbalance vertically in the frame.

2. In a dental engine, the combination with a frame mounted to turn about a vertical axis, of a supporting arm mounted to turn about a horizontal axis on the frame, a hand piece on the arm, a counterbalance mounted in the frame, means guiding the counter-balance vertically on the frame, a sector-shaped rack on the arm concentric with the axis of the latter, and a straight rack on the counterbalance meshing with the sector-shaped rack.

3. In a dental engine, the combination with a frame mounted to turn about a vertical axis and provided with vertical guideways, of a supporting arm mounted to turn about a horizontal axis on the frame, a hand piece on the arm, a motor for driving the hand piece, guide projections resiliently carried by the motor and operating in the vertical guideways of the frame, driving connection between the motor and the hand piece, and means operatively connecting the motor and the arm whereby the latter is counterbalanced by the former.

4. In a dental engine, the combination with a frame mounted to turn about a vertical axis, of a supporting arm mounted to swing about a horizontal axis on the frame, a hand piece supported by the arm, a motor vertically movable on the frame for driving the hand piece, a sector-shaped rack on the arm concentric with the axis of turning of the latter, a straight rack resiliently connected to the motor, and a driving connection leading from the motor and connected to the hand piece.

5. In a dental engine, the combination with a yoked frame having guideways on its arms and mounted to turn about a vertical axis, of an arm mounted to swing on the frame about a horizontal axis, a hand piece supported by the arm, a motor for driving the hand piece mounted in said frame, guide projections resiliently carried by opposite sides of the motor and coöperating with the guideways on the frame so that the motor is alined with the axis of turning of the frame, a sector-shaped rack on the arm, a straight rack on the motor resiliently connected to the latter, and a driving connection leading from the motor and connected to the hand piece.

6. In a dental engine, the combination with a frame, of a supporting arm mounted to turn about a horizontal axis on the frame, a hand piece carried by the supporting arm, a motor slidably mounted upon the frame and having a connection with the supporting arm whereby to counter-balance the same, and driving connections between the motor and the hand piece.

7. In a dental engine, the combination with a hand piece and a supporting arm therefor, of a motor, means for guiding the motor vertically, counter-balancing connections between the motor and the supporting arm, a driving cable leading from the motor and connected to the hand piece, and a pair of pulleys located in the rear of the turning axis of the arm and having the driving cable passing thereover toward and from the hand piece.

8. In a dental engine, the combination with a supporting arm mounted to turn about a horizontal axis, of a hand piece carried by the arm, a motor for driving the hand piece mounted in the frame for vertical movement and having connection with the supporting arm whereby to counter-balance the latter, an elastic buffer for retarding the movement of the latter, and a driving connection leading from the motor to the hand piece.

9. In a dental engine, the combination with a hand piece and a supporting arm therefor, of a motor, a driving connection leading from the motor to the hand piece, the supporting arm embodying a pivoted member having projections extending therefrom, a member formed of tubes fitting the projections, a plate connecting the tubes, and means for securing the plate to the pivoted member.

10. In a dental engine, the combination with a hand piece and a supporting arm therefor, of a motor, a driving connection leading from the motor to the hand piece, the supporting arm embodying a pivoted member having projections extending therefrom and a shoulder at the base of the projections, of a member comprising two tubes fitted to the projections, a plate connecting the tubes and abutting the shoulder, and a screw for holding the plate against the shoulder.

11. In a dental engine, the combination with a hand piece and a supporting arm therefor, of a motor, a driving connection leading from the motor to the hand piece, the supporting arm embodying an inner member including a pair of rods, a connecting device at the outer ends of the rods, an outer member arranged for movement in the connecting device and having guiding means

coöperating with each of the beforementioned rods.

12. In a dental engine, the combination with a hand piece and a supporting arm therefor, of a motor, a driving connection leading from the motor to the hand piece, the supporting arm embodying a member provided with an opening having tapering walls, a member passing through the opening, a split sleeve also fitting in the opening about the last mentioned member and engaging the tapering walls of the opening, and a packing ring held by the split sleeve and compressed upon the last mentioned member by the tapered walls.

13. In a dental engine, the combination with a frame mounted to turn about a vertical axis, of a supporting arm mounted to turn on the frame about a horizontal axis, a hand piece carried by the supporting arm, a counter-balance mounted in the frame, means operatively connecting the counter-balance with the supporting arm comprising a curved toothed surface on one of the parts in engagement with a correspondingly toothed plane surface on the other part, and means for guiding the counter-balance vertically in the frame.

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