No. 670,816. Patented Mar. 26, 1901.

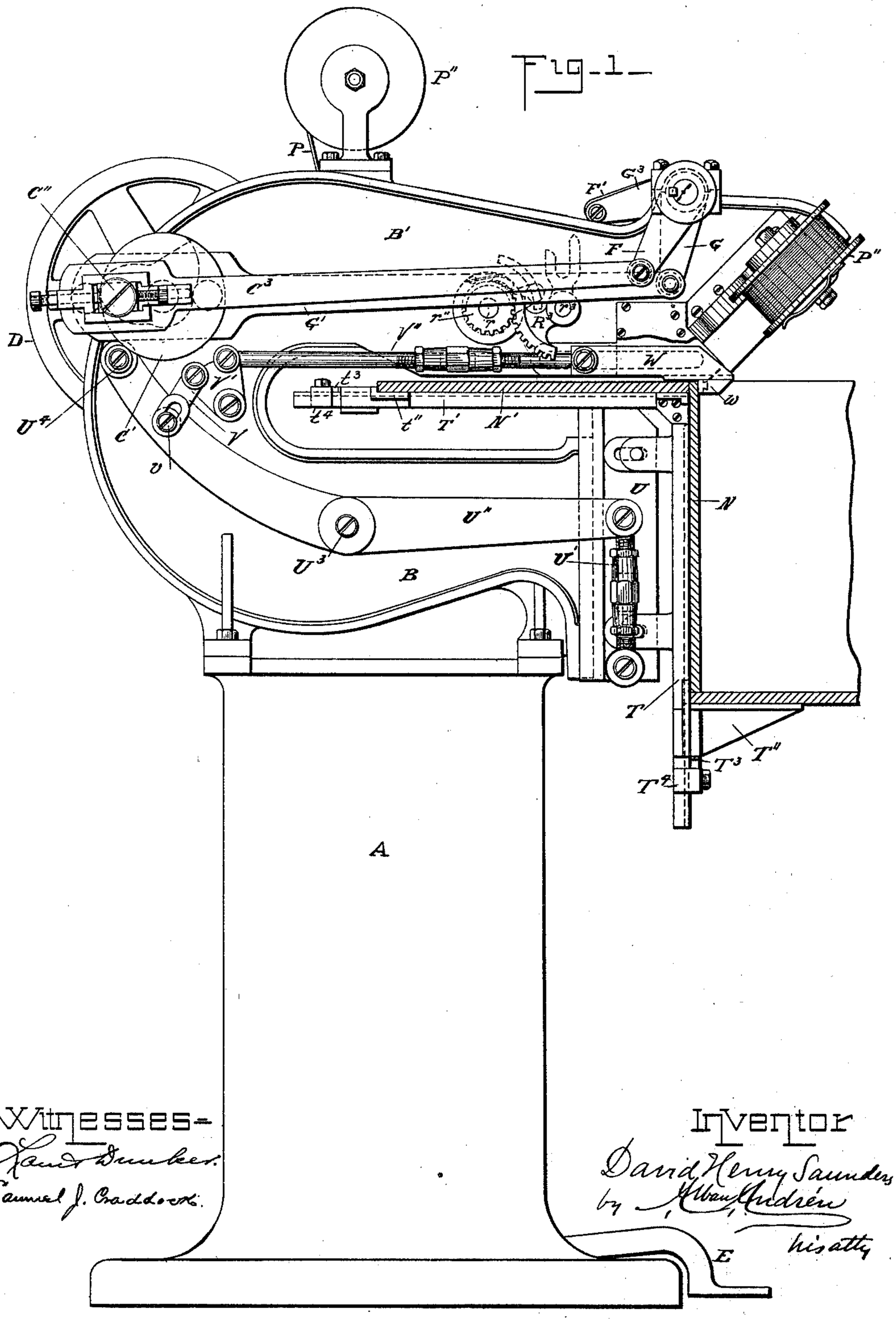
D. H. SAUNDERS.

BOX HINGING MACHINE.

(Application filed Jan. 5, 1900.)

(No Model.) 7 Sheets—Sheet 1.

Fig. 1.



Witnesses—
Saml Dunbeer.
Samuel J. Craddock.

Inventor
David Henry Saunders
by Albert Andrén
his atty

No. 670,816. Patented Mar. 26, 1901.

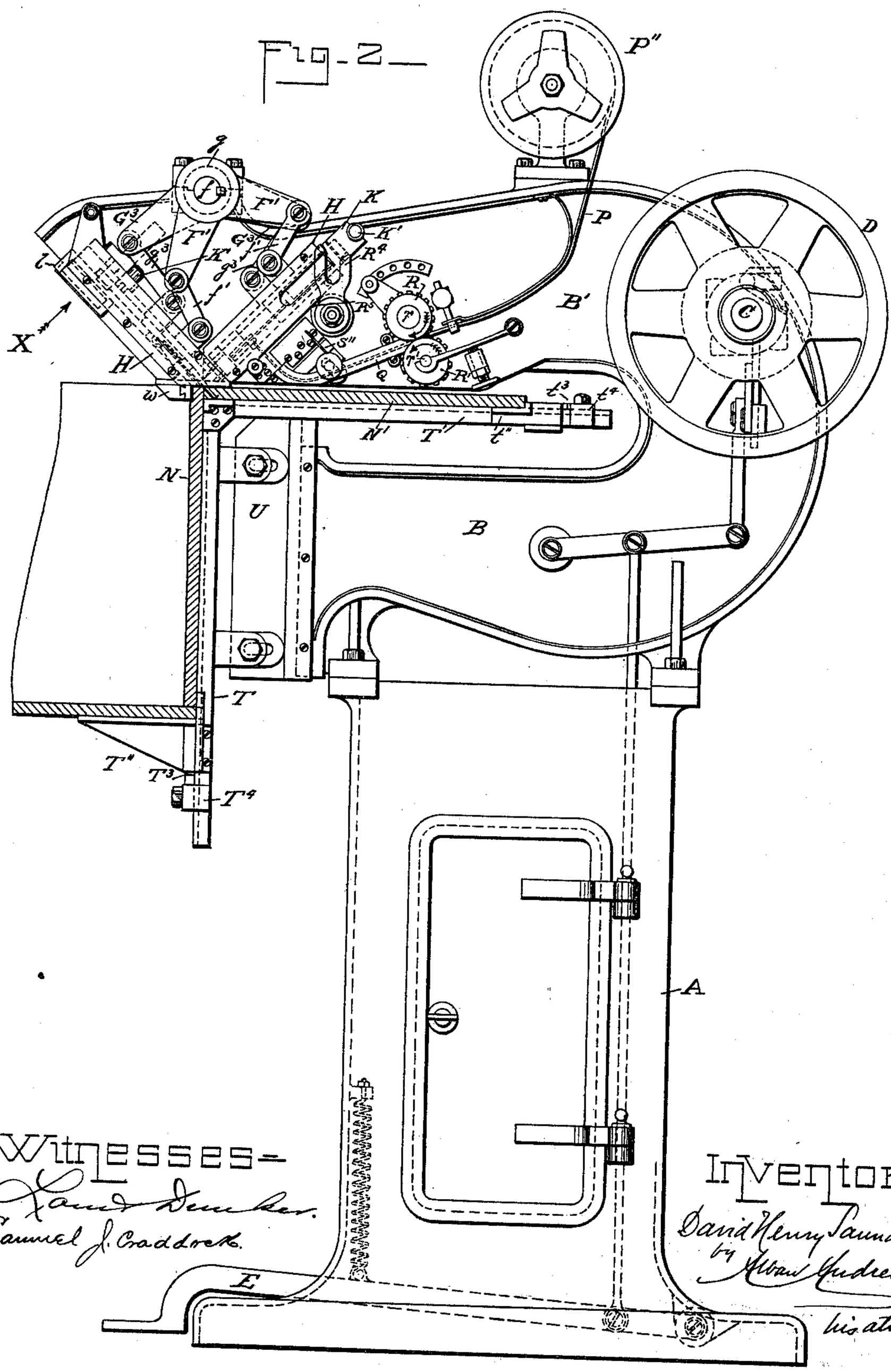
D. H. SAUNDERS.

BOX HINGING MACHINE.

(Application filed Jan. 5, 1900.)

(No Model.) 7 Sheets—Sheet 2.

Fig. 2.



Witnesses—
Laurd Denker.
Samuel J. Craddock.

Inventor
David Henry Saunders
by Albert Gudrich
his atty.

No. 670,816. Patented Mar. 26, 1901.

D. H. SAUNDERS.

BOX HINGING MACHINE.

(Application filed Jan. 5, 1900.)

(No Model.) 7 Sheets—Sheet 3.

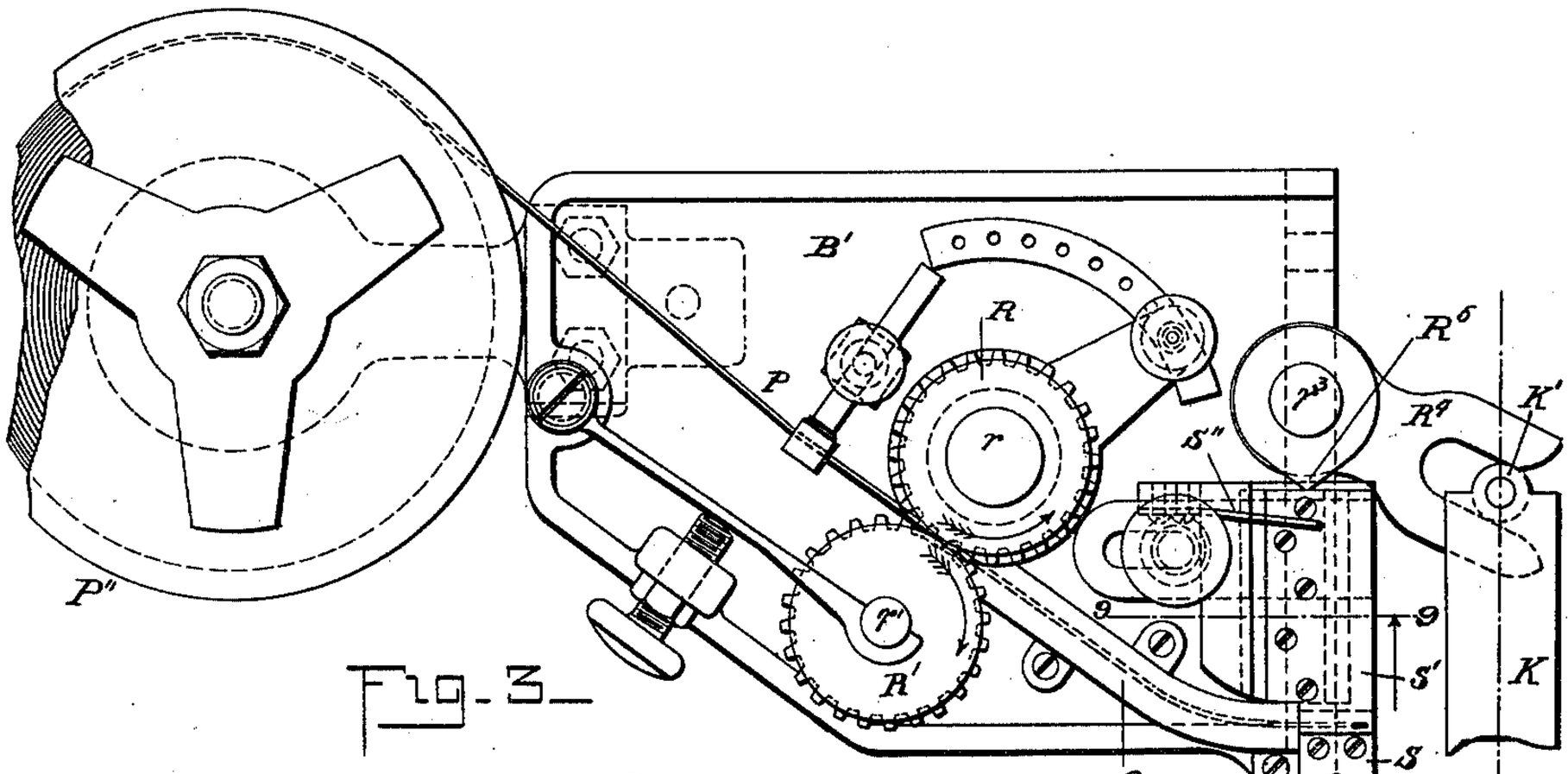


Fig. 3.

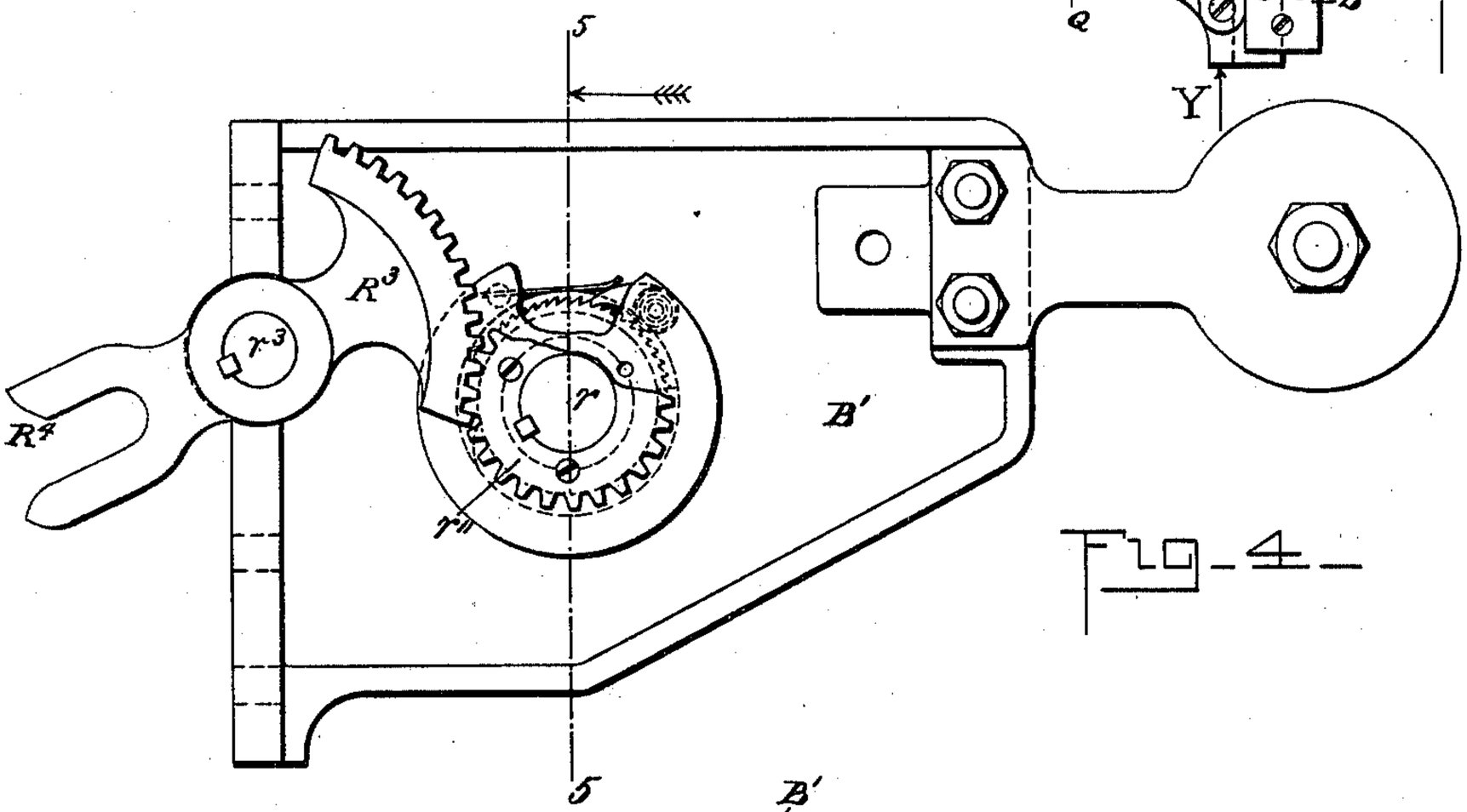


Fig. 4.

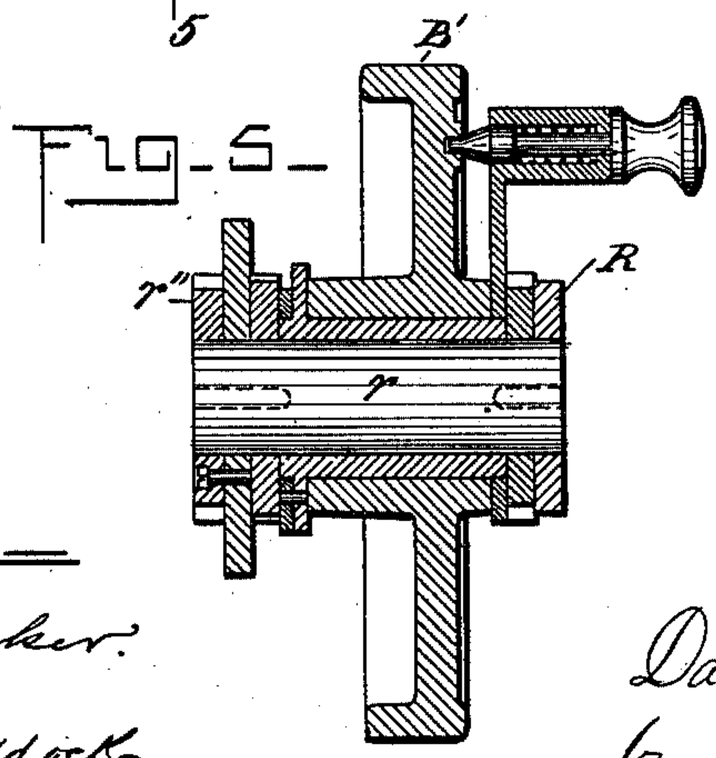


Fig. 5.

Witnesses—
Louis Dunker.
Samuel J. Craddock.

Inventor
David Henry Saunders
by Wm. Lindsey
his atty.

No. 670,816. Patented Mar. 26, 1901.

D. H. SAUNDERS.

BOX HINGING MACHINE.

(Application filed Jan. 5, 1900.)

(No Model.) 7 Sheets—Sheet 4.

Fig. 6.

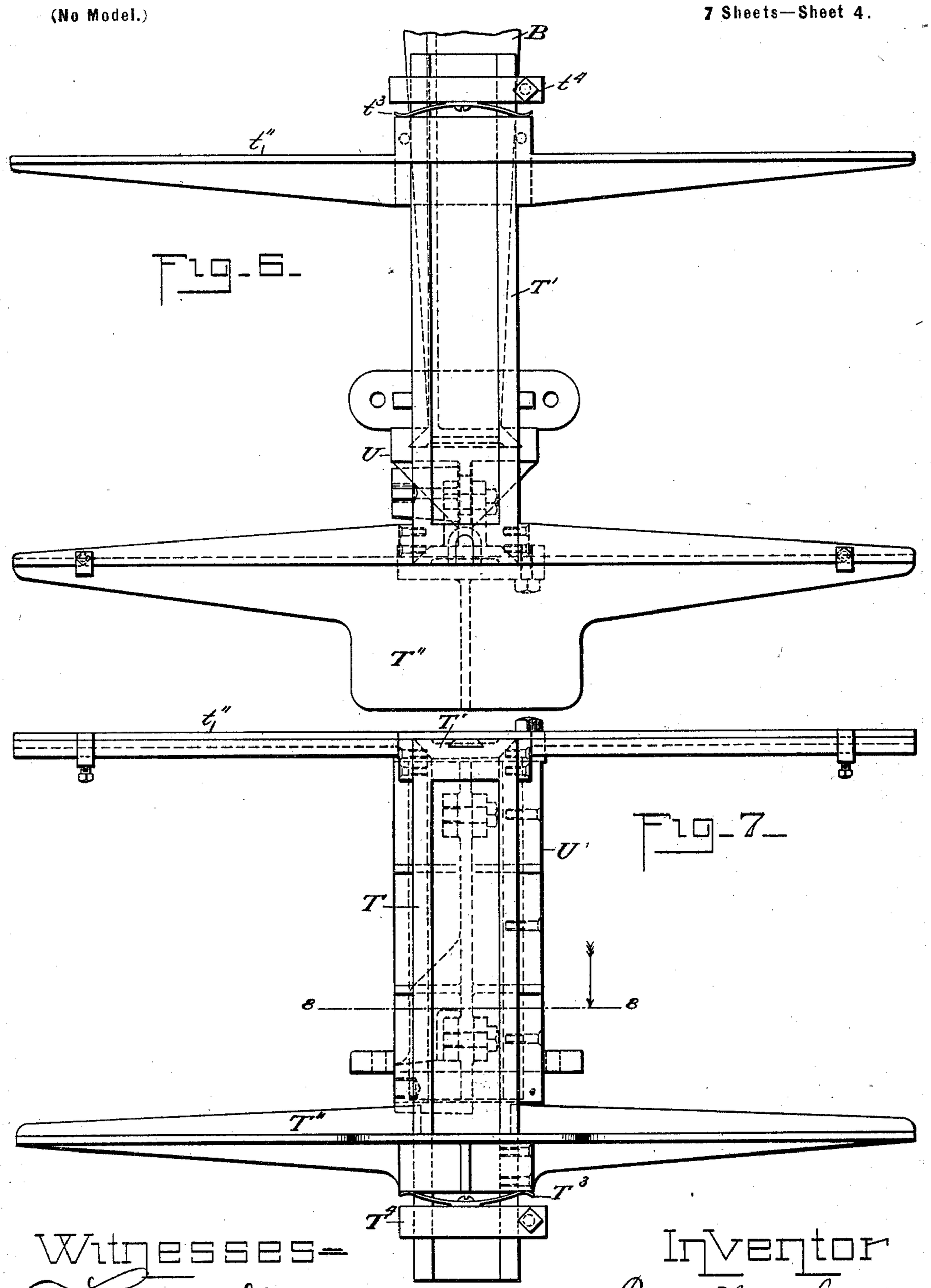


Fig. 7.

Witnesses—

Louis Dunker.

Samuel J. Braddock.

Inventor

David Henry Saunders

by Albert Gridley

his atty.

No. 670,816. Patented Mar. 26, 1901.

D. H. SAUNDERS.

BOX HINGING MACHINE.

(Application filed Jan. 5, 1900.)

(No Model.) 7 Sheets—Sheet 5

Fig. 8.

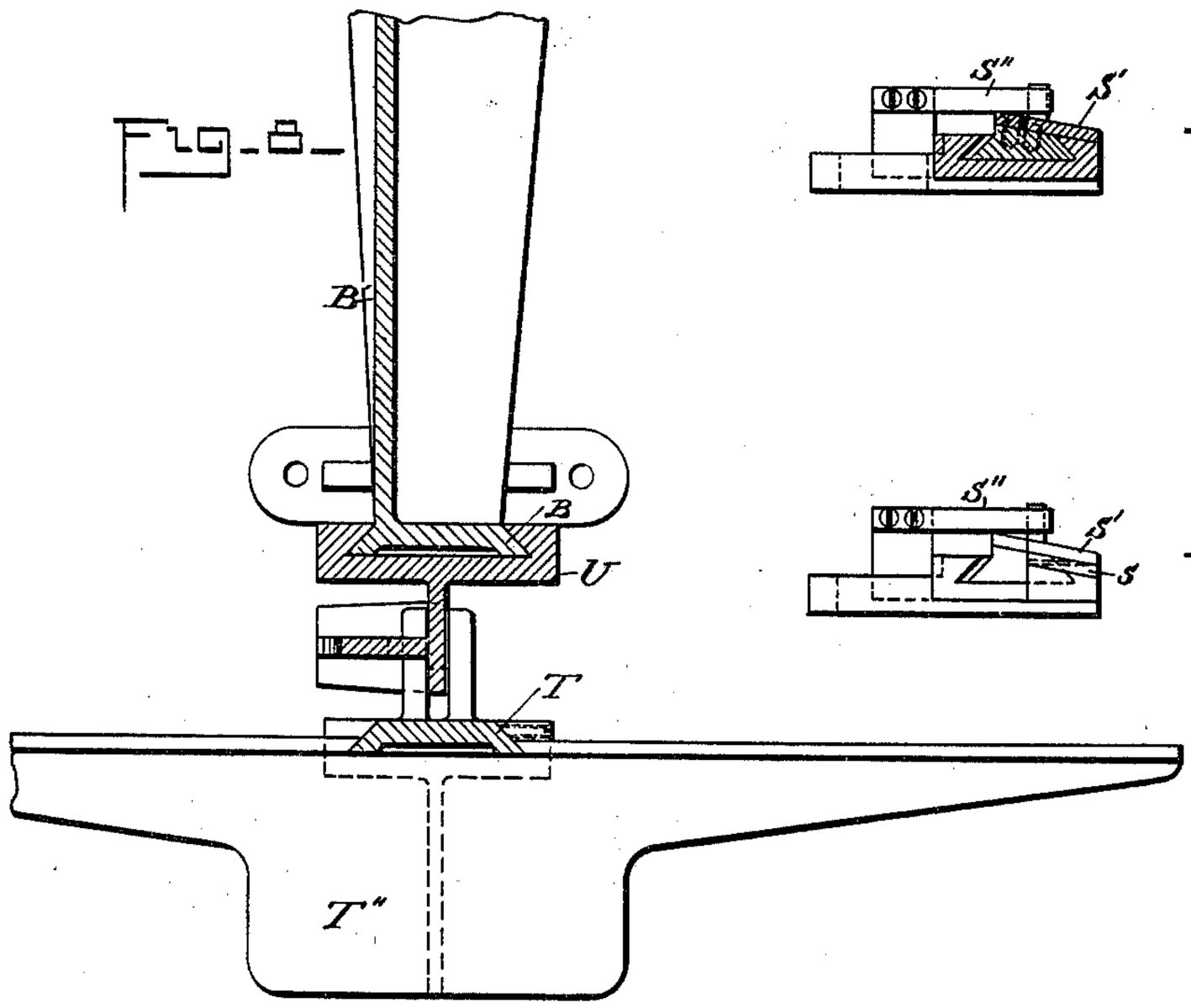


Fig. 9.

Fig. 10.

Fig. 11.

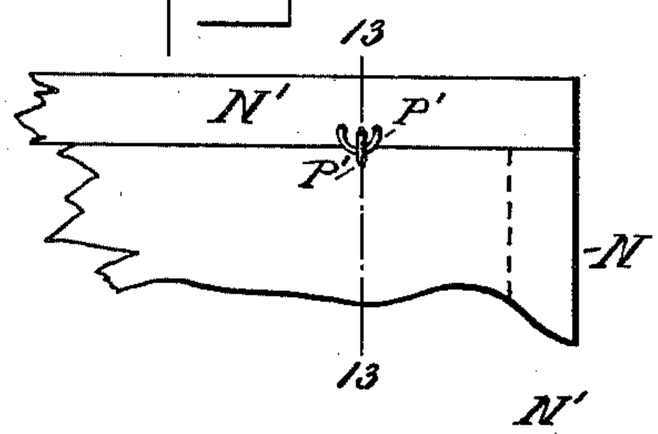


Fig. 12.

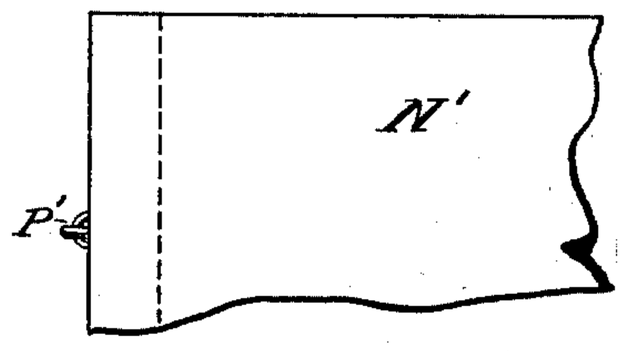


Fig. 13.

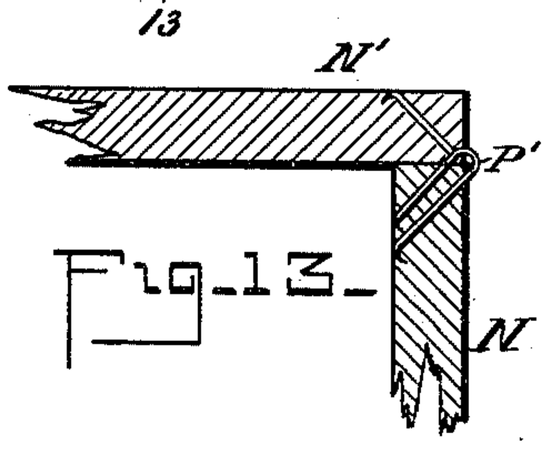
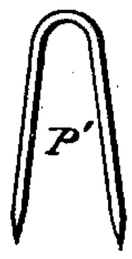


Fig. 14.



Witnesses—
Louis Dunker.
Samuel J. Craddock.

Inventor
David Henry Saunders
by Albert G. Davis
his atty.

No. 670,816.

Patented Mar. 26, 1901.

D. H. SAUNDERS.

BOX HINGING MACHINE.

(Application filed Jan. 5, 1900.)

(No Model.)

7 Sheets—Sheet 6.

Fig. 15.

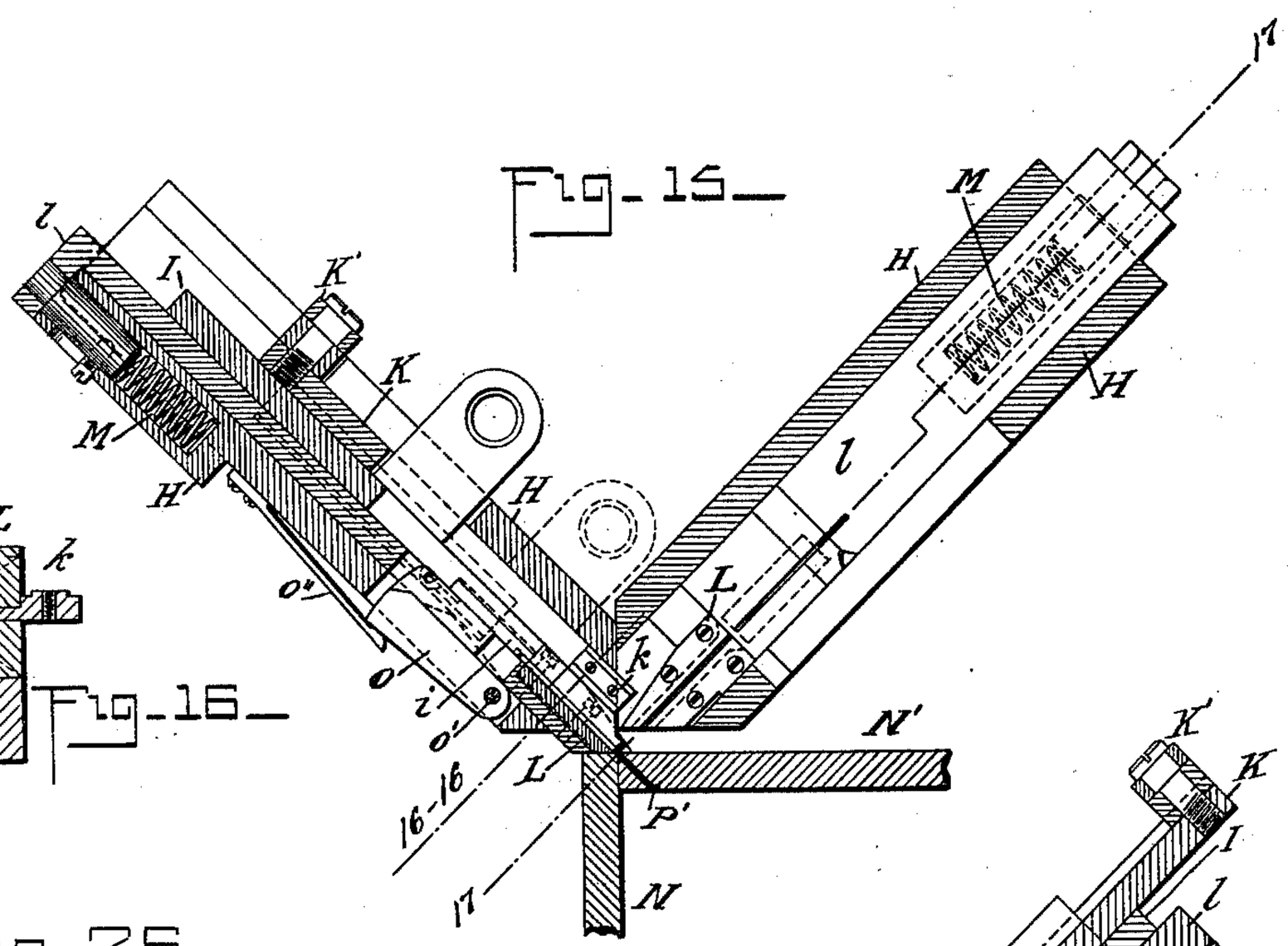


Fig. 16.

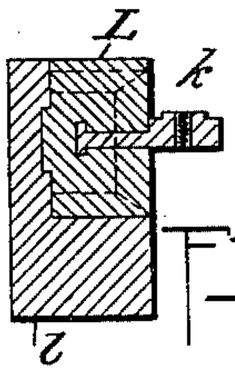


Fig. 26.

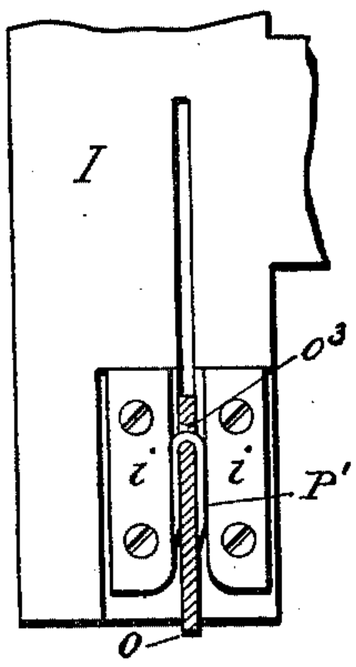


Fig. 27.

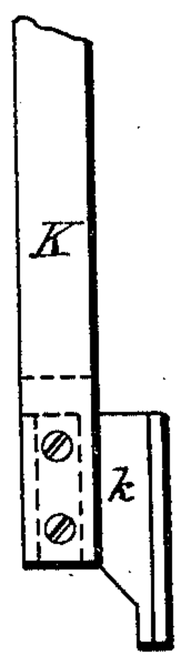


Fig. 17.

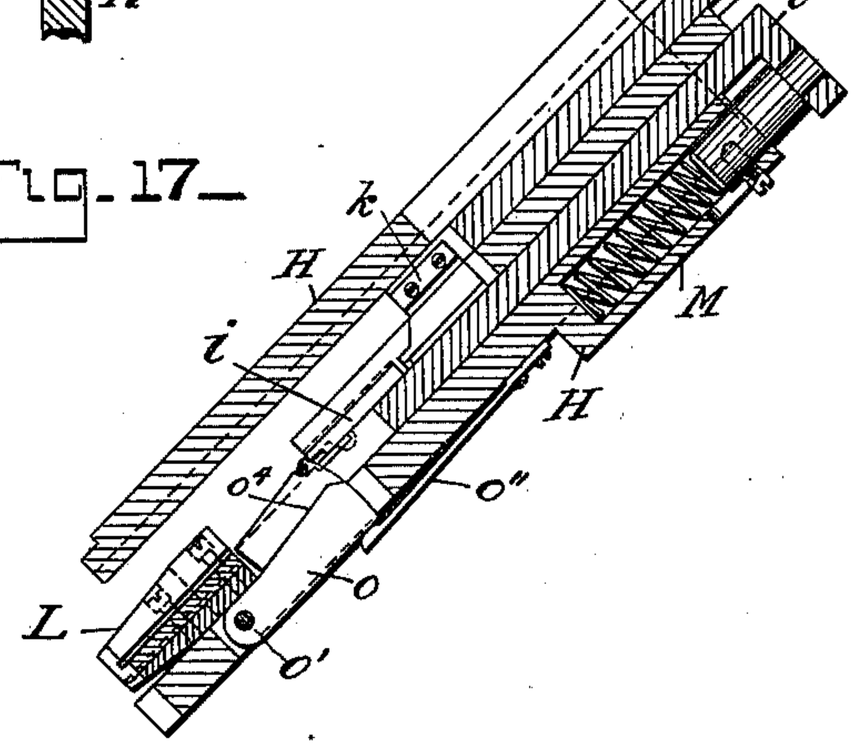


Fig. 19.

Fig. 20.

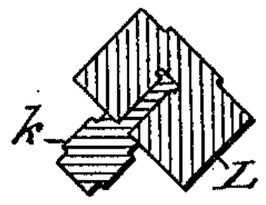
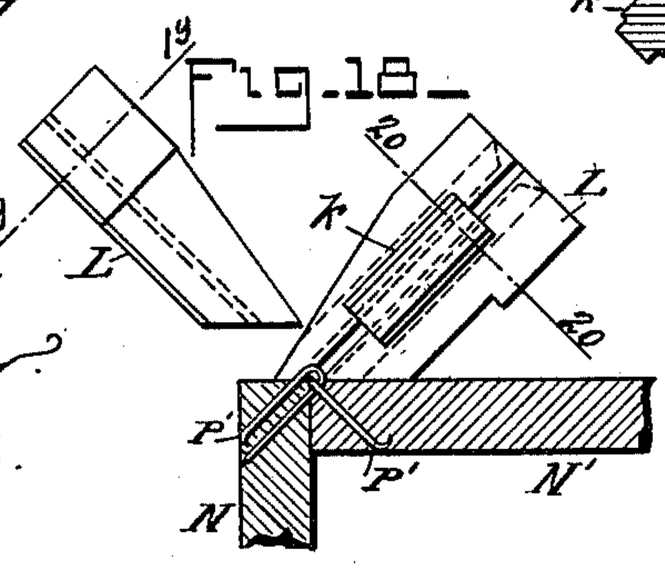


Fig. 18.



Witnesses—

Louis Dunker.

Samuel J. Craddock.

Inventor

David Henry Saunders

by Albert G. Andrews

his atty.

No. 670,816. Patented Mar. 26, 1901.

D. H. SAUNDERS.

BOX HINGING MACHINE.

(Application filed Jan. 5, 1900.)

(No Model.) 7 Sheets—Sheet 7.

Fig. 21.

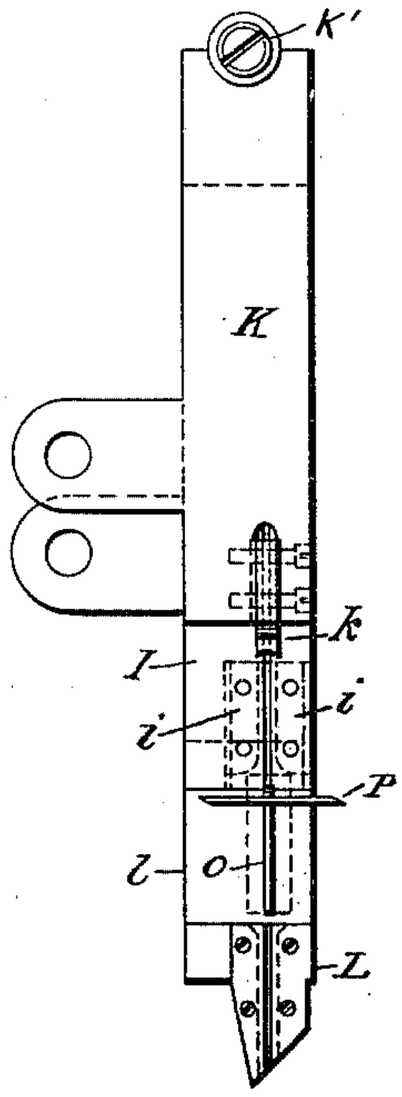


Fig. 22.

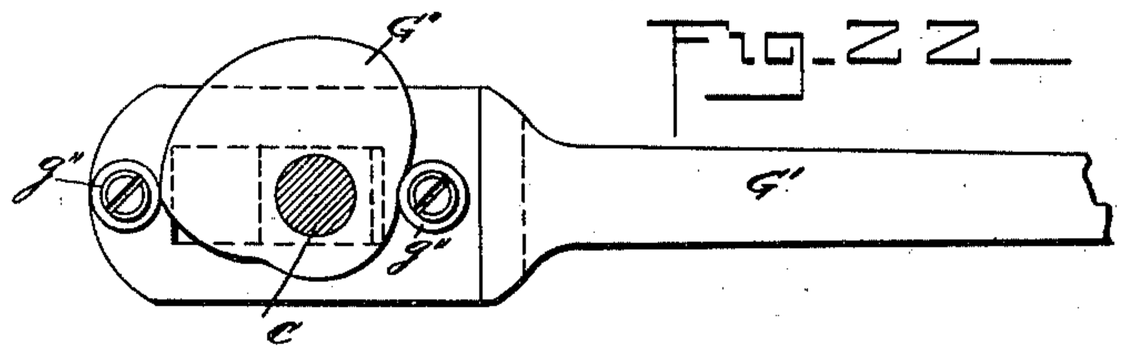


Fig. 28.

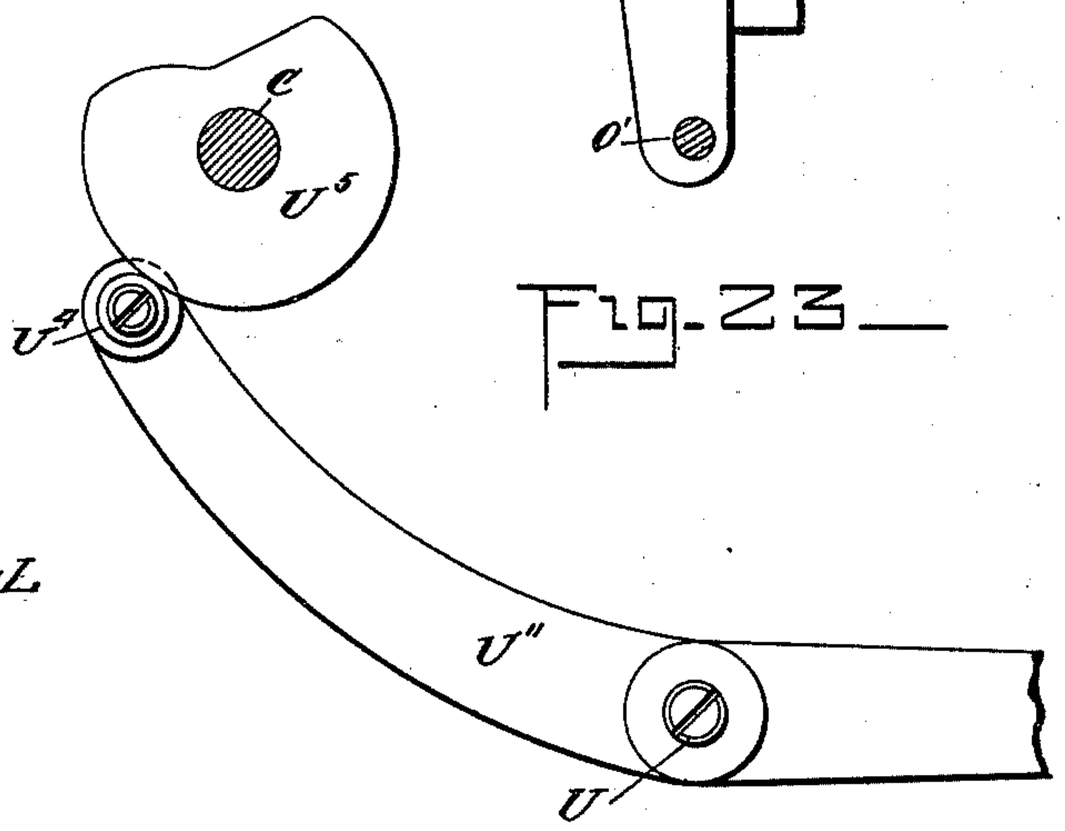


Fig. 29.

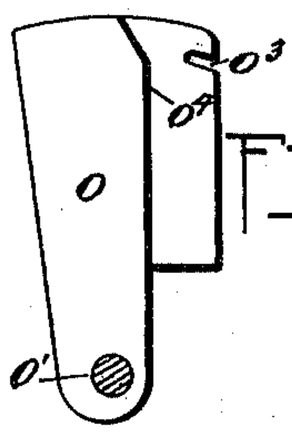


Fig. 23.

Fig. 24.

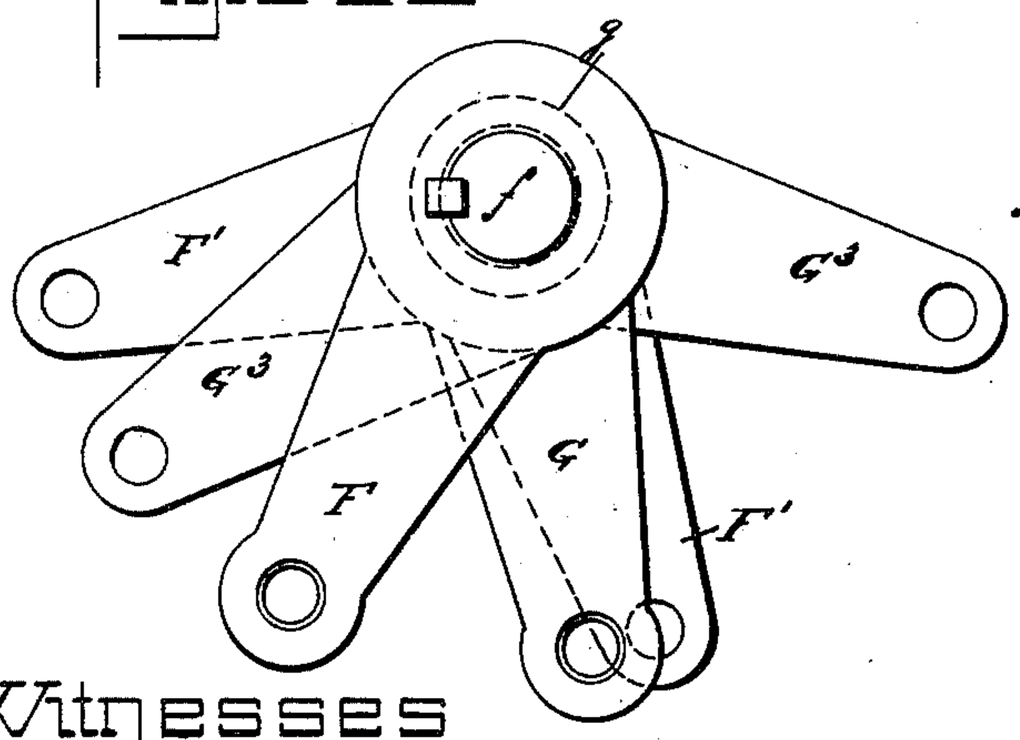
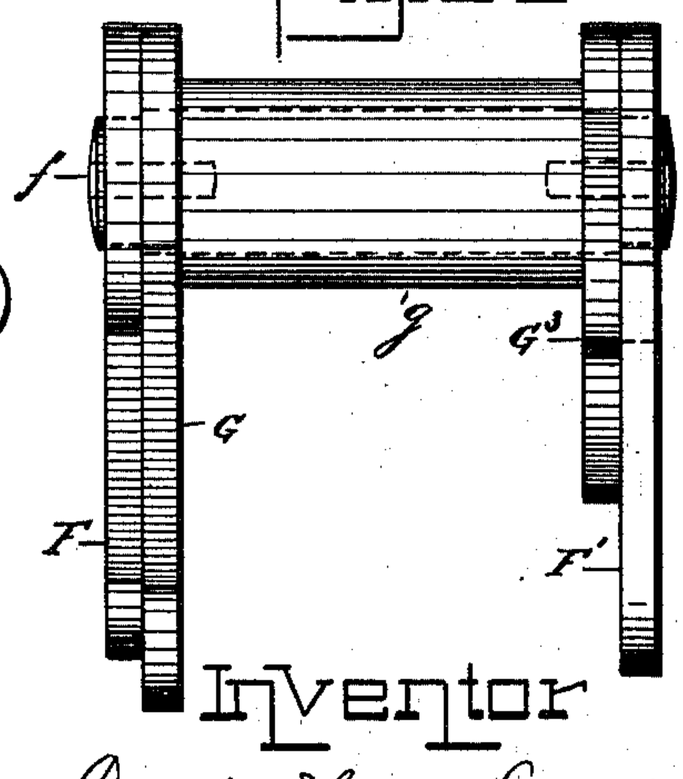


Fig. 25.



Witnesses
Laura Drucker.
Samuel J. Craddock.

Inventor
David Henry Saunders
by Alban Andrews his atty.

UNITED STATES PATENT OFFICE.

DAVID HENRY SAUNDERS, OF GLOUCESTER, MASSACHUSETTS.

BOX-HINGING MACHINE.

SPECIFICATION forming part of Letters Patent No. 670,816, dated March 26, 1901.

Application filed January 5, 1900. Serial No. 455. (No model.)

To all whom it may concern:

Be it known that I, DAVID HENRY SAUNDERS, a citizen of the United States, residing at 13 Addison street, Gloucester, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Box-Hinging Machines, of which the following is a specification.

This invention relates to certain new and useful improvements in box-hinging machines for the purpose of automatically hinging wooden or other boxes by means of interlocking wire staples; and it consists of the novel combination and arrangement of parts hereinafter more particularly described, illustrated in the accompanying drawings, and particularly pointed out in the claim hereunto annexed.

In describing the invention in detail reference is had to the accompanying drawings, forming a part of this specification, wherein like reference-letters indicate corresponding parts throughout the several views, and wherein—

Figure 1 represents a side elevation of the improved box-hinging machine, showing the box and cover clamped in position for hinging, with the staple driven through the cover. Fig. 2 represents a similar side elevation seen from the opposite side of Fig. 1. Fig. 3 represents a detail front elevation of the wire feeding, guiding, and cutting device as seen from X in Fig. 2. Fig. 4 represents a rear view of Fig. 3. Fig. 5 represents a cross-section on the line 5 5 shown in Fig. 4. Fig. 6 represents a detail top plan view of the box and cover supporting device. Fig. 7 represents a front view of Fig. 6. Fig. 8 represents a cross-section on the line 8 8 shown in Fig. 7. Fig. 9 represents a cross-section on the line 9 9 in Fig. 3, showing the wire cutting and pointing device. Fig. 10 represents a bottom plan view of the said wire cutting and pointing device as seen from Y in Fig. 3. Fig. 11 represents a rear view of a portion of the box and cover or box parts after being hinged together by the interlocking staples. Fig. 12 represents a top plan view of Fig. 11. Fig. 13 represents a cross-section on the line 13 13 shown in Fig. 11. Fig. 14 represents an enlarged view of one of the staples. Fig. 15 represents a vertical longitudinal section of the two staple forming and driving devices, showing one of said devices in position immediately after its staple is formed and driven and showing the other one in position just previous to forming and driving its staple. Fig. 16 represents a cross-section on the line 16 16 shown in Fig. 15. Fig. 17 represents a longitudinal section on the line 17 17 shown in Fig. 15. Fig. 18 represents a detail side view of the two staple-receivers, showing one of the same raised to its normal position after its staple has been driven and showing the other in its lowered position during the driving of its staple. Fig. 19 represents a cross-section on the line 19 19 shown in Fig. 18. Fig. 20 represents a cross-section on the line 20 20 shown in Fig. 18. Fig. 21 represents a side elevation of one of the staple former, driver, and receiver, showing the wire blank after being cut off and in position for being formed and driven. Fig. 22 represents a detail side elevation of mechanism for operating the staple-forming device and receiver-bar. Fig. 23 represents a detail side elevation of mechanism for operating the box and cover supporting and clamping device. Fig. 24 represents an end view of the rocking levers for operating the staple forming, receiving, and driving devices. Fig. 25 represents a side view of Fig. 24. Fig. 26 represents a detail rear view of the female and male formers, showing the staple in the act of being formed. Fig. 27 represents a detail side elevation of the driver-bar and driver. Fig. 28 represents a detail side elevation of the receiver-bar and receiver, and Fig. 29 represents a detail side elevation of the male former.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

In the drawings, A represents the base or pedestal, to which is secured the gooseneck-frame B B′, as shown. In the frame portion B′ is journaled a rotary driving-shaft C, on which is loosely journaled a pulley D, to which a constant rotary motion is applied by means of belt-power, as usual. A suitable or well-known clutch is interposed between said pulley D and shaft C, which clutch is

preferably actuated by a spring-pressed pedal-lever E and suitable intermediate connecting mechanism, as is common in clutch starting and stopping mechanism for machines in which the depression of a pedal-lever will cause one complete rotation to be imparted to the driving-shaft. Such clutch mechanism forms no part of my present invention, and need therefore not be described in detail.

On the driving-shaft C is secured a disk C′, provided with a crank-pin C″, pivotally connected to a link C^3, the forward end of which is pivotally connected to a rock-lever F, secured to a shaft *f*, journaled in a sleeve *g*, which latter is journaled in a bearing in the forward portion of the frame B′, as shown in Figs. 1, 24, and 25. To the other end of the rock-shaft *f* are secured levers F′ F′, suitably connected to the staple-driving devices, as will hereinafter be more fully described.

To one end of the sleeve *g* is secured a lever G, the lower end of which is pivotally connected to a link G′, to which a longitudinal reciprocating motion is imparted by means of a cam G″, secured to the driving-shaft C, said cam engaging pins or pins and rolls *g″ g″* on the link G′, as shown in detail in Fig. 22. To the opposite end of the sleeve *g* are secured the levers G^3 G^3, which are suitably connected to the female former-bars, by which the staples are formed and the receiver-bars actuated, as will hereinafter be described.

In this machine I make use of a pair of stationary guides or cases, arranged, preferably, at a right angle to each other, each of said guides or cases containing a laterally-movable male former and a longitudinally-movable female former for the purpose of bending the pointed staple-wire blank into the form of a staple, each such guide or case also containing a longitudinally-movable driver-bar for driving the finished staple and a longitudinally-movable throat or staple receiver, in which the staple is forced by the driver previous to the driving operation and guided therein during the staple-driving operation. Such longitudinally-movable staple-receiver is moved downward toward or in contact with the box and cover previous to the driving of the staple by means of the female former-bar, which during its descent comes in contact with the said throat or receiver and holds the latter in contact with the box and cover, or nearly so, during the staple-driving operation, by which arrangement the looped portion of the staple is prevented from spreading sidewise during the operation of driving and clenching the said staple.

The two devices for forming, receiving, guiding, and driving the staples are shown in Figs. 2, 15, 16, 17, 18, 19, 20, 21, 26, 27, and 28, each such device being composed of a stationary guide or case H, in which are longitudinally movable the female former-bar I and driver-bar K. The female former-bar I is reciprocated by the rocking lever G^3, which is pivotally connected to said former-bar by means of a link g^3, as shown in Fig. 2. The driver-bar K is reciprocated by the rocking lever F′, which is pivotally connected to said driver-bar by means of a link *f′*, as shown in Fig. 2. To the lower end of the former-bar I is secured the female former *i*. (Shown in Figs. 15, 17, and 26 and in dotted lines in Fig. 21.)

k is the driver, secured to the lower end of the driver-bar, as shown in Figs. 15, 16, 17, 18, 20, 21, and 27.

L is the throat or receiver, attached to or made integral with the lower end of the receiver-bar *l*, which is normally held raised, as shown in the right-hand portion of Fig. 15 and left-hand portion of Fig. 18, by the influence of a suitable spring M. (Shown in Figs. 15 and 17.)

The throat or receiver L is automatically forced downward toward or in contact with the box N and cover N′, as shown in the left-hand portion of Fig. 15 and right-hand portion of Fig. 18, during the driving of the staple, and such downward motion of said throat or receiver is caused by the lower end of the female former-bar I coming in contact with the throat or receiver during the downward movement of said former-bar after the staple has been formed. After a staple has been driven and the female former-bar I raised upward the throat or receiver L is automatically raised to the position shown in the right-hand portion of Fig. 15 and left-hand portion of Fig. 18, by the influence of the spring M, in which position it remains until another staple has been formed and ready to be driven.

In the operation of the machine the throats or receivers L are alternately held against the box and cover and raised above the same, so as to cause one of said receivers to get out of the way of the other.

In combination with the longitudinally-movable female former *i* I use a laterally-movable or oscillating male former O, which is pivoted to the case H at O′, as shown in Figs. 15, 17, and 29, and said male former is normally held in its inward position for the formation of the staple by the influence of the spring O″, as shown in Fig. 17.

The inner portion of the male former O is provided with a notch or recess O^3, adapted to receive the wire P previous to its being cut off to the desired length for the formation of the staple P′, and the said wire after being cut off to the desired length is retained in said notch until the female former in its descent causes the staple to be formed by being bent on the opposite sides of the male former. After the staple has thus been formed the male former is pressed outward to the position shown in the left-hand portion of Fig. 15 by the receiver-bar *l* coming in contact with a cam projection O^4 on said male former, thus automatically moving the male former

out of the way of the staple, so as to allow it to be driven during the descent of the driver-bar and its driver.

The various parts comprising the staple forming, guiding, and driving devices in one guide or case H are arranged at a right angle to the corresponding parts in the other guide or case, so as to make and drive one staple at a right angle to the other.

To each of the staple forming and driving devices is fed a wire P from a reel P″, and in practice I prefer to feed such wire through a guide or track Q. (Shown in Figs. 2 and 3.)

In connection with this machine I use for each of the two staple forming and driving devices an intermittent wire-feed device, preferably composed of a pair of feed-rollers R R′, geared together and secured, respectively, to shafts r r', journaled in bearings in the frame portion B′, as shown in Figs. 2 and 3. To one end of the shaft r is secured a gear r'', the teeth of which mesh in the teeth of a segmental gear R^3, secured to a shaft r^3, journaled in a bearing in the frame portion B′, as shown in Figs. 1 and 4. The segmental gear R^3 is provided with a forked arm or extension R^4, to which an intermittent rocking motion is imparted by a pin or pin and roll K′, attached to the upper end of the driver-bar K, as shown in Figs. 2, 15, and 17. The feed of the wire takes place during the downward movement of the driver-bar K, which causes the feed-rollers R R′ to turn in the direction of arrow shown in Figs. 2 and 3. During the upward movement of the driver-bar K the segmental gear R^3 and its forked arm R^4 are automatically moved to the position shown in Fig. 2, and during such movement the wire-feed rollers are held stationary by means of any suitable pawl-and-ratchet mechanism usually employed in intermittent feed devices for this purpose. In connection with such intermittent feed mechanism I prefer to employ any well-known device or mechanism for regulating the length of the wire that is being fed, according to the size or length of the staple that is to be formed.

I wish to state that I do not desire to confine myself to any particular construction of the intermittent feed device or means for regulating the length of the feed, as this may be done in any suitable manner without departing from the essence of my invention.

In connection with this my improved box-hinging machine I use a wire pointing and cutting-off device, preferably constructed as follows: S is a stationary shear, and S′ is a movable shear, between which the wire is fed previous to being formed and driven. The shear S′ is moved downward across the face of the stationary shear S by means of a cam or projection R^5 on the rock-shaft r^3, as shown in Fig. 3, and after the wire has been cut and pointed the cam R^5 is automatically released from said movable shear, which is then automatically raised above the stationary shear by the influence of a spring S″, as shown in Fig. 3. The wire is fed to one of the cases or guides H at a right angle to the wire fed to the other guide or case, so as to cause the staples to be formed and driven interlocked at a right angle to each other.

With this machine I use an automatic mechanism for forcing and holding the box and cover against the under side of the frame portion B′ or a projection thereon during the staple-driving operation, and it is constructed as follows: T T′ represent the angular box and cover support, on which T is the vertical and T′ the horizontal portion. Upon the vertical portion T is vertically adjustable a bracket T″, upon which the bottom of the box N is supported during the box-hinging operation, as shown in Figs. 1 and 2. The bracket T″ is yieldingly supported on a spring T^3, interposed between the under side of said bracket and a vertically-adjustable stop or rest T^4. (Shown in Figs. 1, 2, and 7.) The object of the spring T^3, which is interposed between the rest T^4 and the lower part of the bracket T″, is to compensate for slight variations in the depths of the boxes that are being hinged. The rear portion of the cover-support T′ is provided with a similar yielding bracket or gage t'', bearing against a spring t^3, interposed between said bracket and a rest or stop t^4, adjustably secured to the box-support T′, as shown in Figs. 1, 2, 6, and 7, and this is for the purpose of compensating for the slight variations in the width of the covers that are to be hinged by the improved machine. The vertical box-support T is horizontally adjustable relative to a slide-bar U, that is guided upon and made vertically adjustable relative to the front portion of the frame B, as shown in Figs. 1, 2, 6, 7, and 8.

The object of making the box-support T horizontally adjustable is to enable the box and cover to be adjusted relative to the staple-driving devices, so as to cause the interlocking staples to be driven in such a position as to make the cover fit properly on the top of the box when the cover is closed thereon.

The slide-bar U is guided in vertical ways on the front portion of the frame B, and to it is pivotally connected an adjustable link U′, the upper end of which is pivotally connected to a rock-lever U″, pivoted at U^3 to the frame B and having at its rear end a pin or pin and roll U^4, actuated by a cam U^5, secured to the rotary driving-shaft C, as shown in Figs. 1 and 23. The said cam U^5 serves to move the box and cover supports upward, so as to hold the box and cover up against the under side of the frame portion B′ or a projection thereon during the staple forming and driving operation. After a pair of interlocking staples has been driven through the box and cover, respectively, the cam U^5 ceases to act on the lever U″, causing the box and cover supports T T′ to descend by gravity, thus enabling the operator to remove the hinged box and cover or to move the same horizontally into position for receiving another set of hinges.

The clamping device for automatically clamping the rear side of the box N against the vertical portion T of the box-support and clamping the cover N′ against the said rear side of the box and between it and the gage t'' is constructed as follows: To the lever U″ is pivoted at v a link V, the upper end of which is pivotally connected to a bell-crank lever V′, the latter being pivotally connected to an adjustable link or rod V″, the forward end of which is connected to a clamp-bar W, having a downwardly-extending clamping projection w, provided with a suitable clenching-surface and adapted to clamp the back of the box N against the vertical box-support T and front edge of the cover N′, and to hold such parts properly clamped together during the staple forming and driving operation, as shown in Figs. 1 and 2. The clamp w is automatically released when the cam U^5 ceases to act upon the lever U″, at which time the upward pressure on the box and cover support is likewise released, enabling the operator to adjust or remove the hinged box and cover, as may be desired.

It will be noticed that in this my machine the two staple forming and driving devices are arranged at a right angle to each other in a vertical plane, so as to cause the staples from the said two devices to be driven properly interlocked through the box and cover, respectively, and it will also be noticed that the staple forming, guiding, and driving mechanism in one of said devices is arranged at a right angle to the corresponding parts in the other device for the purpose of placing one staple in position to be driven interlocked with the other staple.

The operation of the machine is as follows: The operator places a box-cover or box part N′ on the horizontal cover-support T′ and against the yielding gage t'' on such support and places the box or box part N upon the yielding bracket T″ of the vertical portion of the box-support, after which he starts the machine, causing the automatic clamping devices to force the box in close contact with the front edge of the cover and vertical portion of the box-support and causing the upper edge of the box and the cover to be confined and clamped between the vertically-adjustable box and cover support and a stationary projection on the frame of the machine, thus holding the box and cover rigidly clamped in position for receiving the wire staples, as shown in Figs. 1 and 2. During a previous partial rotation of the driving-shaft a wire has been fed, cut, and pointed, formed into a staple, and placed into one of the throats or receivers, which, during such partial rotation of the shaft, has been moved downward toward or in contact with the box and cover. The driver descends and causes the staple to be forced through such throat or receiver and into and through the cover and clenched against the box and cover support. The throat or receiver and the staple forming and driving device are then automatically raised in position for forming and driving a subsequent staple, the blank for which has been fed and cut during the driving of the first staple. While the box and cover are still clamped in position the throat or receiver of the other staple forming and driving device descends toward or in contact with the box and cover, and the descent of its driver causes a previously-formed staple, cut off from another wire fed at a right angle to the first, to be driven through the box and clenched against the clamping device and in such a manner as to be interlocked with the previously-driven staple. The throat or receiver and the staple forming and driving device for said second staple are then automatically raised in position for forming and driving a subsequent staple, the blank for which has been fed and cut during the driving of said second staple. The clamping device is then automatically released and the box-support lowered to its lowest position, enabling the operator to laterally adjust the position of the box and cover relative to the staple forming and driving devices for receiving another hinge in a manner as above described, or removing the hinged box and cover to be replaced with a fresh box and cover to be hinged together as before, and so on during the operation of the machine.

Having thus fully described the nature, construction, and operation of my invention, I wish to secure by Letters Patent and claim—

In a box-hinging machine, a pair of pivoted spring-pressed alternately-operating laterally-moving male formers, each adapted to receive a cut of wire from which a staple is formed, a pair of alternately-operating longitudinally-moving female formers adapted to engage the said cuts of wire for forming the same into staples, a pair of spring-actuated alternately-operating longitudinally-moving throats or receivers adapted to receive and automatically remove the said male formers, from engaging with the staples, and a pair of alternately-operating longitudinally-moving driver-bars adapted to engage and drive the said staples in a box and cover for hinging the same together.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

DAVID HENRY SAUNDERS.

Witnesses:

ALBAN ANDRÉN,

MARGARET E. DALEY.