(No Model.) 2 Sheets—Sheet 1.

A. W. BROWNE.

DENTAL ENGINE.

No. 368,187. Patented Aug. 16, 1887.

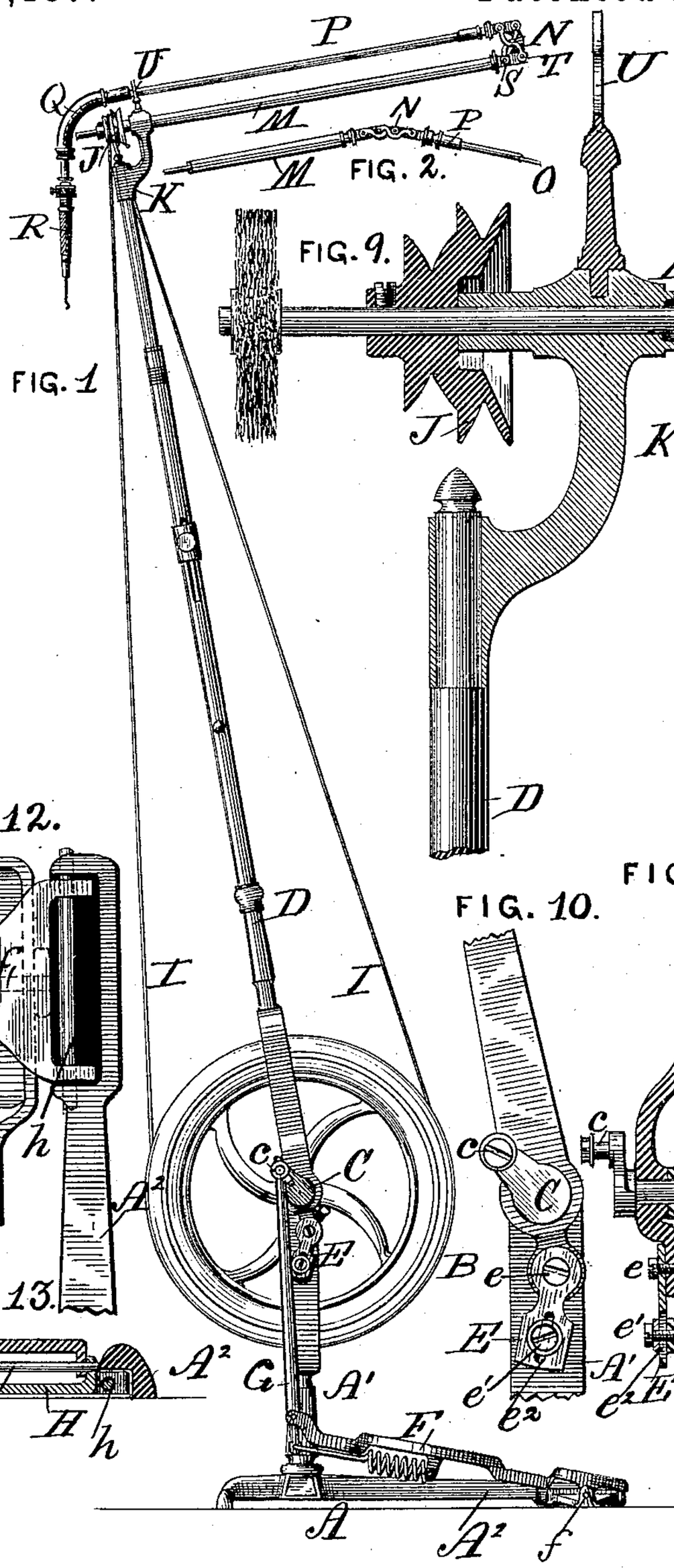

FIG. 2.

FIG. 9.

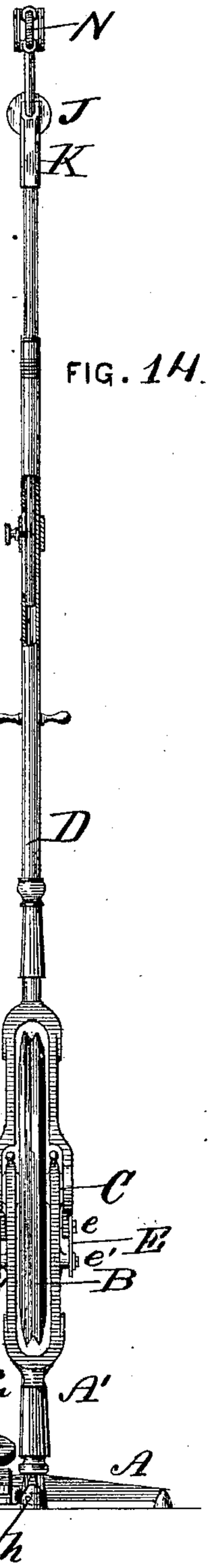

FIG. 14.

FIG. 1

FIG. 12.

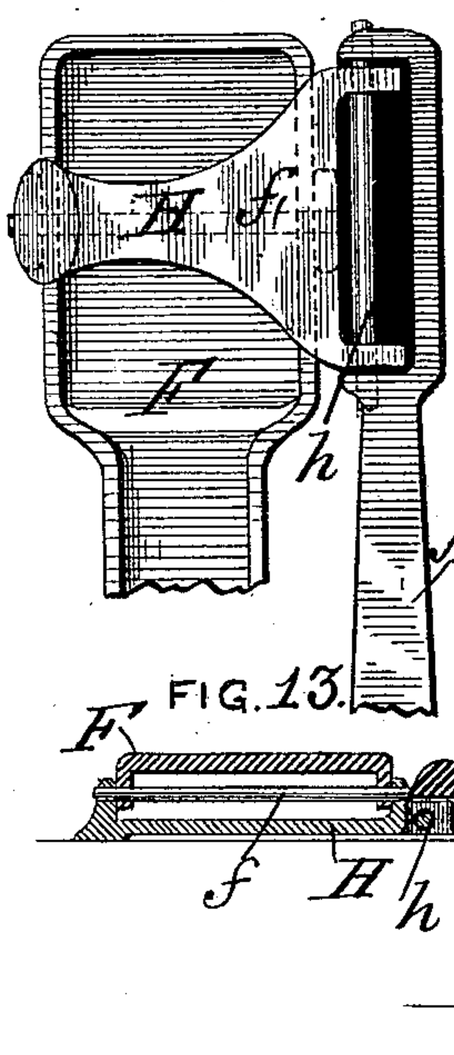

FIG. 13.

FIG. 11.

FIG. 10.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 8.

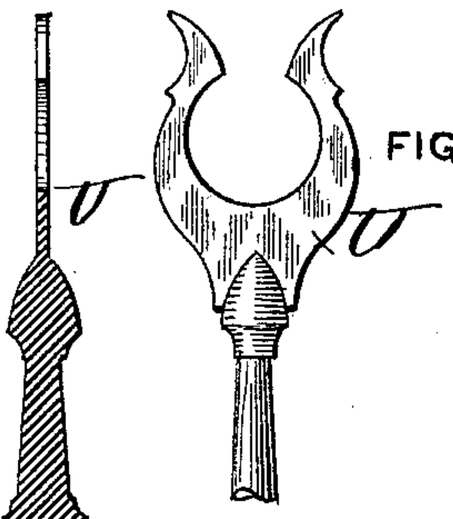

FIG. 7.

FIG. 3.

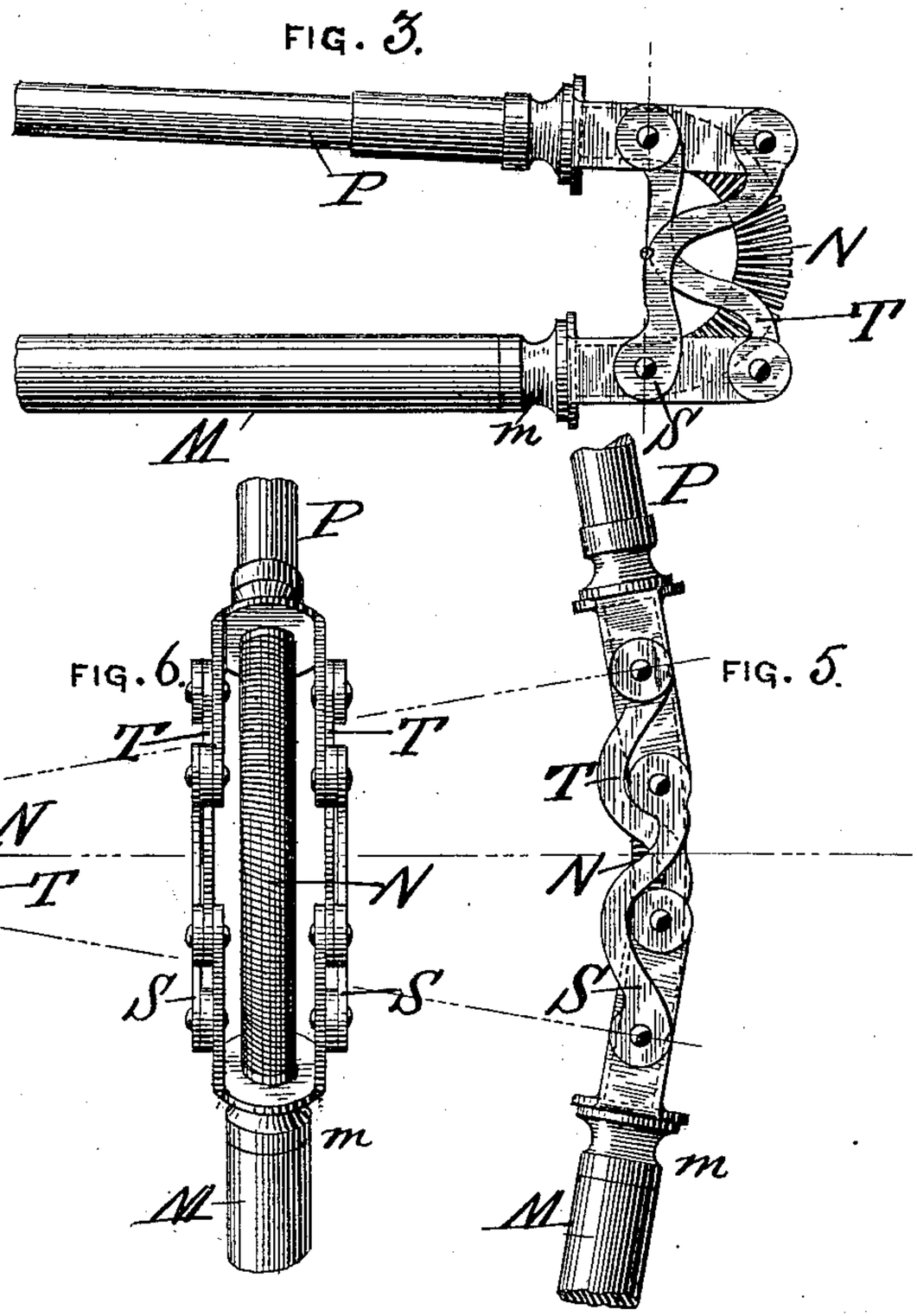

FIG. 4.

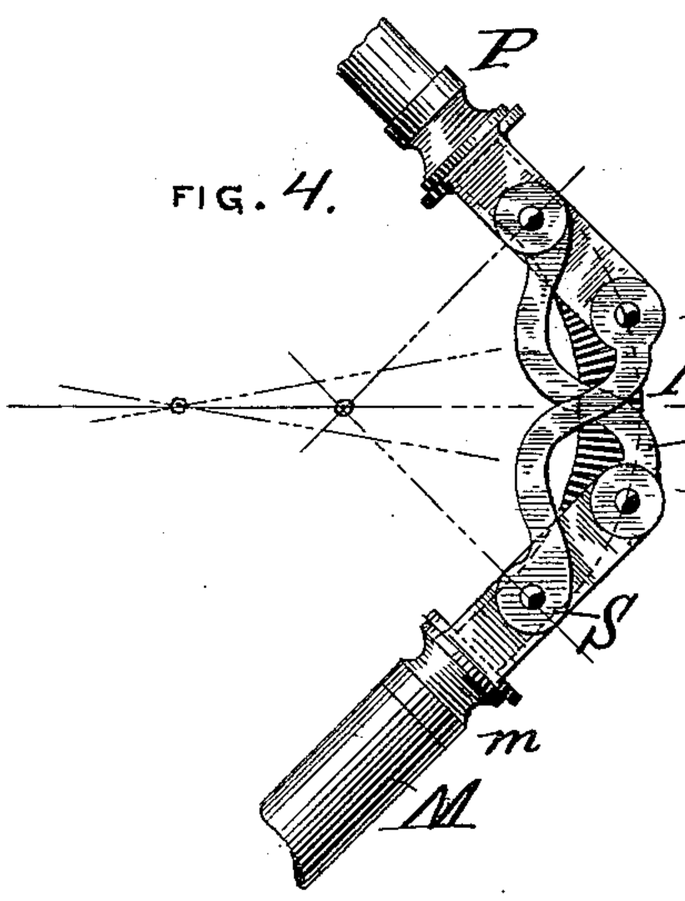

FIG. 6.

FIG. 5.

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UNITED STATES PATENT OFFICE.

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

DENTAL ENGINE.

SPECIFICATION forming part of Letters Patent No. 368,187, dated August 16, 1887.

Application filed January 12, 1887. Serial No. 224,115. (No model.) Patented in England January 26, 1887, No. 1,278.

To all whom it may concern:

Be it known that I, ARTHUR W. BROWNE, a citizen of the United States, residing at Westfield, in the county of Richmond and State of New York, have invented certain new and useful Improvements in Dental Engines; 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 said invention having been patented in England January 26, 1887, as No. 1,278.

My invention relates to dental engines, wherein a rapid-revolving motion is imparted to a driving-shaft, and by said shaft to a tool-holder, to drive an operating-tool carried by said tool-holder. The driving-shafts of such engines are either flexible shafts—such as wire-coil shafts—or are made up of stiff sections of shafting connected by flexible or universal joints, whereby the operating-tool driven by the shafting may be freely moved about within certain limits to direct the tool to the proper point and at the proper angle to do its work. The usual wire-coil shafts are open to some objections—such as unsteadiness in operation and lack of durability—while in the other class of shafts, made up of stiff sections united by universal joints, there is generally either a stiffness in the joints or the same liability to unsteady rotation as is observable with the wire-coil shafts. These defects in the stiff-sectioned universally-jointed shafts of previous constructions seem to be due to imperfections in the universal joints employed both for the shafting and the tubes or sleeves which envelop the shaft-sections.

The object of the first part of my present invention is to improve the dental engine as respects its stiff-sectioned driving-shaft connections and bearings, whereby while the tool is free to be readily moved about to be directed to its work the shafting will be steadily and positively driven in whatever direction the tool may be operating with a like steady and positive operation on the part of the tool driven by said shafting, and whereby, also, the durability of the shafting will be increased.

A further object of this part of my invention is to improve the organization of the driving-shaft and lateral engine-arm so that the shafting may be readily supported horizontally by the top of the engine standard or upright out of the way when not in use.

The next part of my invention relates to the manner of connecting the foot-pedal and attachments to the base or tripod of the engine, so as to avoid tilting the engine upon an uneven floor when the weight of the operator is thrown upon the pedal in operating it.

The subject-matter claimed herein as my invention will first be described in detail as organized in the best way now known to me, and will then be distinctly set forth at the close of this specification.

In the accompanying drawings, which illustrate so much of a dental engine as is necessary to an understanding of my present improvements, Figure 1 is a side elevation of my improved engine, showing the vertical standard as adjusted slightly out of the perpendicular and the shafting as supported out of the way, as when the engine is not in use. Fig. 2 is a detached view of a portion of the flexible or universal shafting and its enveloping sleeves or bearings. Fig. 3 is an enlarged elevation of a portion of the shafting and enveloping-sleeves, one section thereof being bent backward, so as to lie substantially parallel with the section beneath it. Fig. 4 is a similar view with one section of the shaft bent at right angles to the other. Fig. 5 is a similar view with the outer shaft section at its extreme extended position. Fig. 6 is a view of the flexible or universal joint of the shaft at right angles to the views previously shown, showing an edge or plan view of the connecting-links between the enveloping sleeves or tubes of the jointed shafting. Fig. 7 is a longitudinal section through the engine-head and lateral engine arm or sleeve, with a side view of the flexible or universal shafting to show the construction more clearly; and Fig. 8 is a view of the vertical fork for securing and supporting the swinging section of the driving-shaft and its sleeve and the hand-piece of the engine carried at the outer end thereof. Fig. 9 is a similar section to that of Fig. 7, with a little difference in detail, and showing the rear end of the driving-shaft as carrying a brush-wheel to be rotated. Fig. 10

is an enlarged view of the adjustable friction-connection between the vertical engine-standard and the base or tripod by which said standard may be moved or adjusted out of the perpendicular and back again, as required; and Fig. 11 is a vertical section through said friction-connection of the engine standard and base. Fig. 12 is an enlarged bottom plan of the jointed connection between the foot-treadle and base or tripod of the engine, and Fig. 13 is a cross-section therethrough on the pivot-line of the rocking pedal. Fig. 14 is a rear elevation of the improved engine.

The base A of the engine is preferably the tripod base, as usual, having an upright or forked post, A′, to receive the driving-pulley B. Said pulley is mounted between the forks of the post A′ and keyed to revolve with its crank-shaft C, the bearings of which are formed in the upper ends of said post A′. The lower forked end of the vertical engine standard or upright D also straddles the driving-pulley B, and is fitted to rock or be adjusted on the extended ends or bosses of the forked end of the post A′ in a common way. The said engine upright or standard D is maintained in its adjusted position by a frictional connection with the post A′ of the base or tripod A, and said connection is preferably organized by extending the lower forked ends of the engine-upright below their pivotal connection with the post A′, and fitting thereto on each side of said post, preferably, (although one side would do,) friction-plates E E, the upper ends thereof being secured by screws *e e* to the lower ends of the upright, and the lower ends of said plates being secured to the post A′ or bosses thereof by screws *e′ e′*, passing through longitudinal slots e^2 e^2 in said plates into the sides of said post A′. By tightening said screws any required amount of friction can be exerted upon the lower end of the engine standard or upright D, and it may consequently be readily rocked or adjusted to the desired vertical inclination, and will there remain until again adjusted to the normal perpendicular or other position desired.

Motion is imparted to the driving-pulley B through a crank, *c*, on the end of the crank-shaft C, by a foot-treadle, F, and pitman G, as usual. In order to avoid any rocking or tilting of the engine upon an uneven floor when weight is thrown upon the foot-pedal, I pivot said pedal F by its crosswise-rocking pivot *f* to a base-piece, heel-plate, or arm, H, and in turn joint said base-piece, plate, or arm to one of the legs A^2 of the base or tripod A by a longitudinal pivotal connection, *h*, whereby the pedal F may rock or move independently upon and in the longitudinal line of said leg A^2 of the base or tripod. The weight, therefore, that is thrown upon the pedal is accommodated by the movement of the pedal and its connections without tilting the base or tripod.

The upright standard D of the engine is preferably a sectional adjustable one, as usual, to secure the proper adjustments and tension of the driving-belt I, which passes from the driving-pulley B over the driven pulley J of the engine-head K, mounted at the upper end of said engine upright or standard, as usual. Said engine-head is fitted to turn or swing around the upper end of the upright or standard D, as usual, by the usual socket-and-pivot connection, (shown in Fig. 9,) and is fitted with a bearing for the rear stiff section, L, of the revolving driving-shaft carrying the driven pulley J, as usual. Said pulley J is keyed upon said driving-shaft section L, and rapidly revolves or drives it when the driving-pulley B is revolved by the foot-treadle. An arm or sleeve, M, connected with or forming part of the engine-head K, extends out laterally from said head, as usual, and being tubular forms a bearing or bearings for the pulley-section L of the driving-shaft. This shaft-section L is a stiff shaft, and it extends to the outer tubular end, *m*, of the lateral arm or sleeve M, where it is connected by a wire-coil driving-spring, N, with the inner end of a second stiff shaft-section, O, which is also fitted to turn in a tubular sleeve or bearing, P, the outer end of which is preferably connected by the usual flexible wire-sleeve connection, Q, with the rear end of the usual hand-piece casing, R. The outer end of said second section, O, of the driving-shaft is also connected by the usual wire-coil driving connection to the rear or butt end of the tool-holder, fitted in said hand-piece casing to revolve said tool-holder and the operating-tool carried thereby when the shaft is revolved.

It is desirable that the connection between the outer end of the sleeve or tubular lateral arm M and the inner end of the sleeve P should be a universal connection, and such that in the movements of the sleeve P and shaft-section carried thereby relatively to the lateral arm and shaft-section L thereof there will be no straining or uneven bending or buckling of the wire-coil connection N, and consequently no unsteady, jumping, or irregular motion in the driving-shaft, and consequently, also, none in the rotating operating-tool. The wire-coil or driving spring N should take its natural curve or bend, and thereby avoid changing the length of said spring N, either by stretching or compressing it. To attain these ends I preferably form the adjacent ends of the two sleeves M P each with a fork, and unite the opposing arms or members thereof together by a compound link-connection, whereby in bending one section of the driving-shaft and its enveloping-sleeve relatively to the other in operating with the engine the wire-coil driving-spring connection N will always be bent substantially in the arc of a circle, and without varying its length or contracting it when in such bent position. The curves formed by said wire-coil connection or spring N in its various positions due to bending the stiff shaft-sections are substantially segments of circles of various radii, (see dotted lines, Figs. 4 and 5,) and the shafts occupy the positions of

tangents to the various circles. This compound link-connection consists, preferably, of four curved links, two of said links, S S, being pivoted at their inner or rear ends to opposite sides of the tubular lateral arm or sleeve M, or the forked end thereof, and at their front ends to the opposite sides of the rear forked end of the sleeve P, and the other two links, T T, (the counterpart of the links S S,) being pivoted by their rear ends to the front forked end of the sleeve M in advance of the pivots of the links S S with said sleeve, and by their front ends to the opposite sides of the forked end of the sleeve P in advance of the pivots of the front ends of the links S S with said sleeve P. The links are curved and cross each other, as shown, whereby the sleeves M P, with their contained shaft-sections, may be extended in approximately a straight line, as shown in Figs. 2 and 5, until limited by the abutment of the pivot-connections of the links, or may be bent toward each other through a range of motion substantially approximating to a parallel position, as shown, for example, in Figs. 1 and 7. This (in connection with the flexible connections at the butt-end of the hand-piece and tool-holder thereof) gives all the motion of the driving-connections necessary to enable the hand-piece and operating-tool carried thereby to be freely moved about to work at the point desired, and at the same time insures durability of the flexible driving-spring connection with a steady uniform rotation of the driving-shaft and operating-tool.

In order to give greater freedom of movement to the hand-piece of the engine, and to provide for holding the front shaft-section, O, and its sleeve or bearing P out of the way when the engine is not in use, I form the front end, *m*, of the lateral engine arm, bearing, or sleeve M in the form of a swiveling or turning sleeve, (see Fig. 7,) whereby the driving-shaft and the sleeve or bearing P, universal connections, and hand-piece may be turned around or axially, or be rocked sidewise relatively to the rigid lateral engine arm, bearing, or sleeve M. By this organization, also, the front sleeve, P, and connected parts may be turned around relatively to the lateral engine-arm M, and the said sleeve P and its contained shaft folded back parallel with said engine-arm to fit in the vertical retaining-fork U, mounted on the engine-head, as clearly shown in Figs. 1. 7, and 14, so as to be held out of the way of the operator when not in use.

I claim as my invention—

1. The combination, with the engine-base, of the pedal fitted substantially parallel with one of the legs of said base, the heel-plate to which said pedal is pivoted, and the direct horizontal longitudinal pivotal connection of said heel-plate to said leg, whereby said pedal with its heel-plate may rock independently upon and in the longitudinal line of said leg, substantially as described.

2. The engine-head or lateral arm provided with a vertical fork thereon to support the horizontally-bent driving-shaft, substantially as described.

3. A compound joint for the sleeves or bearings of a flexible or universal driving-shaft, said joint consisting of a double set of links, one of which is pivoted in advance of the other, substantially as described.

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

ARTHUR W. BROWNE.

Witnesses:

MELVILLE M. JOHNSTON,

GILBERT S. BARNES.