SCISSORS-HANDLE DEVICE FOR SURGICAL INSTRUMENTS

Filed April 25, 1936
2 Sheets-Sheet 1

Fig. 1

Fig. 2

Fig. 3

INVENTOR.

Joseph E. Held.

BY

Frederick Freitenfeld

ATTORNEY.
My present invention relates generally to surgical instruments, and has particular reference to the type of instrument in which a tool is mounted for reciprocatory movement relative to a stationary part such as a stem or sheath.

A general object of the invention is to provide an improved means for effecting the reciprocating movements of the tool.

In carrying out my invention, I resort to the use of a pair of scissors-handles which are adapted to be grasped by the surgeon in the same way as he would grasp an ordinary pair of scissors; and my improved tool-acting means is associated with the scissors-handles. My invention consists in fixedly associating one of the scissors-handles with the stationary part of the instrument, and providing a gear segment on the movable scissors-handle, the gear segment engaging with a rack that is provided on the tool or other movable part.

One of the features of my invention lies in providing an indicating device which is associated with the scissors-handles and which is adapted to indicate the extent of reciprocatory movement of the tool when the instrument is used.

By way of example, I have herein illustrated and shall hereinafter describe my invention as it may be applied to a surgical punch and to a surgical stone crusher, but it will be understood that certain phases of the invention are not restricted to these specific surgical instruments.

In connection with the punch, it is a further feature of my invention to provide an arrangement of parts which permits the punch, together with its associated scissors-handles, to be withdrawn in its entirety from the sheath.

In connection with the stone crusher, it is a further feature of my invention to provide a conduit which may be used simultaneously as an irrigation conduit and as a tube for accommodating a telescope, the rear end of the conduit being adapted to be entirely sealed when the telescope is removed so that the conduit may be used exclusively for irrigation purposes.

I achieve the foregoing objects, and such other objects as may hereinafter appear or be pointed out, in the manner illustratively exemplified in the accompanying drawings, wherein—

Figure 1 is a side view of a surgical punch showing the manner in which my invention may be applied thereto, certain parts being broken away for the sake of compactness;

Figure 2 is a fragmentary rear elevational view of the punch element or tool, and this view also shows a portion of the scissors-handles;

Figure 3 is an enlarged cross-sectional view taken substantially along the line 3–3 of Figure 2;

Figure 4 is a side view of a surgical stone crusher, showing the manner in which my invention is applied thereto, parts being broken away for the sake of compactness;

Figure 5 is a top view of the instrument of Figure 4;

Figure 6 is a fragmentary elevational view of the rear portion of the instrument of Figure 4, shown from the opposite side; and

Figure 7 is an enlarged cross-sectional view taken substantially along the line 7–7 of Figure 4.

The punch of Figures 1–3 consists of a tubular sheath 10 having the usual forward beak 11, and rear coupling sleeve 12. The latter carries a pair of irrigation petcocks 13 disposed in diametrically opposed relation, only one of the petcocks being visible in Figure 1. The sleeve 12 carries a locking ring 14 which is preferably of the character described and claimed in United States Letters Patent No. 1,880,551, issued October 4, 1932. By means of the locking ring 14, the operative portions of the instrument, the elements of which will be more fully described hereinafter, may be removably inserted into association with the sheath 10.

The member 15, shown most clearly in Figure 2, is a plug member having a portion 16 adapted to fit into the sleeve 12. The portion 16 preferably carries opposed pins 17 which are adapted to be engaged by and to cooperate with the locking ring 14, as more fully set forth in the aforementioned United States Letters Patent No. 1,880,551. When thus engaged, the member 15 forms a fixed rigid portion of the instrument along with the sheath 10; and the sheath and its associated parts may thus be considered, for the present purposes, as a "stationary part" of the instrument.

Rigidly secured to the member 15 is the scissors-handle 18. Pivotally connected to the handle 18, as at the pivot point 20, is the complementary or movable scissors-handle 19, the two handles being adapted to be engaged by the hand of an operator and manipulated between the full line and dot-and-dash line positions of Figure 1.

Carried by the movable scissors-handle 19 is a gear segment 21 whose center of curvature is at the pivot axis 20. The member 15 is provided with a slot or channel 22 to accommodate the gear
segment 21 and permit its movement between the full-line and dot-and-dash line positions of Figure 1. The teeth of the gear segment 21 mesh with the teeth of a rack 23 which is carried by the punching tube 24. In the case of a surgical punch, this tube constitutes the "tool" whose reciprocating movements are to be controlled by the scissors-handles. The tube 24 is slidably mounted within the member 16 so that it moves axially back-and-forth when the scissors-handle 19 is moved relative to the fixed scissors-handle 18.

The punching tube 24, per se, may be of usual construction and has a forward end sharpened so that it will punch an opening through any body or tissue which is engaged in the lateral fenestra 25 of the sheath 10. Near its rear end, the tube 24 is provided with the opposed longitudinal slots 26 which register with the irrigation ports 19, so that continuous irrigation may be maintained, if desired, notwithstanding longitudinal movements of the tube 24 relative to the sheath 10. At its rear end, the tube 24 is preferably provided with the bearing portion 27 through which a telescope tube 28 may be inserted. The latter may be of any usual construction, having the rearward eye-piece 29 and, preferably, provided with a lamp 30 at its forward end, the objective 31 being adapted to command a forwardly oblique view of the fenestra 25.

The characterizing improvements of the surgical punch illustrated, as compared with punchers of conventional construction, reside in the gear segment 21; the manner in which this gear segment cooperates with the rack 23; and the construction and arrangement of parts which permit the punching tube 24 to point directly above the pivot axis 20, throughout the entire manipulation of the scissors-handles. Accordingly, a uniform and more controllable force may be applied to the punching tube throughout its entire operative stroke.

In Figures 4-7, I have illustrated the manner in which the scissors-handle improvement may be applied to a surgical stone crusher. The fixed scissors-handle 40 is pivoted to the movable handle 41 at the pivot axis 42. The fixed handle 40 is rigidly secured to the block 43 forming a portion of the relatively "stationary" part of the instrument. The block 43 is provided with a slot or channel to accommodate the gear segment 44 which is mounted on the upper portion of the movable scissors-handle 41. The block 43 is also provided with at least one irrigation outlet or passage, and I have illustratively shown the preferred construction in which an outlet 45 extends upwardly, and a somewhat larger outlet 46 extends laterally. Projecting forwardly from the block 43 is a fixed stem 47 carrying a fixed crushing jaw 48 at its forward end. One portion of the stem is provided with a longitudinal T-slot, as shown most clearly in Figure 7, and within this slot a movable stem 49 is mounted, this movable part of the instrument carrying at its forward end the complementary crushing jaw 50, and at its rear end the rack 51 which meshes with the gear segment 44.

In the embodiment illustrated in Figures 4-7, the block 43 is provided with the fixed indicator plate 52, and the movable handle 41 carries the pointer 53 which is adapted to move over the plate 52. The position of the pointer 53 on scale 52 indicates to the operator the relative position of the movable crushing jaw. For example, with the parts in the full-line position of Figure 4, the two jaws 48 and 50 are in their fully closed relationship, and the pointer 53 is, therefore, positioned over the designation "Closed" on the plate 52. As the movable jaw 50 is withdrawn from the fixed jaw 48, by virtue of the manipulation of the scissors-handles, and the interengagement between the gear segment 44 and the rack 51, the pointer 53 moves over the dial 52. The latter is preferably provided with markings arranged to indicate the distance between the jaws in millimeters, thus permitting the operator to determine the size of a stone before the crushing operation, and permitting him also to make sure that the jaws are in a closed relationship after the crushing procedure.

A lateral portion of the fixed stem 47 is hollowed out to provide a conduit 54 most clearly indicated in Figure 7. This conduit communicates with an aligned bore extending through the block 43, and the conduit continues rearwardly of the block 43, as indicated in Figures 4 and 5. At its rear end, the conduit is provided with a clamp 55, and just in front of the clamp 55 is a valve device 56, including a rotatable plug element 57, as shown in the drawings. This valve may be of any suitable construction, having the usual eye-piece 59 at its rear end and provided with a lamp 60 at its forward end, and with an objective which commands a view of the operative range of the crushing jaws. When the telescope is fully inserted, a pin 61 carried thereby engages within a slot 62 in the clamping device 55, and the forward portion of the telescope protrudes by a slight amount by the forward opening end of the conduit 54. The pin 61 assures a proper disposition of the telescope so that the objective will be facing in the correct direction so as to command the desired view of the operative range of the jaws.

The conduit 54 is slightly oversized with respect to the telescope tube, so that the petcock 45 and 46 may be used during the crushing procedure to irrigate the region of operation. When a stone has been completely crushed, it is desirable to permit the fragments to be flushed out of the body through a passageway as large as possible. Accordingly, the present invention provides for the complete rearward withdrawal of the telescope so that the conduit 54 may be utilized to its fullest extent for flushing purposes. With this object in view, the valve device 56 is provided, the manipulation of the plug element, by swinging the handle 51 into the dot-and-dash position of Figure 5, serving to plug and seal.
the rear end of the conduit 54 after the telescope has been withdrawn.

It will be understood that the structural improvements involving the conduit 54, the irrigation outlets connected with it, and the valve device 55, are phases of the invention independent of the means whereby the movable jaw is reciprocated.

In general, it will be understood that changes in the details, herein described and illustrated for the purpose of explaining the nature of my invention, may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. It is, therefore, intended that these details be interpreted as illustrative, and not in a limiting sense.

Having thus described my invention, and illustrated its use, what I claim as new and desire to secure by Letters Patent is—

1. In a surgical punch, a sheath having a fenestra therein, a punching tool mounted within the sheath for longitudinal reciprocatory movement relative to the fenestra, a pair of pivoted scissors-handles one of which is rigidly secured to the rear of the sheath, a rack carried by the rearward portion of the punching tool, and a gear segment carried by the movable scissors-handle and meshing with said rack.

2. In a surgical punch, a sheath, a punching tool adapted to reciprocate within the sheath, a pair of pivoted scissors-handles for controlling the movements of the punching tool, and means for separably locking one of the scissors-handles into rigid association with the rear of the sheath.

3. In a surgical punch, a sheath, a punching tool adapted to reciprocate within the sheath, a pair of pivoted scissors-handles for controlling the movements of the punching tool, and means for separably locking one of the scissors-handles into rigid association with the rear of the sheath, said means comprising a sleeve on the rear end of the sheath, a plug member fixedly secured to one of the scissors-handles, and a releasable means for interlocking said sleeve and plug member.

4. In a surgical punch, a sheath having a sleeve at its rear end, a punching tool adapted to reciprocate within the sheath, a rack on the rear end of the punching tool, a pair of pivoted scissors-handles for controlling the movements of the punching tool, a gear segment on one of the handles and meshing with said rack, and means for separably locking the other scissors-handle into rigid association with said sleeve.

5. In a surgical punch, a sheath having a sleeve at its rear end, a punching tool adapted to reciprocate within the sheath, a rack on the rear end of the punching tool, a pair of pivoted scissors-handles for controlling the movements of the punching tool, a gear segment on one of the handles and meshing with said rack, and means for separably locking the other scissors-handle into rigid association with said sleeve, said means comprising a plug member fixedly secured to said scissors-handle, and a releasable means for interlocking said plug member with said sleeve.

6. In a surgical punch, a sheath having a sleeve at its rear end, a punching tool adapted to reciprocate within the sheath, a rack on the rear end of the punching tool, a plug member adapted to fit into said sleeve and provided with a bore which slidably accommodates said punching tool and rack, a pair of pivoted scissors-handles one of which is fixedly secured to said plug member, a gear segment on the other handle and meshing with said rack, and a releasable means for interlocking said plug member and sleeve into rigid association.

7. In a surgical punch, the combination with the elements set forth in claim 1, of a telescope arranged longitudinally with respect to said sheath with its eyepiece projecting rearwardly therefrom, both of said handles extending in a substantially transverse direction away from the sheath so as to leave the eyepiece of the telescope accessible during manipulation of the scissors-handles.

8. In a surgical punch, the combination of elements set forth in claim 1, the rigidly secured scissors-handle extending at an angle of about 45° to the axis of said sheath, the other scissors-handle being arranged directly in front of the first-named scissors-handle when the handles are closed.

JOSEPH E. HELD.