(No Model.)

4 Sheets—Sheet 1.

A. J. McDONALD.

DENTAL ENGINE.

No. 604,837. Patented May 31, 1898.

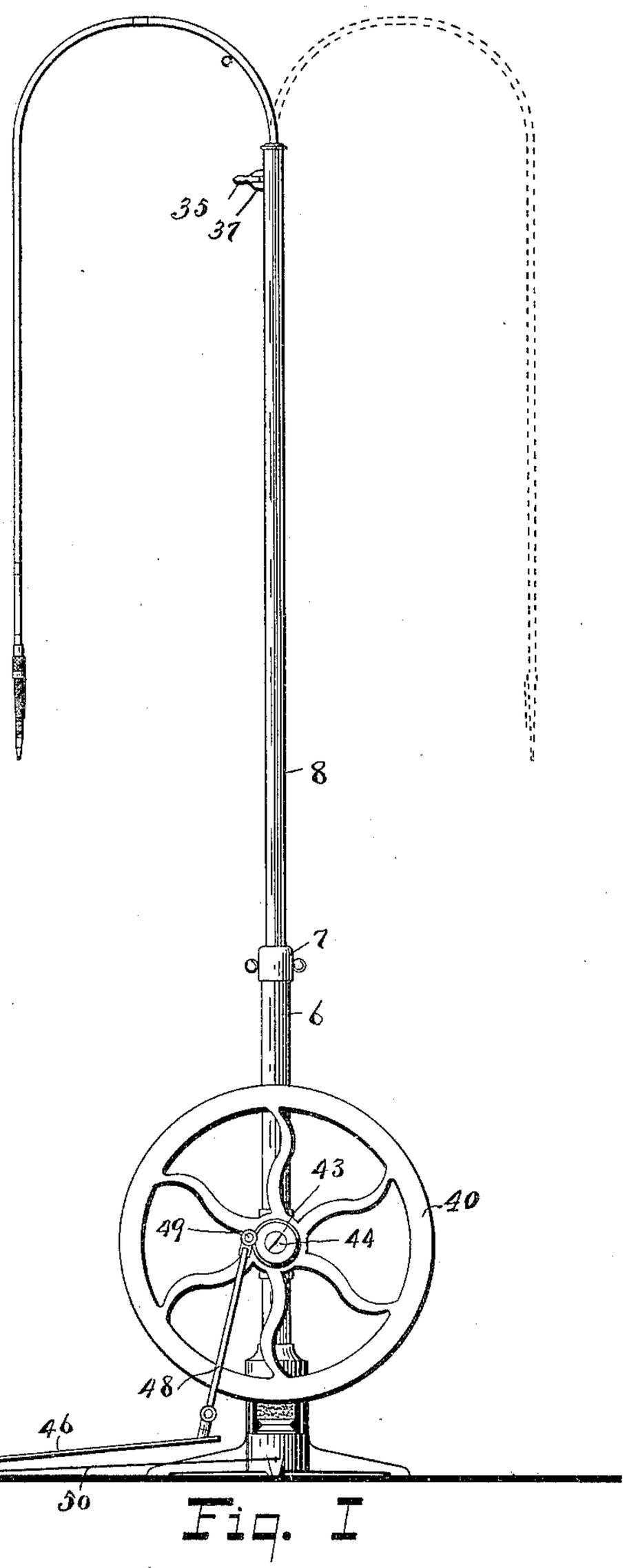


Fig. I

WITNESSES:
R. C. House
H. M. Imboden

INVENTOR,
A. J. McDonald,
BY
Warren & House,
HIS ATTORNEY.

(No Model.) 4 Sheets—Sheet 2.

A. J. McDONALD.

DENTAL ENGINE.

No. 604,837. Patented May 31, 1898.

Fig. II

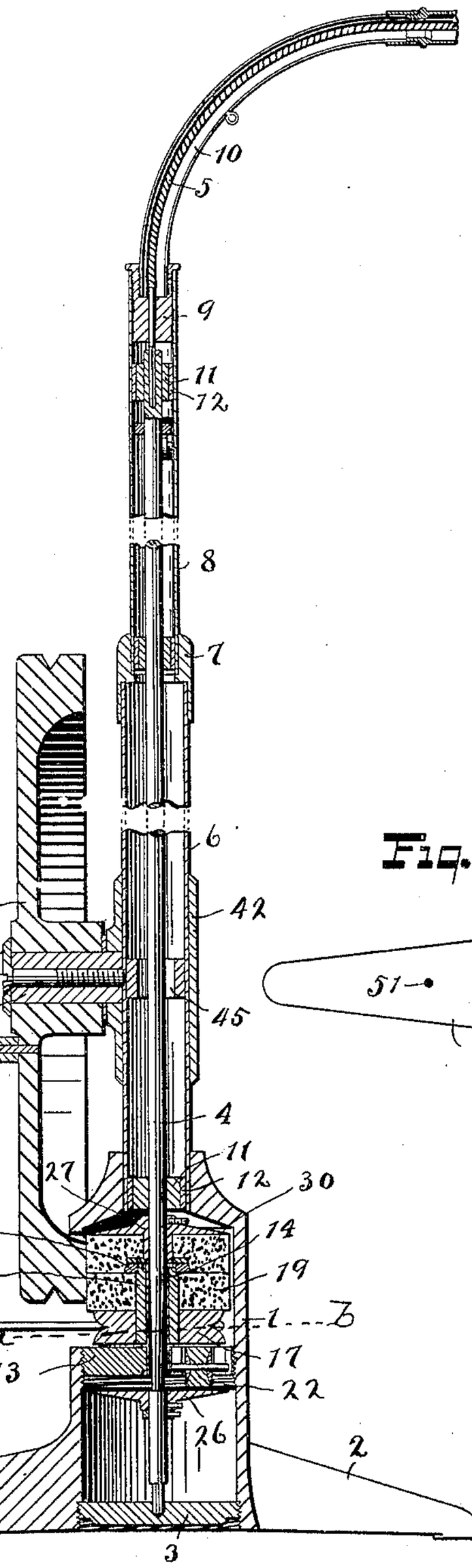
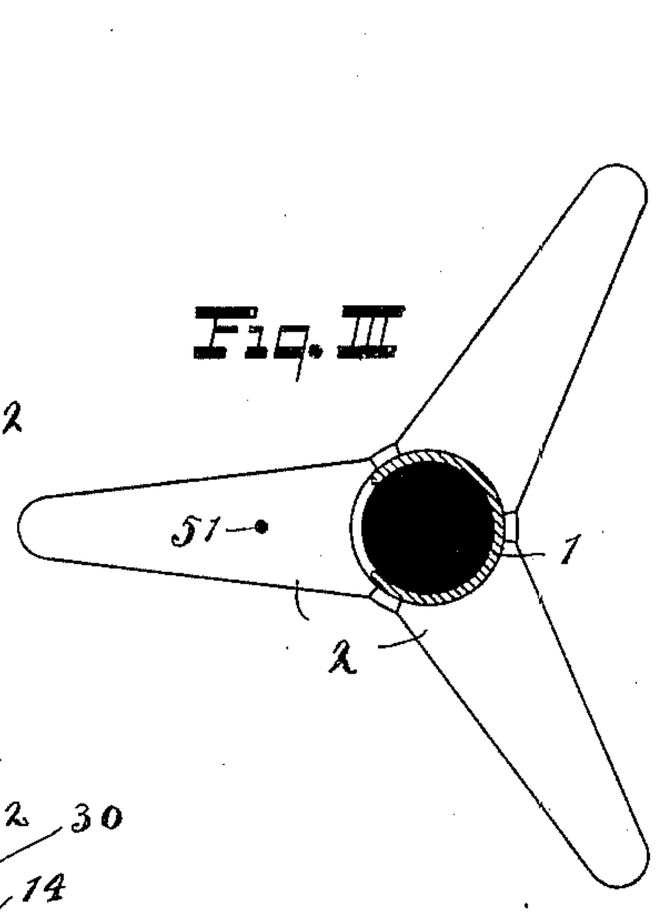


Fig. III



WITNESSES:

A. M. Imboden

R. C. House

INVENTOR,

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HIS ATTORNEY.

(No Model.)

4 Sheets—Sheet 3.

A. J. McDONALD.

DENTAL ENGINE.

No. 604,837. Patented May 31, 1898.

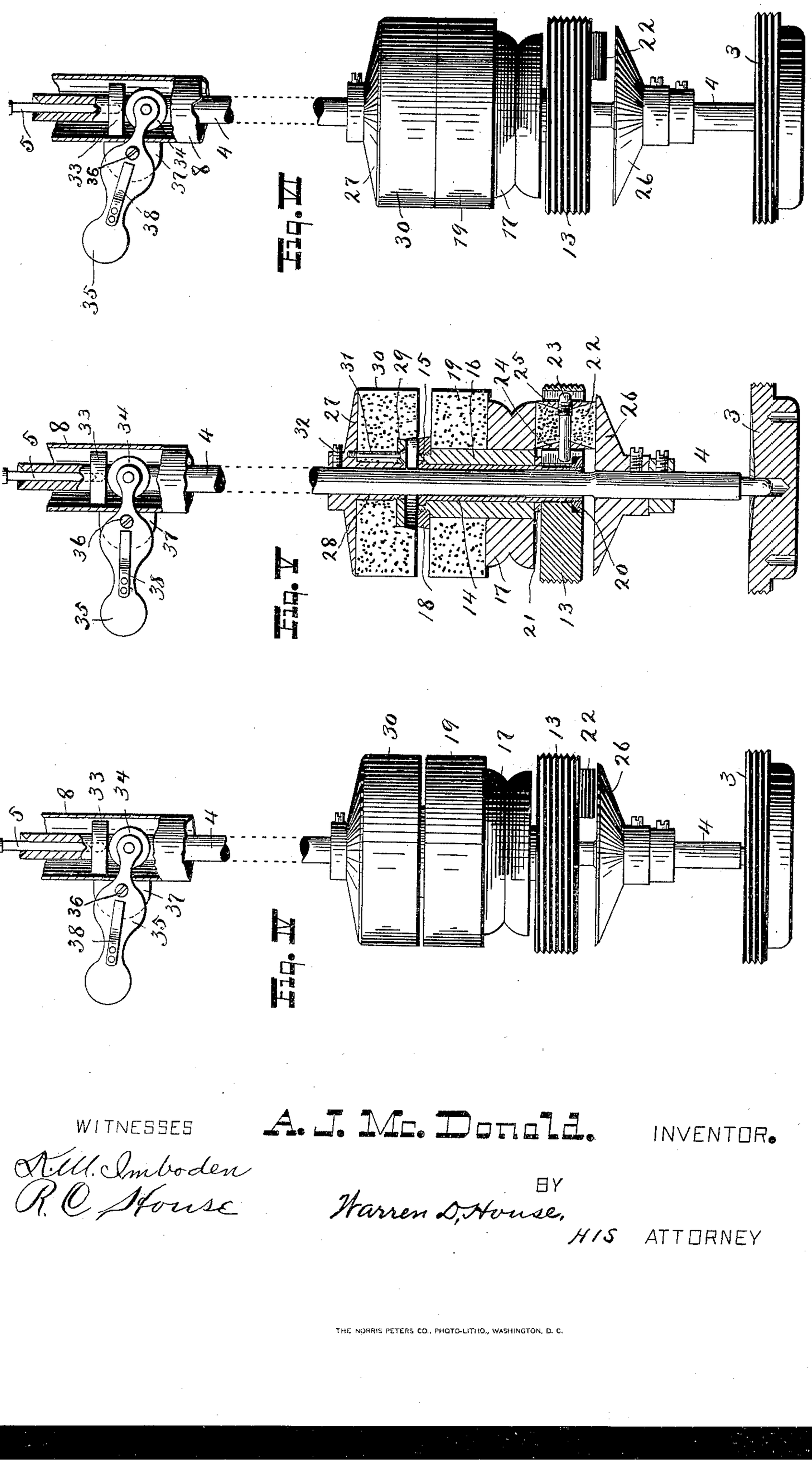

Fig. V.

Fig. VI.

Fig. IV.

WITNESSES

R. M. Imboden

R. C. House

A. J. Mc. Donald. INVENTOR.

BY

Warren D. House.

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(No Model.)

4 Sheets—Sheet 4.

A. J. McDONALD.

DENTAL ENGINE.

No. 604,837. Patented May 31, 1898.

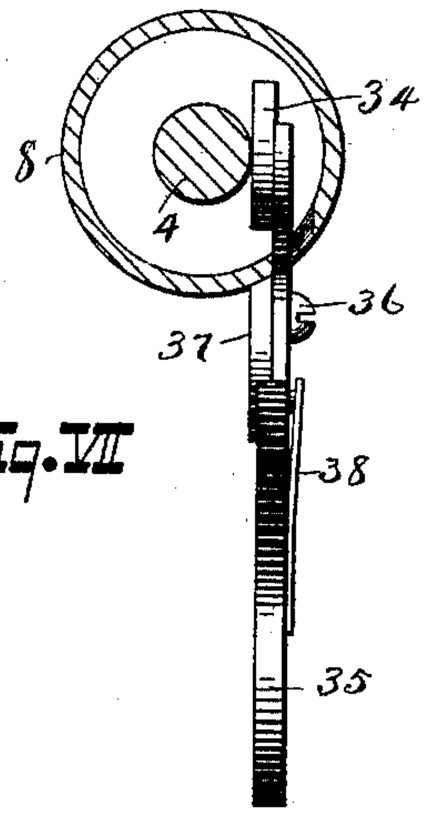

Fig. VII

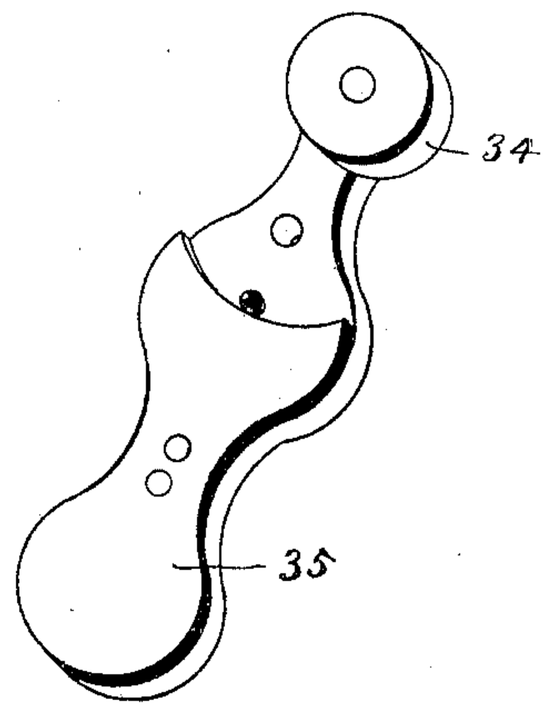

Fig. VIII

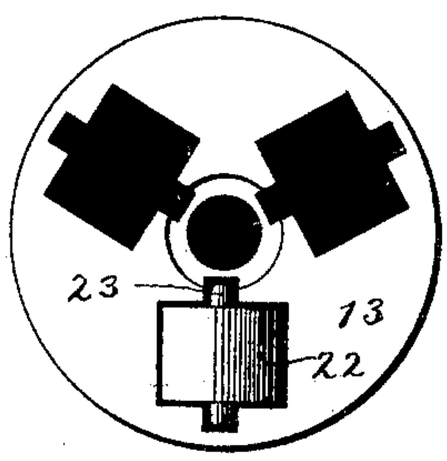

Fig. IX

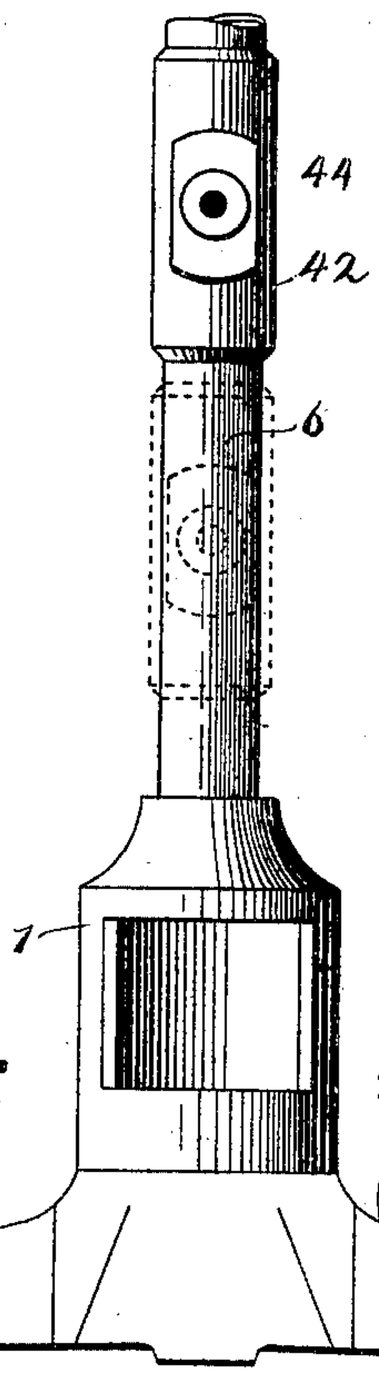

Fig. XI

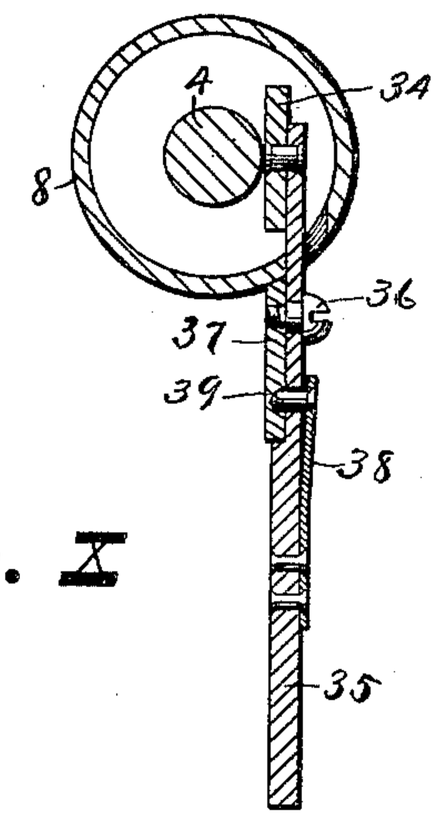

Fig. X

WITNESSES

K. M. Imboden

R. C. House

A. J. McDonald, INVENTOR

Warren D. House, BY

HIS ATTORNEY

UNITED STATES PATENT OFFICE.

ARTHUR J. McDONALD, OF KANSAS CITY, MISSOURI.

DENTAL ENGINE.

SPECIFICATION forming part of Letters Patent No. 604,837, dated May 31, 1898.

Application filed May 11, 1896. Serial No. 591,186. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR J. McDONALD, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Dental Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in dental engines.

The object of my invention is to provide, in a dental engine having a revoluble driving-shaft mounted in a suitable support, a novel construction of clutch by means of which the direction of rotation of the shaft may be changed, together with means for stopping the rotation of the said driving-shaft without stopping the motive power.

My invention further provides certain novel peculiarities of construction which provide for the utilizing of various motor devices.

My invention further provides a vertical driving-shaft, a tight and a loose pulley mounted upon the said shaft, a support in which the said shaft is mounted, and means for changing the direction of the driving-shaft's rotation, the two pulleys being adapted to have a frictional contact with each other, whereby the rotation of the driving-shaft is governed by the loose pulley, all when combined, as described, in a dental engine.

My invention consists, further, in novel features of construction hereinafter fully described and claimed.

In the accompanying drawings, which illustrate my invention, Figure 1 represents an elevation view and shows the engine provided with a foot-power driving mechanism. Fig. 2 represents a vertical sectional view with a portion of the foot-power mechanism removed and sections of the vertical tube removed. A belt is shown connected with the loose pulley in this view. Fig. 3 represents a cross-section taken on the dotted line *a b* of Fig. 2 and having the driving-shaft and other parts removed. Fig. 4 represents an elevation view of the clutch and shaft elevating mechanism and some of the parts connected with the driving-shaft. In this view the upper end of the driving-shaft is shown in section, as is a portion of the vertical supporting-tube. Fig. 5 represents a vertical sectional view of the same parts shown in Fig. 4, the elevating-lever being shown in elevation. Fig. 6 represents an elevation view of the same parts shown in Fig. 4, the two pulleys being shown in contact with each other. Fig. 7 represents a top view of the elevating-lever, the driving-shaft and the supporting-tube being shown in cross-section. Fig. 8 represents a perspective view of the elevating-lever. Fig. 9 represents a plan view looking at the under side of the plate in which is pivoted the driving-roller, which is acted upon by the loose pulley. Fig. 10 represents a horizontal sectional view of the elevating-lever, tubular support, and driving-shaft. Fig. 11 represents an elevation view of the base and the lower end of the tubular support, some of the parts connected with them being omitted. In this view in dotted lines is shown another position of the collar and stud on which is mounted the foot-power driving-wheel.

Similar numerals of reference indicate similar parts throughout the several views.

1 indicates the base, which is cylindrical in form, closed at the top, and provided at its lower end with three radial feet 2. The base is hollow and has secured in any suitable manner in its lower end a horizontal plate 3, which is detachable. In the center of the said plate 3 is a vertical recess in which is stepped the lower end of the vertical driving-shaft 4, the upper end of which is provided with a vertical opening in which may be secured the inner end of a flexible shaft 5, to the outer end of which is adapted to be secured the hand-piece ordinarily used by the operator. Secured in any suitable manner in a vertical opening in the top of the base is the lower end of a vertical tube 6, the upper end of which has secured to it a collar 7, in which is secured the lower end of another vertical tube 8, in the upper end of which is rotatively fitted a plug 9, in which is rigidly secured the lower end of a laterally-curved tube 10, in which is revoluble the flexible shaft 5. The plug 9 is provided with a central vertical opening in which may rotate the rigid spindle attached to the flexible shaft 5. Within the tubes 6 and 8 at suitable distances apart are located bearing-blocks 11, which are each provided with a central vertical opening in which is

mounted the rotary shaft 4. For the purpose of deadening the noise caused by the running of the shaft each of the blocks 11 has inserted between it and the tube a bushing 12, preferably of a substance similar to soft rubber.

In one side of the base 1 is provided an opening, and immediately below this opening a horizontal annular plate 13 is secured within the base in any desirable manner, as by a screw-thread connection therewith. Secured in a vertical central opening in the plate 13 and extending vertically upward therefrom is a tube 14, the upper end of which is provided with a lateral flange 15 for preventing vertical movement of the sleeve 16. Revoluble upon the tube 14 between the flange 15 and the plate 13 is a sleeve 16, to the lower end of which is secured a grooved pulley-wheel 17, adapted to be connected by a belt with the motor used to operate the engine. Above the pulley 17 is a rubber friction-wheel 19, centrally secured upon the sleeve 16. The upper end of the sleeve 16 is externally screw-threaded and is provided with a nut 18, the function of which is to secure the rubber wheel 19 upon the sleeve 16. The lower end of the tube 14 is externally screw-threaded and is provided with a nut 20, located in an annular recess in the under side of the plate 13. The tube 14 is shouldered, as shown in Fig. 5, at a point just even with the upper side of the plate 13, thus providing means for rigidly securing the tube 14 to the plate 13 when the nut 20 is tightened. Upon the tube 14 between the sleeve 16 and the plate 13 is a washer 21, which serves to prevent the sleeve or pulley from coming in contact with the plate 13. The shaft 4 is rotatively fitted in the tube 14. The plate 13 is provided with one or more vertical openings, as illustrated in Fig. 9, in which may be inserted one or more rubber driving-wheels 22, the axis of which is horizontal. The rubber driving-wheel 22 is provided with a central shaft 23, having secured to it at one end a plate 24. The other end of the shaft or rod 23 is screw-threaded and has fitted thereon a plate 25. The rubber wheel 22 is held securely upon the rod 23 by being compressed between the two plates 24 and 25. Secured upon the shaft 4 below the plate 13 is a disk 26, which is adapted to have its upper surface come in contact with the rubber driving-wheel 22 when the shaft 4 is elevated in the manner hereinafter described. Secured upon the driving-shaft 4 above the tube 14 is a horizontal disk 27, which is provided with a downwardly-extending central tubular projection 28, the lower end of which is externally screw-threaded. A horizontal plate, annular in form and indicated by 29, is provided with a vertical central screw-threaded opening fitted to the screw-threaded end of the tubular projection 28. A cylindrical rubber disk 30 is provided with a central vertical opening fitting the projection 28 and is held clamped between the plate 29 and the disk 27. The plate 29 is provided with a vertical opening through which extends a vertical screw 31, which extends also through the disk 30 and engages a vertical screw-threaded opening in the disk 27. This screw prevents rotation between the plates 29 and 27 of the rubber disk 30. The under side of the disk 30 is provided with a circular recess large enough to admit the nut 18, so that when the shaft 4 is lowered sufficiently the under side of the rubber disk 30 will press against the upper side of the rubber disk 19, so that the direction of motion of the disk 19 may be imparted to the rubber disk 30 and thereby communicated to the driving-shaft 4. A horizontal set-screw 32 is fitted in a screw-threaded opening through the hub, which is provided upon the upper side of the disk 27. By means of this set-screw the disk 27 may be vertically adjusted and held rigidly in the position chosen.

Secured to the shaft 4 near its upper end is a horizontal disk 33. A friction-roller 34, adapted to be brought in contact with the under side of the disk 33, is pivotally secured to the inner end of a lever 35, which extends through an opening in the side of the tube 8. The lever 35, outside the tube 8, is pivoted by means of a screw 36 to a projection 37 on the tube 8. Upon the side of the lever 35 opposite to the projection 37 is secured at one end a flat spring 38, the free end of which rests against the outer end of a pin 39, (see Fig. 10,) which extends through an opening in the lever 35 and is adapted to have its other end enter at different times two countersunk openings in the projection 37. By depressing the outer end of the lever 35 the shaft 4 may be raised first to the position shown in Fig 4, in which the rubber disks are separated, and then to the position shown in Fig. 5, in which position the disk 26 has forced the rubber driving-wheel 22 against the under side of the pulley 17. By releasing the lever 35 the shaft 4 is permitted to drop until the rubber disk 30, secured thereon, is in contact with the upper side of the rubber disk 19, as illustrated in Fig. 6. In this position the wheel 22 is out of contact with the plate 26. The wheel 22 is prevented from dropping out of the opening in which it is located in the plate 13 by the nut 20, against the upper side of which rests the inner end of the rod 23.

When it is desired to operate the engine by foot-power, a vertical wheel 40 is pivotally mounted upon a horizontal stud 41, which extends from a sleeve 42, which is fitted to the exterior of the tube 6. A washer 43 is held against the outer end of the stud 41 by means of a screw 44, which has a screw-thread connection with a central longitudinal opening in the stud 41. An opening is provided in the side of the pipe 6 for the entrance of the inner end of the screw 44, which prevents rotation or longitudinal movement of the sleeve 42 upon the pipe 6. Within the pipe 6 and opposite to the end of the screw 44 is secured a collar 45, which serves as a reinforcement to the pipe 6. A treadle of the ordinary kind, as indi-

cated by 46, has one end pivotally mounted in a plate 47, which rests on the floor, and the other end is pivotally connected with the lower end of a pitman 48, the upper end of which is pivotally connected with a pin 49, secured to the outside of the wheel 40. To prevent sliding of the plate 47 upon the floor, it has connected to it the outer end of a rod 50, the inner end of which is bent and enters a vertical opening 51 in the upper side of one of the feet 2. The inner side of the wheel 40 is provided with an inwardly-extending peripheral flange adapted to press against the peripheries of the rubber disks 19 and 30.

My invention is operated as follows: When some power other than foot-power is to be used in operating the engine, the wheel 40 is removed and a belt is connected with the driving-shaft of the motor and the pulley 17. Motion is thus imparted from the motive mechanism to the pulley 17, which rotates upon the tube 14 through the intermediacy of the sleeve 16, which carries the rubber disk 19. If it is now desirable to rotate the shaft 4, the lever 35 is released at its outer end, thus permitting the shaft 4 to drop until the rubber disk 30 rests upon the upper side of the rubber disk 19, which by its frictional contact therewith causes the rubber disk 30, together with the shaft 4, to revolve in the same direction as the pulley 17. The curved tubular arm 10, having therein the flexible shaft 5, to the outer end of which is secured the instrument in the handpiece which is to be used, is then inserted in the upper end of the pipe 8, the inner end of the flexible shaft 5 being at the same time inserted in the opening in the upper end of the shaft 4. The opening in the upper end of the shaft 4 being otherwise than round and the tip of the flexible shaft being of the same shape, the motion of the shaft is imparted to the flexible shaft. If it is desired to stop the rotation of the shaft 4 without stopping the motive power, the lever 35 is depressed until the spring-actuated pin 39 enters the first depression in the projection 37 on the pipe 8. This raising of the shaft 4 to the first position removes the friction-disk 30 from contact with the rubber disk 19 and the shaft stops rotating. If it be now desired to rotate the shaft 4 in the reverse direction, the outer end of the lever 35 is still further depressed until the pin 39 enters the second countersunk opening in the side of the projection 37. At this point the rubber wheel 22 is forced by the plate 26 against the underside of the pulley 17, which in rotating causes the wheel 22 to rotate, and this in turn causes the plate 26, together with the shaft 4, to rotate in the reverse direction.

If it is desired to use the foot-power instead of the motive power operating upon the pulley 17, the belt is removed from the pulley-wheel and the wheel 40, pedal, and pitman are connected with the engine in the manner hereinbefore described. Power is then applied to the pedal, and through the intermediacy of the pitman and wheel 40 the rubber disks 19 and 30 are rotated, together with the shaft 4. As it is not necessary to keep up a rotation of the wheel 40 when it is desired to stop the shaft 4, the mechanism for reversing or stopping the shaft 4 is not used when the foot-power is used.

In an application filed by me on even date with this one I have shown and claimed a tubular arm and flexible shaft adapted to be connected in the same manner as in the one herein shown and described, and in this application I make no claim to such construction.

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

1. In a dental engine, the combination with a rotary driving-shaft, of a wheel secured thereto and rotatable therewith, a wheel rotatable around but independently of the driving-shaft, and means for bringing the two wheels into or out of engagement with each other, substantially as described.

2. In a dental engine, the combination with a rotary driving-shaft, of a wheel secured thereon and rotatable therewith, a wheel rotatable around but independently of the driving-shaft, and means for imparting longitudinal motion to the driving-shaft, for the purpose of engaging or disengaging the two wheels, substantially as described.

3. In a dental engine, the combination with a driving-shaft rotatable in a suitable support and longitudinally movable therein, of a flexible shaft connected to and rotatable with the driving-shaft, a wheel secured upon and rotatable with the driving-shaft, a wheel independently rotatable of the driving-shaft, means for rotating the second-named wheel, and means for engaging the two wheels with each other when the driving-shaft is moved longitudinally in its support in the proper direction, substantially as described.

4. In a dental engine, the combination with a driving-shaft rotatable in a suitable support and longitudinally movable therein, of a flexible shaft connected to and rotatable with the driving-shaft, a wheel secured upon and rotatable with the driving-shaft, a second wheel rotatable independently of the driving-shaft, means for imparting rotation to the second wheel, means for imparting rotation in the same direction to the driving-shaft when it is moved longitudinally in one direction, and means for reversing the direction of rotation of the driving-shaft when it is moved in the opposite direction longitudinally, substantially as described.

5. In a dental engine, the combination with a rotary driving-shaft, of a wheel secured thereon and rotatable therewith, a wheel rotatable independently of the driving-shaft, a plate rotatable with the driving-shaft, a roller located between the independent wheel and the plate, means for moving the driving-shaft in one direction for the purpose of engaging

the two wheels together, and means for moving the driving-shaft in the opposite direction for the purpose of engaging the roller with the independent wheel and the said plate, substantially as described.

6. In a dental engine, the combination with a rotary driving-shaft, of a wheel secured to and rotatable with the driving-shaft, a plate secured to and rotatable with the driving-shaft, a wheel rotatable independently of the driving-shaft and located between the said plate and the first wheel, a roller located between the independent wheel and the said plate and adapted to have a rolling connection between the two, a lever for controlling the lengthwise movement of the driving-shaft in opposite directions, whereby when moved in one direction, the roller may be brought into engagement with the independent wheel and the plate, and when moved in the opposite direction the independent wheel may be brought into engagement with the wheel secured to the driving-shaft, substantially as described.

7. In a dental engine, the combination with a longitudinally-movable rotary shaft provided with a suitable support, of a driving-pulley mounted upon said support and rotatable about and independently of said shaft, a friction-wheel secured to the shaft at one end of the said pulley and rotatable with the driving-shaft, a plate on said shaft at the other end of said pulley also rotatable with the driving-shaft, a roller interposed between the driving-pulley and said plate, and means whereby the shaft may be longitudinally shifted to alternately bring the friction-wheel and roller in contact with the driving-pulley for reversing the rotary movement of the shaft.

8. In a dental engine, the combination with a rotary driving-shaft, of a plate secured to and rotatable therewith, a driving-wheel rotatable independently of the driving-shaft, a roller between the plate and driving-wheel, and means for bringing the plate and driving-wheel in and out of revolving contact with the roller, substantially as described.

9. In a dental engine, the combination with a rotary driving-shaft, of a driving-wheel rotatable independently of the driving-shaft, a plate secured to and rotatable with the driving-shaft, a roller located between the plate and driving-wheel, and a lever pivoted to a suitable support and adapted to engage the driving-shaft for the purpose of moving the said shaft lengthwise whereby the roller is made to have a revolving contact with the plate and the driving-wheel, substantially as described.

10. In a dental engine, the combination with a rotary driving-shaft, of a wheel rotatable therewith, a wheel rotatable around but independently of the driving-shaft, means for preventing longitudinal movement of the independent wheel, and means for bringing the two wheels into or out of engagement with each other, substantially as described.

11. In a dental engine, the combination with a rotary driving-shaft, of a driving-wheel rotatable around the driving-shaft, two devices rotatable with the driving-shaft, means for engaging the driving-wheel with one of the said devices for rotating the driving-shaft in one direction, and means for engaging the driving-wheel with the other device for rotating the driving-shaft in the opposite direction, substantially as described.

12. In a dental engine, the combination with a rotary driving-shaft, of a flexible shaft rotatable therewith, and connected thereto, a driving-wheel rotatable in a fixed plane independently of the driving-shaft, means for imparting rotation from the driving-wheel to the driving-shaft in one direction when the driving-shaft is moved in one direction, and means for imparting rotation to the driving-shaft in the opposite direction when the driving-shaft is moved lengthwise in the opposite direction, substantially as described.

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

ARTHUR J. McDONALD.

Witnesses:

KEENER M. IMBODEN,

WARREN D. HOUSE.