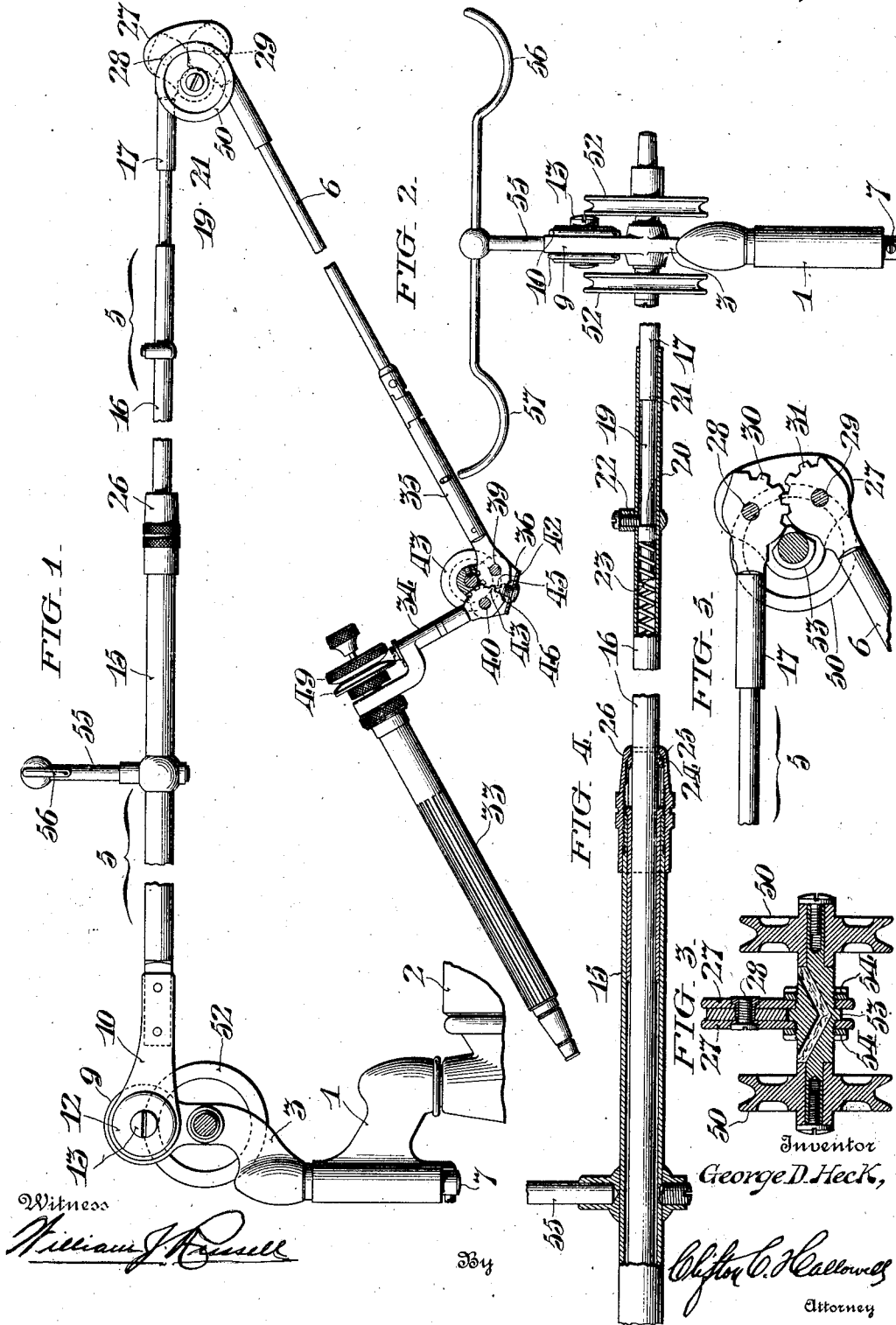


1,361,578.

Patented Dec. 7, 1920.



UNITED STATES PATENT OFFICE.

GEORGE D. HECK, OF PRINCE BAY, NEW YORK, ASSIGNOR TO THE S. S. WHITE DENTAL MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

SURGICAL ENGINE.

1,361,578.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GEORGE D. HECK, a citizen of the United States, and a resident of Prince Bay, in the county of Richmond, State of New York, have invented certain new and useful Improvements in Surgical Engines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates particularly to that class of devices that comprise a tool carrying crane formed of a plurality of jointed arms, carrying pulley wheels over which a driving cord or belt may extend in cooperative relation with a dental handpiece or other such device, also carried by said arms for universal movement, and provided with a tool such as a drill or bur for operating upon the teeth or bone.

The principal objects of my invention are to provide a surgical engine so constructed and arranged as to afford to the operator a feeling of firmness without curtailing the desired flexibility of the tool carrying arms, and to provide such relative adjustment of said arms as to accommodate driving belts of different lengths and to insure the desired belt tension.

My invention comprehends a jointed engine crane having yielding means tending to extend its length, thereby affording constant tension upon the engine driving cord or belt and having means whereby its length may be adjusted to vary the tension of said yielding means, and to provide such a pivotal connection between the respective arms of the crane as to limit their relative swinging movement and thereby eliminate the possibility of their becoming twisted and locked.

Specifically stated, the form of invention as hereafter described comprises a crane arranged to be supported by a stand or bracket and having a main-arm and a fore-arm carrying a surgical handpiece, the main-arm and fore-arm and the fore-arm and handpiece being pivotally connected by links and provided at their respective adjacent ends with toothed sectors in mesh.

My invention also includes all of the various novel features of construction and arrangement as hereinafter more definitely specified.

In the accompanying drawings, Figure 1 is a side elevational view of an engine crane conveniently constructed in accordance with

my invention, the jointed connection between the members of the wrist joint of the handpiece being shown in section for convenience of illustration; Fig. 2 is a rear elevational view of the engine crane shown in Fig. 1; Fig. 3 is a transverse sectional view of said engine crane taken in a plane passing through the axes of the pulleys and one of the adjacent pivotal connections at the right hand end of Fig. 1; Fig. 4 is an enlarged longitudinal sectional view of the main-arm of the engine crane shown in Fig. 1, and Fig. 5 is an enlarged fragmentary sectional view of the connection between the main-arm and fore-arm.

In said figures, the engine crane is shown supported by a bracket 1, upon a motor frame 2, and comprises the mounting 3, main-arm 5, and fore-arm 6, the mounting 3 being provided with depending post 7 extending through a suitably provided bearing in the bracket 1 and being rotatable therein to permit the lateral movement of said engine crane.

The mounting 3 is preferably offset forwardly and provides a head 9 to which the bifurcated inner end 10 of the main-arm 5 is pivotally connected for vertical movement and frictionally engaged by suitable washers 12 and screw bolt 13, which may be adjusted to vary the frictional engagement of the main-arm 5 with the head 9 of said mounting 3.

The main-arm 5 is telescopically adjustable, being formed of three relatively movable sections, the inner section 15 being tubular to receive the tubular middle section 16 in telescopic relation, and the outer section 17 being telescopically held within the tubular middle section 16.

The outer section 17 has a reduced portion or broad annular groove 19 adjacent to its inner end to provide relatively spaced annular shoulders 20 and 21, which are arranged to limit the longitudinal movement of said outer section 17, with respect to the middle section 16, by cooperating with the screw top 22 whose inner end projects within said middle section 16 so as to be engaged by said shoulders 20 and 21, said stop 22 being retractable to permit the withdrawal of the outer section 17 when desired.

The middle section 16 of the main-arm 5 is provided with the spiral spring 23 inclosed therein and abutting against the in-

ner end of the outer section 17 and tending to force it outwardly to engage its shoulder 20 with the screw top 22.

The middle section 16 snugly fits within the inner section 15, the free end of which serves as a chuck, being saw cut longitudinally and having its outer edge chamfered to provide a conical surface, against which the loose chuck collar 25 is arranged to be forced, to bind said saw cut end upon the middle section 16, by means of the chuck sleeve or nut 26. Said chuck sleeve has knurled annular bands by which it may be conveniently rotated in threaded engagement with said inner section 15, and has a shoulder 24 for engaging the loose chuck collar 25 and forcing it against said chamfered edge.

The main-arm 5 and fore-arm 6 are connected by parallel links 27 to which said main-arm and fore-arm are separately pivoted at 28 and 29 respectively, with their flattened opposed ends disposed between said links whereby said fore-arm is free to swing toward and from the main-arm, in the planes of its axis.

As best shown in Fig. 5, the opposed ends of the main-arm and fore-arm are in toothed engagement, the outer end of the main-arm being flattened to form a sector having gear teeth 30, and the inner end of the fore-arm being flattened to form a sector having gear teeth 31 in mesh with said gear teeth 30, so that when the fore-arm is moved toward and from the main-arm, said links will always assume a uniform position with respect to each of said arms, that is, a plane passing through the pivotal axes at 28 and 29 will assume an equal angle with respect to the arms 5 and 6 irrespective of the relatively angular position of said arms.

The fore-arm 6 swivelly carries the handpiece 33 which is connected therewith by the wrist-joint comprising the slip joint frame 34 and swivel frame 35 respectively connected by links 36 between which said slip joint frame and swivel frame are pivotally connected upon relatively spaced axes 39 and 40.

The opposed ends of the slip joint frame and swivel frame form sectors which are respectively provided with gear teeth 42 and 43 in mesh, and said sectors are respectively provided with shoulders 45 and 46 arranged to abut against each other to limit the relative movement of said wrist-joint members.

The handpiece 33 is provided with the driving pulley 49 about which the driving cord or belt, not shown, is arranged to extend, said driving cord or belt being arranged to be carried by pulleys 43 mounted on the links 36 of the wrist-joint, pulleys 50 which are journaled on the links 27 and pulleys 52 which are journaled on the mounting 3', said driving cord or belt may

be either connected with the driving pulley 65 of the motor 2 or it may be connected with the fly wheel of a treadle engine stand as desired.

The pulleys 50 are mounted upon a common shaft which extends through the links 27 and which has the central flange 53, disposed between said links against which they are bound by the nuts 54.

The main-arm conveniently carries a substantially T-shaped support comprising the standard 55 and the oppositely extending lateral hooks 56 and 57 upon which the fore-arm may be supported when not in use, it being noted that said fore-arm is limited in its movement toward the main-arm by the flange 53 to prevent twisting and locking of said arms, which is likely to occur should they be permitted to too closely assume parallelism.

My invention is advantageous in that by connecting the main-arm and fore-arm, and the slip joint frame and swivel frame by geared sectors, there is a feeling of firmness to the device which is characteristic to this structure which differs from such devices as heretofore-constructed which have such play as to give a feeling of looseness and insecurity to the operator.

My invention is further advantageous in that the main-arm sections are telescopically arranged and are so adjustable as to vary the tension of the spring which provides tension on the driving cord or belt and renders it possible to maintain a predetermined tension upon the belt and also renders said arm adjustable to belts of different lengths. Furthermore, the main-arm may be so extended to such a range of movement as to accommodate the desires of different operators.

Although I have shown the engine arms and wrist joint as being connected with gear sectors, said sectors may be frictionally engaged and therefore I do not desire to limit my invention to the precise details of construction and arrangement as herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of my invention as defined in the appended claims. Having thus described my invention, I claim:—

1. A surgical engine comprising a crane having a main-arm and fore-arm pivotally connected and respectively provided with gear sectors with teeth in mesh, yielding means tending to extend the length of said main-arm and means adjustable to vary the tension of said yielding means upon a belt extending between the main-arm and the fore-arm.

2. A surgical engine comprising a crane having a main-arm and fore-arm pivotally

connected and respectively provided with gear sectors in cooperative engagement to move with each other, said main-arm comprising relatively movable sections for varying its length, one of said sections having means tending to force an adjacent section longitudinally, and being longitudinally adjustable with respect to another adjacent section and arranged to be secured thereto in different adjusted positions.

3. A surgical engine comprising a crane having a main-arm and fore-arm pivotally connected together and respectively provided with relatively cooperative gear sectors, a mounting for said crane, driving belt pulleys carried by said mounting, driving belt pulleys carried by said crane adjacent to the pivotal connection between said main-arm and fore-arm, said main-arm comprising an inner section, an outer section and a middle section, means tending to longitudinally separate said middle section and outer section, to provide tension on the driving belt carried by said pulleys, the inner and middle sections being telescopically connected, and adjustable means arranged to secure said inner and middle sections together in different longitudinally adjustable positions.

4. A surgical engine comprising a crane having a main-arm and fore-arm each provided with relatively cooperative sectors, links pivotally connecting said fore-arm with said main-arm, a mounting pivotally supporting said crane, driving belt pulleys carried by said mounting, belt pulleys carried by said links, said main-arm comprising an inner section, an outer section and middle section telescopically arranged, a spring tending to force said middle section and outer section apart to provide tension upon the driving belt carried by said pulleys, and a chuck provided on the inner section for adjustably securing the middle sec-

tion thereto in variable positions to vary the spring tension.

5. A surgical engine comprising a crane having a main-arm and fore-arm pivotally connected, said main-arm comprising an inner section, an outer section and a middle section telescopically arranged, a spring tending to force the outer section longitudinally outward from said middle section, and the inner section comprising a chuck arranged to adjustably secure the middle section in different positions with respect to the inner section, to vary the tension of said spring upon a belt extending between the main-arm and the fore-arm.

6. A surgical engine comprising a crane having a main-arm and fore-arm pivotally connected, said fore-arm comprising three relatively movable telescopically arranged sections, yielding means tending to force two of said sections apart longitudinally, and means for securing together one of said two sections and the third section in relatively adjustable positions longitudinally, to vary the tension of said yielding means upon a belt extending between the main-arm and the fore-arm.

7. A surgical engine comprising a crane having a main-arm and fore-arm, each provided with gear sectors, links pivotally connecting said main-arm and fore-arm together and maintaining the teeth of said gear sectors in mesh, and a hand-piece carried by said fore-arm having a wrist-joint comprising opposed gear sectors pivotally linked together with the teeth of the gear sectors in mesh.

In witness whereof, I have hereunto set my hand this 26th day of October, A. D. 1917.

GEORGE D. HECK.

Witnesses:

SAMUEL R. BARTON,
WARREN H. BARTON.