

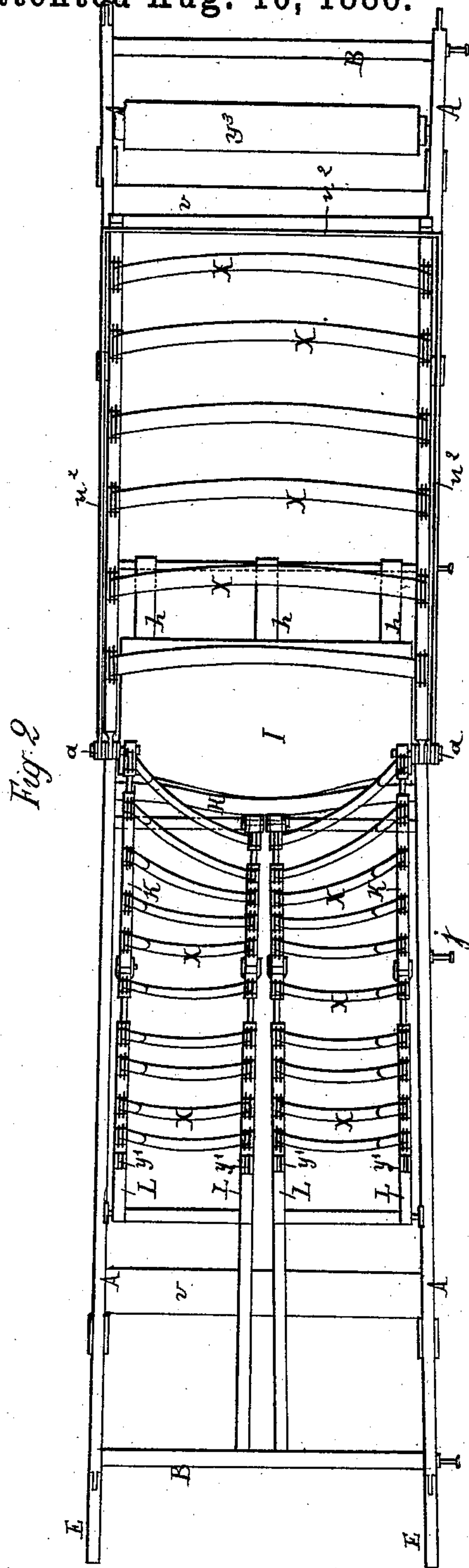
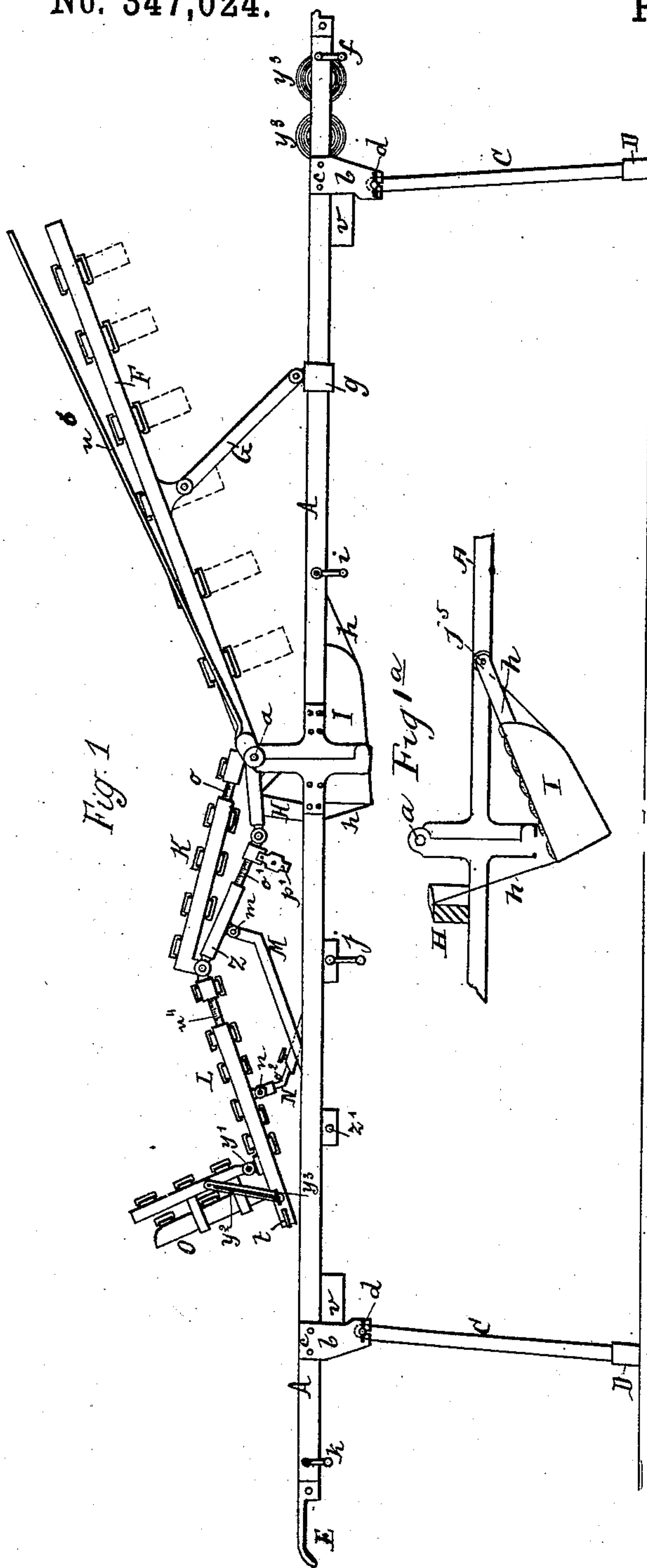
(No Model.)

4 Sheets—Sheet 1.

E. BONNEFOY.  
SURGICAL CHAIR.

No. 347,024.

Patented Aug. 10, 1886.



WITNESSES:

E B Bolton

Geo. Scintor

INVENTOR:

Eugene Bonney  
 by his attys  
 Burke, Traver & Bonney

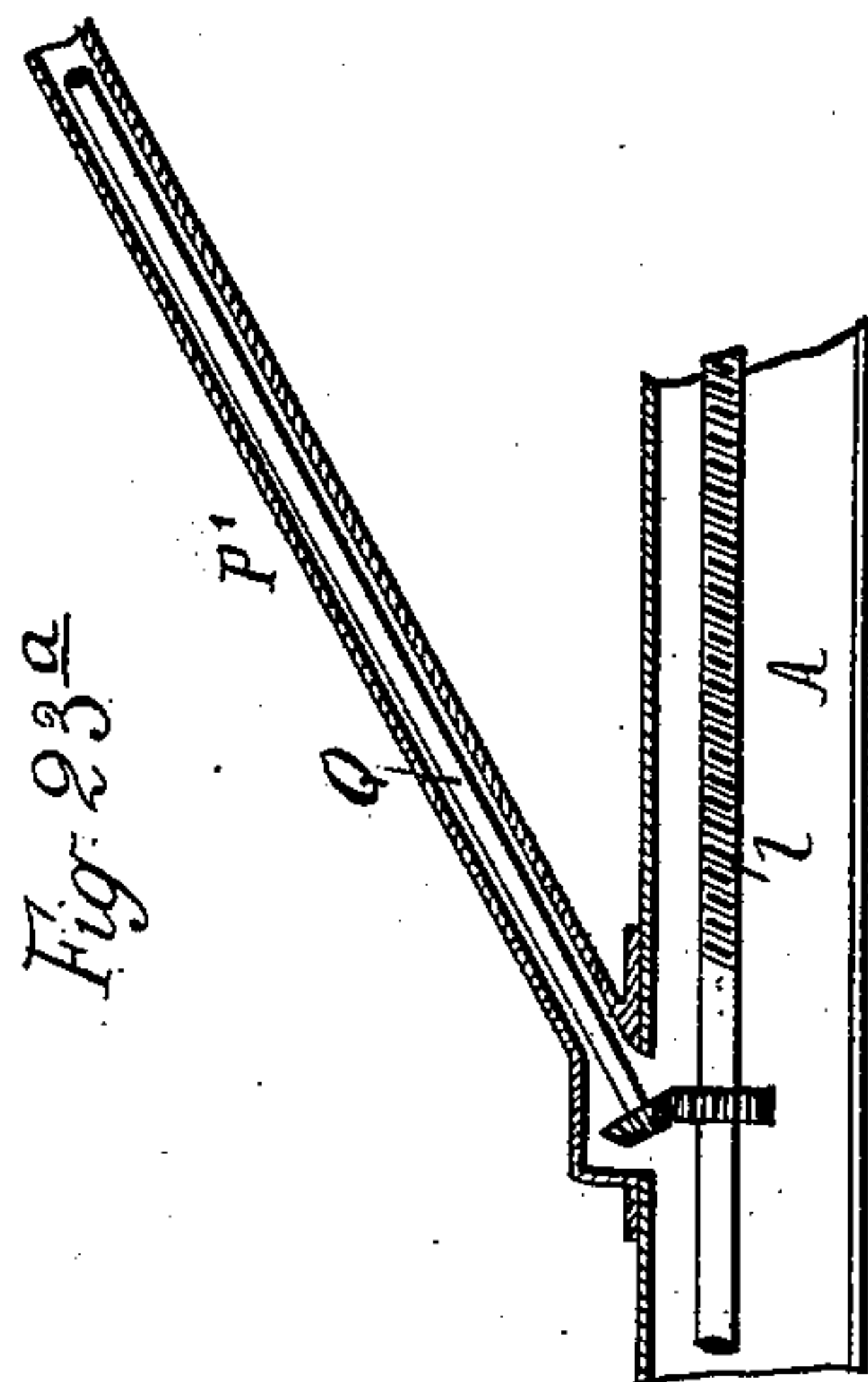
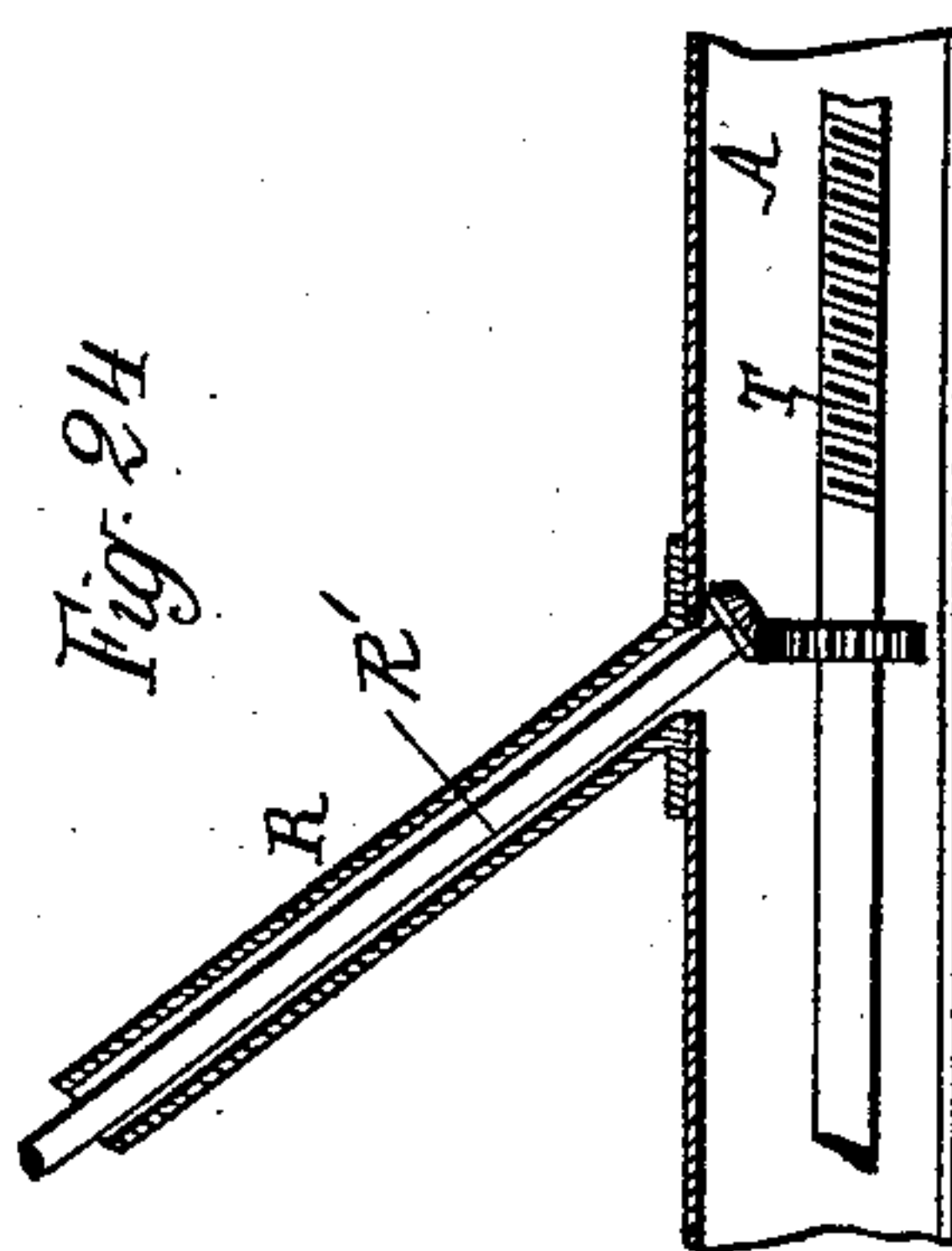
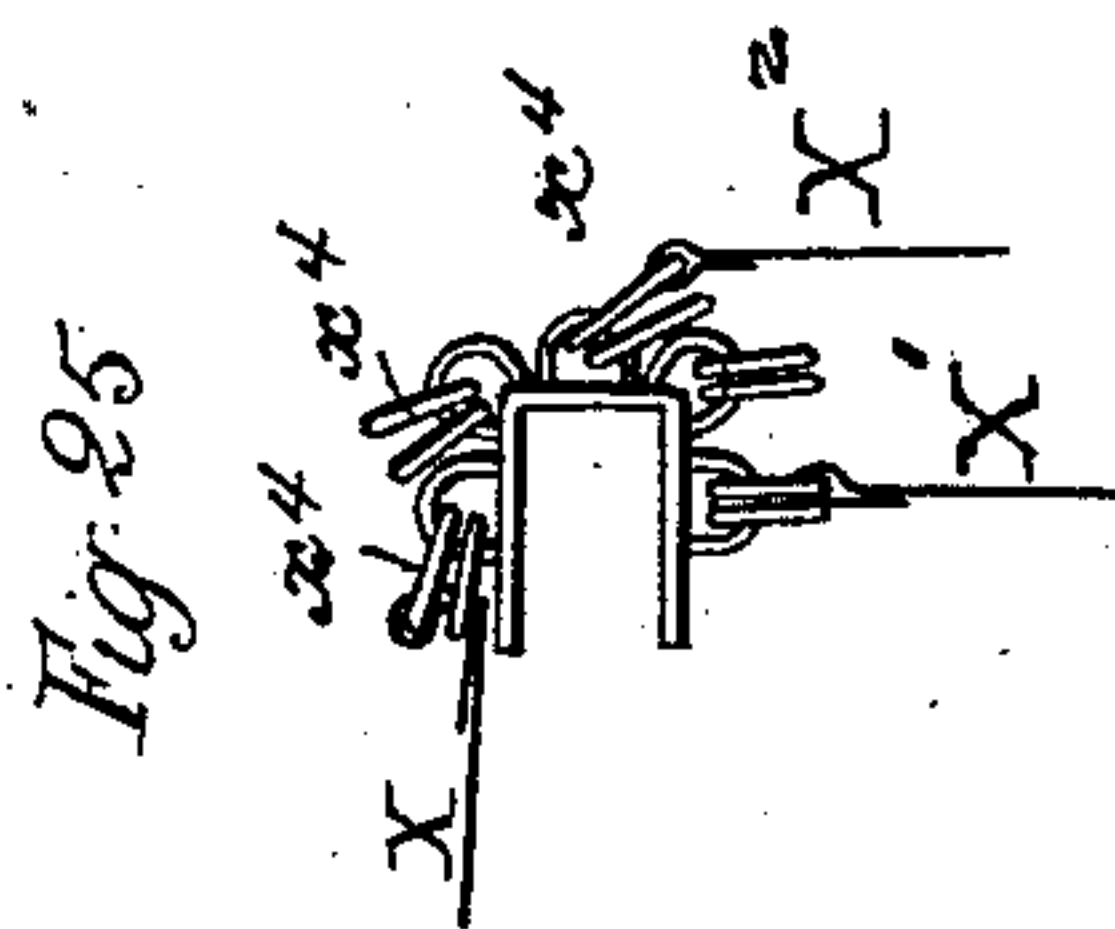
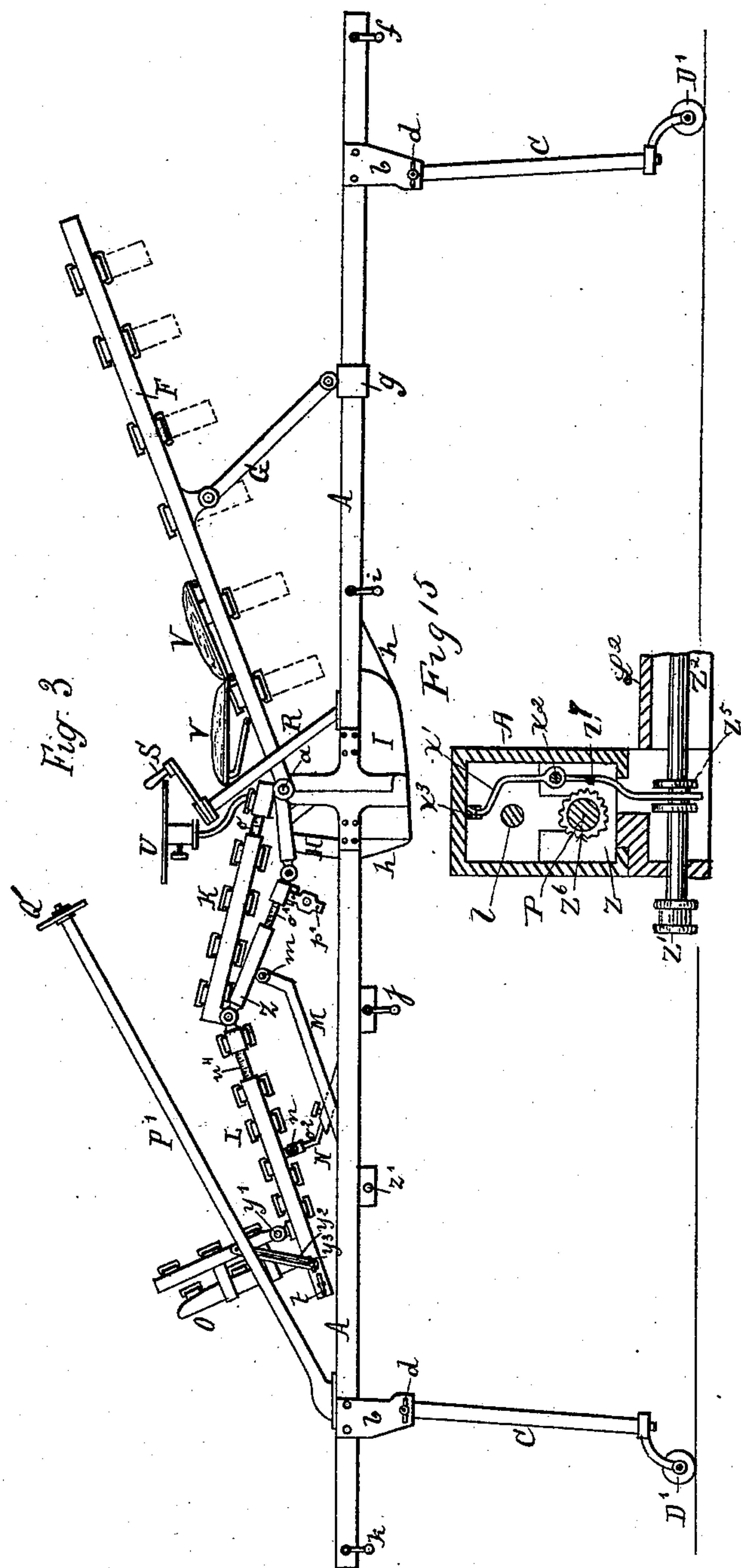
(No Model.)

**E. BONNEFOY.**  
**SURGICAL CHAIR.**

4 Sheets—Sheet 2.

No. 347,024.

Patented Aug. 10, 1886.



WITNESSES:

C. B. Bolton

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Burke, Fraser & Co.

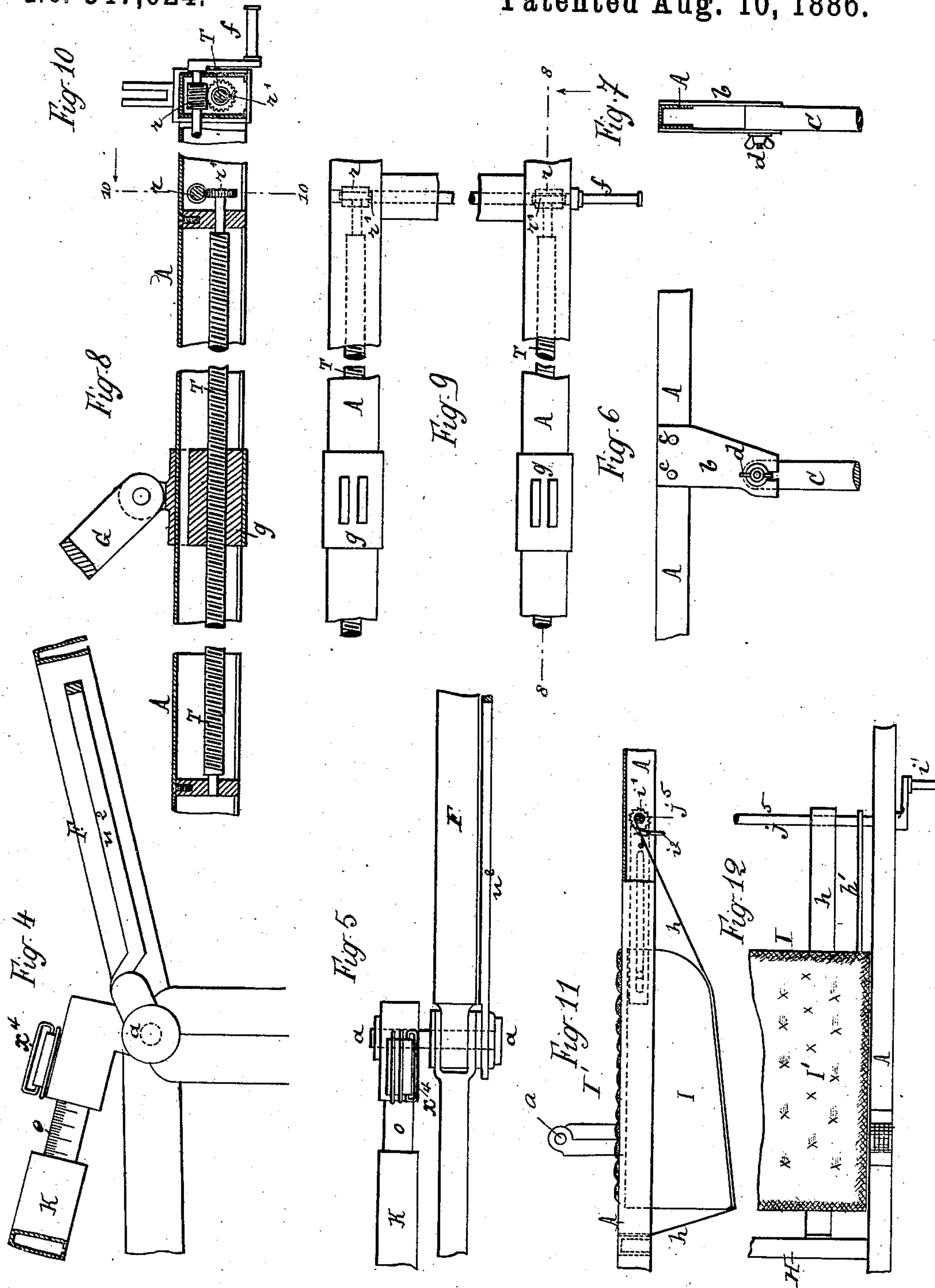
(No Model.)

4 Sheets—Sheet 3.

E. BONNEFOY.  
SURGICAL CHAIR.

No. 347,024.

Patented Aug. 10, 1886.



WITNESSES:

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Geo. Bainson

INVENTOR:

Eugene Bonnefoy  
by his Attys  
Parker, Traver & Bennett



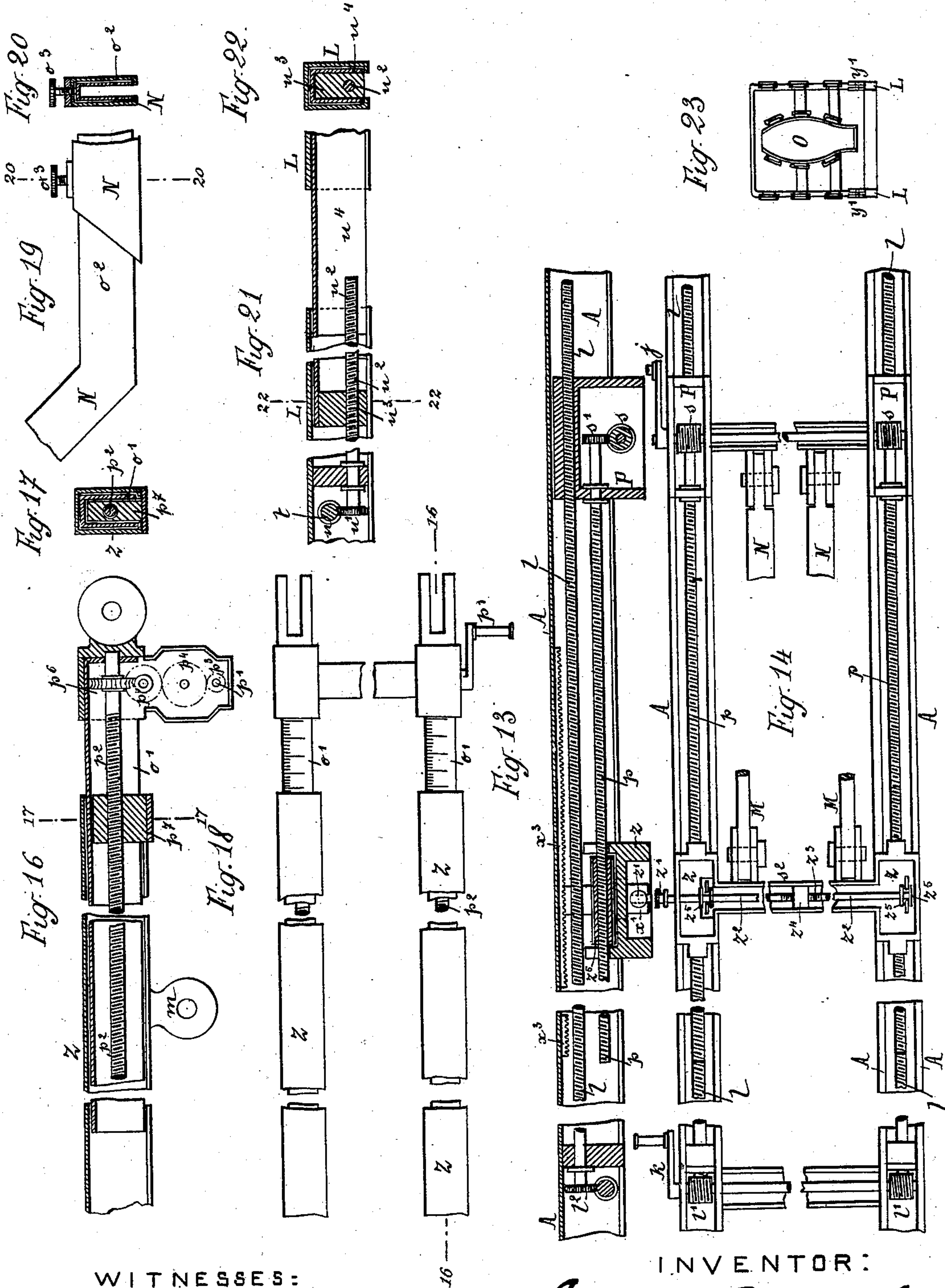
(No Model.)

4 Sheets—Sheet 4.

E. BONNEFOY.  
SURGICAL CHAIR.

No. 347,024.

Patented Aug. 10, 1886.



WITNESSES:

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Geo. D. Dainion

INVENTOR:

Eugene Bonnefoy  
by his attys  
Brooke, Fraser & Bennett



# UNITED STATES PATENT OFFICE.

EUGÈNE BONNEFOY, OF ROANNE, FRANCE.

## SURGICAL CHAIR.

SPECIFICATION forming part of Letters Patent No. 347,024, dated August 10, 1886.

Application filed July 27, 1883. Serial No. 102,095. (No model.) Patented in France August 2, 1881, No. 144,221; in England August 3, 1881, No. 3,395, and in Belgium December 12, 1882, No. 59,836.

*To all whom it may concern:*

Be it known that I, EUGÈNE BONNEFOY, a citizen of the French Republic, and a resident of Roanne, (Loire,) France, have invented certain new and useful Improvements in Surgical Apparatus for the Treatment of Fractures, Diseases of the Joints, &c., of which the following is a specification.

Heretofore in the treatment of fractures, 10 coxalgies, and osseous regenerations it has been the universal custom to employ plaster molds and splints for the injured member, to hold the parts firmly in place and prevent any movement of the same during the healing process or knitting of the bones. This mode of 15 treatment has serious inconveniences. It does not permit of articular movements of the member or part incased; it renders the treatment of the injury very difficult, and it prevents the attendant from carefully noting the progress of the cure. In case of complications, arising from any cause, the mold must be taken off.

What I have said of plaster is equally true 25 of all other methods of this character.

In my present invention I have sought to avoid the above inconveniences by substituting for the mold or splint a mechanism which offers important advantages.

30 By means of my apparatus I am enabled to fix immovably and in an instant the fractured or injured parts, so as to insure a perfect joining of the fragments until complete consolidation is effected, with the possibility of flexing the joints without the least reaction on the 35 injured parts.

My apparatus also provides, in addition to the holding of the osseous fragments in the axis of the member, a means whereby the member may, according to requirement, be lengthened or shortened—that is to say, the fractured parts, while being firmly held, may be moved toward or from each other. Free access may be had to the injured part at all 40 times, and the progress of the healing and knitting noted.

With my apparatus I am able not only to treat simple fractures of the members, but multiple fractures of the vertebral column and 45 basin or pelvic region, as well as osseous regenerations and coxalgies.

My apparatus comprises, in general, a litter provided with hinges which correspond to the hip, knee, and ankle joints of the patient, straps to hold the members down firmly 55 to the couch of the litter, mechanism for varying the angles at the hinges, and mechanism for elongating and shortening the parts, all as will be hereinafter more fully described.

In the drawings, which serve to illustrate 60 my invention, Figure 1 is a side elevation of my apparatus as adapted for use in general, and especially for ambulance or outdoor use. Fig. 1<sup>a</sup> is a detached elevation of the box or cushion-receptacle I and its cushion, shown as 65 lowered. Fig. 2 is a plan of the same. Fig. 3 is a side elevation similar to Fig. 1, showing my apparatus for indoor use, provided with additional conveniences for the patient, and with casters, whereby it may be wheeled about 70 conveniently. The main features of construction are the same as those seen in Figs. 1 and 2. Figs. 4 to 25 are detached fragmentary detail views, on a larger scale, that illustrate the working parts. These will be referred to 75 more particularly hereinafter.

The base of my apparatus is a stout frame made of sheet-steel, of U shape in cross-section, and comprising side rails, A A, connected by transverse bars B B. The rails A 80 are hinged at their middles at *a*. Figs. 4 and 5 show, respectively, a side elevation and a plan of the hinge. This hinging at the middle enables the frame to be folded for convenience of transportation. The frame has legs C C, 85 which are hinged to shorter legs *b b*, riveted to the rails A at *c c*. The legs C are connected to the shorter legs *b* by means of clamping thumb-screws *d d*, as clearly shown in the two detached elevations, Figs. 6 and 7. The legs 90 C are provided with feet of rubber D, as shown in Fig. 1, or casters D', as shown in Fig. 3. At the ends of the side rails, A, are mounted hinged or folding handles E E, for convenience in carrying the litter. On this frame is 95 hinged at *a a*, Figs. 1, 3, 4, and 5, the movable back F of the couch, the movement of which on its hinges is effected by mechanism (best seen in Figs. 8, 9, and 10) which are respectively a longitudinal vertical section of rail 100 A on line 8 8 in Fig. 9, a plan of rails A A, and a transverse section on line 10 10 in Fig. 8.



G is a link-brace hinged at its upper end to the back F, and at its lower end to a slide-nut, *g*, mounted on rail A.

T is a screw mounted in bearings in the hollow of the rail and engaging nut *g*.

*r'* is a worm-wheel on the end of screw T.

*r* is a worm or screw mounted rotatively in the rail A, and engaging wheel *r'*, and *f* is a crank fixed on the axis of the worm *r*.

The operation of raising and lowering the back F by means of the crank *f* will be readily understood. Each side rail is provided alike, and the two worms *r* are on a shaft in common, which extends across the frame in the hollow of the transverse bar B. When the patient reclines on the couch, the hinging axis of the back F corresponds exactly with the axis of articulation of the hip-joints, and it is at this point also that I hinge those parts of my apparatus which support the inferior members, and take the points of counter-extension which support the basin in front on the rest H. This rest is padded and fixed, and its shape may be represented by a curved line fitted in front to the ischions and the superior and inferior parts of the thighs, and by a right line which traverses the basin and passes through the axes of the hip-joints. The hinge at the middle maintains the perfect symmetry of the two parts of the body by permitting the necessary play or flexure at the hips. It is this which gives me pelvic counter-extension—that is to say, the immobilization of one of the fragments or parts to adapt it to the other, which otherwise would not be possible. The basin rests on a small cushion or mattress, I', in a box or receptacle, I, which is hinged at one end between the rails A by means of arms *h'*, hinged on a cross-shaft, *j'*, as seen in Figs. 10, 11, and 12, the former of which are elevations and the latter a plan of the part. The cushion-box I is supported on straps *h h*, attached at one end to the rest H and at the other end to the shaft *j'*, on which they are wound by rotating said shaft through the medium of a crank, *i*. The shaft *j'* is provided with an ordinary ratchet, *i'*, and pawl *i''*, to prevent it from rotating backward inadvertently. By means of this supporting device the cushion I' may be raised or lowered for convenience in treating the patient.

For supporting the inferior members and forming a part of the couch, I provide two concave supports, K K, for the thighs, which are hinged at *a a*, and are perfectly independent of each other. To these are hinged similar concave supports, L L, for the inferior portions of the legs, the hinges being at the knees. Each leg-rest K L rests on two points of support. The part K is supported by the brace-link M and the part L by the brace-link N. The upper end of link N is hinged directly to the rest L at *n*, and the upper end of link M is connected indirectly (in a manner that will be hereinafter described) to the rest K at *m*.

Figs. 13, 14, and 15 illustrate the mechanism for raising and lowering the rests K L, Fig. 13 being a longitudinal vertical section through a side rail, A, Fig. 14 a sectional plan, and Fig. 15 a transverse section. The link M is controlled by a crank, *j*, and the link N by a crank, *k*. The crank *j* bears on its axis or shaft two worms or screws, *s s*, which drive each a long screw, *p*, arranged in the hollow of a rail, A, through the medium of a worm-wheel, *s'*, one on each screw *p*. The screws *p* in turning cause to advance or retreat nuts *z z*, connected by a cross-piece, *s''*, to which are hinged the lower ends of the links M. The parts I have called "nuts *z z*" are merely sliding boxes mounted in the rails A A, and in each is rotatively mounted a sleeve-like nut, *z'*, the functions of which will be hereinafter explained. The crank *k* transmits movement to the screws *l* through the medium of the worms *l'* and the worm-wheels *l''*. The nuts P are traversed by the screws *l*, and as these screws are journaled in the rails A, (see at the left in Figs. 13 and 14,) it follows that the screws will drive the nuts P back and forth along the rails A. The crank *j* and its axis or shaft are mounted in the nuts P, and the screws *p* have collared bearings in the same; consequently the screw *l* will also, under certain conditions, hereinafter described, impart motion to the nuts *z*, as will be seen from inspection of Fig. 13. When the rests K L have been properly adjusted, the parts may be fixed by turning the shaft *z'*, through the medium of the milled head *z''*. The shaft *z'* has screw-threads *z'''*, which engage a female screw in a fixed nut, *z''*, in the cross-piece *s''*.

On the shaft *z'* are collars *z'''*, arranged in pairs, (see Fig. 14,) and between each pair of collars the slotted lower ends of two plates, *x'*, straddle the shaft *z'*. The plates *x'* are pivoted or fulcrumed in the sliding nut *z*, at *x''* (see Fig. 15,) and by the movement of the screw *z'* back and forth the plates are made to oscillate. The upper ends of the plates are toothed to fit into the teeth of racks *x''*, fixed on the lower faces of the crowns of the rails A. When the teeth of plates *x'* are in engagement with the teeth of rack *x''*, the parts above described are locked fast to rails A, as seen in Fig. 15. The crank *k* cannot now be turned. As for the crank *j*, this can be turned, but the sleeve-nut *z'* on screw *p*, which is collared in the slide-nut *z*, turns with the screw, and no endwise movement is obtained. This sleeve-nut *z'* has teeth like a long pinion, and on the plate *x'* is formed a projection or tooth, *z'*, (see Fig. 15,) which engages these teeth on the sleeve-nut when the plate is not in engagement with rack *x''*, and holds the nut from turning. When the plate *x'* is engaged with the rack, as in Fig. 15, the tooth *z'* is out of engagement with the sleeve-nut and the latter will rotate with the screw *p*. The side rails of the rests K are constructed telescopic, so as to be lengthened and shortened to suit the



requirements of the surgeon. The part hinged at  $a$  has a graduated bar,  $o$ , (see Fig. 1,) which slides in the side rail of the rest K.

The extension of the rest K is effected by the mechanism shown detached and enlarged in Figs. 16, 17, and 18. Fig. 16 is a longitudinal section on line 16 16 in Fig. 18. Fig. 17 is a cross-section on line 17 17 in Fig. 16, and Fig. 18 is a plan. This device is in the nature of telescopic bars coupled at one end to the frame which supports the rest H, (see Fig. 1,) and at the other end to leg-rest K L, where the two parts are hinged together, and provided with screw mechanism for sliding the telescoping parts on each other.

Z is a hollow bar, U-shaped in section. This bar is coupled to the leg-rest at the hinge, as seen in Fig. 1. In this bar Z slides another similar bar,  $o'$ , which is graduated on top, as seen in Fig. 18. This bar is hinged to the frame which supports rest H. In the hollow of bar  $o'$  is rotatively mounted a screw,  $p^2$ , the thread on which engages a thread in a nut,  $p^1$ , fixed to bar Z. On screw  $p^2$  is fixed a worm-wheel,  $p^6$ , which is driven, through a worm on screw  $p^5$  from a crank,  $p'$ , through suitable gear-wheels,  $p^4$ . To the bar Z the links M are coupled at  $m$ .

The links N are constructed to be lengthened and shortened at will, as illustrated in Figs. 19 and 20, the former of which is a side elevation and the latter a cross-section. The part  $o^2$  slides telescopically into the other part, and a set-screw,  $o^3$ , is employed to clamp the two together when properly adjusted.

The part L of the leg-rest is provided with means for varying its length, which are similar to those before described. This construction is illustrated in Figs. 21 and 22, the former being a longitudinal section of one of the rails of the rest L and the latter a cross-section. The bar  $w^1$  slides telescopically in L, and is graduated, as seen in Fig. 1.

On the crank-shaft  $t$  is a worm,  $u$ , which meshes with a worm-wheel,  $u'$ , on a screw,  $u^2$ , which is rotatively mounted in collared bearings in L. The thread on this nut engages the thread in a nut,  $w^3$ , fixed in bar  $w^1$ .

The operation will be readily understood.

The sandals or foot-rests O of the couch are hinged at  $y'$  to the leg-rests L, and their inclination can be varied by means of slotted braces  $y^2$ , hinged at their upper ends to the sandals, and secured to L at their lower ends by set-screw or clamp-screw  $y^3$ . In Fig. 23 I have shown one of these sandals O in front elevation.

In the more elaborate form of my apparatus (illustrated in Fig. 3) I have shown it provided with means whereby the patient may himself effect the proper or desired adjustments, and also provided with other conveniences that will be hereinafter described. In this form P' is a tubular sheath attached at its lower end to a rail, A, and projecting back to within reach of the patient. Within this sheath is mounted

a shaft, Q, provided with a hand-wheel or crank, Q', on its upper projecting end, and provided with a toothed wheel on its lower end, which meshes with a toothed wheel on the screw L. This mechanism is shown clearly in the enlarged sectional view, Fig. 23<sup>a</sup>. Through this mechanism the patient is enabled to effect the rotation of screw L. In a similarly-arranged sheath, R, (see Figs. 3 and 24,) is mounted a shaft, R', which has a crank, S, on its upper end within reach of the patient. This shaft bears a toothed wheel, which meshes with another toothed wheel on the screw T, whereby the patient is enabled to raise or lower the back F.

U is a small table mounted on the litter at the side of the patient for his convenience, and V V are cushion supports or rests for his arms.

Fig. 25 is a detached view showing rings  $x^1$ , arranged along the side rails of the back-rest F, the leg-rests K L, and the foot-rests O. Extending across the said rests from rail to rail, and attached by means of these rings, are, first, an upper set of rubber bands, X X, next to the body of the patient, and, second, a set of bands, X', below these, to support a mattress, on which the body of the patient rests. When it is desired to remove the mattress for any reason, the bands X are drawn tight, when they will be firmly held by the grip of the attaching-rings, as clearly illustrated in Fig. 25. The lower series of bands, X', supporting the mattress, may now be slacked up and the mattress lowered, leaving the patient resting for the time on the bands X. By this means the bedding on which the patient rests may be removed from below and changed without disturbing his position. This is very important in some cases. The bands or straps  $x^2$ , for securing a limb in position, for example, are attached to the rings seen in Fig. 25. By the slacking or tightening of the bands X the body of the patient may be raised or lowered at will. The rings  $x^1$  are in couples, and the attachment of the band X or X' is made by passing the end of the band up through both rings, around the upper ring, and then back under the lower ring, whereby the said end is clamped between the ring and the band. This forms a well-known fastening-hitch, that will at once give way as soon as the band is slackened, but will hold its grip while there is tension on the band. It will be seen that the body of the patient is suspended between the rails of the back F, and that the bar H supports the body against any endwise movement, especially when the back F is inclined. The cushion I forms a support for the buttocks and heavier part of the body, and it may be lowered very conveniently to make room for a vessel or commode, when such is required.

I am enabled to provide my apparatus with all that is necessary for treatment with irrigations without soiling the mattress, and to



employ irrigation with phenol without touching the wound or member, which may be held fixed in an atmosphere of phenol vapor, as in renewing the dressings or performing an operation.

The form of apparatus seen in Figs. 1 and 2 carries with it all the operating parts. The cranks are under the control of the surgeon only, in order that the position he gives to the patient may not be changed through ignorance. The cranks are made removable, so that the surgeon may carry them in his pocket.

In Fig. 1,  $y'$  represents two rolls of some thin material which may be used to form an awning to shade the patient on the battle-field or in the open air. In forming a tent or awning of these one is placed on the other to insure warmth in cold weather. One is made impermeable or water-proof, and this one is placed above. A light bow or frame,  $u^6$ , hinged at  $a$ , and capable of being raised up or turned down, like a carriage-top, is employed to support the awning-cover. The sheets, when stretched over the bow  $u^6$ , may be secured to the frame of the litter in any convenient way. The frame or bow will be held erect by the fabric stretched over it.

The form of litter shown in Fig. 3 may also be provided with a bow,  $u^6$ , to support an awning, if such is desired. At each end of the frame of the litter may be arranged lock-boxes  $v$   $v$ , Fig. 1, to hold bandages, &c., for the surgeon's use.

In Figs. 1 and 3 the position of the bands  $X$  and  $X'$  is indicated on the back  $F$  by dotted lines, and in Fig. 2 the bands  $X$  are shown in full lines. It will be understood, however, that these bands are not, ordinarily, attached permanently to the couch.

Having thus described my invention, I claim—

1. The combination, with the stout frame of the apparatus hinged at its middle,  $a$ , for folding, of the adjustable couch mounted on said frame, and comprising the back  $F$ , hinged to the frame also at  $a$ , the jointed leg-rests  $K$   $L$ , hinged to the frame also at  $a$ , and means, substantially as described, for supporting said back and leg-rests in an inclined position, whereby the frame and couch may be folded on a common hinge-axis, as described.

2. The back  $F$  and leg-rests  $K$   $L$  of the couch, constructed of side rails and flexible bands, which latter hang down between the side rails, so as to bring the hinging-axis  $a$  coincident with the axis of the hip-joint of the patient, and the rigid curved rest or bar  $H$ , mounted as shown, and arranged to take under and support the upper portions of the thighs, as set forth.

3. The combination, with the back  $F$ , hinged at  $a$  to the main frame, and the said main frame, of the screw  $T$ , mounted in bearings in the hollow rail  $A$ , the nut  $g$  on said screw, the link  $G$ , coupled at one end to the back and at the other end to said nut  $g$ , the worm-wheel  $r'$  on said screw  $T$ , the worm  $r$ , engaged with wheel  $r'$ , and the crank  $f$  on the axis of said worm, all substantially as described.

4. The combination, with the main frame, of the box  $I$ , hinged in the same at its one end, its cushion  $I'$ , the supporting-straps  $h$   $h$  under said cushion, the winding-shaft  $j^5$ , on which said straps are wound at their one ends, the crank  $i$ , and the pawl and ratchet for preventing the backward rotation of shaft  $j^5$ , substantially as set forth.

5. The combination, with the hollow rail  $A$  of the main frame, and the screw  $l$ , mounted therein, of the sheath  $P'$ , fixed to rail  $A$ , the oblique shaft  $Q$ , mounted in said sheath, and provided with a crank,  $Q'$ , and the intermeshing gear-wheels on shaft  $Q$  and screw  $l$ , respectively, whereby the patient may operate the said screw, as set forth.

6. The combination, with the hollow rail  $A$  of the main frame and the screw  $T$ , mounted therein, of the sheath  $R$ , fixed to rail  $A$ , the oblique shaft  $R'$ , mounted therein, and the intermeshing gear-wheels on the shaft  $R'$  and screw  $T$ , respectively, whereby the patient may operate said screw, as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

EUGÈNE BONNEFOY.

Witnesses:

AUGUSTE BONNEFOY,  
VICTOR RIBOLET.