

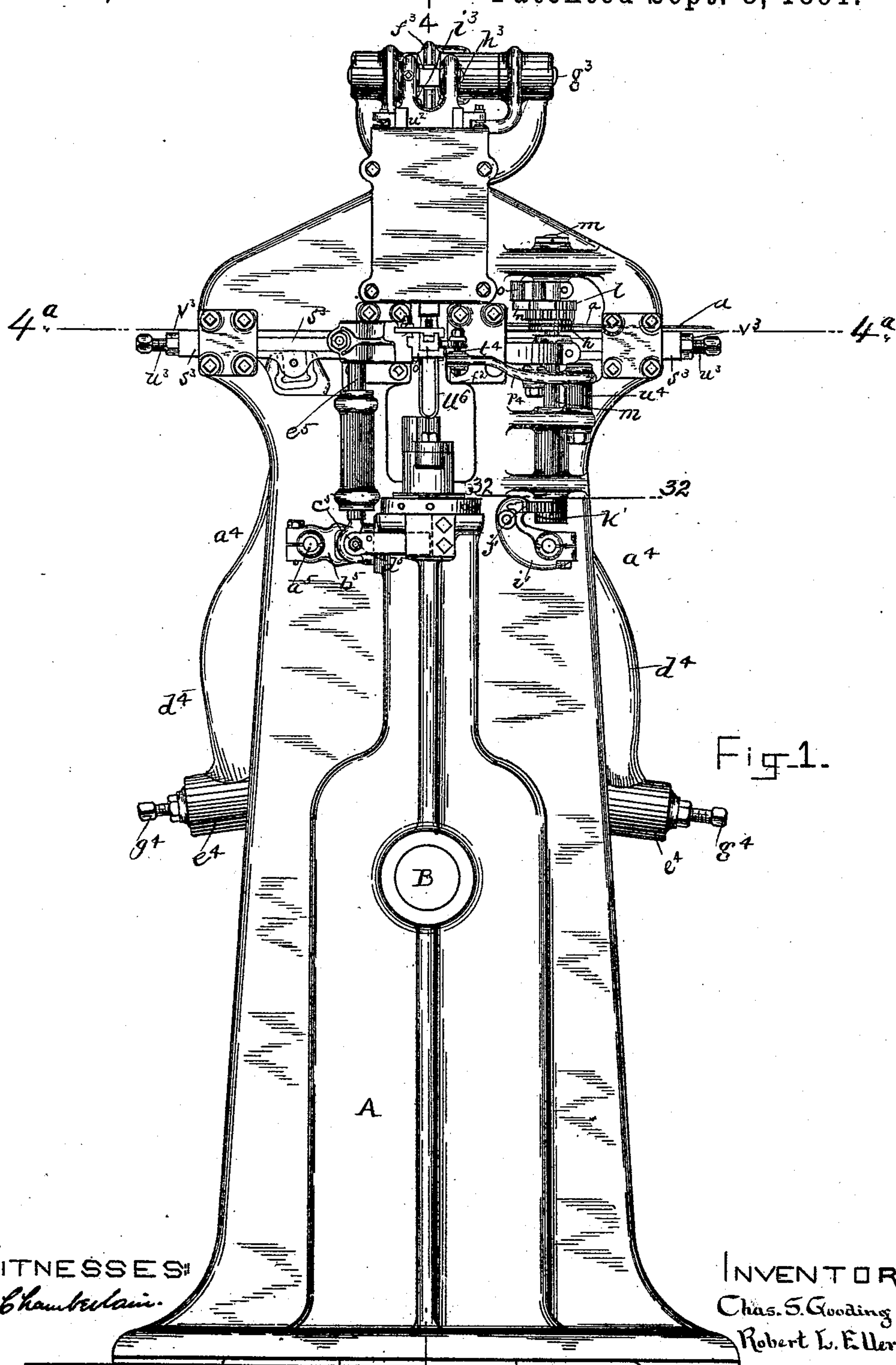
(No Model.)

19 Sheets—Sheet 1.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:
G. H. Chamberlain.

INVENTORS:
Chas. S. Gooding,
Robert L. Ellery,
by

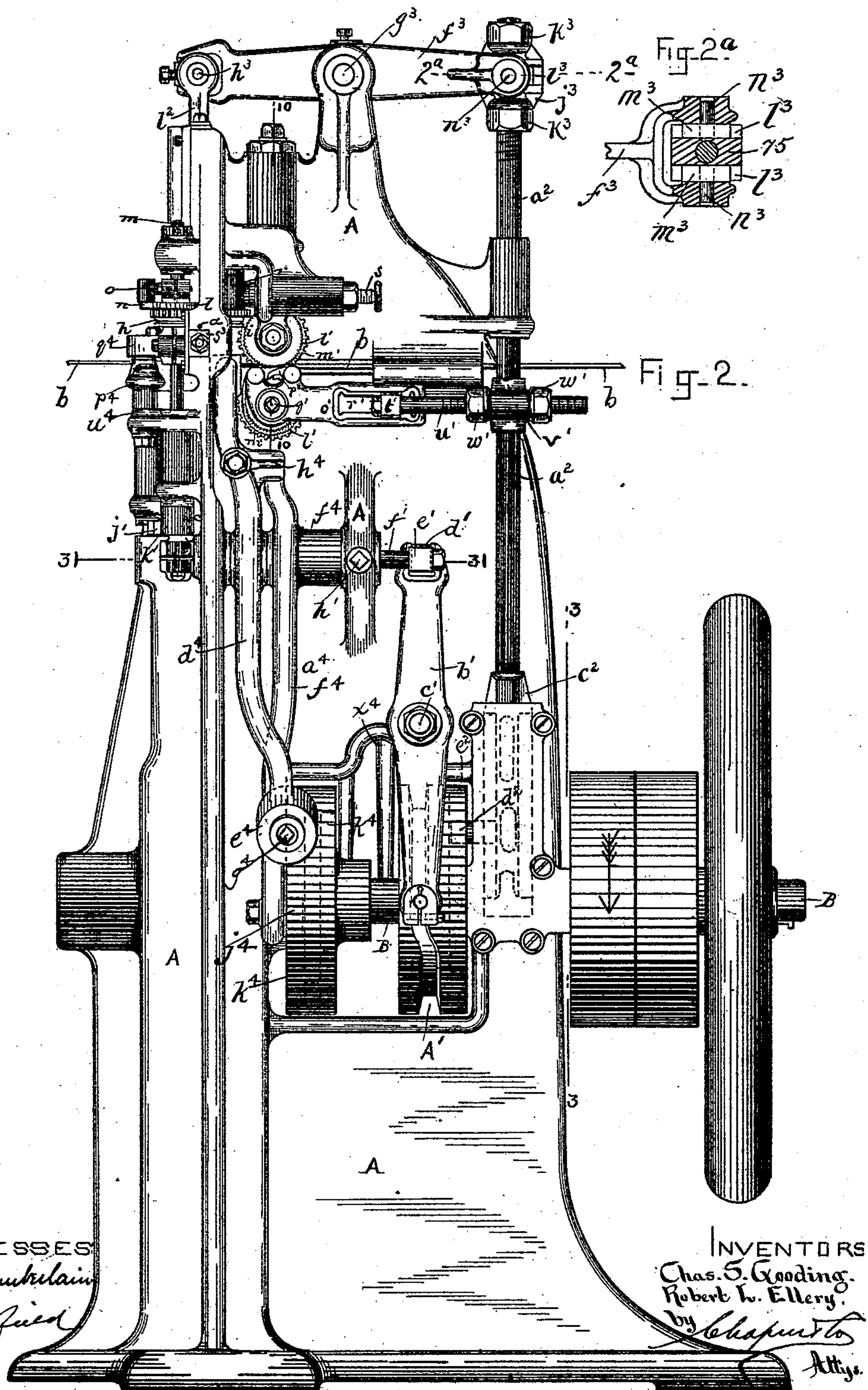
J. W. Garfield

Chapin & Co Attys.

19 Sheets—Sheet 2.

No. 459,376.

Patented Sept. 8, 1891.



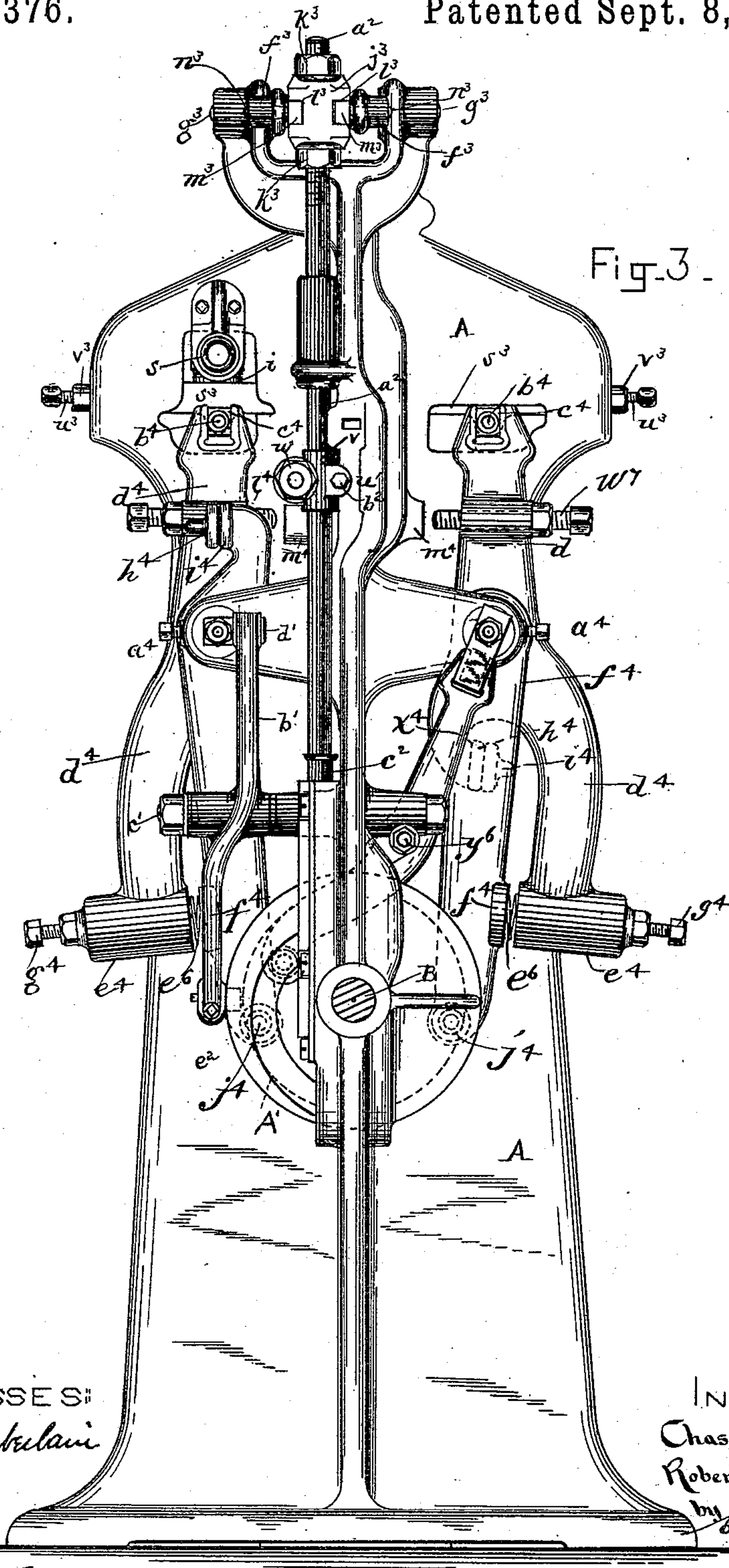
(No Model.)

19 Sheets—Sheet 3.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:
G. M. Chamberlain

INVENTORS:
Chas. S. Gooding.
Robert L. Ellery.
by *Chapman & Co.*
Attys.

J. W. Garfield

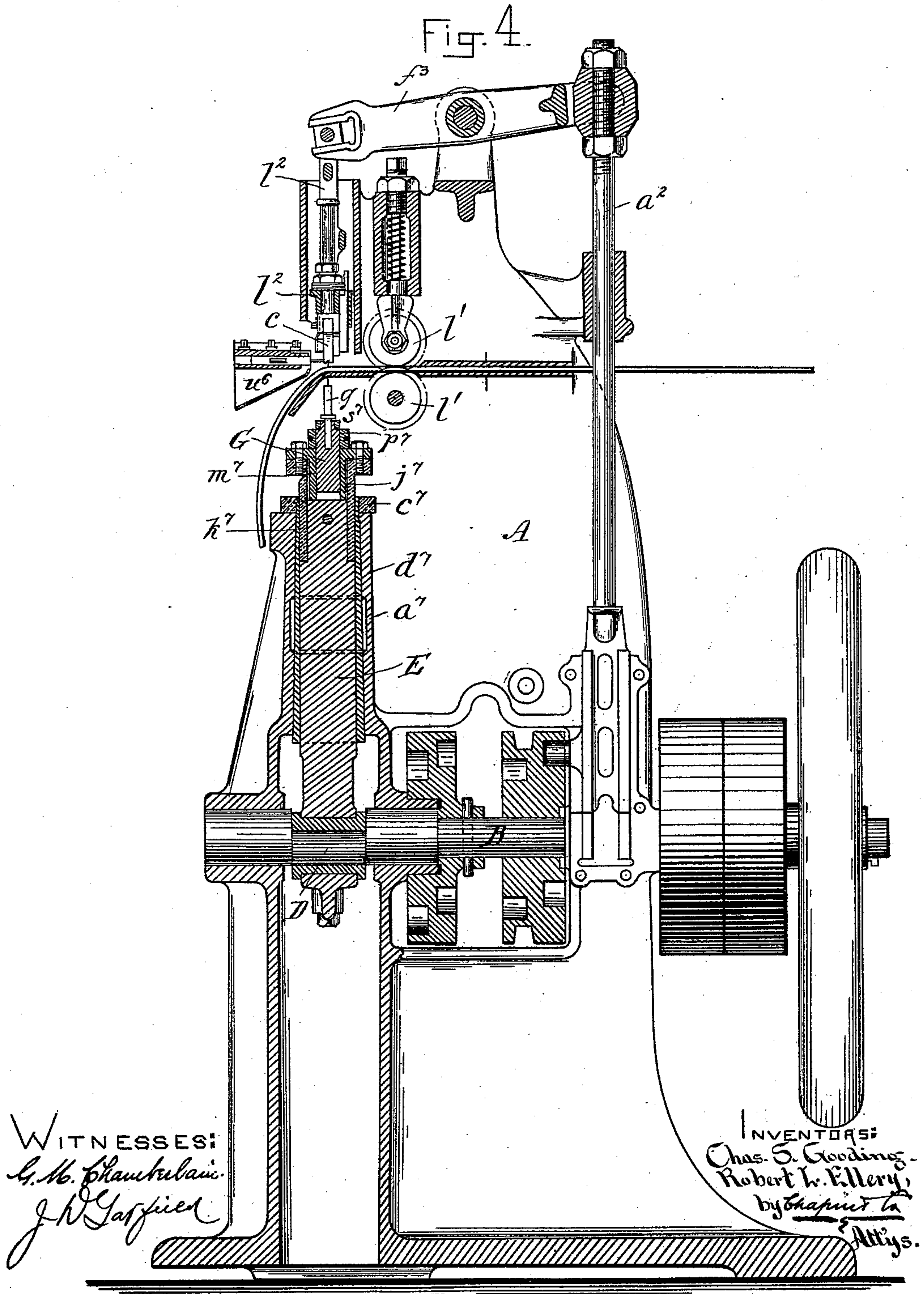
(No Model.)

19 Sheets—Sheet 4.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



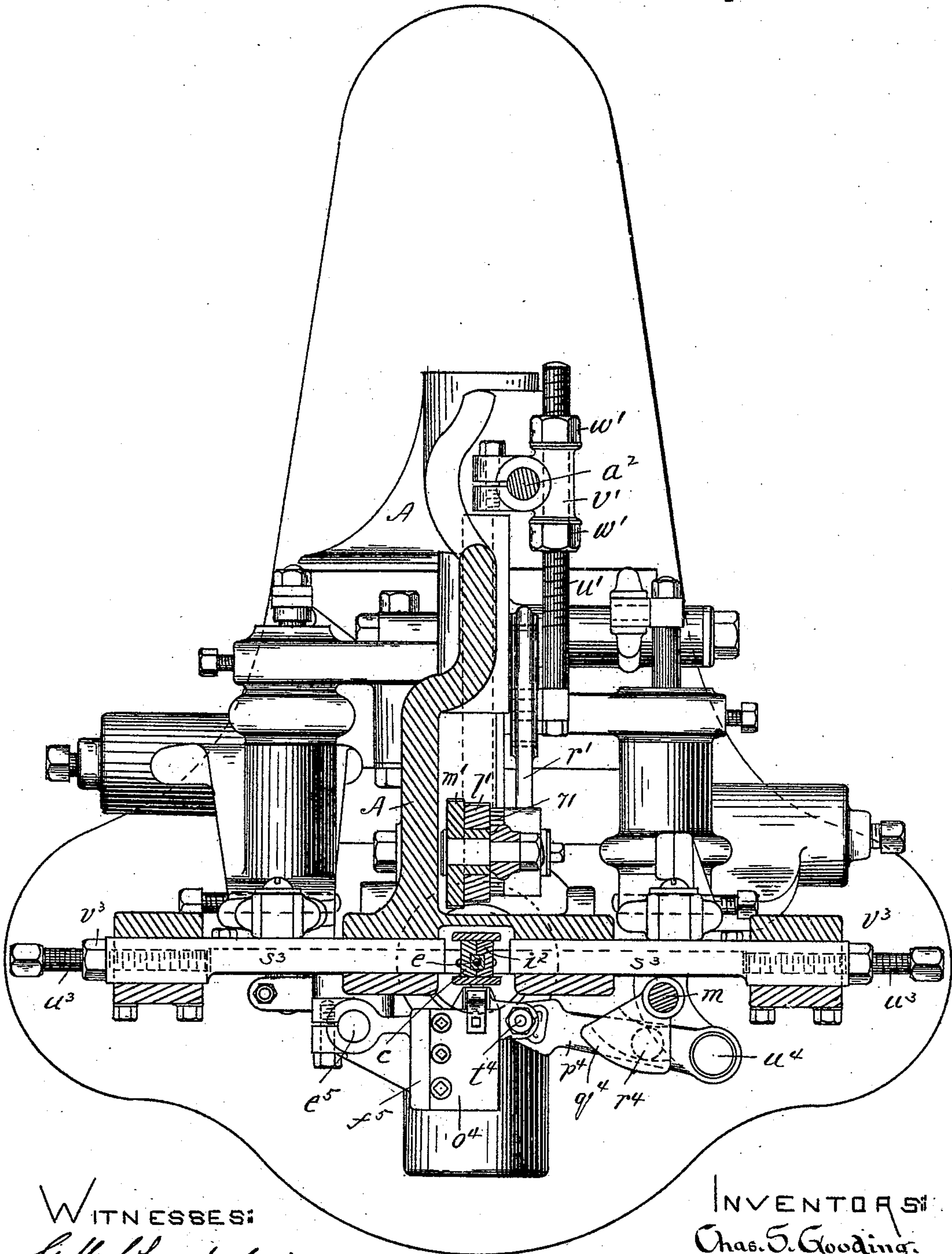
(No Model.)

19 Sheets—Sheet 5.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:

G. M. Chamberlain.

J. A. Garfield

Fig. 4a.

INVENTORS:

Chas. S. Gooding.

Robert L. Ellery.

by

Chapman & Co.

Attys.

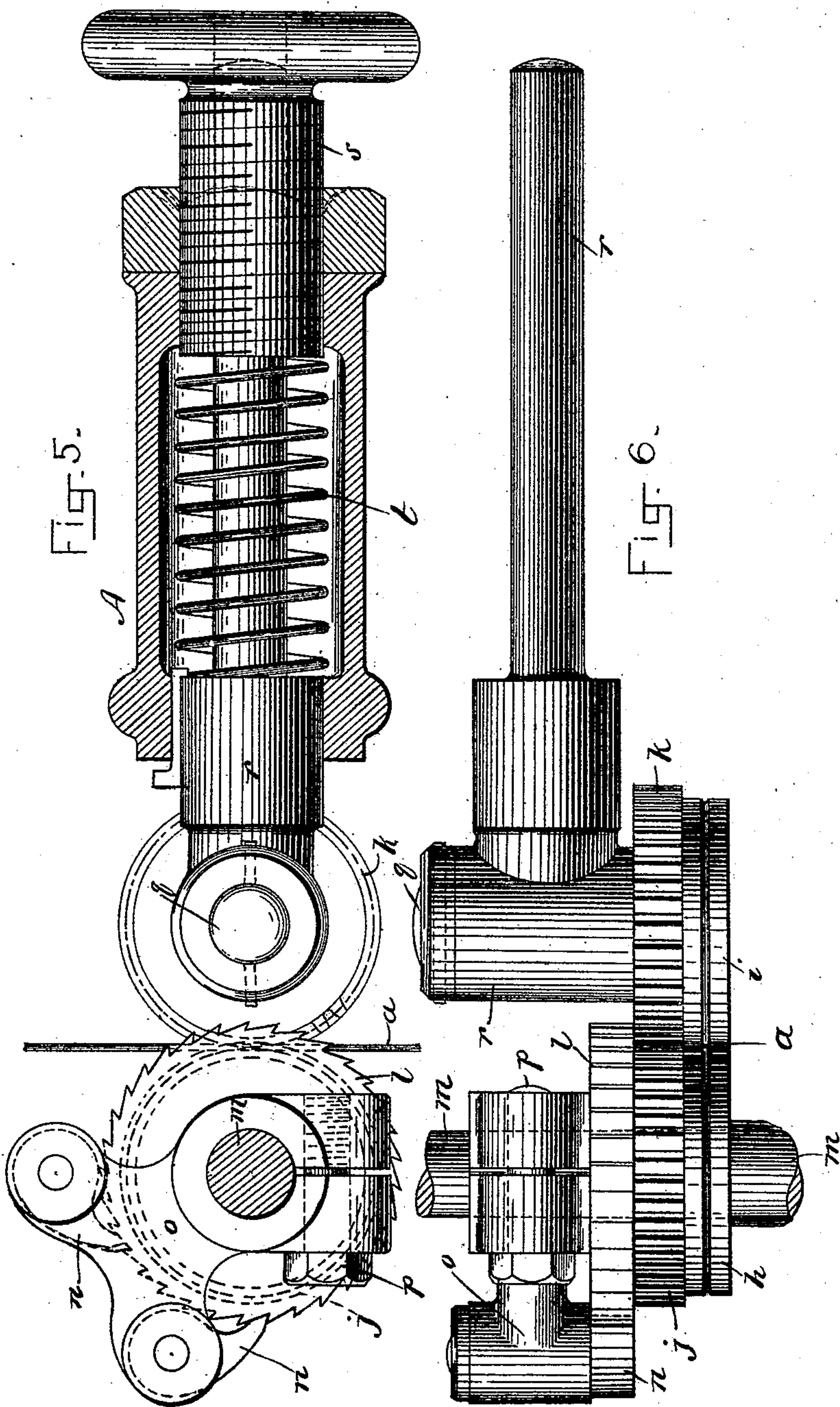
(No Model.)

19 Sheets—Sheet 6.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:
G. H. Chamberlain
J. D. Garfield

INVENTORS:
Chas. S. Gooding,
Robert L. Ellery,
by *Chapman & Co.* Attys.

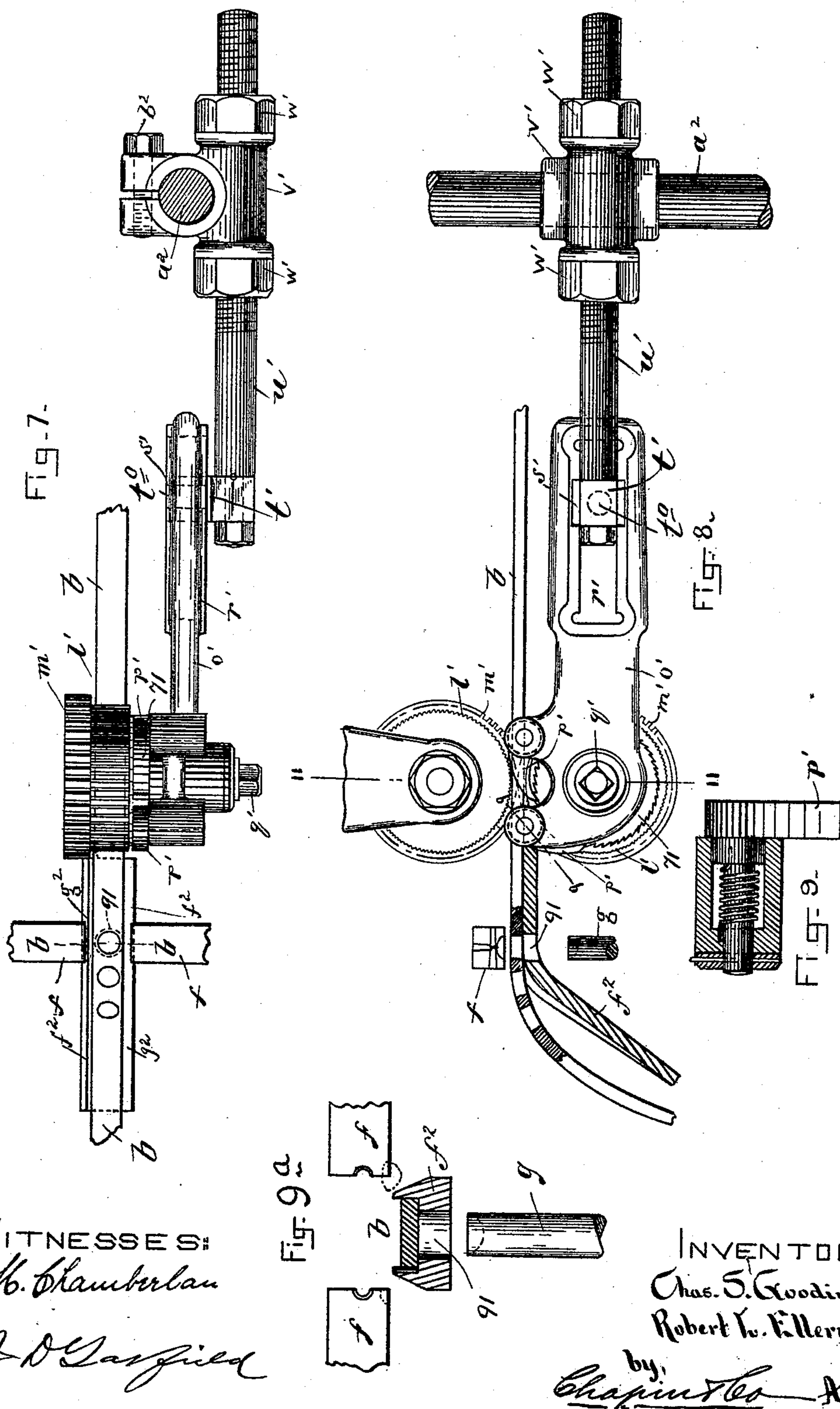
(No Model.)

19 Sheets—Sheet 7.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:
G. M. Chamberlain
J. D. Garfield

INVENTORS:
Chas. S. Gooding,
Robert L. Ellery,
by *Chapin & Co.* Attys

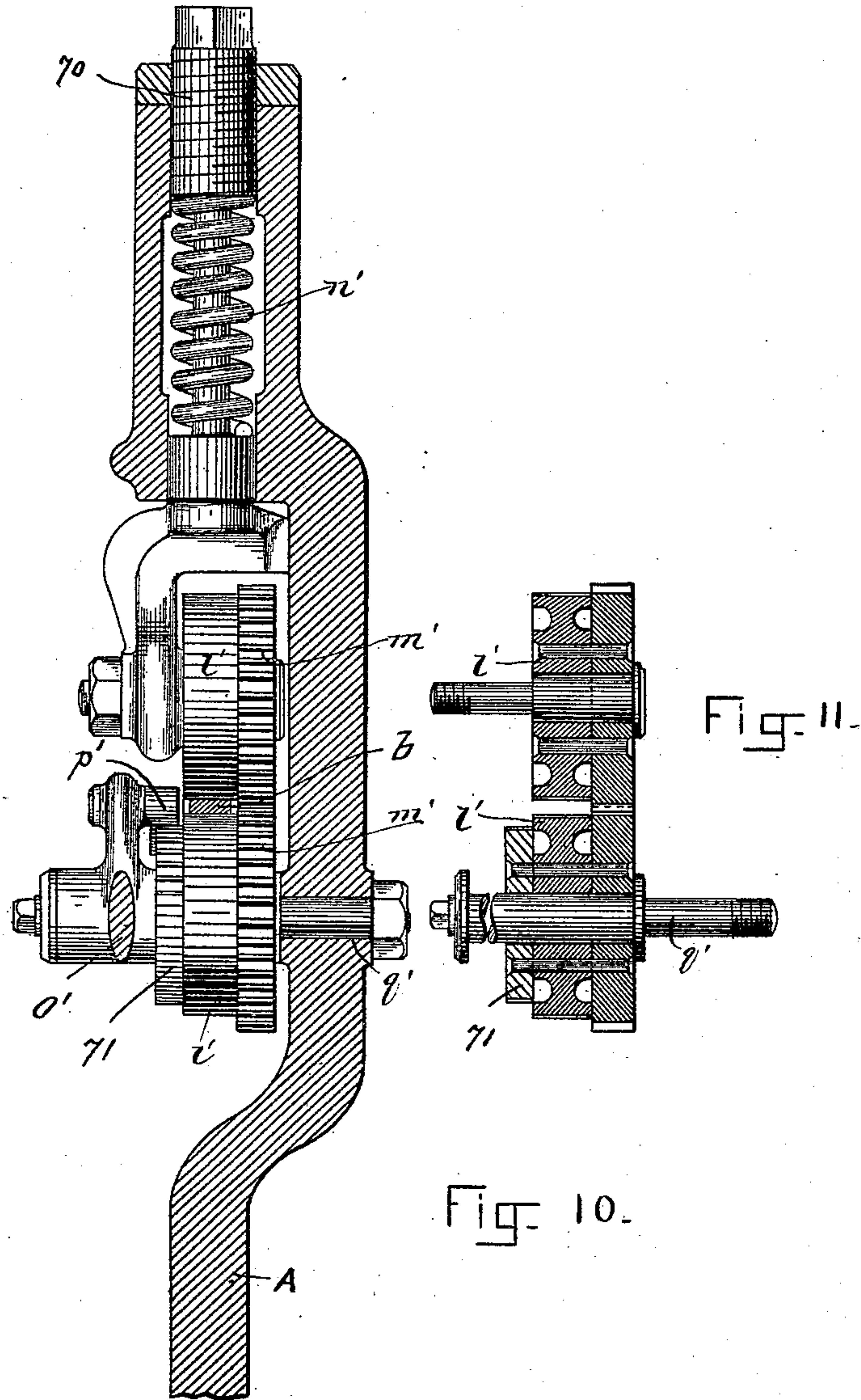
(No Model.)

19 Sheets—Sheet 8.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:

G. H. Chamberlain.

J. W. Garfield

INVENTORS:

Chas. S. Gooding.

Robert W. Ellery,

by,

Chapman & Co. Attys.

(No Model.)

19 Sheets—Sheet 9.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.

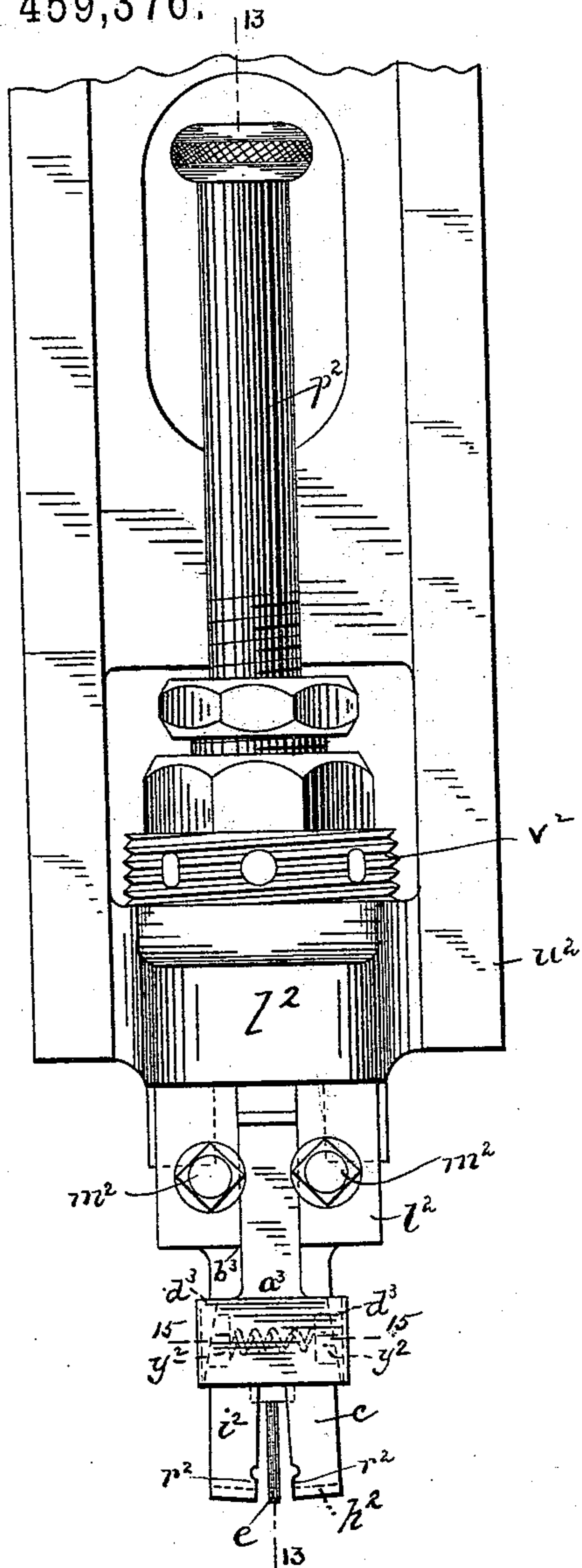


Fig. 12.

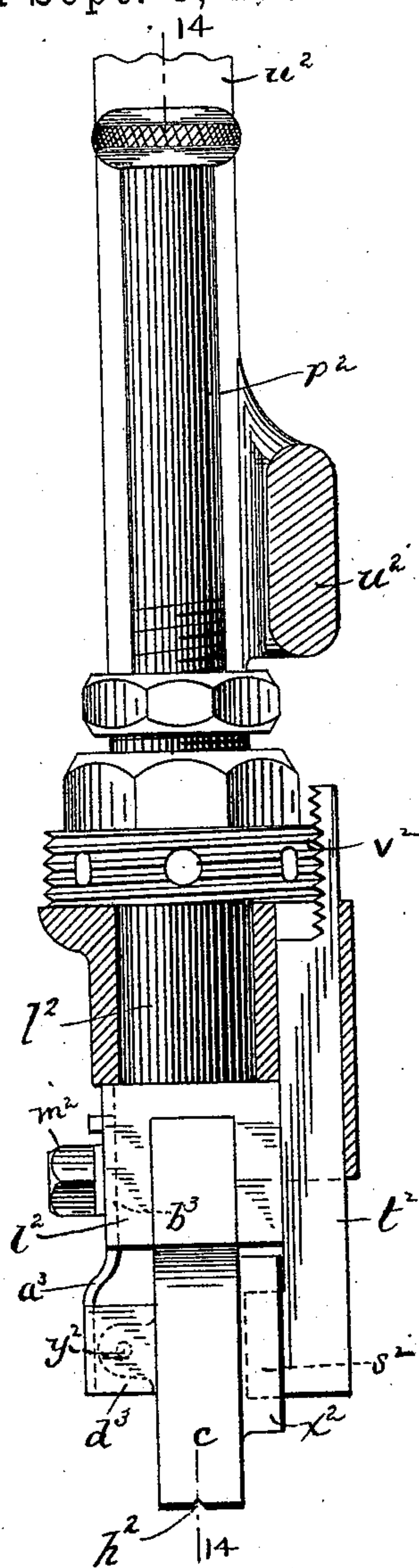


Fig. 13.

WITNESSES:

G. M. Chamberlain.

J. D. Garfield.

INVENTORS:

Chas. S. Gooding.

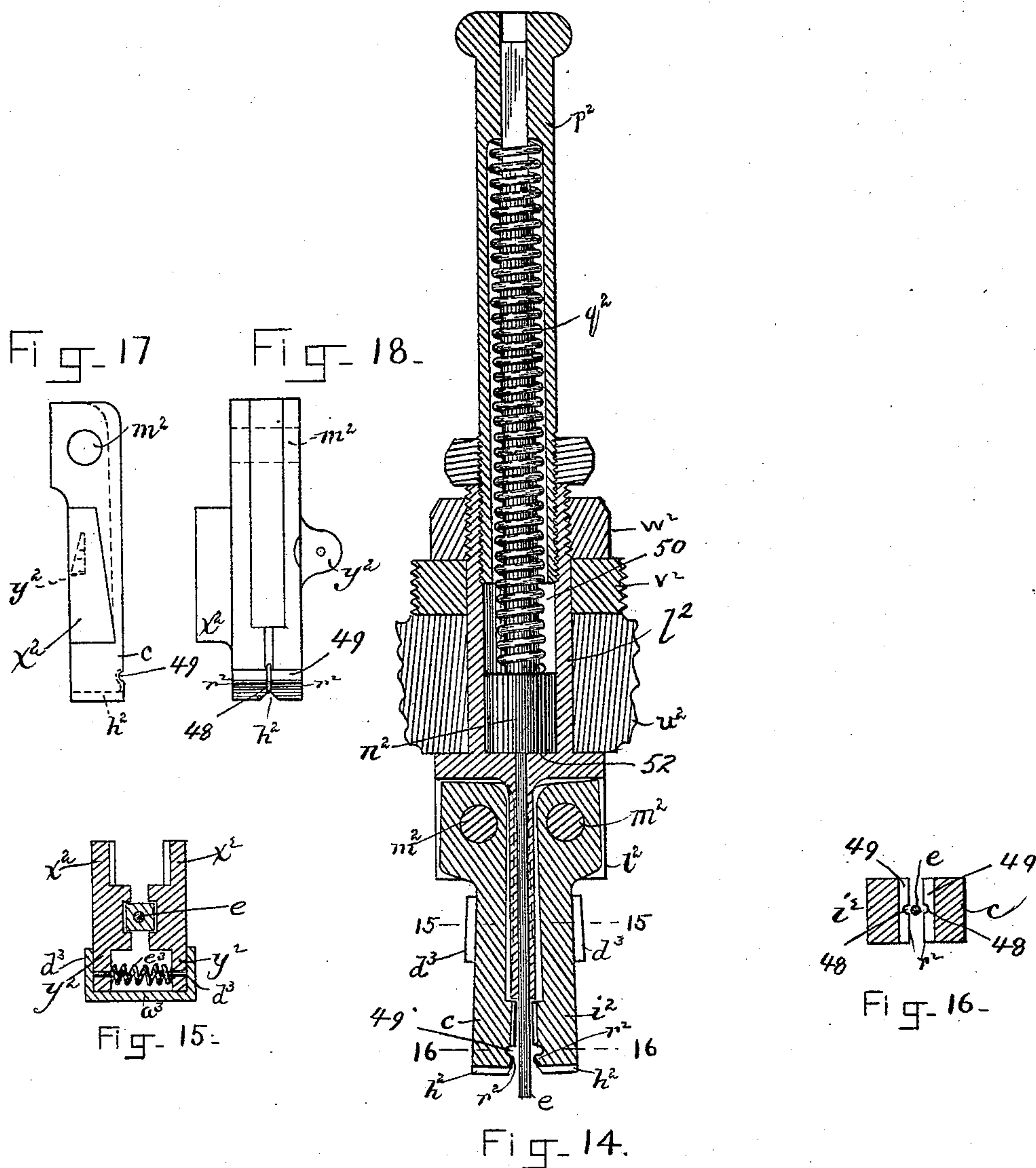
Robert L. Ellery.

by
Chapman & Co Attys.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:

G. M. Chamberlain.

J. D. Garfield

INVENTORS:

Chas. S. Gooding.

Robert L. Ellery.

by Chapin & Atlys.

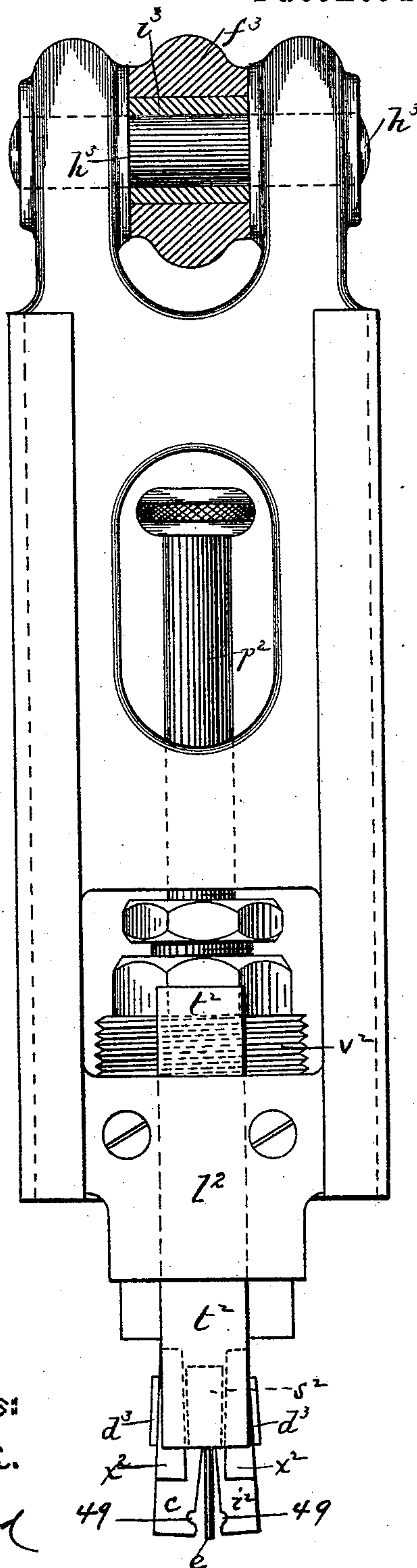
(No Model.)

19 Sheets—Sheet 11.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:
G. M. Chamberlain.
J. W. Garfield

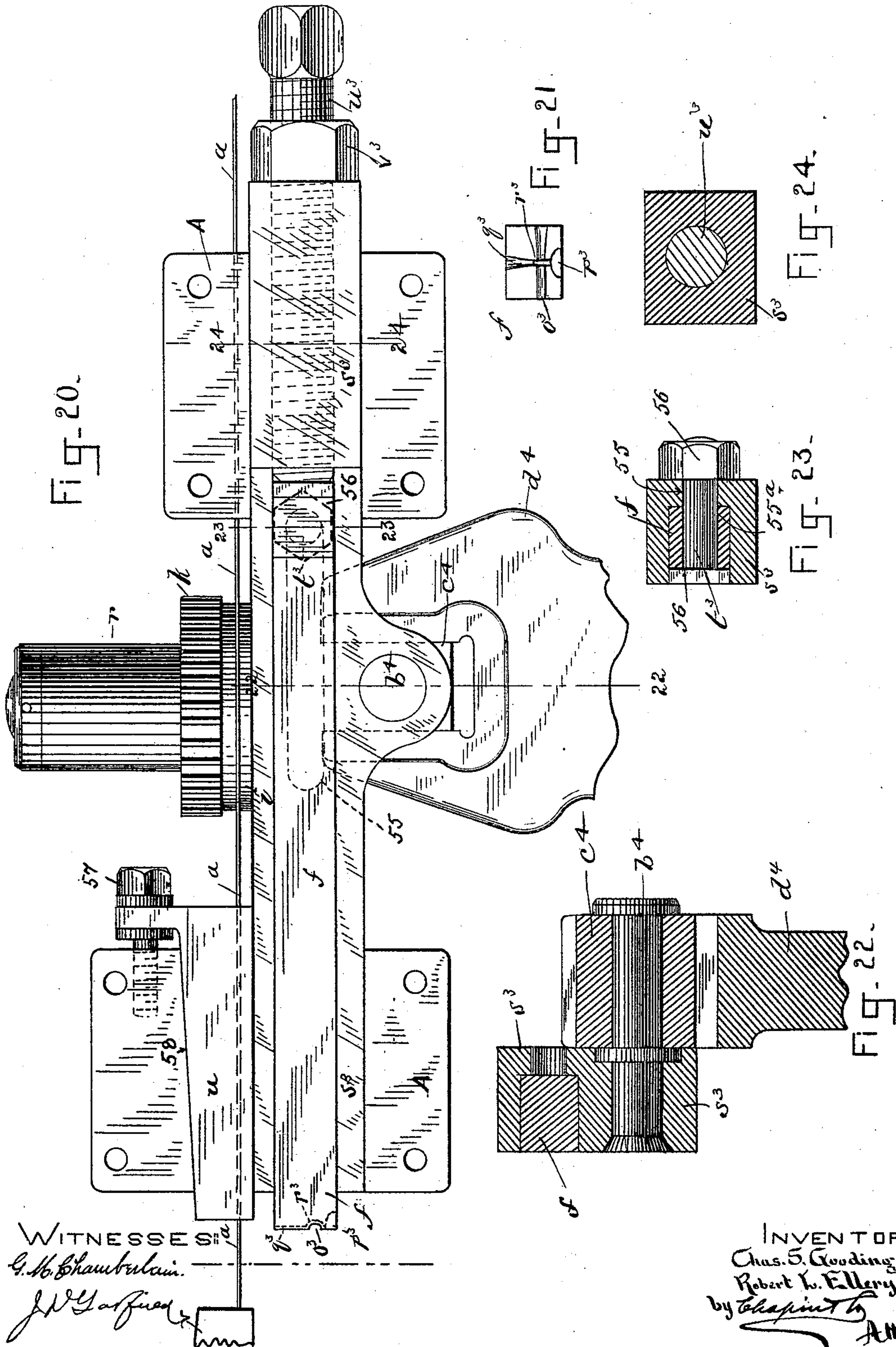
INVENTORS:
Chas. S. Gooding.
Robert L. Ellery.
by Chapin & Co.
Attys.

Fig. 19.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:
G. W. Chamberlain.
J. W. Garfield.

INVENTORS:
Chas. S. Gooding.
Robert L. Ellery.
by *Chapman & Co.*
Attys.

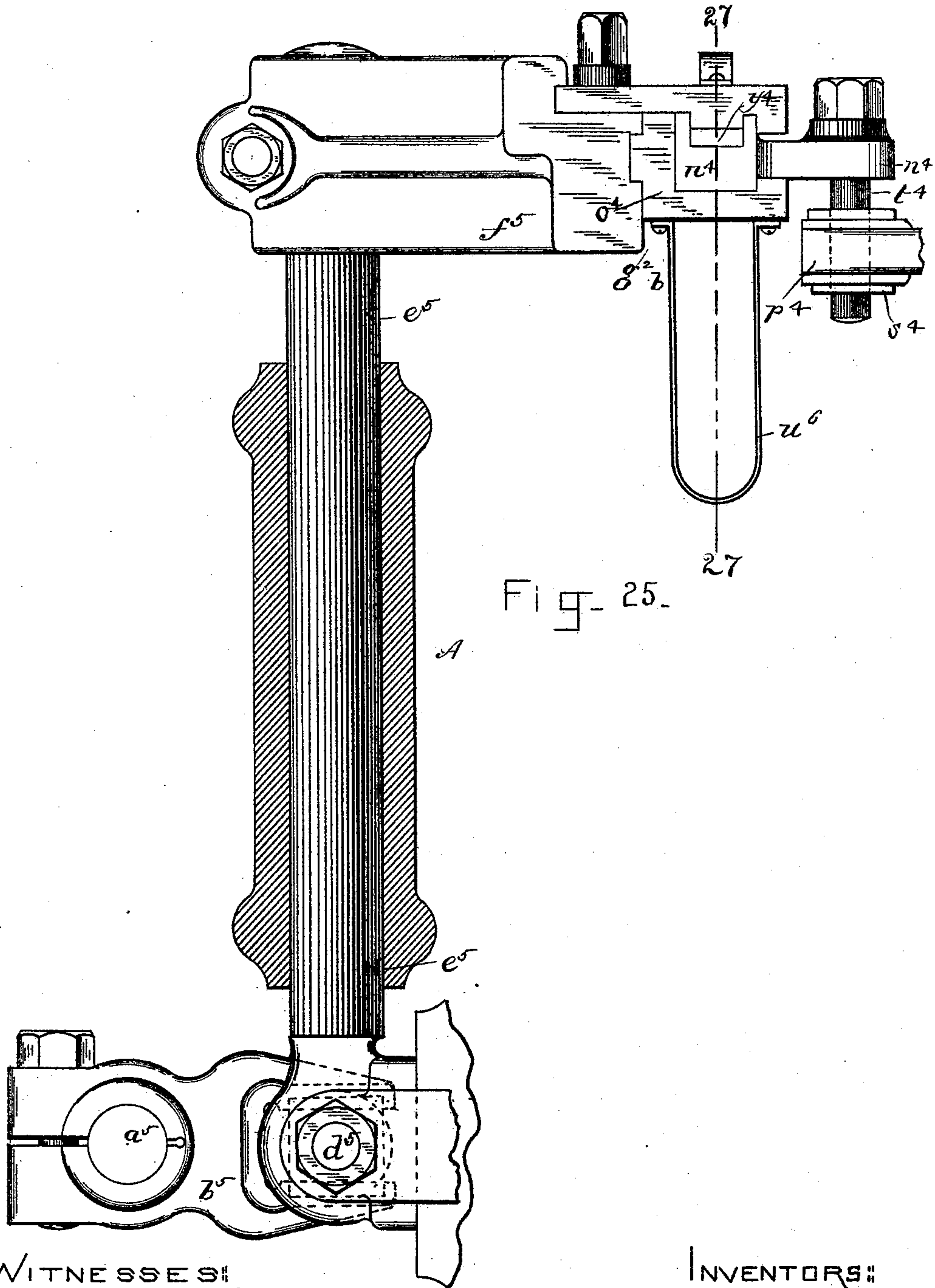
(No Model.)

19 Sheets—Sheet 13.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:
G. H. Chamberlain.
J. W. Garfield

INVENTORS:
Chas. S. Gooding -
Robert L. Ellery.
by
Chapman & Co. Attys.

(No Model.)

19 Sheets—Sheet 14.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.

Fig. 26.

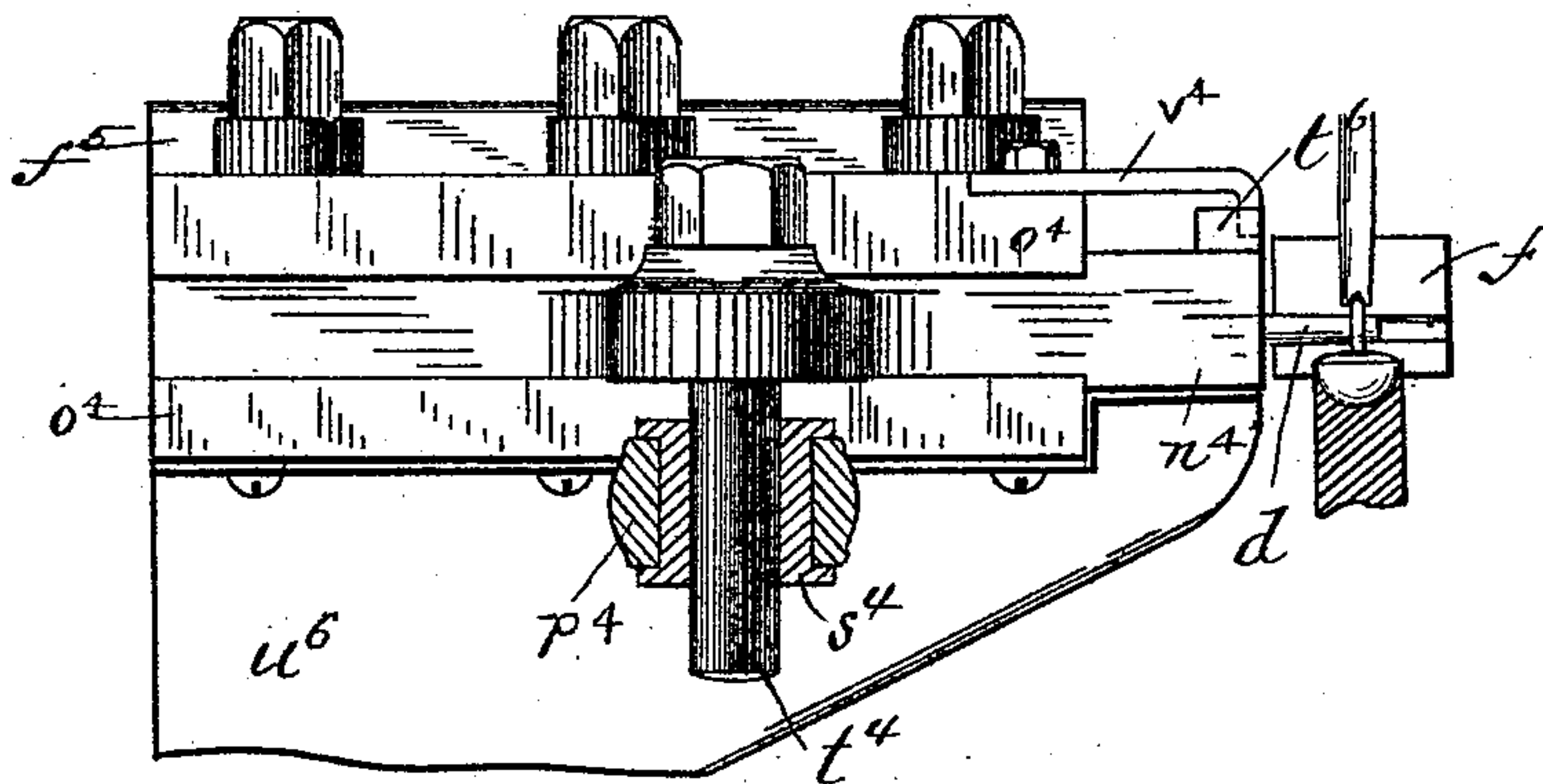


Fig. 27.

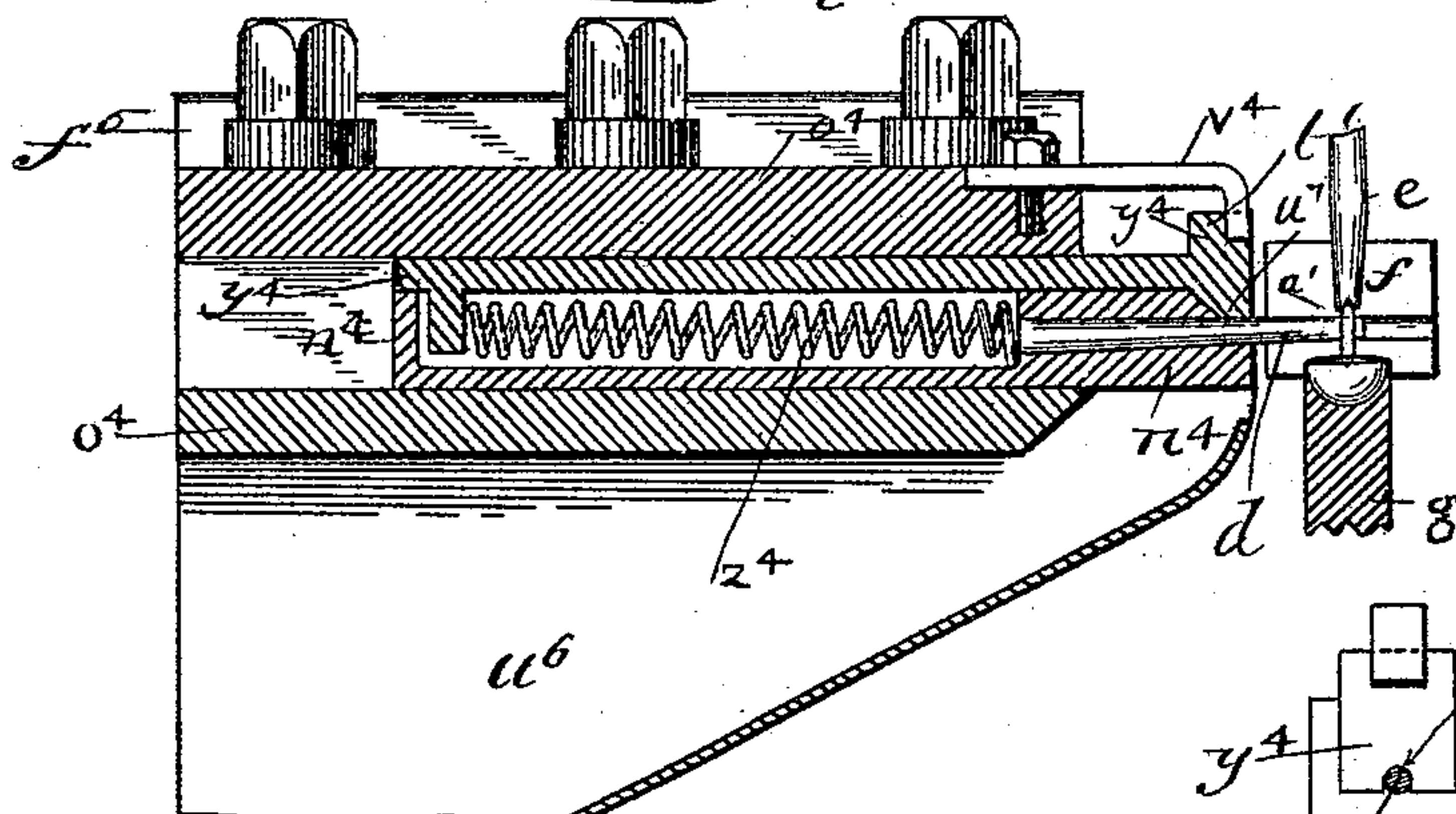


Fig. 27^a.

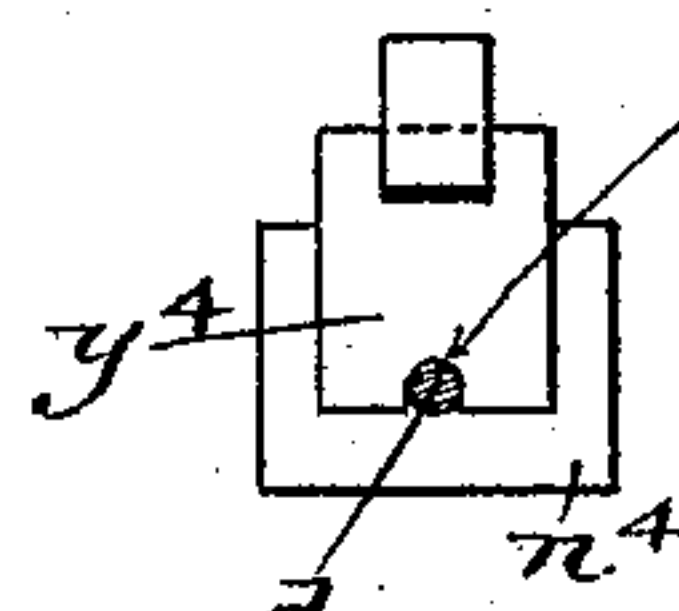
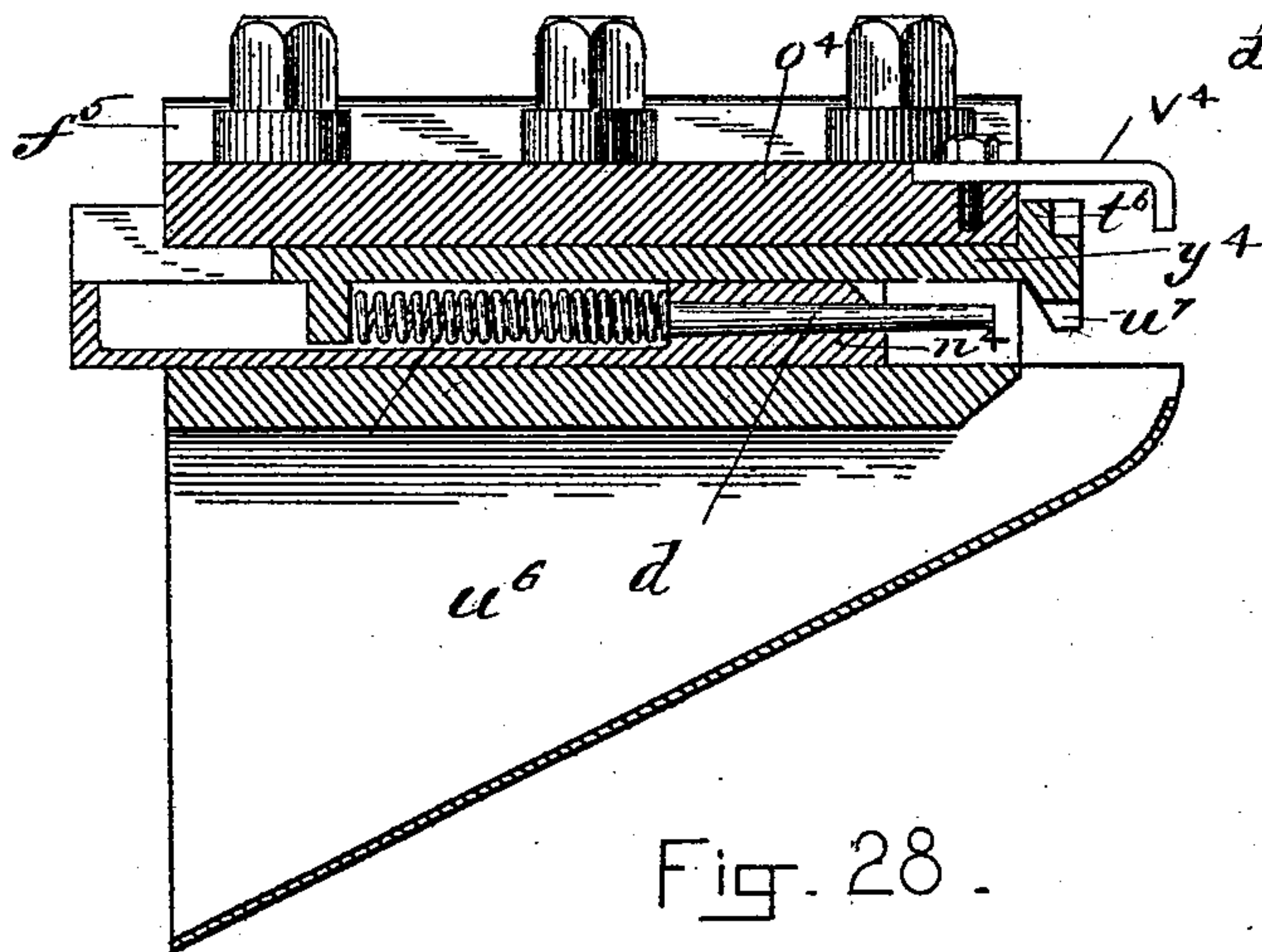


Fig. 28.



WITNESSES:

G. H. Chamberlain.

J. D. Garfield

INVENTORS:

Chas. S. Gooding.

Robert L. Ellery,

by Chapin &

Attys.

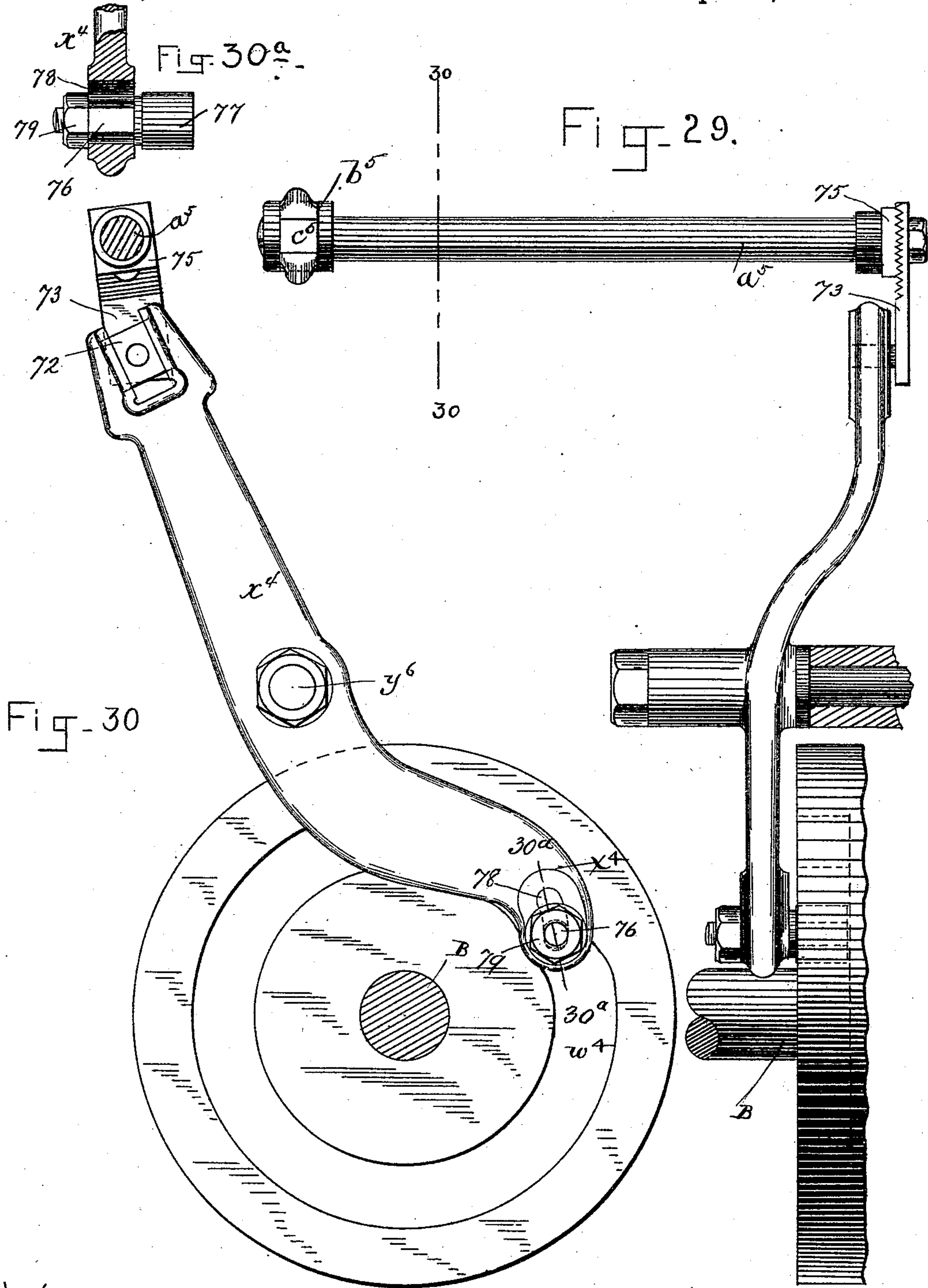
(No Model.)

19 Sheets—Sheet 15.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



WITNESSES:
G. M. Chamberlain
J. D. Garfield

INVENTORS:
Chas. S. Gooding
Robert L. Ellery
by *Chapman & Co.* Attys.

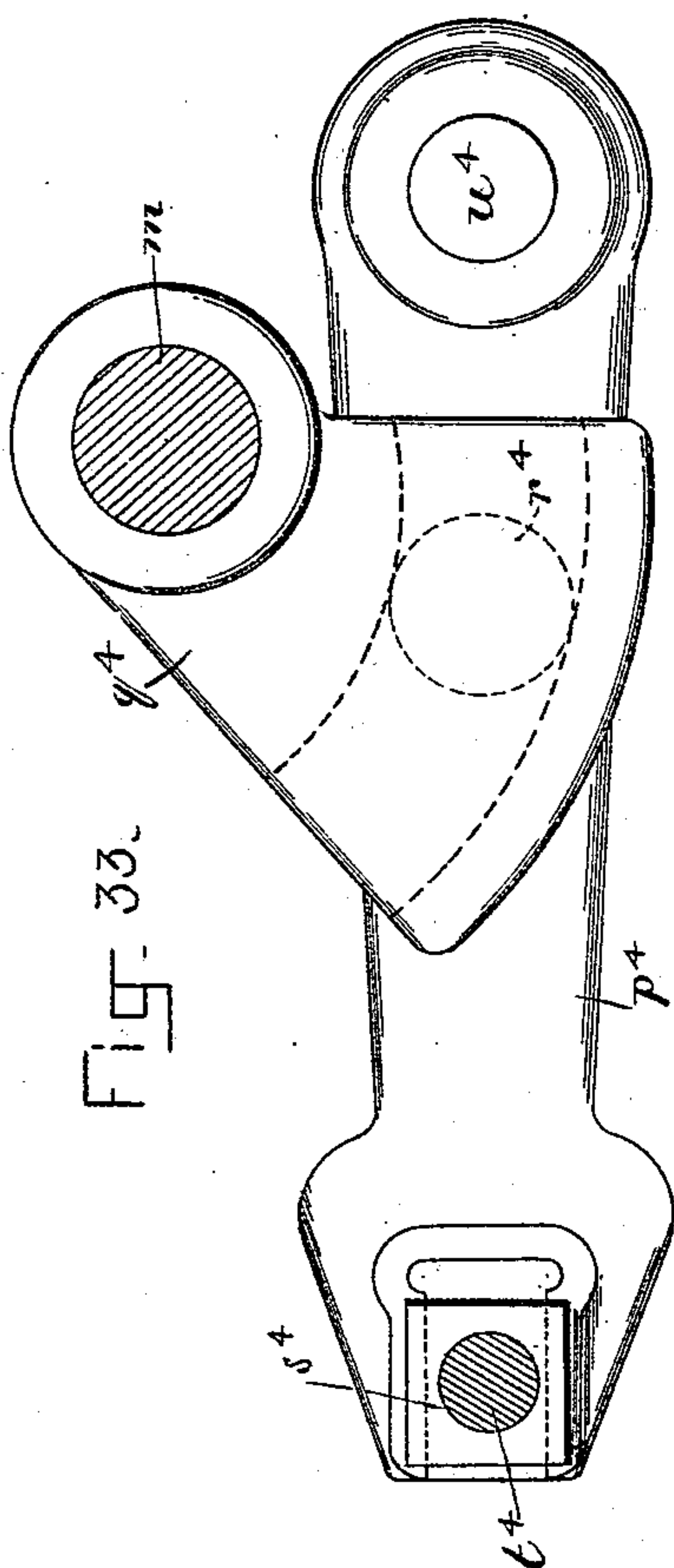
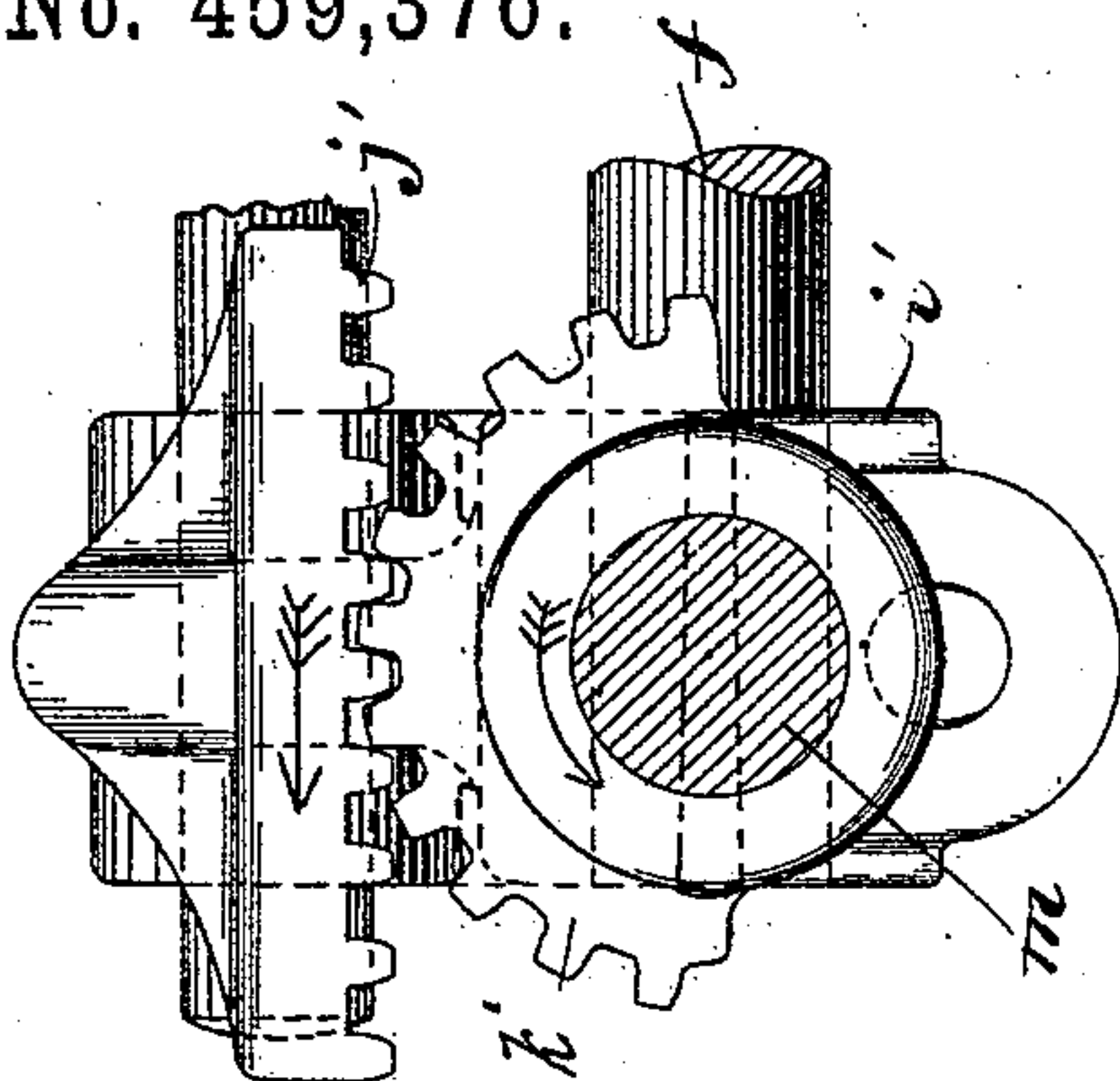
(No Model.)

19 Sheets—Sheet 16.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

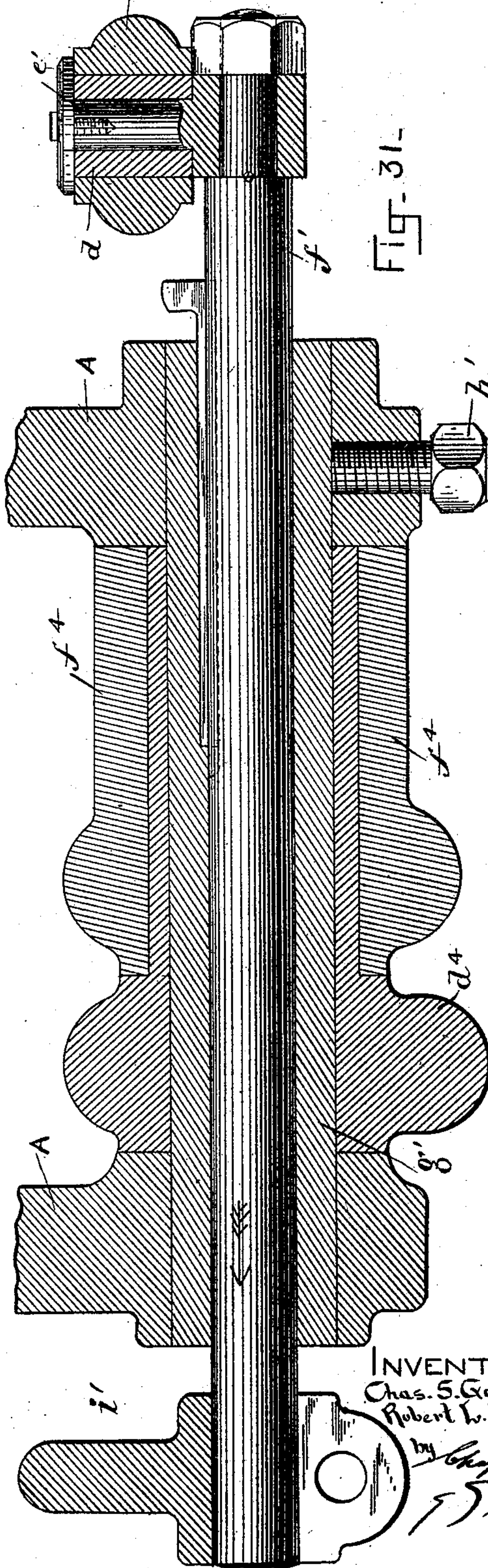
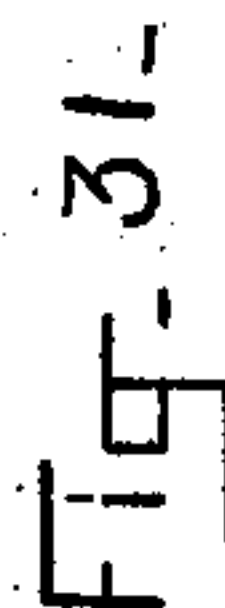
Patented Sept. 8, 1891.



WITNESSES:

G. H. Chamberlain.

J W Garfield



INVENTORS:

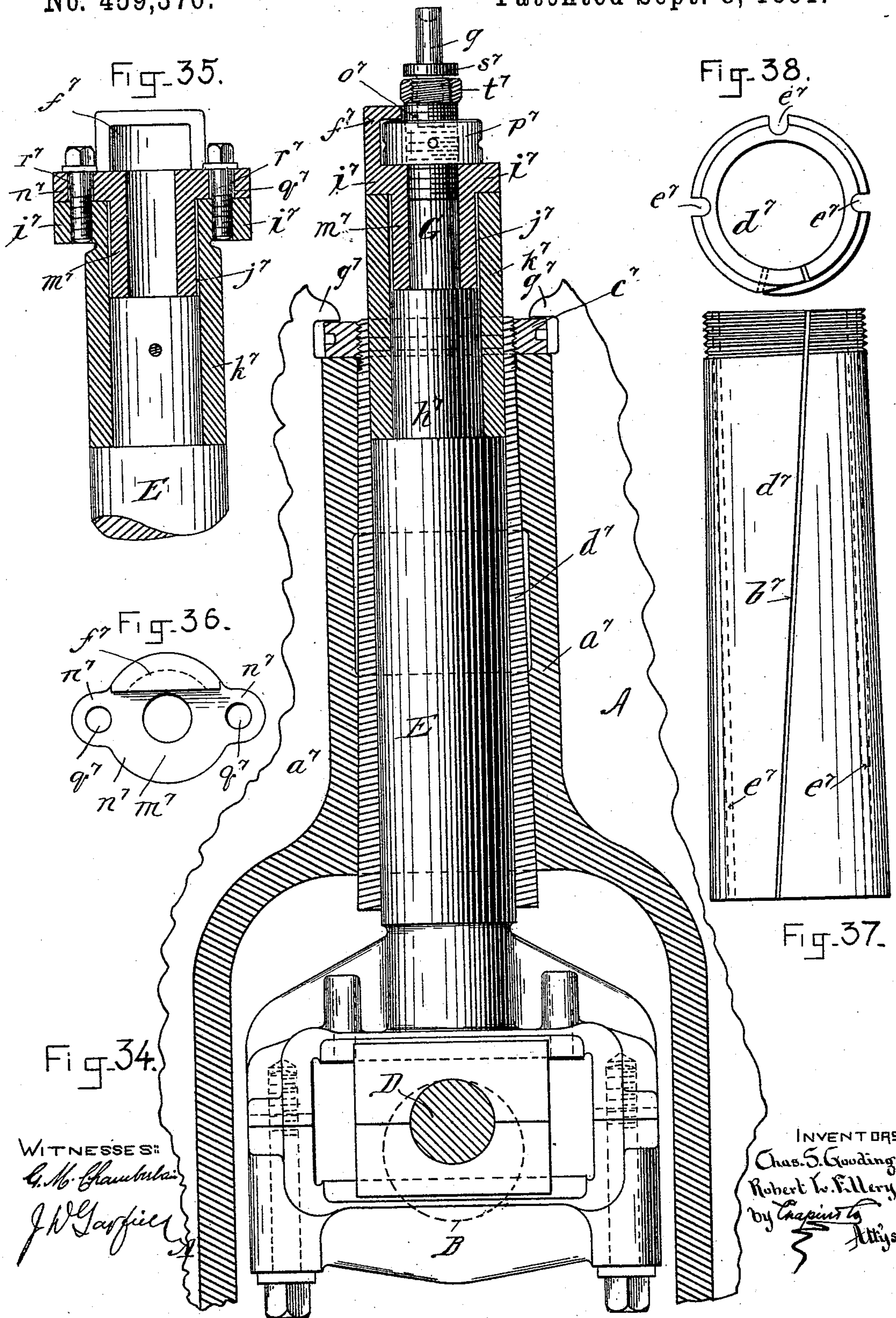
Chas. S. Gooding
Robert L. Ellery

by Chapman
Attys.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.



C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.

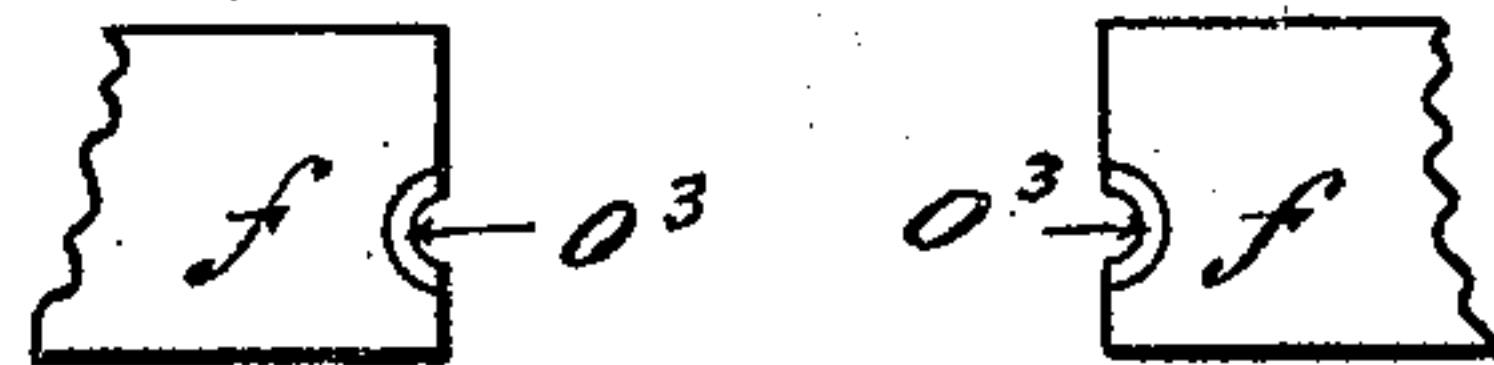
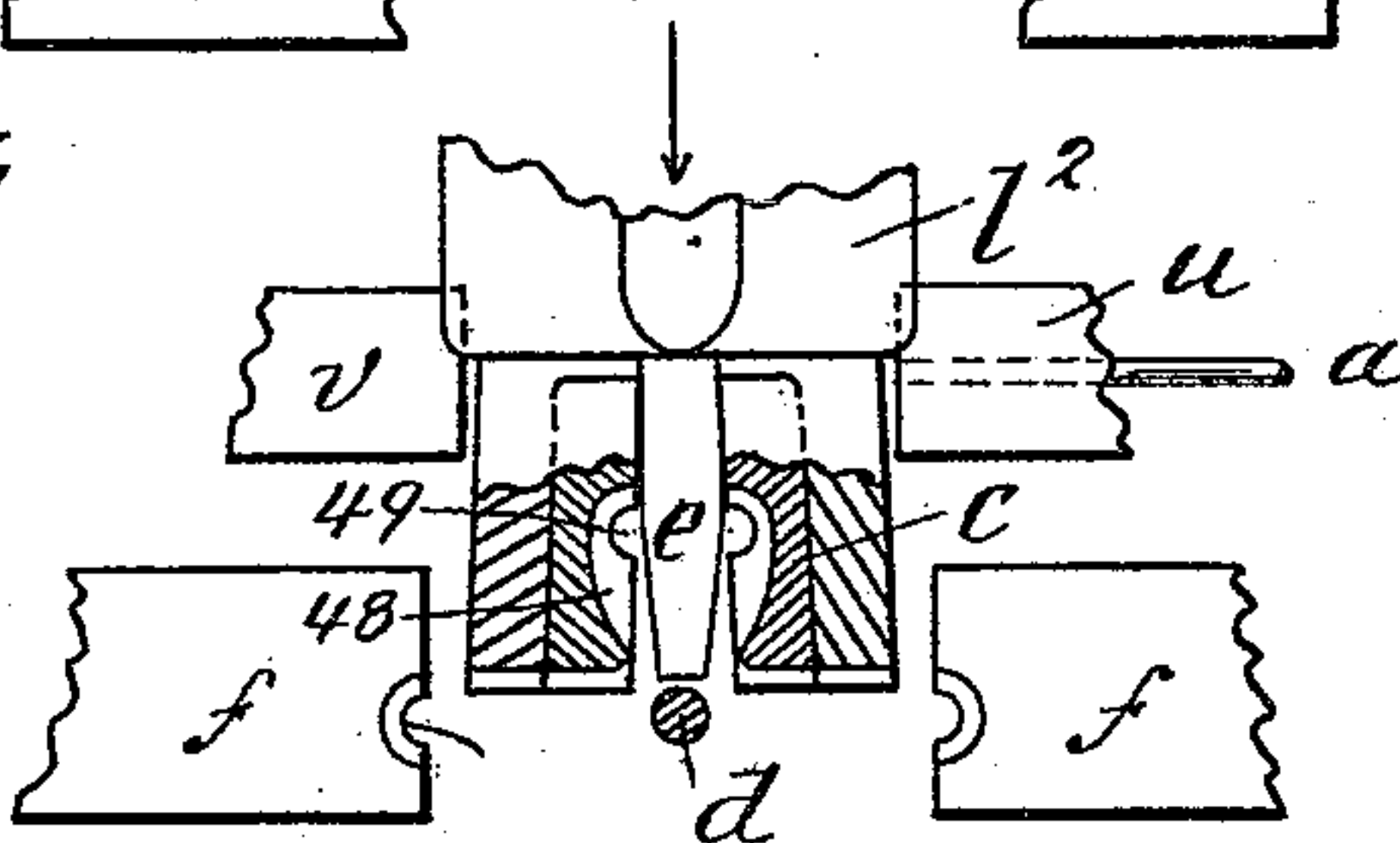
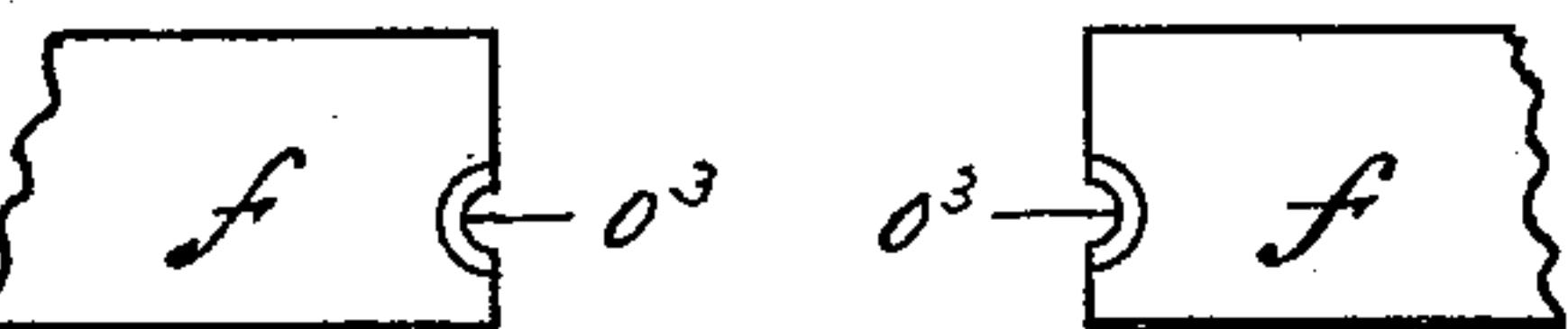
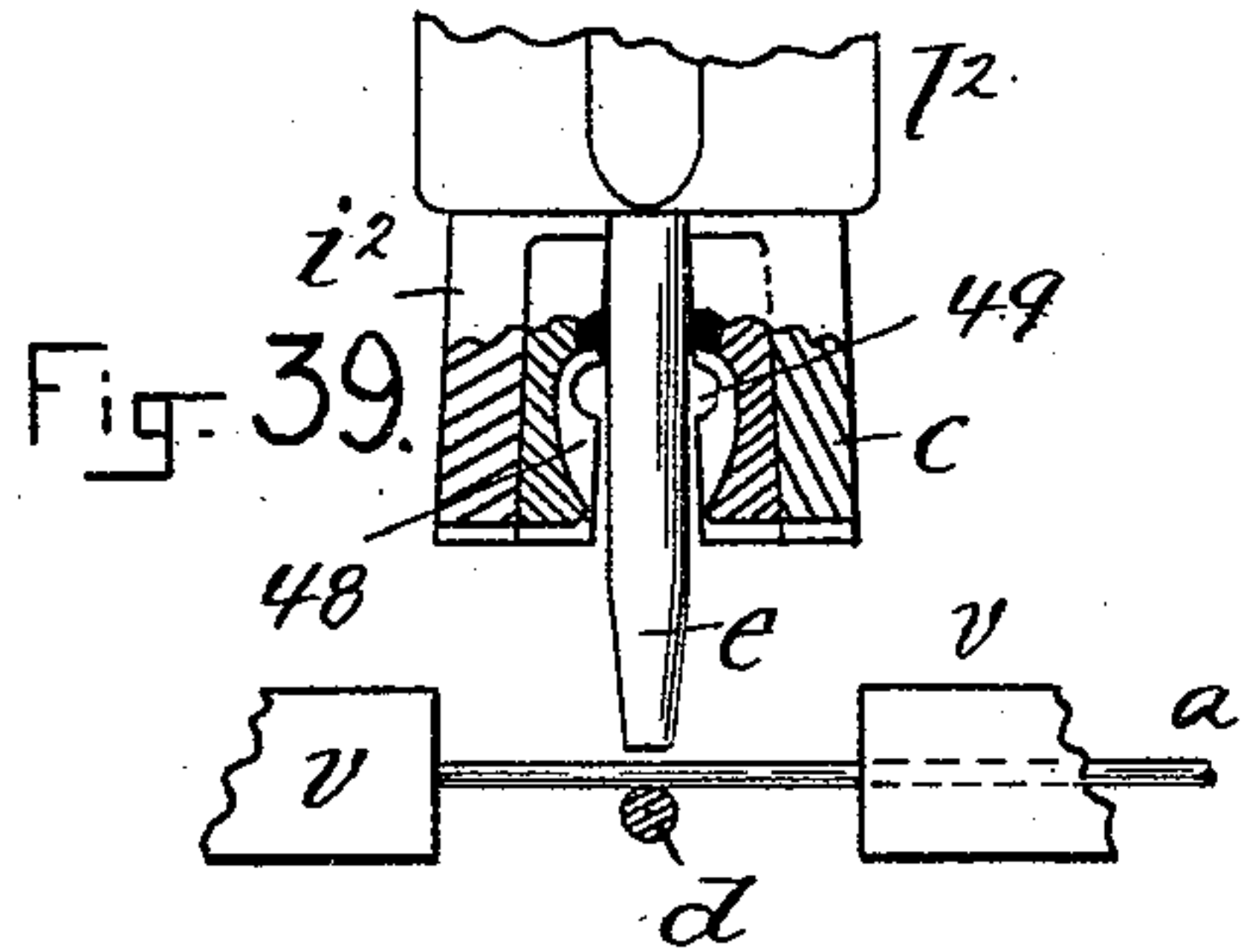
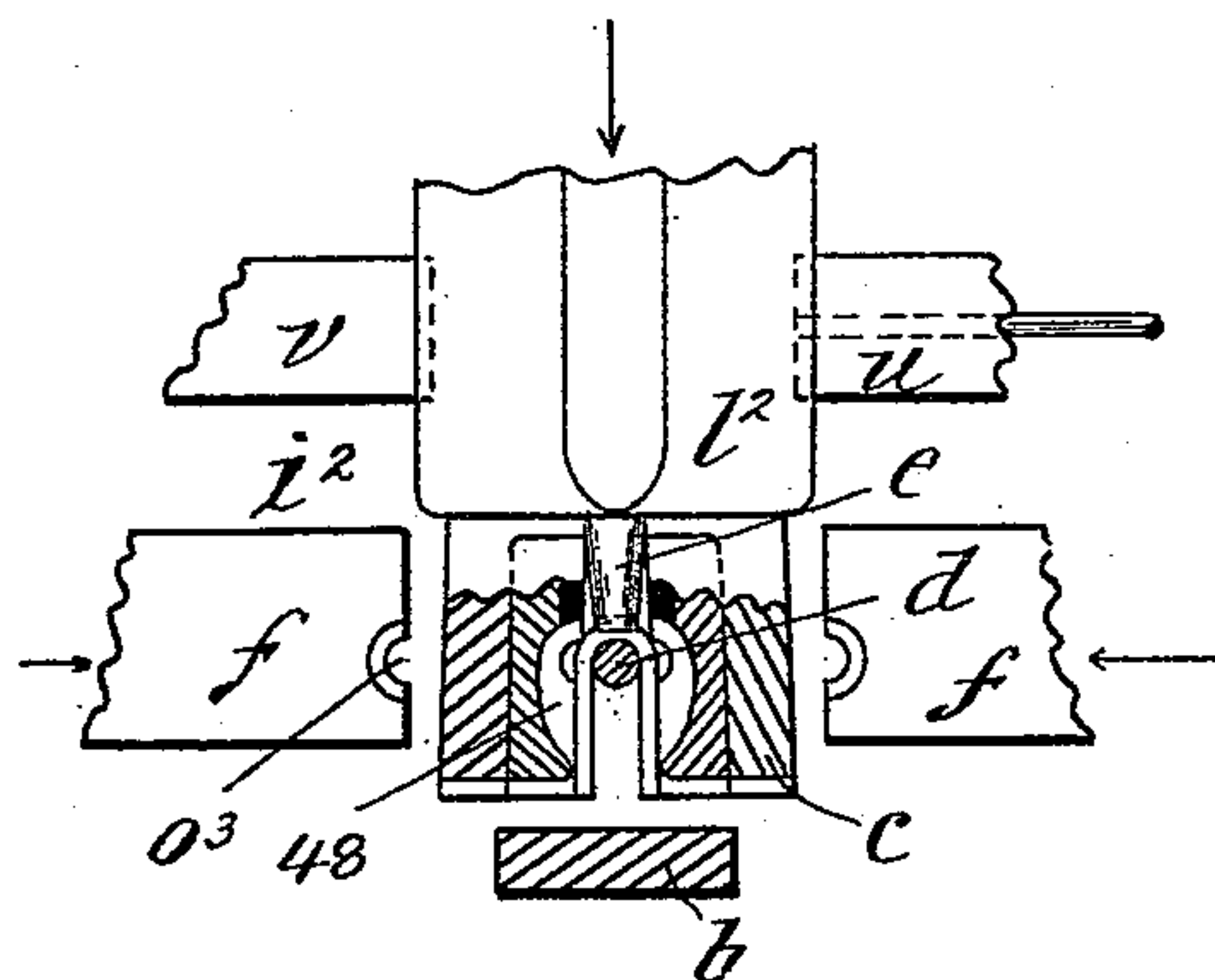
Fig. 41. 

Fig. 42.

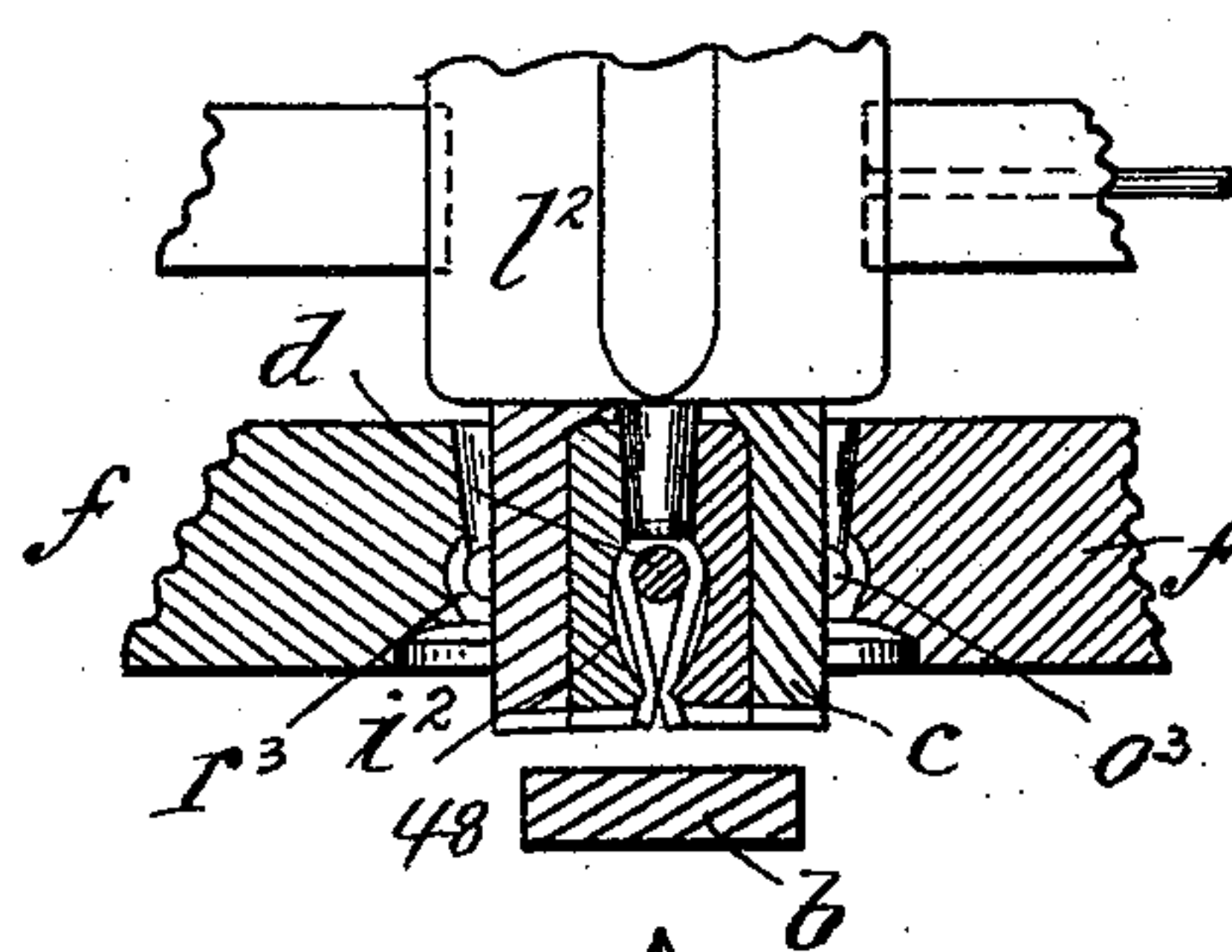
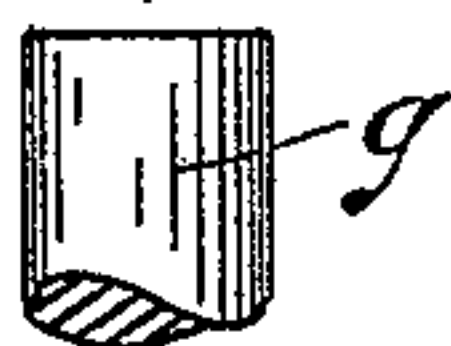


Fig. 43.



WITNESSES:

G. M. Chamberlain.

J. W. Garfield

INVENTORS:

Chas. S. Gooding,

Robert L. Ellery,

by *Chapin & Co.*
Attys.

C. S. GOODING & R. L. ELLERY.
METHOD OF AND MACHINE FOR MAKING BUTTONS.

No. 459,376.

Patented Sept. 8, 1891.

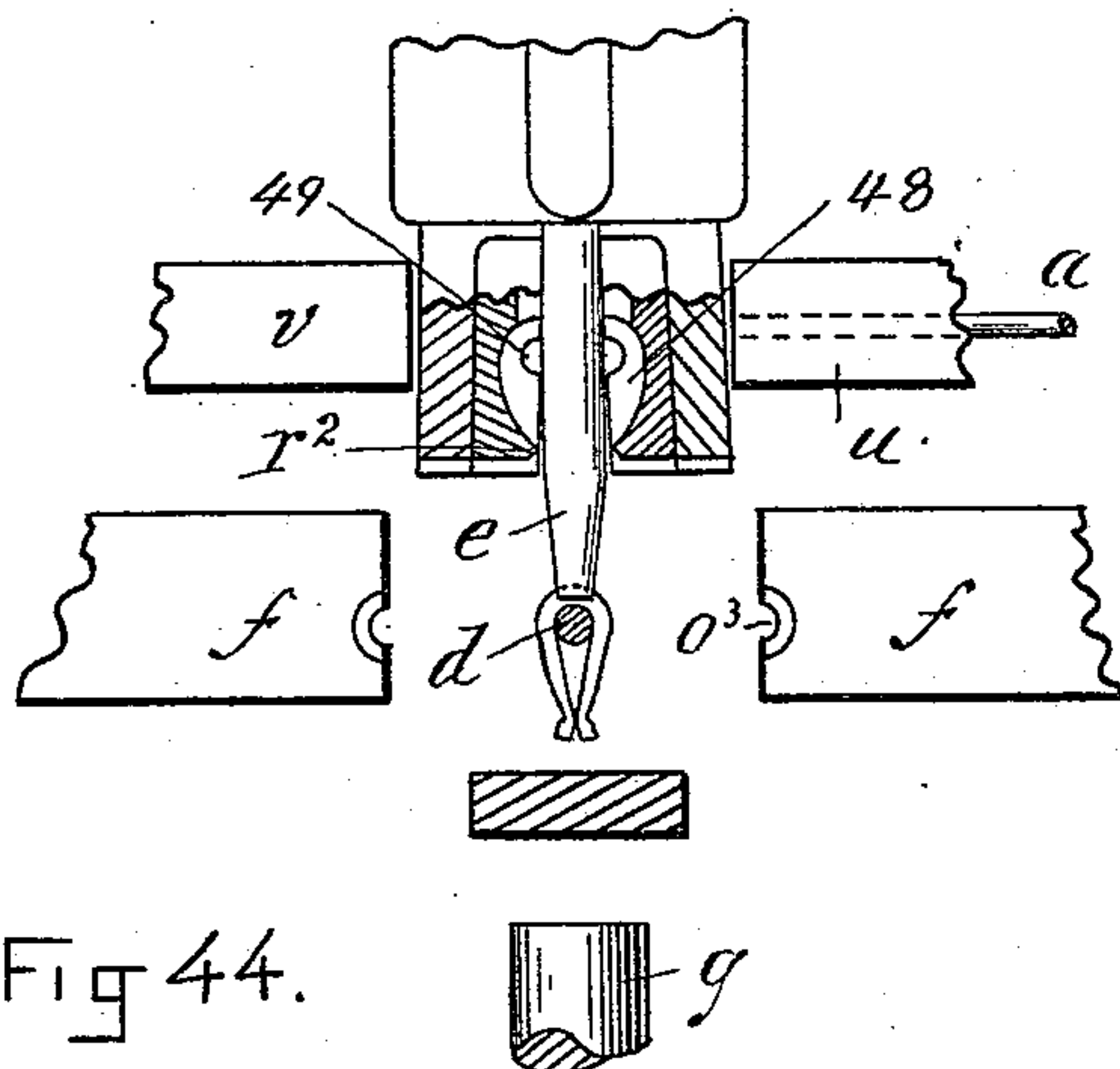


Fig 44.

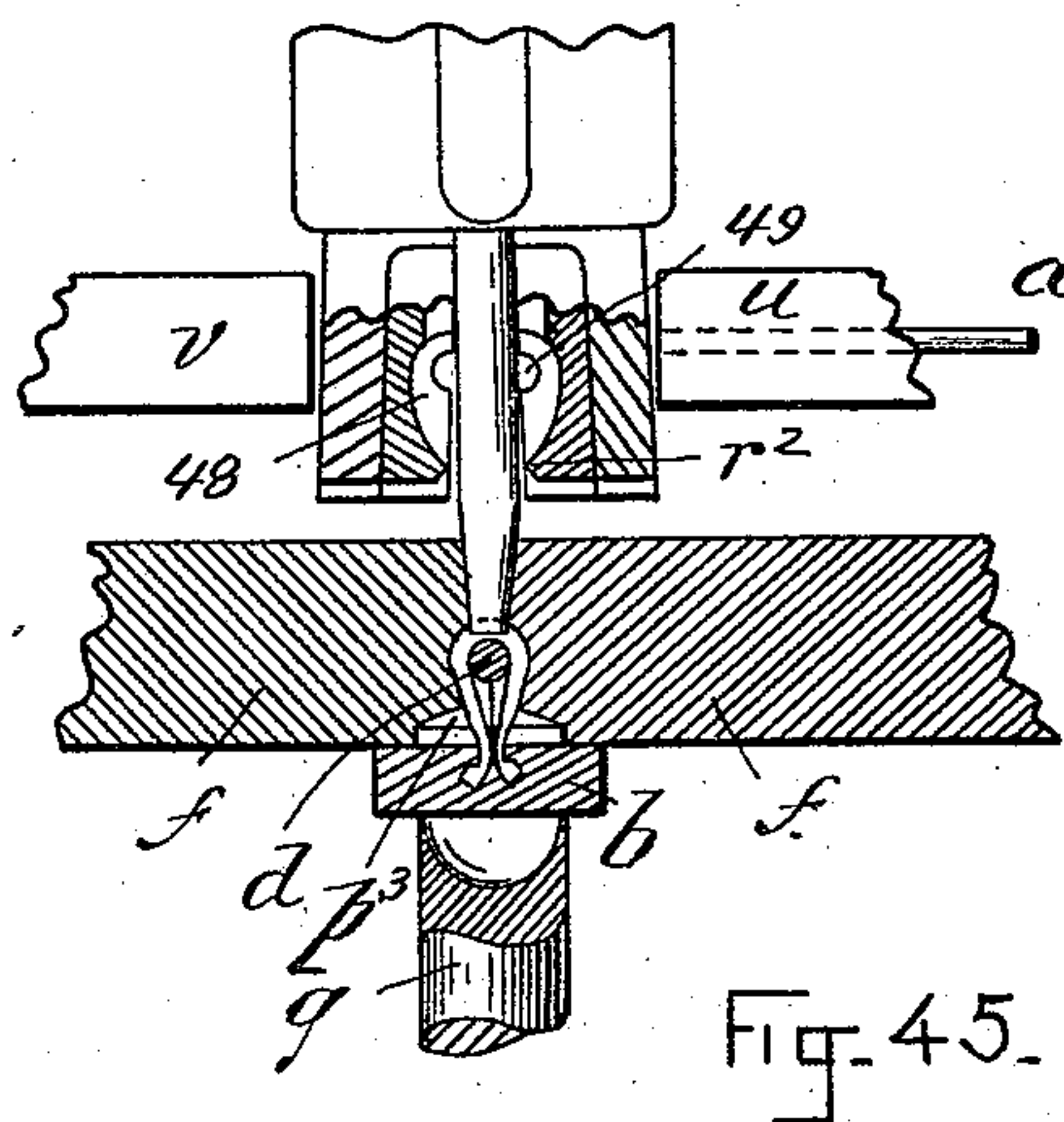


Fig. 45.

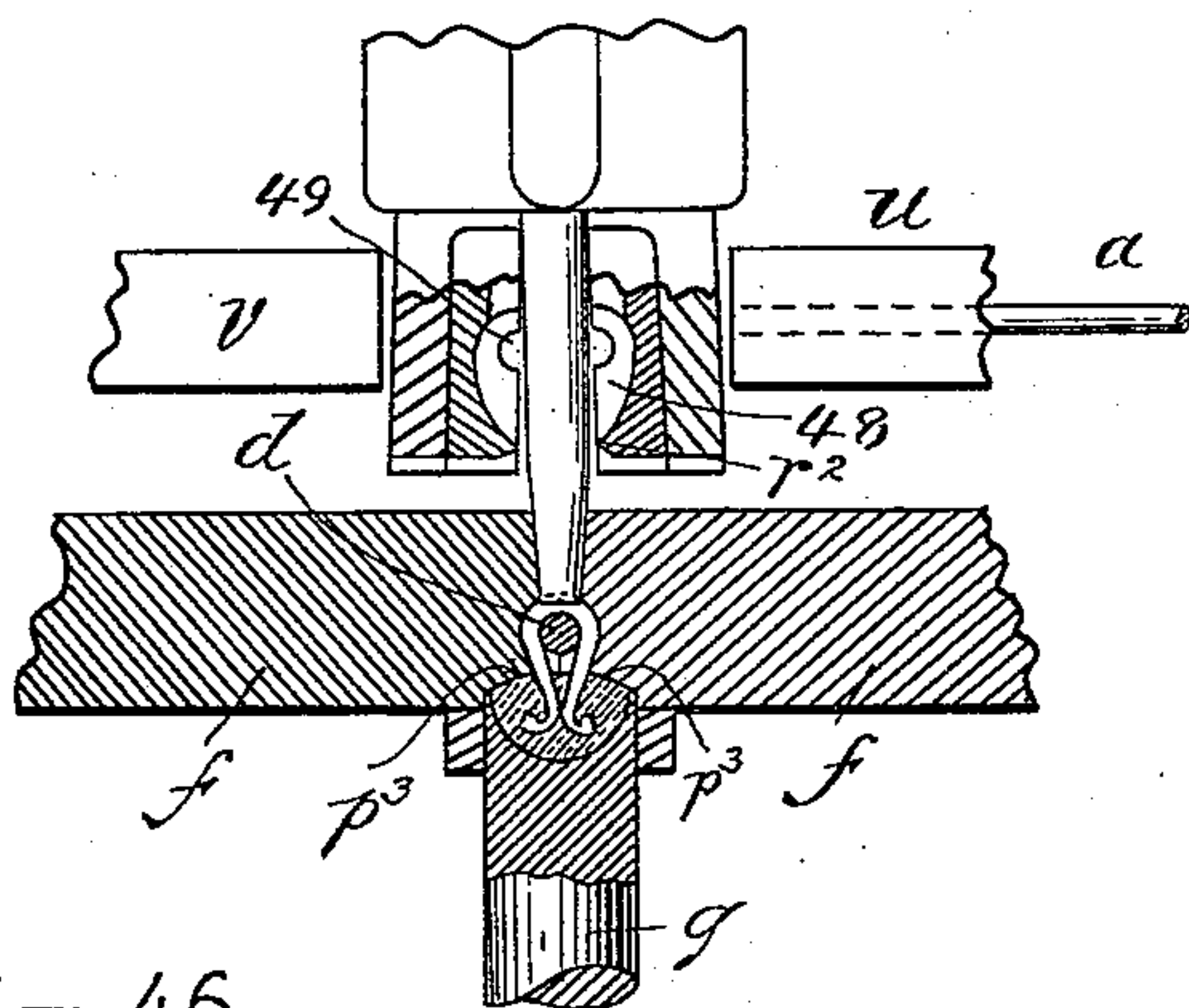


Fig-46.

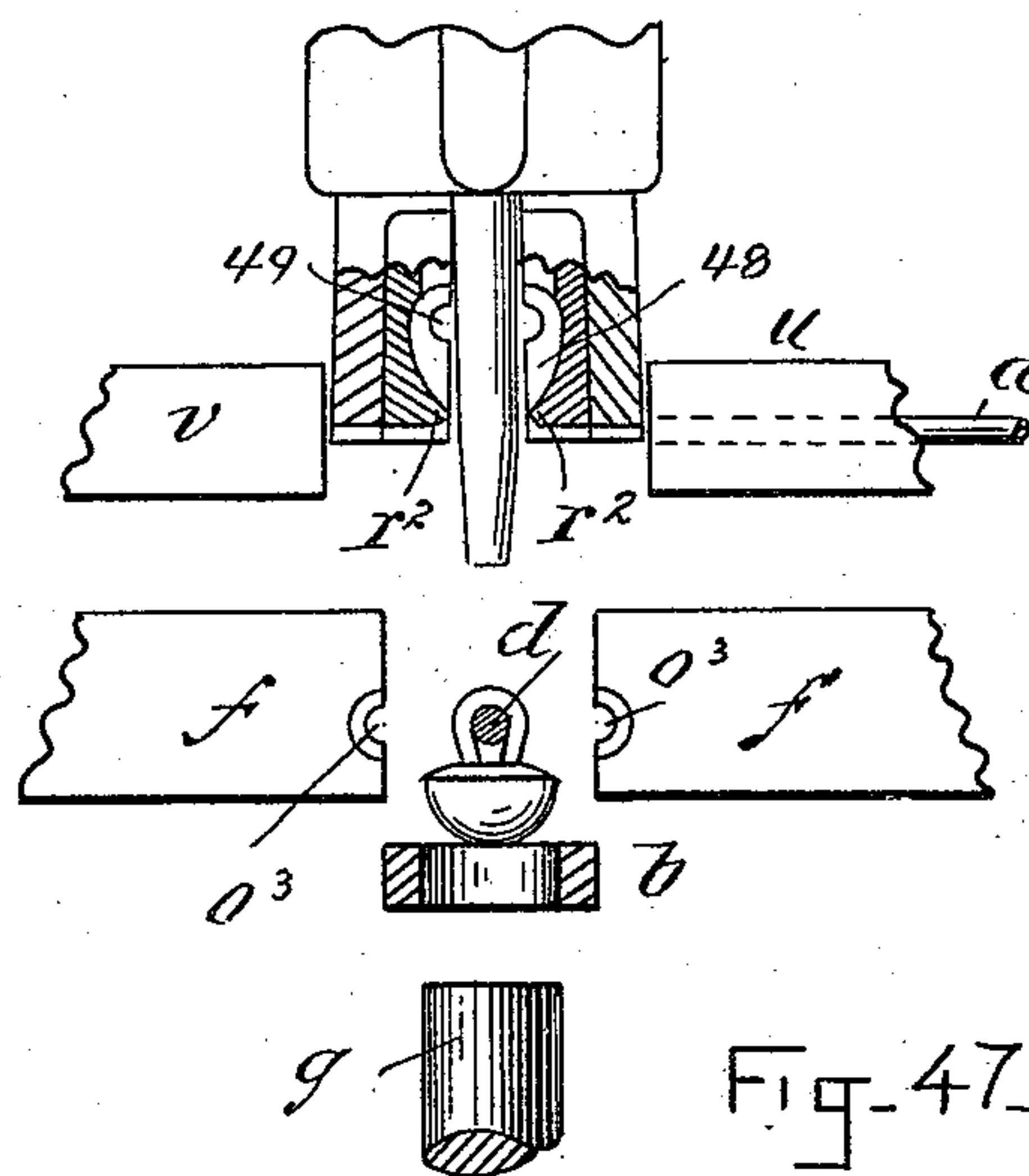


Fig-47.

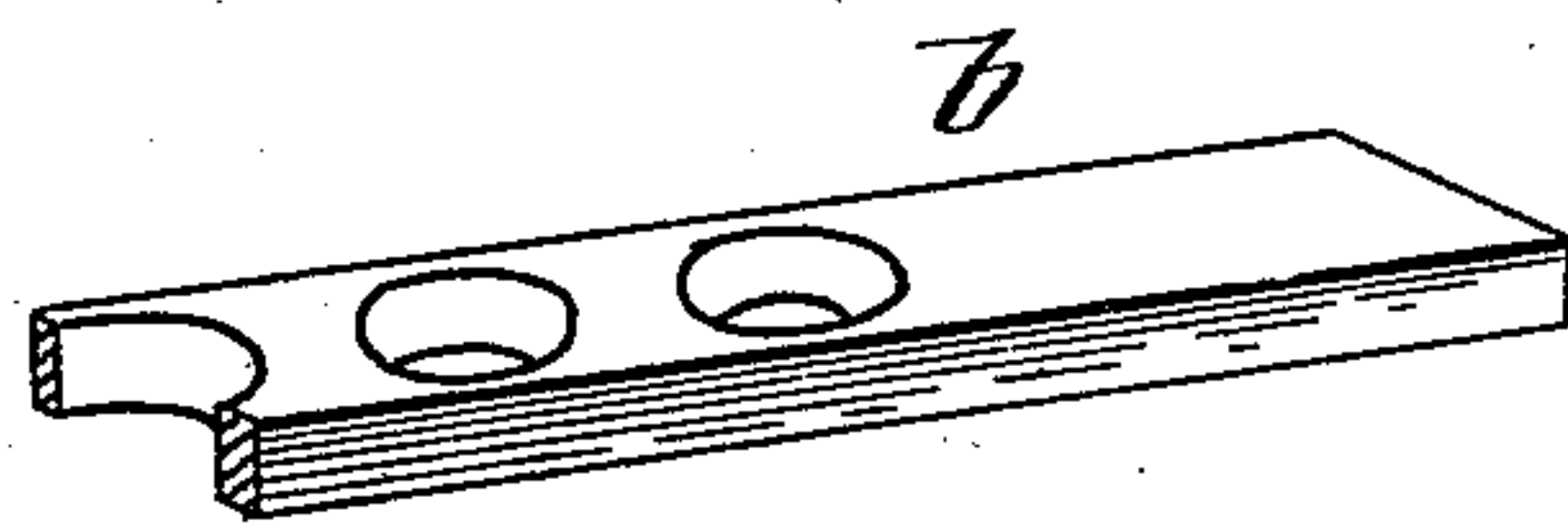


Fig. 49.

WITNESSES:

G. M. Chamberlain.

J. D. Garfield.

INVENTORS:

Chas. S. Gooding.
Robert L. Ellery.

by *Chapin & Co.*
Attys.

UNITED STATES PATENT OFFICE.

CHARLES S. GOODING, OF BOSTON, AND ROBERT L. ELLERY, OF TAUNTON,
ASSIGNORS TO THE MORLEY BUTTON MANUFACTURING COMPANY, OF
BOSTON, MASSACHUSETTS.

METHOD OF AND MACHINE FOR MAKING BUTTONS.

SPECIFICATION forming part of Letters Patent No. 459,376, dated September 8, 1891.

Application filed December 12, 1890. Serial No. 374,516. (No model.)

To all whom it may concern:

Be it known that we, CHARLES S. GOODING, residing at Boston, in the county of Suffolk, and ROBERT L. ELLERY, residing at Taunton, in the county of Bristol, and State of Massachusetts, citizens of the United States, have invented new and useful Improvements in Methods of and Machines for Making Buttons, of which the following is a specification.
10 This invention relates to improvements in machines for making shank buttons, particularly shoe-buttons, the heads or bodies thereof being formed of papier-maché or other suitable compressible material, and identified
15 with the instrumentalities hereinafter set forth, and in detail described there is an improvement in the process or method of forming a button.

The object of the improved method is to
20 form a button which is most perfect and accurate in shape, and as to the engagement of the eye-shank with the head is of unusual strength. The advantage of a strong button is obvious, and it is particularly important
25 to produce buttons which are absolutely alike and accurate, the eye-shank in one button always being in exactly the same arrangement and engagement with the button-head as in another when the buttons are to be
30 sewed onto the boots or shoes or other fabric by automatic machinery, as is possible under the use of certain machines well known in the trade.

The improved method consists, essentially,
35 in providing an eye-shank having the legs thereof slightly separated or deflected and supporting and immovably confining same with relation to said support, then forcing the papier-maché or stock material upon and
40 about the legs of the eye-shank, molding and compressing by suitable dies the button-head, and, finally, at substantially the instant of the completion of the molding and compressing operation, severing that portion of the stock
45 material from which the button-head is formed from the supply strip or sheet.

The invention further consists in the combination of certain coacting mechanisms or instrumentalities and in the particular con-

struction and combination of parts constituting or comprised in said instrumentalities, also as will hereinafter more fully appear and be identified by the claims.

Reference is to be had to the accompanying drawings, forming part of this specification, wherein similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a front elevation of the machine. Fig. 2 is a side elevation thereof; and Fig. 2^a is a horizontal section in detail on line 2 2, Fig. 2. Fig. 3 is a rear elevation of the machine. Fig. 4 is a central vertical section of the machine, taken from front to rear thereof or on the plane indicated by line 4 4, Fig. 1. Fig. 4^a is a horizontal section of the machine, taken on the line 4^a 4^a, Fig. 1. All the remaining figures are on larger scales. Fig. 5 is an enlarged plan view of the mechanism for feeding the wire, a supporting portion of the frame or casting being shown in horizontal section. Fig. 6 is a side elevation of the said wire-feed mechanism. Fig. 7 is a plan view of the mechanism for feeding the strip of stock material, the support for the upper roll being removed. Fig. 8 is a side elevation of the paper-feed mechanism. Fig. 9 is an enlarged section in detail on line 9 9. Figs. 8 and 9^a is a sectional elevation on line *b b*, Fig. 7. Fig. 10 is a sectional elevation of said paper-feed mechanism on line 10 10, Fig. 2. Fig. 11 is a section on line 11 11, Fig. 8, through the feed-roll. Fig. 12 is a front elevation of the wire cutting and bending mechanism; and Fig. 13 is a sectional elevation of the same on line 13 13, Fig. 12. Fig. 14 is a central vertical section of said mechanism on line 14 14, Fig. 13. Fig. 15 is a horizontal cross-section on line 15 15, Fig. 12. Fig. 16 is a cross-section on line 16 16, Fig. 14. Figs. 17 and 18 are respectively front and side elevations of one of the jaws for bending the wire. Fig. 19 is a rear elevation of the wire cutting and bending mechanism. Fig. 20 is a front elevation of one of the button-forming dies and its guiding and carrying mechanism. Fig. 21 is an end view of the die. Fig. 22 is a vertical section on line 22 22, Fig. 20. Fig. 23 is a vertical cross-section on line 23 23, Fig. 20. Fig. 24 is a cross-section through a portion

of the die-carrier, taken on line 24 24, Fig. 20. Fig. 25 is a front elevation of what will be termed the "button feeding or ejecting mechanism," a portion of the frame of the machine being shown in section. Fig. 26 is a side elevation, with parts in section, of the button supporting and clearing mechanism. Fig. 27 is a section vertically of the same, taken on the line 27 27, Fig. 25. Fig. 27^a is an end elevation in detail of the clearing mechanism. Fig. 28 is a vertical section similar to Fig. 27, the parts, however, being shown as in different operative relations. Fig. 29 is a side elevation in detail of the mechanism for imparting a vertical motion to the button supporting and feed mechanism. Fig. 30 is an elevation of said mechanism as seen at right angles to the view Fig. 29, a part thereof being shown in section taken on the line 30 30. Fig. 30^a is a sectional view in detail of certain of the parts of the said last-mentioned mechanism, taken on the line 30^a 30^a, Fig. 30. Fig. 31 is a horizontal section of details, taken from front to rear of the machine on the line 31 31, Fig. 2. Fig. 32 is a horizontal section of parts as seen above the line 32 32, Fig. 1; and Fig. 33 is a horizontal section of certain of the parts as seen about on the same plane as that on which Fig. 4^a is taken. Fig. 34 is a sectional elevation taken transversely of the machine, illustrating the punch-die and its supporting, guiding, and actuating mechanism. Fig. 35 is a sectional elevation of some of the upper portions of the mechanism shown in Fig. 34, but taken on the plane at right angles thereto, and the die-punch and parts for directly supporting and regulating the same being removed. Fig. 36 is a plan view of a portion in detail comprised in said preceding figures, to be hereinafter particularly referred to. Fig. 37 is a side view of a sleeve or bushing comprised in said last-mentioned mechanism, to be hereinafter referred to; and Fig. 38 is a plan view of same. Figs. 39 to 47 are views in the nature of diagrams, to be hereinafter referred to, wherein the pinchers and a portion of the carrier therefor are shown, the former in partial vertical section, together with other parts of the button-forming mechanism, the relations of the said several parts being varied in the different views in accordance with different stages in the formation of a button. Fig. 48 illustrates a short portion of a strip of paper-stock material from which button-heads are to be formed.

The general operation of the button-forming mechanism taken as a whole will be first briefly described. The wire *a*, out of which the eye of the button is formed, is fed into the machine in a continuous length against a stop *v*, as shown in Fig. 39. A section of wire *a'* corresponding to the distance between stop *v* and the part *u* is then cut off by the nipper *c*, as shown in Fig. 40, being held against the eye supporting and forming pin *d* by the spring-holder *e*. The nippers *v* *c*, section of wire *a'*, forming-pin *d*, and holding-pin *e* then

descend together and in unison to the position shown in Fig. 41, in which figure, however, the section of wire is not shown. The forming-pin, holding-pin, and wire section then stop, while the nippers continue their downward motion at either side of and past the forming-pin, thus bending the wire into the form of a staple, as seen in Fig. 42, the staple-legs ranging in parallelism. The nippers having reached the limit of their downward movement, their ends being below the bottom plane of the dies *ff*, are forced toward each other by said dies, as shown in Fig. 43, such action of the nippers forcing the extremity of one staple-leg against the other, causing the extreme points to spread, as shown in said Fig. 43. The dies *ff* then recede from each other slightly and the nippers move upward and outward, leaving the formed eye hanging upon the forming-pin *d* retained by the spring-pressed holder *e*, as seen in Fig. 44. The dies again advance to an end-to-end abutment, as seen in Fig. 45, the punch *g* moving up, as there shown, under and to a contact with the stock-strip *b*, and, continuing, forces the stock material onto and about the extremities of the eye-shank, and then against and into the shaping-depressions in said dies *ff*, crowding the paper into the said recess, thereby forming the under half or portion of the button, the depression in the die-punch forming the other or upper half or portion of the button-body. It will be particularly understood that the portion of the paper is by the punch forced upon and about the eye before the punch commences the operation of forming the button-head by crowding the paper into the recesses in the dies *ff* by itself shaping the other half of the button-head, and thus the points of the eye, which are already separated to a slight extent, as mentioned and shown, are separated still further as the stock material is compressed and molded upon, over, and about them, the strip being at this time plastic and capable of considerable compression and offering but slight resistance to the entrance of the eye-points and of the spread thereof before the completion of the button-head. It is also to be noted that after the strip has been forced upon the eye of the button the final upward movement of the punch forms the button-head, which is partly in the depression of the dies *ff* and partly in that of the punch; but at no time before the completion of the button-head is the portion of material from which the same is formed severed from the supply-strip, such severing being practically simultaneous with the final compression and molding of the head. The positions of the dies and coacting devices at the time of the completion of the button are shown in Fig. 46. The punch then retreats downwardly, followed by the retreat of the dies *ff* laterally relative to the movement of the punch, while the nippers and carrier therefor continue to move upwardly in the direction the reverse of

that of the die-punch, leaving the finished button suspended upon the forming bar or pin *d*, as shown in Fig. 47, to be expelled from the machine by the movement of said former-pin in connection with other parts intimately related thereto, to be hereinafter particularly described. The forming-pin is then returned to the position shown in Fig. 39 in time to receive another section of wire from the wire-supply, when the eye-forming and button head engaging and forming operations are repeated, as has been described.

The wire from which the eye or shank of the button is formed is fed into the machine by the mechanism illustrated in Figs. 5 and 6 and Figs. 1, 2, and 3. The run of the wire is above and parallel with the movement of the dies *f f*, and said wire-feeding mechanism consists of two grooved rolls *h* and *i*, mounted to rotate in a horizontal plane with their edges in contact and between which the wire is fed. The roll *h* is secured to a gear *j*, on which is secured the ratchet *l*, so that the three are rotated upon the shaft *m* as one by means of the spring-pressed pallets *n n*, which have bearings in the holder *o*. The said holder *o* is secured on the shaft *m* by means of the bolt *p* passing through the separated ear-pieces thereof, and from the rocking motion imparted to the said shaft *m* an intermittent rotary motion is imparted to the wire-feed roll *h* through the said ratchet devices. The gear *j* rotates the gear *k*, which is secured on the grooved feed-roller *i*, said latter gear and roll being fastened together and to the shaft *q*, which is mounted for rotation in a bearing in a casting *r*, a portion of which is of extended or spindle form. Said casting *r* has a bearing by one portion thereof in a part of or affixed to the frame of the machine and by another in the adjusting screw-plug *s*, which has a screw engagement with the said portion of the machine-frame. The spring *t* forces the feed-roll *i* against the other *h*. In Fig. 20 the run of the wire with relation to the feed-rolls therefor and one of the dies *f* and the carrier therefor is illustrated, the wire passing through a hole in a part of the machine-frame (as also indicated at *a* in Fig. 2) and through a hole in the adjustable gib *u* against the adjustable stop *v*. The mechanism for insuring the rocking movement of the shaft *m* is shown in Figs. 1, 2, 3, 31, and 32, and consists of and operates as will now appear. A cam *A'*, which rotates on and with the main shaft *B* of the machine, actuates a lever *b'*, pivoted to the frame *A* at *c'* and connected by a sliding block *d'* and stud *e'* to the shaft *f'*, which is adapted to slide horizontally and forwardly and rearwardly of the machine. The said shaft *f'* has a bearing in a bushing *g'*, fastened to the frame *A* by the set-screw *h'*, Fig. 31. To the front end of the shaft *f'* is fastened a casting *i'*, upon which is cut a rack *j'*, with which the segment-gear *k'* engages, the said gear being fastened to the lower end of the shaft *m*. Therefore as

the shaft *f'* is moved forward and back by said cam *A'* and lever *b'* the gear *k'* and shaft *m* will receive a partial rotation forward and back through means of the rack *j'*, thus effecting, through the ratchet and feed-roll devices, the feed movement of the supply-wire.

The stock strip of paper or analogous material out of which the button-head is formed is fed into the machine in a strip, as shown in Fig. 48. The mechanism for feeding such strip comprises a pair of rolls disposed edge toward edge and geared together, one roll being movable and spring-pressed toward and adapted to yield from the other, and mechanism for securing a partial rotation intermittently of one of said rolls. There are also provisions for regulating the spring-pressure of the movable roll and for regulating or adjusting the extent of the partial rotational movements of the rolls, as will now appear. *l' l'* represent the feed-rolls having serrated edges, the lower one of which is mounted on a stud *q'*, fixed on the machine-frame *A*, while the other roll is mounted on another stud that is carried horizontally on a movable bracket-piece, which is downwardly spring-pressed. Said bracket is formed on the lower end of the spindle, as seen in Fig. 10, which has a shoulder at or above its junction with said bracket and plays upwardly through a cylindrical chamber formed in the machine-frame or fixture thereof. A spiral spring *n'* is located in the said chamber to encircle the spindle and by its lower end bears on the said shoulder, and is in turn borne upon at its upper end by a screw-plug 70, which has a thread engagement with the upper portion of the walls of said chamber, so that on the turning of the said plug a compression of the spring may be regulated. The said rolls *l' l'* are geared together by the spur-wheels *m' m'*, and on one side of the lower roll is fixed a ratchet-wheel 71, with which a couple of spring-actuated pallets *p' p'* engage. The said pallets are mounted on a lever *o'*, that is hung upon the said stud *q'*, the long arm of said lever being slotted at *r'*. The pallets are adjusted to rest with their points on different points of the back of the ratchet-wheel, so that on each swing of the lever carrying them, should such swing not correspond exactly to the length of one or several of said teeth, there will not be any appreciable lost motion.

Provisions for securing and varying the swing of the lever *o'*, whereby the amount of movement of the rolls *l' l'* may be varied to accord with different desired lengths of feed, may be seen on noting the mechanism, which is provided as follows: Upon the thrust-rod or plunger *a²*, which receives its vertical play from the cam *d²*, (see Fig. 2,) is rigidly connected and supported a rod *u'*, connected to said pallet-carrying lever *o'*. There is upon the said plunger-rod *a²* a laterally-set-off hub *v'*, through which the said rod or arm *u'* is passed for a supporting-bearing, extending

also rearwardly beyond said hub, and said rod w' forward and to the rear of said hub is screw-threaded, receiving thereon the lock-nuts $w'w'$. The said rod on the forward end is provided with a squared block t' , which is keyed thereto and provided with a stud t^o , which enters a circular hole therefor in the slide-block s' , that fits for a close though free sliding movement in and longitudinally of the said lever o' . By unloosening the lock-nuts w' and sliding the rod w' so that its place of connection with the plunger a^2 is varied as to the distance from the center of the slide-block s' a correspondingly varied extent of swing of the pallet-carrying lever will be insured and the feed of the strip accordingly varied. The direction of the feed of the strip is from rear to front of the machine and at right angles to the direction of the wire-feed, and the horizontal plane thereof is slightly below that of the wire-feed and also below the plane of movement of the pair of separable dies.

In an application for Letters Patent of the United States filed by us December 6, 1890, under Serial No. 373,833, we have shown and especially claimed much of the above-described mechanism for the feed of a strip of stock material, and therefore in this specification it is our intention to illustrate it as a mechanism coacting with other devices in the button-machine, having an organization such as here presented, and to claim features relating to such paper-strip-feed mechanism as adapts same for most advantageous use in this said machine.

The mechanism for cutting and bending the wire is illustrated in connection with the eye-forming pin d in Figs. 12 to 19, inclusive, as well as in the general views, notably Figs. 4 and 4^a, and also in the diagram views, Figs. 39 to 47, inclusive, and the same will be now described.

l^2 represents a carrier, on which the nipper-jaws c and i^2 are pivoted, said carrier being adapted for a vertical reciprocatory movement, the same receiving its movement from the engagement therewith of the intermediately-pivoted lever f^3 , and to the other end of said lever f^3 , through a connection, (the construction of which will hereinafter be mentioned,) the plunger-rod a^2 is engaged, which rod a^2 has been already referred to as also imparting the motion to the paper-feed. The carrier l^2 at its lower end is provided with a recess, within which the nipper-jaws are pivoted to have a swinging motion in a direction corresponding to that of the separable dies $f f$.

As has been already mentioned, the wire is fed into the machine preparatory to forming the button-eye against the adjustable stop v , being carried just over and across the forming-pin d . The spring-holder e , being carried and spring-supported on said carrier l^2 , is on the descent of said carrier brought against the upper side of the wire, binding it upon the forming-pin, and after the wire has

been severed by the corner of the nipper c working as a shear against the end of the gib u the forming-pin d has a downward movement in unison with the continued downward movement of the nippers and holding-pin until the forming-pin is in its position opposite the dies $f f$, (seen in Fig. 1,) when the movement of the forming-pin stops. The nippers then, having a still further downward movement, bend the wire into staple form, as seen in Fig. 42, such final downward movement of the nippers being independent of the movement of the holding-pin, and the particular method of mounting of the holding-pin upon the same carrier with the nippers, whereby the holding-pin and nippers may move in unison for awhile, and the nippers then have a motion independent of the holding-pin will be hereinafter referred to. Both jaws on their lower ends have grooves $h^2 h^2$ therein, which are in alignment corresponding to the straight section of wire below them, the transverse contour of said grooves being of a V form, and due to such V form the wire will be made to adjust itself and conform to the innermost portion of said grooves and prevented from any swinging movement on the forming-pin, which action in the formation of a button-eye is of advantage and importance as contributing to the accurate shaping thereof. There is provided in each of the opposing inner faces of the jaws at a suitable distance above its grooved end a channel 49, which extends from front to rear of the jaw and at right angles to the direction of its swinging movement. Each jaw is also provided with a recess 48 in said face, which is formed across said channel 49 and extends in a vertical plane coincident with the direction of the jaw's movement, the recess being continued downwardly to the lower end of the jaw, and said recess is in cross-section preferably of semicircular form, its course vertically being more or less nearly corresponding to the shape of a one-side half of a button-eye shank. It being noted that the base of said recess near but not quite at the lower end of the jaw is formed advanced to constitute a protuberance r^2 , below which the base of the recess recedes, all as particularly shown in Figs. 14, 16, 17, and 18 and the said diagram views. Each jaw above said recess is also grooved vertically, as shown in said views last named, for the accommodation of the eye-holding pin e , such being necessary on account of the close relations of the jaws when forced together. The jaws normally are separated by the application of the interposed spring e^3 .

In order that the nipper-jaws may each advance to the proper position in relation to the center of the button-eye, a stop s^2 is provided so that one nipper is prevented from having any such undue forcing action against the others as to swing the eye, on the forming-pin, whereby it would be left out of the proper alignment with the center line of the punch-die, and consequently with the head of the

button, which is formed upon it by said punch. The said stop is located between the nippers, being carried upon a piece t^2 , which has a rest (being capable of a sliding movement) on the lower end of the said carrier l^2 . The said stop is beveled on its sides, as seen in Fig. 19. The upper portion of said stop-carrying piece is serrated, (see Fig. 13,) with which engages the externally-screw-threaded collar v^2 , that is suitably mounted and adapted to have a rotational movement on the said carrier l^2 .

It will be seen, Fig. 19, that each nipper-jaw is provided with an extension x^2 , the face of which (that is toward said stop s^2) being preferably beveled to correspond with the beveled face of the stop, and it will consequently be seen that when the stop is raised or lowered the distance by which the nippers when touching the stop are separated (or, in other words, when they are nearest together and compressing the wire, as in Fig. 43) may be varied so that the points of said wire may be thrown a greater or less distance apart, as may be desired, and also so that when the gripping protuberances become worn the nippers may be adjusted to compensate for such wear.

It is desirable that the nipper-jaws be governed or limited in their separation, and also adjustable as to the degree of separation, it being evident that the length of wire cut off by the nipper c will be greater or less according to the distance to which the said nipper is permitted to have a swinging movement from the center line of the carrier l^2 , and therefore on the front side of each nipper another stop y^2 is provided, the same being beveled vertically on its outer side, and there is a slide-piece a^3 , having two inwardly-extending flanges or stops d^3 d^3 also beveled, as seen in Fig. 12, against which the stops y^2 y^2 strike when the nippers are forced apart by their spring. By raising or lowering the said stop-carrying piece (the same being vertically guided and movable on the carrier l^2 and adapted to be fixed by the set-screws or bolts m^2 m^2) the distance to which the nippers can move outwardly may be varied. The last-described stop devices also serve to prevent the nippers from being forced apart unduly when they are downwardly moving to bend the wire to staple form.

Provision is made in the connection between the lever f^3 and the plunger-shaft a^2 for operating the carrier for the cutting and bending devices, whereby the said devices may be projected exactly to any given line, as may become advantageous or necessary in the formation of the button-shank leg of different lengths, and on particular reference to Figs. 2 and 2^a it will be seen that the rear end of the lever f^3 is of bifurcated form, within which is the block 75, through which said plunger-shaft vertically passes. The said block on its opposite sides has ways l^3 l^3 , planed therein in the direction of the length of said lever, within which are the slides m^3 m^3 , said slides

being provided with the lateral studs n^3 , adapted to turn in the members of the said bifurcated lever. The plunger-shaft a^2 above and below the said intermediate block is screw-threaded, receiving thereon the lock-nuts k^3 k^3 , which are turned up against the upper and lower ends of the intermediate block 75. By properly loosening the nuts and changing the position of said block upon the plunger-shaft, the place to which the carrier for the nippers will be downwardly projected on each reciprocatory movement of the plunger-shaft may be varied.

In an application for Letters Patent of the United States filed by us December 6, 1890, under Serial No. 373,831 we illustrated, described, and claimed pinchers for button-machines which in some respects embody constructions hereinabove set forth, and, while it is not the intention to herein claim anything which is claimed in said last-referred-to application, it will be found that there are herein described and claimed features of improvement in constructions which are different from and independent of those embodied in the said other application.

With respect to the eye-holding pin e and the mounting thereof on the same carrier as supports said nippers reference is particularly had to Fig. 14, wherein it will be seen that the carrier l^2 is provided with a cylindrical chamber 50 above the pinchers, having an auxiliary extended and contracted passage leading downwardly therefrom, the seat 52 being thereby formed. The holding device as a whole consists of the lower spindle-like member e , constituting the holding-pin proper, an intermediate cylindrically-formed enlargement n^2 , and an upper spindle-like member. The spindle or pin e extends downwardly from the said enlargement n^2 , which forms a stop and normally rests upon the seat 52, and has a notch 53 formed in its end, the length of which ranges transversely of the forming-pin d , the said notch being indicated in Figs. 26 and 27, and also by dotted lines in the diagram views. The upper spindle member of the said holder extends upwardly through and beyond the said cylindrical chamber and has its end portion of squared or other equivalent form. A spiral spring q^2 encircles the upper spindle member for the greater portion of its length, terminating, however, below the upper end thereof and resting by its lower end upon the enlargement n^2 . The said chamber 50 is screw-threaded within its wall with which engages the externally-screw-threaded lower portion of an adjusting-tube p^2 . The chamber in said tube is for the accommodation therein of the spiral spring q^2 , the seat for the upper end of which spring is suitably formed, as shown. The upper contracted passage within said tubular part p^2 is of a squared or otherwise corresponding cross-sectional shape to the inclosed upper portion of said spindle. Owing to such formation and engagement of the parts as just described, there is no rota-

tional movement of the holding-pin with relation to the carrier therefor or to the forming-pin d , although, of course, it is plain that the said holding device is capable of moving axially against the reaction of the spring which normally maintains the holder in its forward or lowermost position with relation to the carrier l^2 . In practice the said eye-holding pin is only caused to retreat upwardly after the button-head has been entirely formed, the same being upwardly moved by the contact with the said enlargement n^2 thereof, of the seat 52 of the upwardly-moving carrier therefor, and for the pinchers. The said holding-pin being constrained against any rotational movement and having a grooved end of course prevents the section of wire or the eye when formed therefrom from having any swinging, sliding, or shifting motion upon the forming-pin.

The eye-retaining mechanism hereinabove just described constitutes the subject-matter of an application for Letters Patent of the United States filed by us December 6, 1890, Serial No. 373,832, and is of course not herein claimed, *per se*.

Within the end of each die-block of the said pair of separable dies $f f$ there is the depression p^3 . (Shown in Figs. 20, 21, and 43.) Said depressions, when the dies are together, correspond and conduce to the shaping of the under half or hemispheroidal portion of the button. Within the end of each of said die-blocks there is a horizontal transverse groove or channel o^3 , whereby when the dies are in contact a passage for the accommodation of the eye forming and supporting pin will be provided. There is also formed within each die end a vertical groove q^3 , which leads from the upper side of the block to the groove o^3 , and said grooves $q^3 q^3$ form, when the dies are in abutment, a passage for the accommodation between them of said eye-holding pin e . It will further be seen that there is within the end of each die an aperture r^3 , Figs. 21 and 43, extended in the direction of the slide of the die, the same being formed as a laterally-extended niche leading from the horizontal channel o^3 and extended downwardly merging into the depression p^3 , and when the dies are together said apertures $r^3 r^3$, which have the proper dimensions and arrangement relative one to the other and to the said passage for the eye-forming pin, form a close chamber substantially conforming to the required shape of the button-shank, the walls of which chamber will hold said shank or eye absolutely immovable, so that when the stock from which the button is formed is pressed up onto and about the shank and is formed into the button-body the shank will be permitted to have absolutely no movement in any direction whereby the button-eye might have a disposition otherwise than exactly centrally with relation to the head. The said dies *per se* form the subject-matter of an application

for patent filed by Robert L. Ellery December 6, 1890, Serial No. 373,814.

In the present improved button-machine it is desirable that the ends of the separable dies $f f$ be brought to and permitted to remain for a suitable period in contact, it being, however, a matter of necessity that the dies be not forced with positive pressure or pounded one upon the other, and die-operating mechanism is provided as follows: To the said dies are connected the double spring-levers $a^4 a^4$ (seen in the front and rear views Figs. 1 and 3, and in the side view Fig. 2) by means of studs $b^4 b^4$ and sliding blocks $c^4 c^4$, particularly shown in Figs. 20 and 22. The levers are each made in two pieces, and although differing in design the principle is the same in both. The levers d^4 of the compound levers are pivoted upon bushings $g' g'$, fastened to the frame, as shown in Fig. 31, and are connected to the die-carriers, as just above described. At the lower end of each of the levers is cast a hollow cylinder e^4 , within which is a heavy spring e^6 , one end of which bears against the lever d^4 and the other against the lever f^4 . The required amount of compression upon said spring is obtained by the means of the set-screw g^4 . Each lever f^4 has a bearing upon a hub formed on the lever d^4 , Fig. 31. Spring e^6 forces the end of the lever f^4 away from the lower end of the other lever d^4 , thus bringing the stop h^4 , which is on lever d^4 , against the stop i^4 on lever f^4 . Upon the lower end of the lever f^4 is a stud and roll j^4 , having an engagement, in the usual manner, by the cam k^4 . (See Fig. 2.) Upon the lever d^4 is an adjusting screw-stop w^7 , which is adapted to come against an abutment m^4 , formed on the machine-frame.

In practice it will be evident that after the parts have been moved so that the screw-stops have come against the abutment-stops m^4 the dies can be adjusted on their carriers so as to just touch each other, so that in operation as the parts are actuated from a cam of a given throw the dies will be caused to contact without force. Any motion imparted by the cam to the lever directly engaged therewith in excess of that necessary to insure the contacting of the dies will cause a compression of the springs interposed between the levers, those d^4 then remaining stationary, while the ones f^4 have a slight swinging motion to effect the compression of the spring. As said spring is always in its interposition between the levers under a considerable compression, the abutment-stops $h^4 i^4$ serve in any position occupied by the levers to prevent the expansion of the spring, another important function thereof being to insure on the return movement of each lever f^4 also a return movement of the other levers for the separation of the dies. The dies $f f$ are held in die-carriers $s^3 s^3$. The said carriers are made in the form of long bars, as

seen in Fig. 20, and each carrier slides in ways planed in suitable parts of the machine-frame. Each bar constituting the die *f* is set into a longitudinal opening in its die-carrier, the working end thereof projecting beyond the end of the carrier, as seen at the left of said Fig. 20.

Means for adjusting and setting the die upon its carrier is provided, consisting of the bolt *u*³, which screws through the end of the carrier, as shown, against the end of the die-bar *f*, whereby on turning the said bolt the said die may be longitudinally forced. The carrier is longitudinally slotted, as seen in dotted lines at 55 in Fig. 20, and also in Fig. 23, through which passes the bolt *t*³, the squared head 56 of which closely fits in the longitudinal way in the carrier and in front of the die-bar, the shank of the bolt passing through the circular hole 55^a in said bar and through the said slot 55, receiving on its projected end the locking-nut 56. The die-bar is made long, substantially as shown, and adjustable on its carrier, so that as occasion requires the die depressions, grooves, and channels in the working extremity of the die becoming worn or defaced such die end may be ground off and new die depressions and channels reformed therein.

The above-described die-operating mechanism having yielding capabilities are made the subject-matter of an independent application for Letters Patent of the United States filed by us under date of December 6, 1890, Serial No. 373,830.

The die-carrier works against the gib *u*, the contacting face of which forms one wall of its slideway. The opposite face of said gib is, as shown, formed at an incline to the face in contact with the die-carrier and is longitudinally movable by the set-screw 57. The provision of this form of bearing for taking up wear between the die-carrier and its slideway is of unusual advantage in the particular situation shown, for in the formation of a button there is a very considerable lateral pressure on the die *f*, which is, as plain, resisted by the long gib-bearing which in turn is sustained by the long surface 58, Fig. 20, of the frame of the machine. The adjustable wire-stop *v* is constituted by the similar gib for the left-hand die-carrier *s*³. The die-punch *g* is mounted to slide vertically at the front of the machine at right angles to the direction of movement of said dies *f f* and in a line coincident with the plane of abutment of said dies.

The punch-die and its carrying devices and the means for giving the same their movements are shown in Figs. 4 and 34, and *D* represents an eccentric formed on the main shaft *B*, the same being encircled by a suitable block having a connection with the plunger *E*, which plays vertically through a suitable casing *a*¹, cast or formed as a part of the frame of the machine. The inner circular

wall of said casing is tapered as to its length, there being placed within same and to closely fit and form a direct bearing for the plunger a bushing-sleeve *d*¹, tapered and cleft, the direction of the cleft or slit *b*¹ being angularly with relation to the axis of the sleeve, so there will be no liability by the edges of the bushing at the slit wearing a groove in the plunger or the casing. The upper extremity of the bushing-sleeve is externally screw-threaded, such portion thereof projecting above the end of said casing and receiving thereon the nut *c*¹, which is prevented from having any axial movement by the engagement therewith of the lug *g*¹. The said bushing-sleeve is longitudinally grooved, as shown at *e*¹ *e*¹, for the purpose of making it flexible and capable of an equable contraction, so that on turning the nut *c*¹ to raise the bushing the same will, on being crowded against the tapering wall outside thereof, be contracted to compensate for any wear thereof or of the plunger.

For the purpose of convenience of construction and of the assemblage of the parts the upper portion of the plunger is necked down, as at *h*¹, whereby the shoulder is formed, receiving, however, upon said reduced portion the sleeve *k*¹, which is longer than such portion *h*¹, the same being provided with the laterally-extended lugs *i*¹ *i*¹, and thus there is formed in the upper end of the plunger a circular pocket *j*¹.

*m*¹ represents a sleeve set into said circular pocket, the same at its upper portion being provided with the flange *n*¹, whereby the sleeve is supported on the upper end of the plunger, the diameter of same being slightly less than that of said pocket.

G represents the die-punch holder, consisting of a circular bar closely fitting within said sleeve *m*¹, projecting upwardly beyond the top of same for a short distance, as shown, being externally screw-threaded and provided in its extremity with a hole, indicated by the dotted lines at *o*¹ in Fig. 34, which forms a socket for the die-punch proper. For readily adjusting the die *g* and holder therefor vertically the holder receives in engagement therewith above the end of said sleeve *m*¹ the nut *p*¹, the lower end of which rests on the upper end of the sleeve, which latter has, however, an upwardly-extended and inwardly-turned lug *f*¹, which overlies the top of the nut. Bolts *r*¹ pass vertically through holes *q*¹ in the flange-lugs of the sleeve and with a screw engagement into the lugs *i*¹ on the upper end of the plunger. The said holes through the sleeve-lugs *n*¹ are of a diameter somewhat in excess of that of said bolts, and on desiring to transversely adjust the die-holder so that the axial line thereof and the die parts carried thereby may be brought with great nicety to the working position by loosening the bolts from their bind upon the sleeve and forcing the sleeve in the proper direction, the same being

susceptible of the movement in any direction transversely of its axis, such adjustment may be readily effected.

Inasmuch as the die-punch g is set into the socket therefor in the holder with a very close fit, provision is made for removing the die, the same consisting in part of the flange s^7 on the die and in part of the nut t^7 thereunder, having a screw engagement with the threaded extremity of the die-holder. On turning the said nut upwardly, of course, through its engagement with said flange, the die is outwardly forced from its seat in the socketed die-holder.

The driving-shaft B of the machine is supported in bearing-hubs in proximity to and at each side of the connection of the plunger with the eccentric, whereby there can be no deflection of the eccentric which might result in an imperfect presentment and operation of the die-punch.

The forming-pin d , upon which the wire is bent, serves as a means for the removal of the button after completion thereof. The mechanism for imparting the rising-and-falling motion to said forming-pin, whereby it may be presented under and at right angles to the wire, fed into the machine, and then lowered in consonance with the nippers, remaining without movement until the completion of the button by the dies, and then, after the separation of the latter, withdrawn forwardly, carrying the button for its ejection from the machine, will be now described.

Particular reference is to be had to Figs. 1, 4, 4^a, and 25 to 33, inclusive. The forming-pin d is fixed in and as an inward projection from a slide-piece n^4 , which moves in the carrying and guiding piece o^4 in a direction parallel with the line of the paper-feed and at right angles to the feed of the wire by the lever p^4 , with which it has an engagement by a stud t^4 and sliding block s^4 . The said lever p^4 is pivoted to the frame at u^4 and receives its swinging motion by the cam-roll r^4 thereon engaging with a cam-groove formed in an arm q^4 , fixed on said vertical shaft m . The mechanism for imparting the intermittent partial rotary motion to said shaft m has been already described in connection with the wire-feed mechanism. In the sliding piece n^4 is planed a groove, within which plays the clearer y^4 . A spiral spring z^4 bears between one end of the clearer and a portion of said sliding piece n^4 , so that normally the clearer and slide-piece are maintained in the position indicated in Figs. 26 and 27. When the slide n^4 is moved from the position shown in Fig. 27 to that shown in Fig. 28, the clearer y^4 moves with it until the projection t^4 strikes the piece o^4 , when its movement is arrested, and the slide o^4 continuing its outward movement relative to the position of the dies the forming-pin recedes through and to the rear of the aperture u^7 in the said clearer, (see Figs. 27^a and 28,) and the button-eye, being

brought into contact with the clearer and thereby forced off from the pin, drops into the chute u^6 , by which it is guided out of the machine. The stop v^4 arrests the forward motion of the clearer.

The mechanism for imparting the periodical vertical motion both up and down of the forming-pin and supporting parts therefor, whereby said forming-pin may have in addition to the last-mentioned action of withdrawal, also during a certain portion of the period for each button-forming operation, the movements in consonance with the nippers, as heretofore set forth, is shown in Figs. 1, 3, 25, 29, 30, and 30^a, and consists as follows: A cam w^4 on the main shaft imparts a swinging motion to a lever x^4 , intermediately pivoted on the frame, as at y^6 . Said lever is, through the block 72, having a sliding engagement therewith, connected to an arm 73, the block having a swiveling engagement with the arm which is secured upon the horizontal rock-shaft a^5 . The said shaft a^5 has secured thereon at its forward end a radial arm b^5 , which, through the sliding block c^5 and stud d^5 , is connected to the upright shaft e^5 , whereby the rocking motion of the horizontal shaft a^5 imparts a vertical reciprocatory motion to the said shaft e^5 , on the upper end of which the support f^5 is rigidly fixed. The carrying and guiding piece o^4 for the slide n^4 is firmly bolted or otherwise secured to the said support f^5 . The chute u^6 , which is of the form shown in Figs. 25 to 27, (of a general triangular form in side elevation and of a deep-troughed or U form in cross-section, open at its forward end, and also having an opening at its apex under the working portion of the clearer to receive the button,) is secured to the said supporting and guiding piece o^4 under and in the plane centrally and longitudinally coincident with the movement of the forming-pin slide. It being a matter of importance that the extent of upward movement of the shaft e^5 and supporting parts thereon be nicely regulated and limited, so that the presentation of the forming-pin may be true with relation to the separable dies, devices are provided which permit of adjustment of the said actuating parts for the forming-pin support, and are particularly shown in Figs. 29 and 30, the same consisting in the arm 73, being adapted for a radial movement upon the shaft a^5 , whereby the connection between said arm 73 and the swinging lever x^4 may be had nearer to or farther from the axis of said rock-shaft. The said arm 73 is formed slotted, and, as shown, is also serrated, being held in confinement against the serrated block 75 on the end of the shaft by the set-screw or bolt shown.

It has been found a matter of advantage to provide in the last-described actuating mechanism for the forming-pin-supporting parts adjustable devices whereby the time of upward movement for presentation of the

forming-pin, and the downward movement thereof may be controlled, and on noting Figs. 30 and 30^a it will be seen that the stud 76, which carries the roll 77, that enters the cam-path w^4 , is capable of adjustment upon the lower end of the lever x^4 , owing to the provision of the slot 78 and the confining-nut 79. Plainly on unloosening the nut and moving the roll-carrying stud either up or down on the lever, the time of the throw of the lever may be varied. Owing to the fact that the slide n^4 has a vertical reciprocatory motion in unison with shaft e^5 and receives its horizontal reciprocatory motion through the swinging of the lever p^4 , which is in a fixed horizontal plane, a peculiar form of connection between the slide n^4 and lever p^4 must necessarily be provided, the same being particularly shown in Figs. 25, 26, and 33. The stud t^4 closely fits but is capable of playing loosely through the slide-block s^4 , that is engaged with and movable longitudinally on the said lever p^4 .

f^2 represents a guide for the paper strip b in advance of the rolls $l' l'$, the same being of trough form open at its top, the base thereof being about in a level with the upper edge of the lower roll, and the distance between the side walls thereof is a little greater than that of the strip. The aperture 91 is formed through the bottom of the guide-trough for the play of the punch-die therethrough, and a spring g^2 is provided for bearing against the strip at its one edge and binding the latter against the one side wall of the trough. At the time the strip has been fed through the machine so that its rear end has passed forward of the rolls $l' l'$, such rear end portion is by the spring prevented from tipping or swinging upwardly, as it would otherwise be liable to do, owing to the disposition of the preponderating portion thereof forward of the guide-trough. Of course it will be plain that were the paper to swing up as mentioned it would not be held in the proper relation to be successfully worked upon by the dies, and again the paper, were it unrestrained, would be liable to clog up the machine and injure the dies. The sides of the trough-guide are upwardly and inwardly beveled, as seen in Fig. 9^a, and it will be explained with respect to such construction that it serves a useful purpose, for in the event of the failure from negligence or other cause to feed the wire into the machine, the button-heads will be formed, and as the dies $f f$ separate at each button-forming operation the head will be liable to remain in and go with one or the other thereof—for instance, as indicated by the dotted lines in said Fig. 9^a—when on the next descent of the pinchers the eyeless head will be forced off from the die, there being plenty of clearance at the inclined side of the paper-trough. In case the paper-stock ceases for any reason to be supplied or fed the wire eyes will be successively fed out of the machine without clogging.

Eye-shanks of a greater or lesser length, as desired, may be readily formed in the operation of the button-machine described, for this is contemplated in the provision of the adjustable devices for the gibs u and v for the separation of the nipper-jaws to correspond with the distance between the ends of said gibs and the adjustable appliances described as comprised in the wire-feed mechanism.

The organization of a machine wherein is embodied an eye-forming pin, wire guiding and gaging devices, and a cut-off for the wire and mechanism for bodily moving the supporting-pin and pinchers between the separable dies $f f$ after the wire has been formed into the staple, mechanism for forcing the said dies toward each other against the pinchers and for then receding to permit the pinchers to be withdrawn from the formed eye and for then again moving said dies to and about the eye, contributes to the unusually rapid production of the button, for the pinchers have the double function of forming the eye, and with the eye-holding pin conveying the eye to the position to be acted upon by the head-forming and engaging dies, and while one part of the operation of the making of a button is taking place the devices for effecting the other part of the button-making operation are resuming their positions and forthwith proceeding in the fulfillment of their respective offices, and thereby the capacity of the machine for a day's production is unusually large.

Having now described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The improvement in the art or method of forming a shank-button, the same consisting in providing an eye-shank having the legs thereof slightly separated or deflected and confining and supporting the same, then forcing stock material while in a comparatively uncompressed condition upon and about and penetrated by the eye-shank, molding and compressing said material to form the button-head, and finally, simultaneously with the completion of the molding and compressing operation, severing that portion of the stock material from which the button-head is formed from the remainder of the supply strip or piece.

2. In a machine for making buttons, the combination, with a forming pin or bar, of a pair of nipper-jaws and a carrier therefor on which they are pivotally mounted, and means for imparting thereto a reciprocatory movement, and a holding-pin spring-supported on and forwardly pressed with relation to the working movement of said carrier, substantially as and for the purpose described.

3. In a button-machine, the combination, with the supporting and forming pin, of a block or support, as u , having a wireway at right angles to the length of said pin and a gage-stop, a pair of nipper-jaws, and a reciprocatory carrier therefor movable angularly

to the feed of the wire, one of said jaws acting in conjunction with the part u as a shear to sever the wire, substantially as described.

4. In a button-machine, in combination, a pin d , a pair of pincher-jaws and a reciprocatory carrier on which they are mounted and a support for said pin and means for moving same reciprocally in the direction of movement of said pinchers, a pair of dies separable and movable one from the other in the direction of the swinging movement of said jaws, and means for imparting thereto their approaching and retreating movements, for the purpose set forth.

5. In a button-machine, the combination, with a carrier having secured thereto and adjustably movable a stop-piece the sides of which are beveled, of a pair of nipper-jaws pivotally mounted on said carrier and provided with abutment-pieces, as $x^2 x^2$, substantially as described.

6. In a button-machine, the combination, with a carrier provided with an adjustably-movable extension or part a^3 , having opposing stop-flanges $d^3 d^3$, beveled on their inner sides, of a pair of nipper-jaws pivotally mounted on said carrier and having portions thereof which are adapted for abutment against said stop-flanges, for the purpose set forth.

7. In a button-machine, the combination, with a carrier having secured thereto and movable thereon a stop-piece the opposite sides of which are beveled and provided with the serrations and a screw-threaded part rotatable on said carrier and having an engagement with said serrations, of a pair of nipper-jaws pivotally mounted on said carrier and adapted to have an abutment for a limitation of their inward swing against said beveled piece, substantially as described.

8. In a button-machine, a pair of dies and means for moving same one toward and from the other, said dies being in their proximate ends provided with the depressions p^3 , the transverse channels o^3 , and the apertures r^3 , extending at right angles to the length of said channels, but coincident with the direction of movement of the dies, combined with a rod or pin for supporting the eye-shank, and capable, when the dies are together, of being disposed in the passage between said pair of dies formed by said channels, substantially as described.

9. In a button-machine, a pair of dies and means for moving the same one toward and from the other, said dies being in their approximate ends provided with the depressions p^3 , the transverse channels o^3 , apertures r^3 , and the channels q^3 at right angles to said channels o^3 , combined with the eye-supporting pin arranged for disposition when the dies are together within said channels o^3 , and an eye-retaining pin arranged for entrance between the dies within said channels q^3 , substantially as described.

10. In a button-machine, in combination, a

pair of nipper-jaws and a carrier therefor on which they are pivotally mounted, guiding means therefor, a lever pivotally mounted and connected to said carrier, and a reciprocatory thrust-rod or plunger to which said lever is adjustably connected at a distance from its pivotal point, whereby said lever may be changed in its connection along the length of said rod, so that by adjustment the given play of the pinchers imparted from the thrust-rod may terminate at a desired point, for the purpose set forth.

11. In a button-machine, the combination, with the reciprocatory carrier for the nipper-jaws, of a lever pivotally mounted and connected thereto and by another portion thereof formed bifurcated, the interposed block provided with the ways $l^3 l^3$ therein, the slide-pieces movable in said ways and having a pivotal engagement with the members of said bifurcated lever, the plunger-rod cam-operated and passed through said block, screw-threaded above and below same, and the lock-nuts $k^3 k^3$, substantially as described and shown.

12. In a button-machine, in combination, an eye-supporting pin and a support therefor, button-head-forming dies and mechanism for moving same toward and from the eye-supporting position of said pin, devices for imparting to said pin a movement axially thereof, and a clearing stop near to said pin and past which the same moves, whereby on the movement axially of the pin a completed button will be forced off therefrom.

13. In a button-machine, an eye forming and supporting pin and means for conveying wire to and over same, combined with mechanism for forming same into an eye and appliances for freeing said eye-forming mechanism from proximity to the eye and its support, a pair of separable dies to form half of a button-head, and appliances for moving said pin into the working line of the dies, substantially as described.

14. In a button-machine, an eye forming and supporting pin and a support therefor, a means for conveying wire onto said pin, mechanism for forming same into an eye, and an eye-holding pin, a pair of separable dies adapted to form half a button-head, and appliances for moving the eye-forming pin and eye-holding pin into proximity with and between said dies, and another die for forming the other portions of the button-head movable at right angles to the line of movement of said separable dies, substantially as described.

15. In a button-machine, a die-punch-carrying plunger and a tapered casing through which same plays, there being interposed between the casing and plunger an externally-tapered bushing cleft and contractible, having a screw-threaded portion, and a nut engaging such portion for axially drawing the bushing along the plunger and within the casing, for the purpose set forth.

16. In a button-machine, the combination, with a plunger having in its extremity a circular pocket, of a sleeve located within and externally of smaller diameter than said pocket, a die shank or holder closely fitting in said sleeve, all whereby on moving said sleeve laterally within the said pocket the punch-die may be axially adjusted, and devices for confining said sleeve in its adjusted position on the plunger, for the purpose set forth.

17. In a button-machine, the combination, with a die-carrying plunger having in its extremity an opening and provided with the lug f^7 , of the die shank or holder set within and projecting beyond said opening and externally screw-threaded, and the nut p^7 , engaging said screw-threads and in turn engaged by said lug, substantially as and for the purpose set forth.

18. In a button-machine, the combination, with the punch-die having in its extremity the depression for forming a portion of a button-head and on its side a flange, of the socketed die-holder within which the die is set, and externally threaded and the nut set under said flange and engaging the screw-threads of the said holder, for the purpose set forth.

19. In a button-machine, the combination, with the plunger having in its extremity a circular pocket and provided with the lugs l^7 , of a sleeve within and of smaller diameter than said pocket and provided with the holes q^7 q^7 , the headed bolts r^7 r^7 , of smaller diameter than said holes, passed through same and having an engagement with said lugs, and a die shank or holder closely fitting within and supported on said sleeve, substantially as described.

20. In a button-machine, the combination, with a pair of separable dies provided in their proximate portions with depressions for forming one half or part of a button-head and mechanism for removing the same toward and away from each other, of a plunger movable at right angles to the traverse of said dies, carrying a die thereon which is adjustable in the direction of the axis thereof.

21. In a button-machine, the combination, with a pair of separable dies provided in their proximate portions with depressions for forming one half or part of a button-head and mechanism for moving the same toward and away from each other, of a plunger movable at right angles to the traverse of said dies, carrying a die thereon which is adjustable across the axis thereof.

22. In a button-machine, the combination, with a pair of separable dies provided in their proximate portions with depressions for forming one half or part of a button-head and mechanism for moving the same toward and away from each other, of a plunger movable at right angles to the traverse of said dies, carrying a die thereon which is adjustable both in the direction of and across the axis thereof, for the purposes set forth.

23. In a button-machine, the combination,

with an eye forming and supporting pin and a slide on which same is supported, of a carrier on which said slide is movable, means for imparting to said carrier a movement at right angles to that of said slide, and a mechanism for moving the pin-carrying slide on said carrier, for the purpose set forth.

24. In a button-machine, the combination, with a carrier for a forming-pin-supporting slide fixed on a shaft constrained for vertical movement in the machine, a rock-shaft provided with an arm which engages said vertical shaft, and a cam-operated lever engaging said rock-shaft, substantially as described.

25. In a button-machine, the combination, with a support or carrier having a slideway, of a slide-piece movable therein and having an eye forming and supporting pin mounted thereon, a lever-arm having an engagement with said slide-piece, and means combined therewith for imparting a swinging motion thereto, for the purpose set forth.

26. In a button-machine, the combination, with a carrier mounted on a vertically-movable support and having a way therein at right angles to the plane of movement of said support, of a slide-piece movable in said way and having an eye forming and supporting pin mounted thereon, a lever-arm suitably mounted and having combined therewith means for swinging same in a fixed plane, and provided with a slide-block and said pin-carrying slide which is capable of a movement axially thereof with relation to one of said parts, for the purpose set forth.

27. In a button-machine, the combination, with a pair of wire-feed rolls geared together, one thereof being loosely mounted on a shaft and having a ratchet-wheel secured thereto, of a pallet-carrier fixed on said shaft and provided with one or more spring-pallets engaging said ratchet-wheel, a segmental gear also fixed on said shaft, and a suitably-actuated reciprocatory slide shaft or bar provided thereon with a rack engaging said segmental gear, for the purpose set forth.

28. In a button-machine, the combination, with the forming-pin, a slide carrying same, and the support in which said slide moves, the horizontally-swinging arm having an engagement with said slide and provided with a stud, of the shaft m , on which are mounted ratchet devices for the wire-feed and having thereon an extended cam-grooved part which engages the said stud, substantially as set forth.

29. The combination, in a button-machine, with a wire-guide one end of which is adapted to form one member of a shear device, and a stop member for the wire which is adjustable, of a pair of wire-feeding rolls comprising ratchet devices and a reciprocating pallet for engaging and actuating same and a rock-shaft on which the pallet is mounted provided with a gear, a reciprocatory bar provided with a rack engaging said gear and also having thereon an arm 73, and an operating-lever

having an engagement with said arm, the arm being adjustable radially with relation to said rack-carrying shaft, whereby from a given throw of the lever a longer or shorter traverse of said shaft may be had for varying the extent of wire-feed.

30. In a button-machine, the combination, with a pair of separable dies and die-carriers therefor movable toward and from each other, of another die movable against and away from said dies at right angles to the movement of their carriers, of a fixed support for said die-carriers having ways therein, one side wall thereof being inclined to the adjacent face of a carrier therein, and the extended gib u , located in the way and provided with a correspondingly-inclined face, whereby the impact of the punch-die against the said separable dies is resisted in the long inclined bearing between said gib and the die-carrier support.

31. The combination, with the die-bar f , provided in its end with a die-depression, of a die-carrier having a channel therein for the said die-bar and means for detachably confining same therein, and a screw passed longitudinally through and with an engagement with said carrier and having a bearing against the end of the die-bar, for the purpose set forth.

32. The combination, in a button-machine, of a channeled carrier provided in its back with a longitudinal slot, of a die-bar having in its extremity a die-depression and provided with a transverse hole, a bolt passed through said die-carrier slot and hole in the die-bar and provided with a head fitting for engagement with the carrier in the channel thereof, and a confining-nut on the extended end of said bolt, substantially as and for the purpose set forth.

33. In a button-machine, the combination, with the eye-supporting pin and means for imparting thereto a forward and backward endwise movement, of a part having a position adjacent a line in axial coincidence with said pin, and which serves on the passage of the pin by same to strip the eye or eyed button from the pin.

34. The combination, in a button-machine, of a carrier and support having therein a slideway, a slide-piece movable on said support, provided with an eye-supporting pin, another part, as y^4 , spring-pressed to move as one with said slide-piece, but capable of yielding against said spring and relative to said piece under a resistance capable of overcoming the stress of the spring, and having a portion thereof located adjacent to the axis of the said supporting-pin, substantially as described.

35. The combination, with a carrier-support, of the supporting-pin and slide n^4 , carrying the same, movable on said support, the part y^4 , extended by a portion thereof to lie adjacent a line in axial coincidence with said pin, a spring interposed between the slide n^4 and part y^4 , and means for imparting a re-

ciprocatory motion to the slide, and an abutment against which said part y^4 contacts, whereby as the slide n^4 through the spring carries the part y^4 into contact with said abutment before the slide has finished its traverse the motion of said part will be arrested to serve as a button-clearer for stripping the button from the pin on the then continued movement thereof.

36. In combination, in a button-machine, the carrier-support way provided and having a limiting-stop, as v^4 , of the slide-piece n^4 , carrying the forming-pin, and means for imparting the movements thereto, and the part y^4 , engaging said slide through the medium of a spring and adapted to have its movement in one direction limited by said stop-piece, and in turn acting as a stop for the projection of said slide forwardly relatively to its carrier-support, substantially as set forth.

37. The combination, with the way-provided carrying-support having secured on the under side thereof a chute, of a forming-pin and slide-piece on which same is mounted that is movable in the way of said carrier-support, the said slide-piece being adapted for a traverse in one direction sufficient for carrying the end of the forming-pin within a line coincident with the inner end of the chute, and an abutment device having a position near to the axial line of said pin to act as a button-clearer, as set forth.

38. A button-machine comprising instrumentalities in co-operative arrangement as follows: an eye-forming pin, wire-feeding mechanism, a confining-pin having a reciprocating motion at right angles to said forming-pin, and means for imparting such motion thereto, wire-severing device comprised in a pair of pinchers, which have a reciprocatory motion toward and away from said forming-pin, the same being susceptible of approaching movements, a pair of separable dies having the depressions p^3 , and means for moving same toward each other against said pinchers and slightly withdrawing same, and on the retreat of the pinchers forcing said dies to abutment, devices for feeding a strip of stock material under said abutted dies, a punch-die movable from under said stock material for forcing same about the eye-shank and molding the button-head, and mechanism for clearing the completed button from the eye forming and supporting pin, substantially as described.

39. The combination, in a button-machine, with a trough-shaped guide and support for a strip having the edges thereof downwardly and outwardly inclined and provided with an aperture through the base thereof, of a pair of separable dies having the depressions p^3 in their ends and means for moving said dies toward and from each other at right angles to the length of said trough-support, and the pinchers having combined therewith means for imparting thereto downward movements to or below the bottom plane of said dies and

in the reverse thereof, substantially as and for the purpose described.

40. In a button-machine comprising a pair of pinchers, a reciprocating carrier therefor, 5 a pivoted lever engaging said carrier, and a cam-operated plunger connected to said lever, and paper feeding and guiding mechanism comprising ratchet devices and a rocking pallet-carrier, which receives its movement from 10 connection with said plunger-shaft, substantially as described.

41. In a button-machine, the combination, with an adjustable stop, as *v*, and the part *u*, 15 comprising a wire-guide, of a forming-pin and a pair of normally-separated nipper-jaws having, bodily, a reciprocatory movement across the run of the wire and also mounted for a swinging movement toward each other, one 20 thereof acting in conjunction with the part *u* as a wire-shear, and devices for regulating the extent of the separation of said jaws, for the purpose set forth.

42. In a button-machine, the combination, with an adjustable gage-stop for the wire, of 25 feeding-rolls for the wire and a mechanism

for imparting the feeding motion thereto, comprising devices for adjustment, whereby the wire-feed by said rolls may be made to correspond to the position of the gage therefor, substantially as described.

43. In a button-machine, in combination, 30 an adjustable gage-stop, as *v*, and the part *u* comprising a wire-guide, a forming-pin, and wire-feed rolls, and mechanism for imparting the feeding motion thereto comprising adjust- 35 ing and feed-regulating devices, a pair of normally-separated nipper-jaws having, bodily, a reciprocatory movement across the run of the wire and also mounted for a swinging movement toward each other, and one thereof 40 acting in conjunction with said part *u* as a wire-shear, and devices for regulating the extent of separation of said jaws, for the purpose set forth.

CHAS. S. GOODING.
R. L. ELLERY.

Witnesses:

WM. S. BELLOWES,
G. M. CHAMBERLAIN.