

Feb. 14, 1933.

V. A. SVENSSON

1,897,625

FASTENING MACHINE

Filed Jan. 28, 1930

2 Sheets-Sheet 1

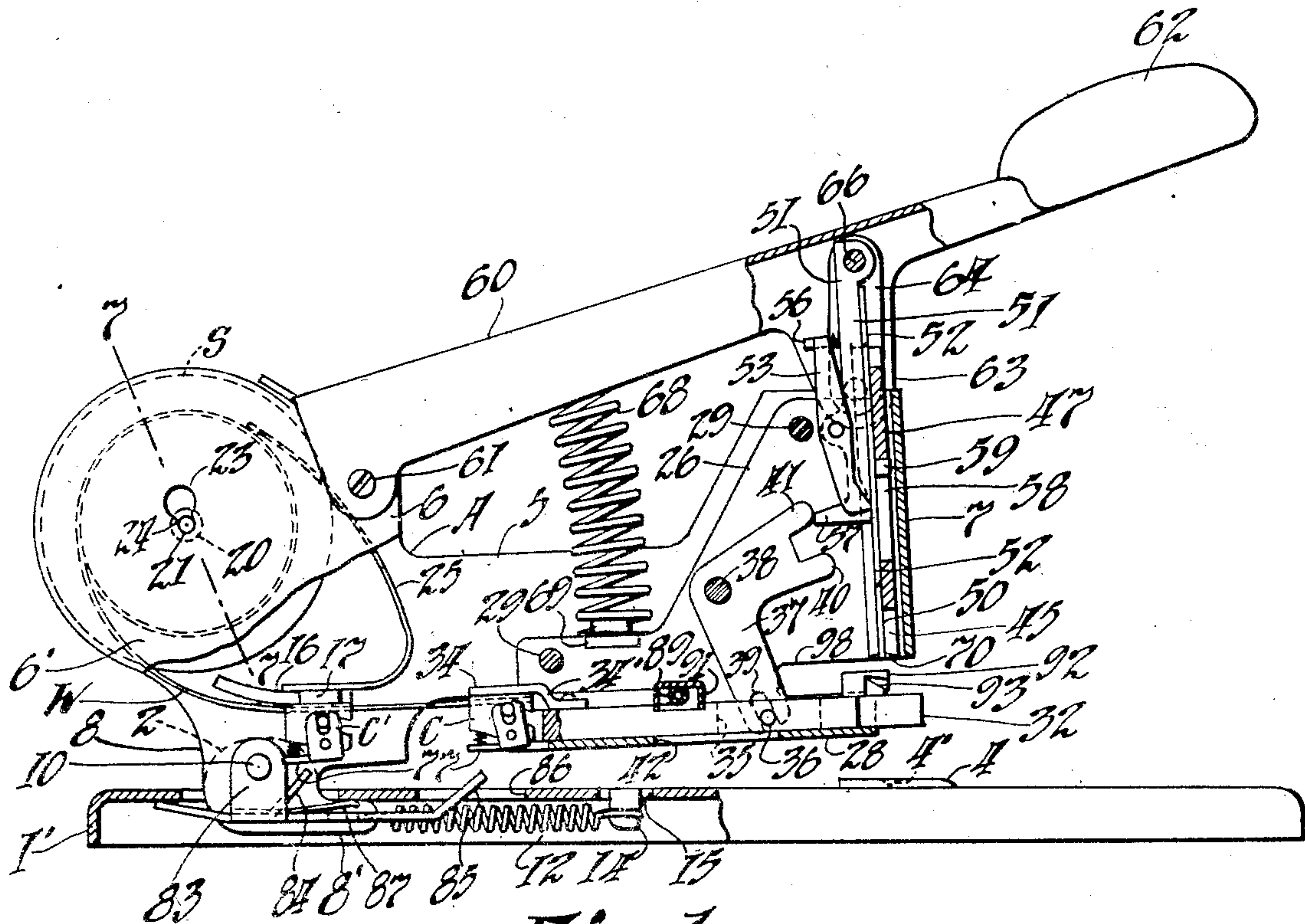


Fig 1

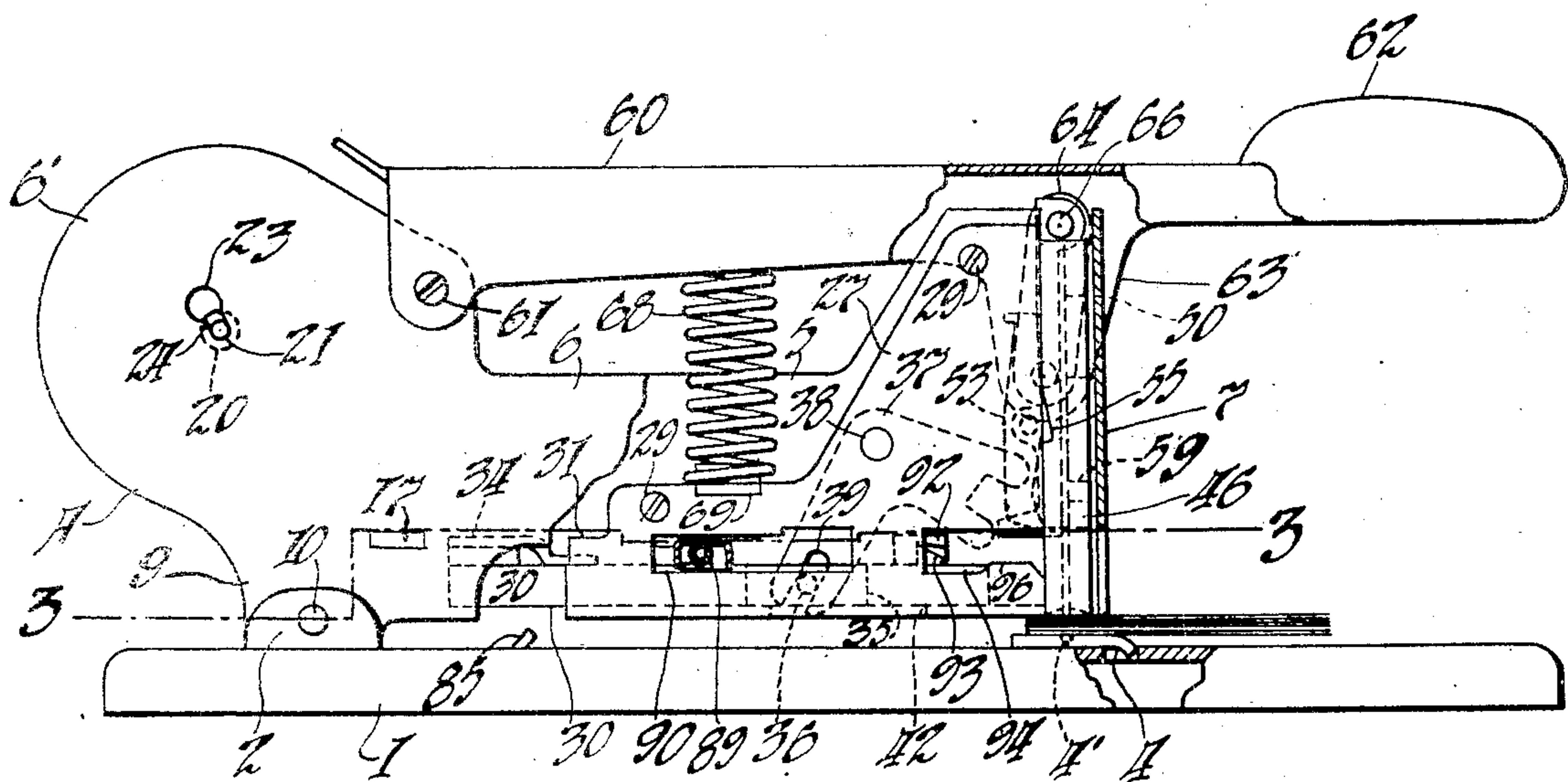


Fig 2 Inventor:
Victor A. Svensson
by William A. Hardy
His Atty.

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2 Sheets-Sheet 2

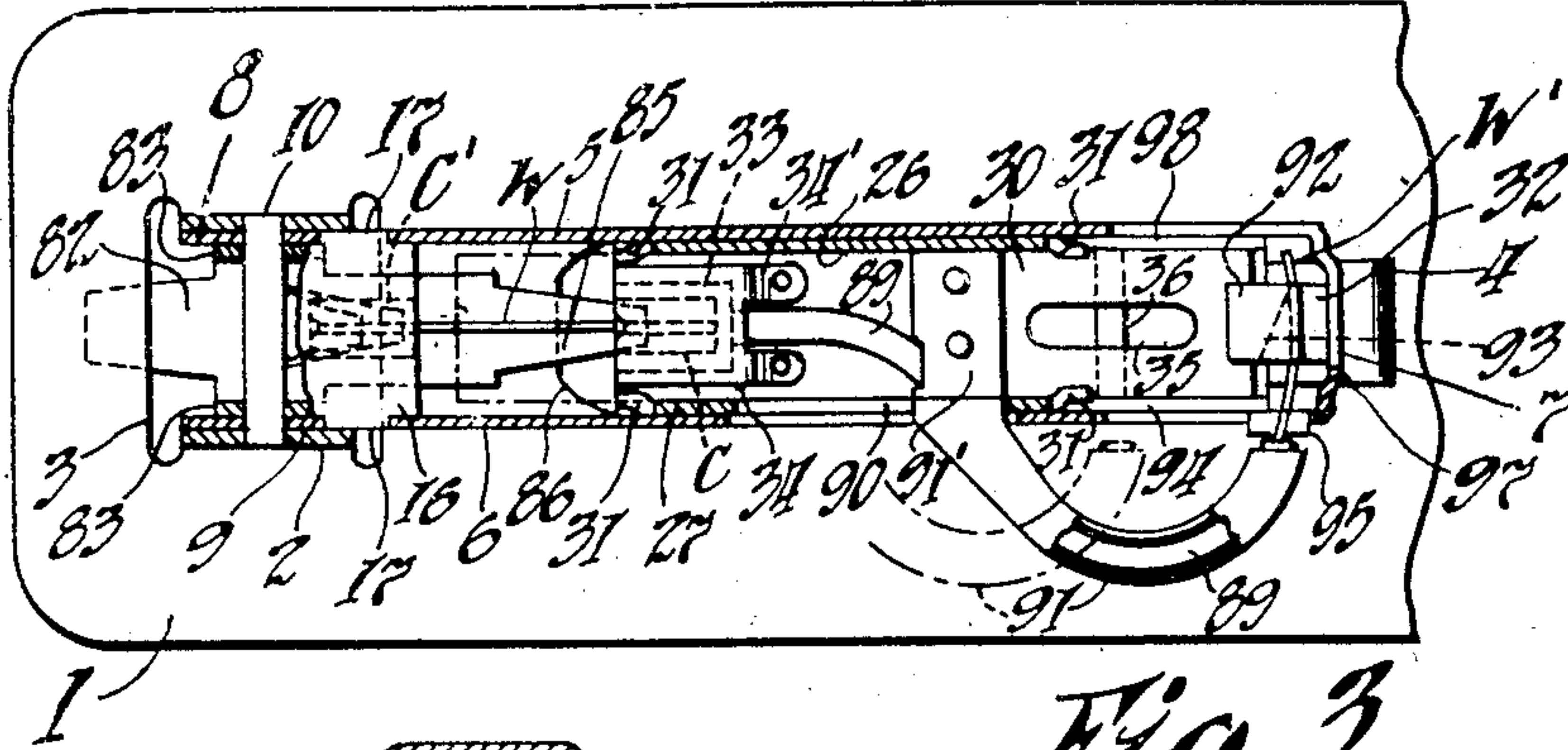


Fig. 3

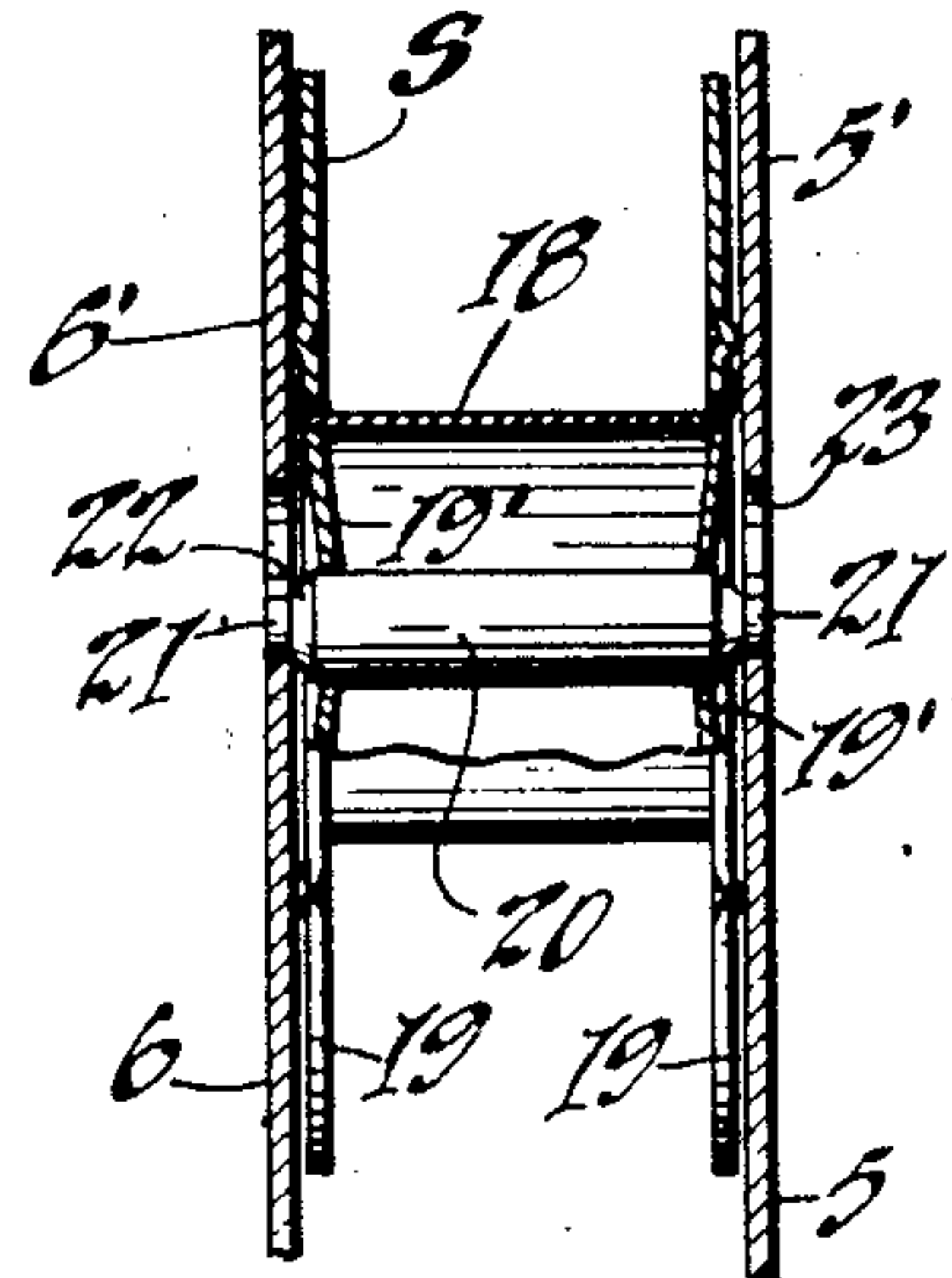


Fig. 7

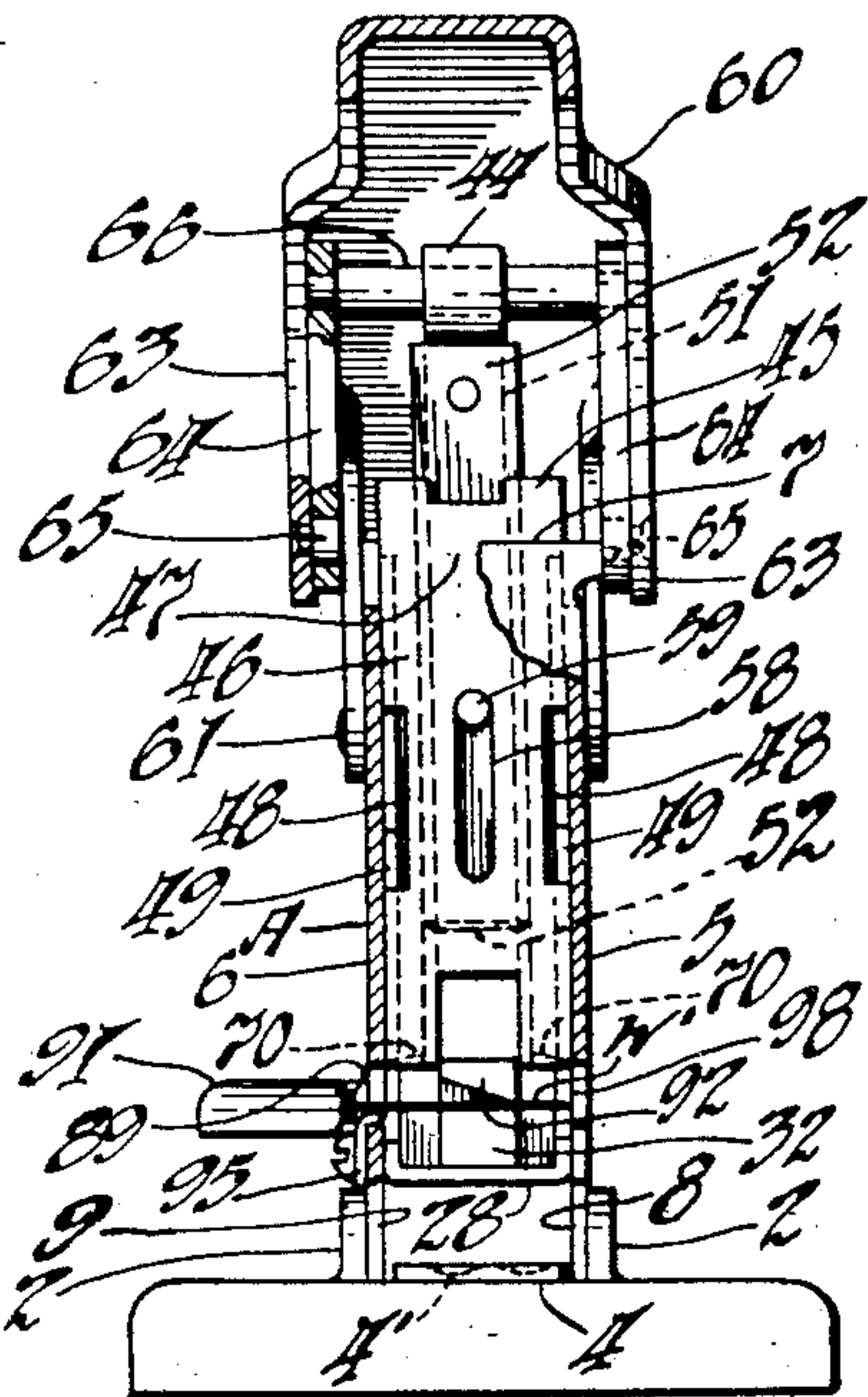


Fig. 5

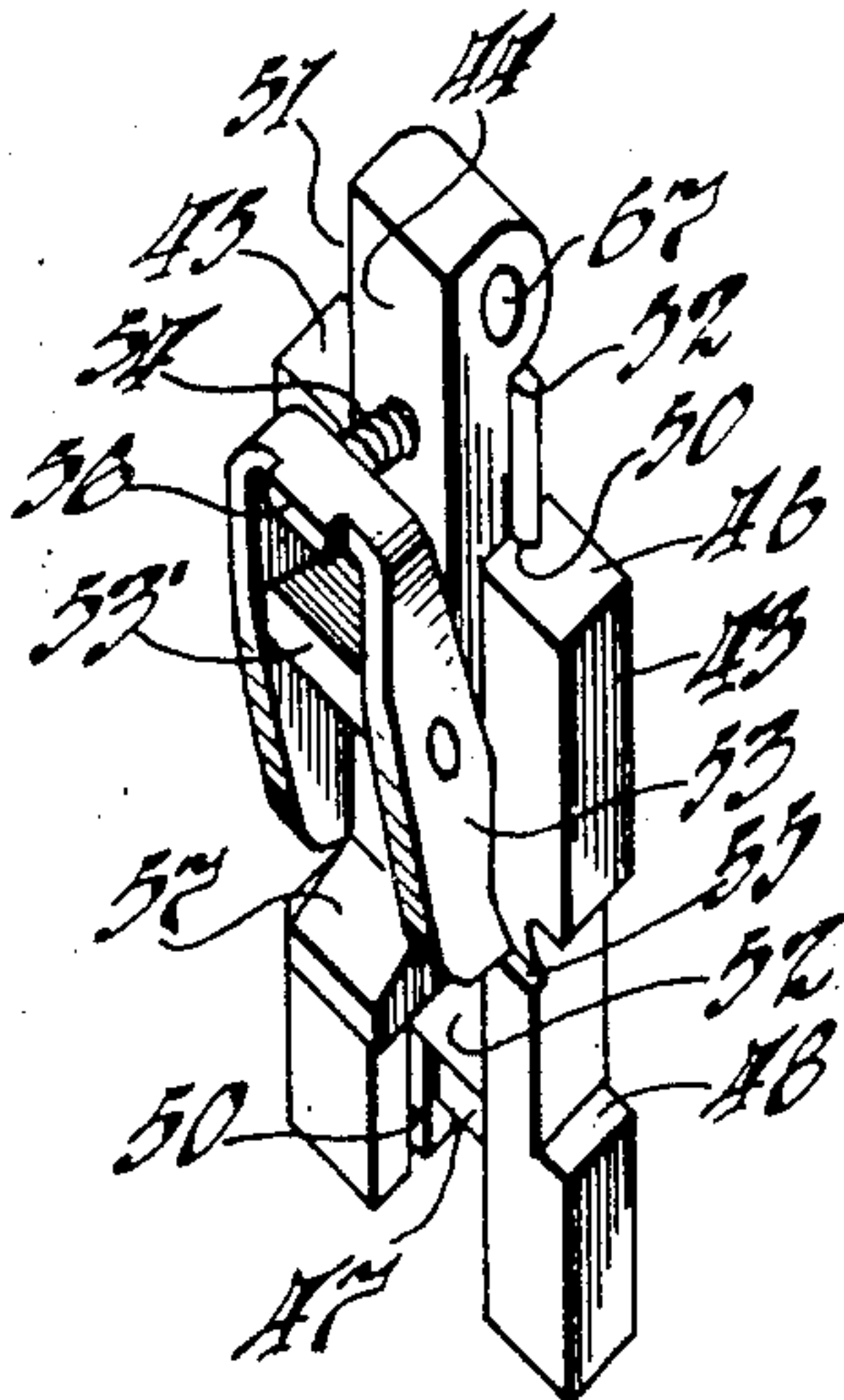


Fig. 6

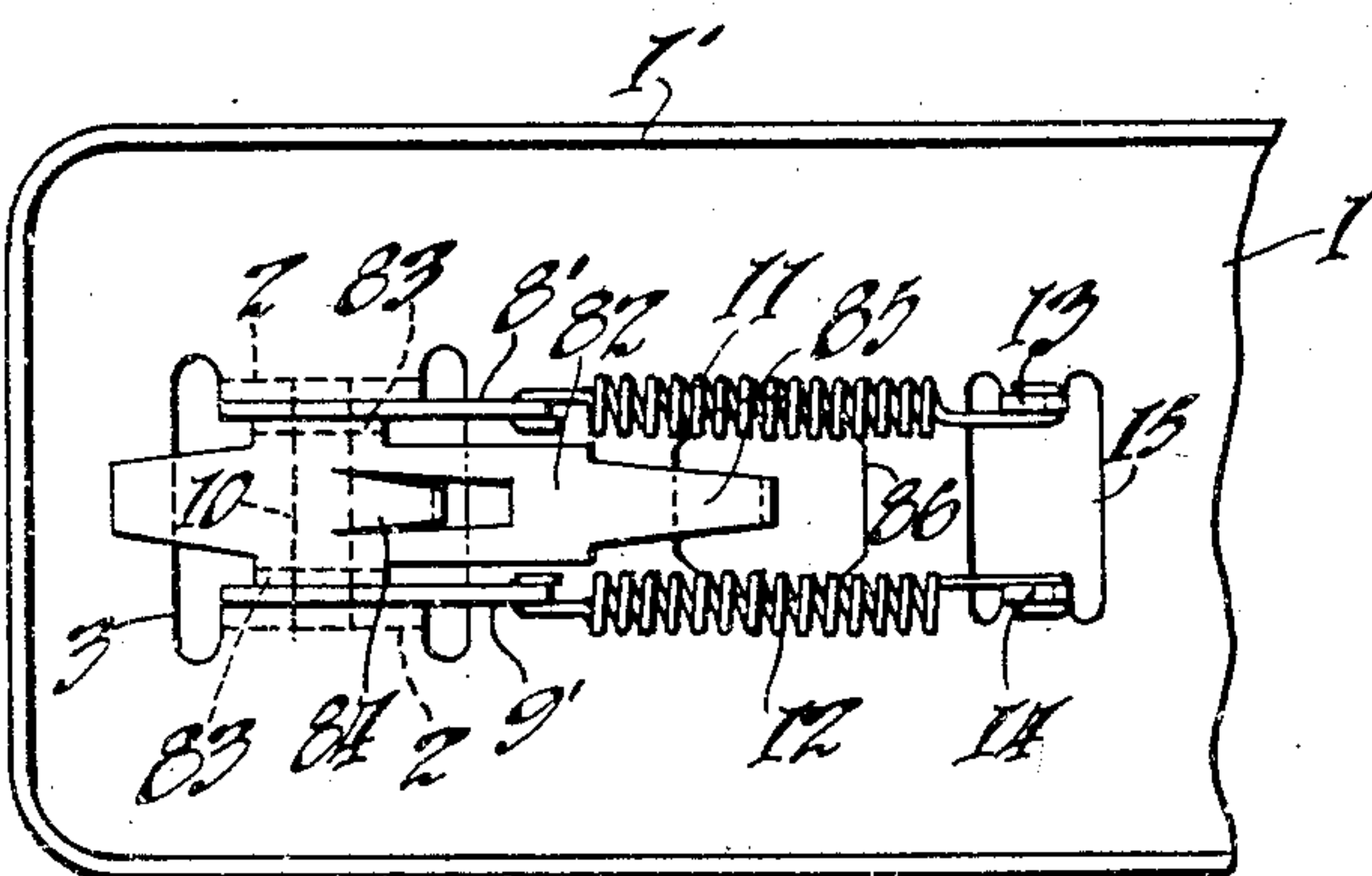


Fig. 4

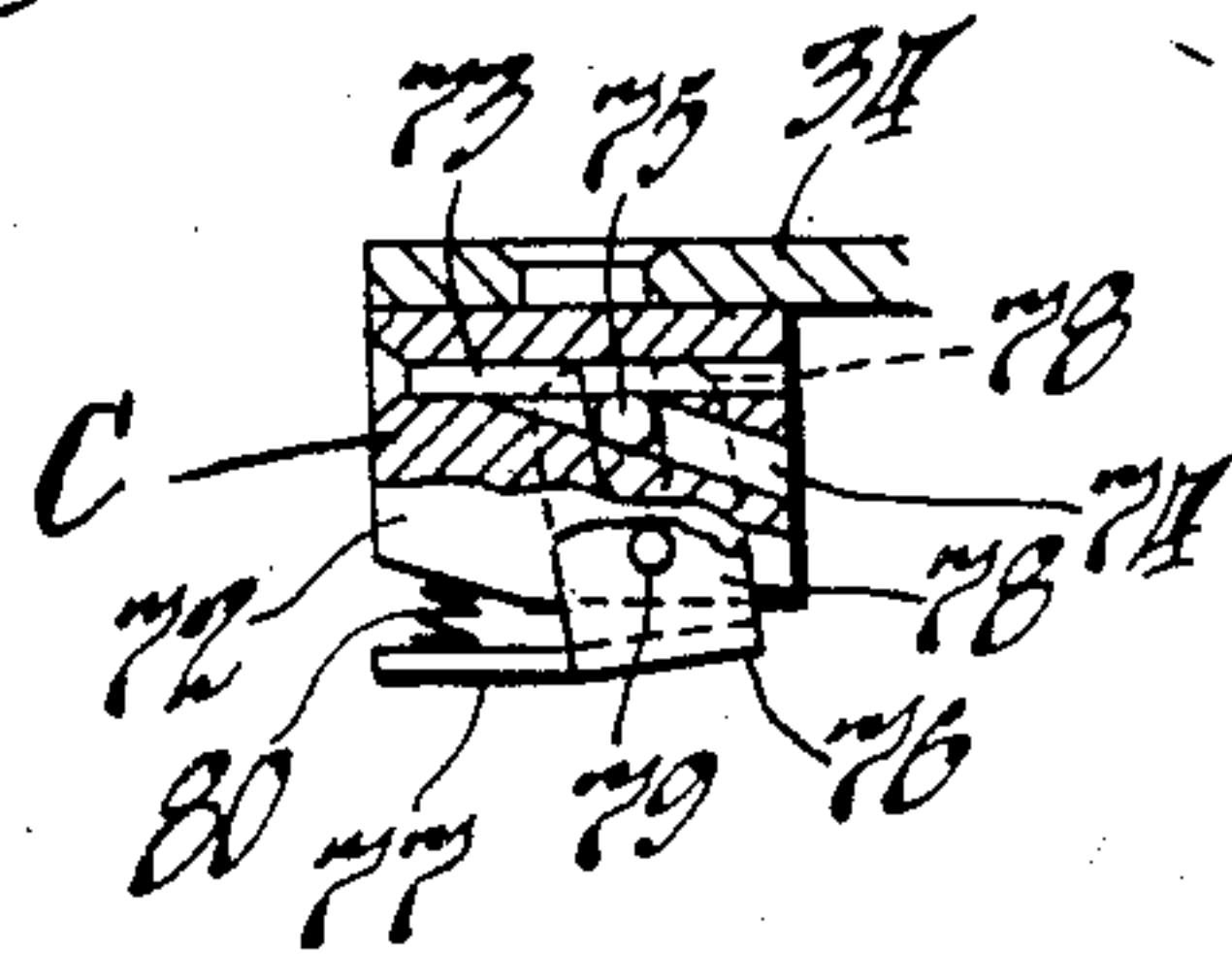


Fig. 8

Inventor:
Victor A. Svensson
by William A. Hardy
his Atty.

UNITED STATES PATENT OFFICE

VICTOR A. SVENSSON, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO THE BATES MANUFACTURING COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY

FASTENING MACHINE

Application filed January 28, 1930. Serial No. 423,972.

My invention relates to fastening machines and more particularly to an improved fastening machine, preferably of the manually-operable desk or table type, adapted to secure together a plurality of superposed sheets or layers of paper or other material, preferably by means of staples cut and formed from wire which in the repeated operations of the machine is automatically fed from a spool or other source, in successive and substantially uniform lengths to a proper predetermined position for the production of the staples therefrom.

In some aspects the present invention is an improvement over those described and claimed in Patents No. 1,610,632 and No. 1,637,357, which were both issued to Sven Svenson on December 14, 1926, and August 2, 1927, respectively.

Generally described a preferred form of sheet-fastening machine in accordance with my invention comprises a base provided with an anvil, a wire-feeding slide or member mounted for reciprocatory movement in a horizontal direction over said base and having a portion constituting a mandrel which in the movements of the slide, is brought to and removed from cooperative relation with said anvil, vertically movable and preferably manually operable means arranged to cooperate with the anvil and mandrel to form and clench the staples and biased to raised inoperative position and mechanism whereby such means in its vertical movements properly controls and effects the reciprocatory movements of the wire-feeding slide and its mandrel. The vertically movable means referred to is preferably in the form of a two-part plunger device, the construction being such that both parts of the plunger device are moved downwardly together during the cutting and forming of a staple and one of such parts is thereafter moved downwardly with respect to the other part to force the formed staple through and clench the same against the sheets being secured together. It is understood, however, that various features of my invention are adapted for application to or embodiment in other forms of fastening

machines and also in machines designed for other uses.

One of the objects of the invention is to provide an improved and simplified machine of the character described and which is preferably so constructed as to provide a much deeper gap for the reception of the sheets to be fastened together whereby the distance from the edges of the sheets within which the fastening staples may be positioned is greatly increased.

Another object of the invention is to provide a fastening machine of this character in the operation of which the superposed sheets to be secured together are first engaged and held in the desired position for stapling and in which uniform movements are thereafter imparted to the plunger device in effecting the cutting, forming and clenching of successive staples regardless of the combined thickness of the said superposed sheets.

Another object of the invention is to provide improved and simplified means whereby the lengths of wire from which staples are formed in successive operations of the machine, are successively fed to and properly lined up or positioned with respect to the plunger device which cuts the wire and forms the staples over the mandrel.

Another object of the invention is to provide in a machine such as described, simple and effective means for ensuring the passage of the forward or free end of the wire, as the latter is advanced in the machine, over the feeding slide to thereby prevent interference between the wire and the said slide and the catching of the wire between such slide and the guide for the latter.

Another object of the invention is to provide in a machine of this character improved and simplified means for positively and effectively imparting the proper reciprocatory movements to the feeding slide upon and by reason of the reciprocatory movements of the plunger device.

Another object of the invention is to provide an improved construction whereby during a portion of each stroke of the plunger device both parts of the latter are caused to move together and during the rest of the

stroke one of such parts moves with respect to and independently of the other.

Another object of the invention is to provide a structure comprising a base carrying the anvil and a support or frame carrying the plunger device and other mechanism, wherein said support or frame is pivotally connected adjacent one end thereof to said base at a point remote from the anvil and wherein means is provided for yieldingly maintaining the forward or free end portion of the support in predetermined raised or spaced position with respect to the anvil so as to permit the insertion of the sheets to be fastened or stapled together, said means also preferably being adapted to prevent play in the pivotal connection between the said base and support and to maintain the plunger device in alignment with the anvil.

Other objects of the invention are to provide a simple and novel mounting for the spool from which the wire for the staples is fed to the machine, which enables the spool to be readily applied to the machine in proper position thereon and to be quickly and easily replaced, and to provide simple and effective means for opposing the unwinding of the wire from the spool with a resistance which preferably varies substantially in direct proportion to the radius of the reel of wire on the spool and which also preferably acts to maintain the spool in its proper mounted position.

A further object of the invention is to provide an improved construction and arrangement whereby the clutch devices which respectively comprise part of and cooperate with the wire-feeding means, may readily be released so as to facilitate the threading or leading in of the wire into the machine and the withdrawal of the wire therefrom.

A further object of the invention is to provide an arrangement wherein the plunger device is actuated in the wire-cutting and staple forming and clenching stroke thereof through a lever action and whereby the expenditure of less effort is required to so actuate the plunger device.

A further object of the invention is to provide a construction preferably including means for limiting the down stroke of part of the plunger device, which will effectually prevent the base of a staple formed in the machine being forced through the material being fastened—something which is quite likely to happen in the operation of certain machines of the same general character, particularly when the sheets being fastened are of small aggregate thickness.

A still further object of the invention is to provide a device of improved design whereby staples may be more readily driven through thick or hard layers of material to be fastened, and the capacity of the machine is accordingly increased.

Other objects and features of the invention will be hereafter more particularly described and claimed.

For a clearer understanding of the invention attention is directed to the drawings accompanying and forming a part of this specification, and wherein:—

Figure 1 is a view in side elevation, partly broken away and partly in section, of a machine in accordance with my invention, the parts being shown in their normal positions with the plunger device at the end of the up-stroke;

Figure 2 is a view similar to Fig. 1, but showing the parts in the positions they occupy at the end of a down stroke of the plunger device;

Figure 3 is a fragmentary view taken approximately on the broken line 3—3 of Fig. 2, parts being broken away and parts being shown in full;

Figure 4 is a bottom plan view of one end portion of the machine shown in Fig. 1;

Figure 5 is a view in front elevation, partly broken away and partly in section, of the machine as shown in Fig. 1;

Figure 6 is a view in perspective of the plunger device showing the two parts in their normal locked relation;

Figure 7 is a sectional view, partly in elevation, on line 7—7 Fig. 1; and

Figure 8 is an enlarged detailed part sectional view of one of the wire-clutch devices.

Referring to the drawings, the fastening machine shown comprises a substantially rectangular base 1 having a peripheral depending flange 1', a pair of lugs 2 struck-up therefrom adjacent its rear end at opposite sides of a substantially rectangular opening 3, and an anvil 4 suitably secured thereto adjacent its forward end. The support or frame A for carrying the spool of wire, the wire-feeding means, the plunger device and various associated parts, comprises a casing consisting of two spaced parallel plates 5 and 6 connected at their forward ends by an integrally formed transverse, vertical web 7, such casing being open at its top, bottom, and rear end. The plates 5 and 6 of frame A are provided at their rear ends, with projections 8 and 9 which extend downwardly through the opening 3 in the base in positions respectively adjacent the inner sides of lugs 2, and a pin 10 secured in the lugs 2 and extending loosely through openings provided therefor in the projections 8 and 9, serves to pivotally support the frame on the base. The projections 8 and 9 are provided at their lower ends with angular forwardly extending arms 8' and 9', and two spiral springs 11 and 12 are respectively connected at their ends to said arms and to lugs 13 and 14 which are struck from the base 1 and extend downwardly at opposite sides of a rectangular opening 15 in the latter. The

springs 11 and 12 are under tension and constantly tend to maintain the frame or support A in its raised or uppermost position, as shown in Fig. 1, the upward movement
 5 of the frame about the pivot pin 10, under the action of these springs, being limited by the engagement of the arms 8' and 9' with the bottom of the base 1. The springs 11 and 12 also act to maintain the pin 10 constantly
 10 in firm engagement with one side of the openings for the pin in the projections 8 and 9. Play in the pivotal connection between the base 1 and frame A is thus prevented and the plunger device (hereinafter described and mounted on the forward end of
 15 the frame) is always maintained in proper alignment with the anvil 4. The construction described normally provides a long gap between the base and frame A for insertion
 20 of the sheets to be secured together over the anvil 4, and permits such sheets to be stapled together at any desired position or positions within a much greater distance from the edges of the sheets than is possible in machines of this character heretofore produced.

The plates 5 and 6 of frame A are maintained rigidly in proper spaced relation at their rear ends by a small fixed substantially flat rectangular member 16, which is horizontally
 30 disposed between said plates at a point slightly above the pivot pin 10 and which has laterally extending rectangular reduced portions or lugs 17 respectively closely engaging correspondingly shaped openings in the
 35 plates. The member 16 has a rearward extension which curves upward and serves as a guide for the wire withdrawn from the spool in the operation of the machine.

The spool S carrying the wire W from
 40 which the staples are produced, is removably supported in a novel manner between similar rearwardly extending and part circular portions 5' and 6' of the plates 5 and 6. The spool comprises a cylindrical barrel 18 and circular
 45 end plates 19 to the central portions of which the ends of the barrel are suitably secured. The plates 19 have aligned circular openings at their centers within which the cylindrical rod or shaft 20 for supporting the spool is
 50 adapted to loosely fit and is normally disposed. The rod 20 has reduced cylindrical ends 21 and beveled or conical shoulders 22 between the latter and the adjacent ends of its main portion. Aligned circular openings
 55 23, slightly larger in diameter than the rod 20, are provided in the portions 5' and 6' of plates 5 and 6 and have downwardly off-set reduced portions 24 which conform to and provide seats for the reduced ends 21 of rod
 60 20. The central portions of plates 19 of the spool are deflected inwardly as indicated at 19', so that the walls of the center openings therein will provide bearings for the ends of the main portion of shaft 20 when the latter
 65 is mounted with its reduced ends 21 disposed

in their seats 24, as shown in Fig. 7. Normally the spool S is mounted in the position shown in Figs. 1 and 7, with the ends 21 of its supporting rod 20 engaging the seats 24. A
 bent spring strip 25 is fixed at one to member 16 so that it is adapted to be engaged at its
 70 free end, by the outermost layers of the wire on the spool S when the latter is mounted as shown. This engagement of the wire with the spring 25 is at a point above the axis of
 75 the spool and tensions the spring, the latter accordingly then acting to maintain the ends 21 of shaft 20 in their seats 24. The spring 25 also by reason of its engagement with the layers of wire on the spool, offers frictional
 80 resistance to the unwinding of the wire, the design being such that such frictional resistance to the turning of the reel decreases substantially in direct proportion to the decrease
 85 in the radius of the reel of wire on the spool, whereby the actual pull necessary to be applied to the wire to unwind the same remains substantially constant regardless of the amount of wire on the spool.

With the construction described, in dis-
 90 mounting the spool, it is merely necessary to raise the same against the action of the spring 25 until the shaft 20 is aligned with the enlarged circular portions of openings 23, and
 95 to then withdraw the shaft from the spool through one of said openings and remove the spool from between the plates 5 and 6. In mounting such spool, the same is first dis-
 100 posed and held between plates 5 and 6 with its axial opening aligned with the circular portions of the openings 23 in such plates and with the wire wound thereon engaging the under side of the free end of spring 25, the
 105 rod or shaft 20 is next inserted in such openings, and the spool is then released whereupon gravity and spring 25 act to force the reduced ends 21 of the rod into their seats 24. The beveled shoulders 22 of the rod 20 greatly facilitate the operations of removing and re-
 110 placing such rod in the manner described.

An auxiliary frame comprising similar spaced parallel vertically disposed plates 26
 and 27 and a transverse substantially horizontal bottom web 28 connecting and preferably
 115 formed integrally with said plates, is firmly secured between the forward portions of plates 5 and 6 of the main support or frame A as by means of screws or bolts 29, with the forward vertical edges of its plates 26 and
 120 27 spaced somewhat rearwardly from the front web 7 of frame A to provide a vertical guideway for the plunger device. The wire-feeding slide 30 is substantially rectangular, and is mounted for horizontal movement in
 125 a guideway provided by the lower portions of the plates 26 and 27 and the bottom web 28, being held in said guideway against vertical movement by spaced pairs of tabs or lugs 31 struck in from said plates. The slide 30
 130 has a reduced forward end portion 32 con-

stituting the mandrel over which the staples are formed, a rectangular notch 33 in its rear end portion within which a one-way roller wire clutch device C is supported from a bracket 34 carried by the slide, and a longitudinally extending slot 35 formed there-through adjacent its forward end. A pin 36 is mounted in the opposite sides of slot 35 and extends across the latter midway between the ends thereof. A bell crank lever 37 is pivoted on a horizontal pin 38 mounted in and extending between plates 26 and 27; the end of one arm of this lever extending into the slot 35 of slide 30 and having a slot 39 fairly closely engaged by pin 36, and the end of the other arm of such lever having two spaced projections or teeth 40 and 41. The bottom web 28 of the auxiliary frame is slotted as shown at 42 to accommodate the lower end of lever 37 in the movements of the latter about pin 38.

The two-part plunger device comprises a cutting and forming member or die 43 which is substantially rectangular and is disposed for vertical reciprocatory movement in the guideway provided by the front vertical edges of plates 26 and 27 and the forward vertical end portion of the main frame or support A, and a substantially rectangular punch or staple driving member 44.

The die 43 consists of similar rectangular spaced side members 45 and 46 connected by a thin integral front web 47, a channel thus being provided in the rear of said web in which the punch 44 is mounted for sliding movement. The web 47 terminates some distance above the lower end of die 43, the construction being such that the lower spaced end portions of the side members of the die are adapted to straddle and fit fairly closely over the mandrel 32 upon the down stroke of the plunger device. The side members 45 and 46 have notches 48 in their outer edges, and lugs 49 projecting from the front edges of plates 26 and 27, extend into these notches and coact with the ends thereof to limit the vertical movements of the die. The inner opposed edges of members 45 and 46 are provided for their entire length with small vertical grooves 50.

The punch 44 consists of a rear thick block or member 51 and a thin front plate or member 52 secured as by riveting to such block. The member 52 extends downwardly below the lower end of block 51 and its edge portions project beyond the side edges of the block and slidably engage the grooves 50 in the die, to which grooves such side edge portions conform. A pawl 53 in the form of an inverted U, embraces block 51 and is pivoted on a lug 53' which is integral with and projects rearwardly from the block. A small compression spring 54 disposed between block 51 and the upper end of pawl 53, tends to maintain the latter in the position shown

in Figs. 1 and 6 in which the teeth thereof engage angular notches 55 formed in the rear faces of members 45 and 46 of the die. At its upper end pawl 53 is provided with a rearwardly extending lug 56 adapted to coact with the upper screw or bolt 29, as will presently appear. At its lower end block 51 is provided with a rearwardly extending lug or tooth 57 which projects between and is adapted to coact with the teeth 40 and 41 to effect angular movements of lever 37 and thereby backward and forward reciprocatory movement of slide 30 upon the down and up strokes, respectively, of the plunger device. The front web 47 of die 43 has a vertical slot 58, and a pin 59 secured to punch 44 extends into said slot and coacts with the upper end thereof to limit the upward reciprocatory movement of the punch with respect to the die.

For the manual actuation of the machine, I provide a long channeled lever 60 which is pivoted at its rear end, by means of the horizontal screw or bolt 61, to the main frame A at a point adjacent that portion of the latter in which spool S is mounted. At its front end, which is located a considerable distance forwardly of the front end of frame A, lever 60 is provided with a handle 62, and intermediate its ends such lever has a pair of similar downwardly extending lugs 63. These lugs 63 are preferably formed integrally with the sides of the channel piece from which lever 60 is formed and embrace the frame A at the front end portion thereof in which the plunger device is mounted. Two vertically disposed links 64 are respectively pivotally connected at their lower ends by pins 65 to the lower ends of the lugs 63 and lie adjacent the inner surfaces of the latter. A horizontal wrist pin or rod 66 is secured at its ends in the upper ends of links 64 and extends loosely through an opening 67 provided in the enlarged upper end of the block 51. The pins 65, links 64 and wrist pin 66, as is obvious, form an operative connection between the plunger device and lever 60. A compression spring 68, of considerably greater strength than the springs 11 and 12 combined, is disposed between lever 60 and the auxiliary frame comprising plates 26 and 27, with its ends respectively seated in the channel of said lever and on a cross-piece 69 secured to the rear low end portions of said plates. This spring 68 constantly tends to maintain lever 60 and the plunger device in their raised or uppermost positions with respect to the main frame A, as shown in Figs. 1 and 5, in which the lower ends of the notches 48 in die 43 engage the lugs 49 of plates 26 and 27, the pin 59 of punch 44 engages the upper end of slot 58 in the die and the teeth of pawl 53 rest in the notches 55 of the die.

The lower active face of the staple driving

member or blade 52 of the punch is made slightly convex or is beveled at its corners, (see Fig. 5), whereby a better support is provided for the staples when the same are driven through and clenched against the sheets being fastened together. This design of the punch blade is particularly efficacious when thick or hard sheets of material are being secured together, and has, to a marked degree, increased the capacity of the machine. The lower end faces of members 45 and 46 of the die are provided with transverse aligned angular notches 70 adapted, upon the down stroke of the die, to engage the end portions of the piece of wire to be formed into a staple and to guide the same into the vertical grooves 50 in said members, the inner ends of the notches respectively intercepting said grooves.

A one-way roller clutch device C', similar in all respects to the clutch device C, is supported by and depends from the plate or member 16. The clutch device C' and C are respectively fixed to the member 16 and the bracket 34, as by being riveted thereto. Each of these clutch devices, referring now to Fig. 8, comprises a rectangular block 72 having a small cylindrical opening 73 extending therethrough from end to end and adjacent the top thereof, and a slot 74 intercepting such opening and inclining downwardly therefrom to the front end of the block. The slot 74 extends from one side of the block to the other and has freely mounted therein the clutch roller 75 the ends of which respectively project beyond the sides of the block. Reference character 76 represents a member for controlling the action of the clutch device, such member comprising a stirrup and an arm 77 preferably formed integrally with the base of the stirrup and extending substantially at right angles to the sides of the latter. The sides 78 of the stirrup embrace the block 72, and the member 76 is pivotally mounted on the block by a pin 79 which extends through the latter and the said sides. The upper end portions of the sides 78 are provided with similar slots with which the projecting ends of the rollers 75 respectively engage. A small coil spring 80 disposed between the bottom of block 72 and the end of arm 77, constantly tends to hold the pivoted member 76 in the position shown in Fig. 8 wherein the stirrup arms 78 maintain the roller 75 positioned with a portion thereof projecting from the upper end of slot 74 into the opening 73.

The clutch devices C and C' are so mounted that the openings 73 provided for the wire W in the blocks 72, are in alignment, the said openings being flared at their rear ends to facilitate the insertion of the wire through the machine. The clutch device C' will permit the wire W to pass freely there- through in a direction from the spool S to-

wards the front part of the machine, but will effectually prevent any movement of the wire therethrough in the other direction; and the clutch device C when moved rearwardly with the slide 30 will slip or travel along the wire without gripping the same or imparting any movement thereto, but when moved forwardly with slide 30, it will tightly grip the wire and impart a like movement thereto and thereby withdraw or unwind more wire from spool S.

An elongated member 82, which is preferably stamped from sheet metal, is disposed just beneath the top of base 1 between the arms 8' and 9' and the springs 11 and 12, and is pivotally supported in this position from the pin 10 by means of spaced upstanding lugs 83 with which such member is provided and through which said pin extends. Projections or tongues 84 and 85 struck up from member 82, respectively extend upwardly through the openings 3 and 86 in base 1 and are adapted to engage and coact with the arms 77 on members 76 of the clutch devices C and C' to release the latter. Normally the clutch releasing member 82 is held in inoperative position by a leaf spring 87 secured at one end to such member and engaged at its other end with the base 1. Movement of member 82 to the left (referring to Fig. 1) about pin 10 and against the action of spring 87, will engage the tongues 84 and 85 with the arms 77 of the respective clutch devices and thereby release the latter. When the clutch devices are thus released the wire may be readily threaded into or withdrawn from the machine, as it can then be passed freely through the clutch devices in either direction.

The bracket 34 carrying the clutch device C has two spaced lugs 34' at its front end which are bent downwardly and riveted to the top of slide 30, the bracket thus being secured to the slide. The construction is such that the main rear portion of bracket 34 to which clutch device C is secured, is disposed at such a distance above the slide 30 that the wire receiving opening 73 in block 72 of said device is at a level only slightly above the upper surface of the slide. A wire guiding tube 89 is carried by slide 30, and has the rear portion thereof extending substantially parallel to the slide and terminating close to the front end of block 72 of clutch device C and with the opening thereof in registry with the opening 73 in said block. Forwardly of its said rear portion, the tube 89 is curved outwardly through registering slots 90 provided in plates 6 and 27, to a point considerably beyond the confines of the main frame or support A, and is thereafter curved inwardly to a point of termination adjacent the front end portion of said frame A and in which the guide is directed transversely of slide 30 but at a very slight angle for-

wardly of a line perpendicular to the direction of movement of the slide. The forward curved portion of guide 89 extends through and is suitably secured within a channeled guard 91 having a rear transverse end portion 91' which extends through slots 90 in plates 6 and 27 and is secured, as by screws or pins, to slide 30. In order that the forward end portion W' of the wire which projects or is to be projected from the forward end of guide tube 89 over and across the mandrel 32 of slide 30, shall be properly positioned over the mandrel and lined up with and beneath the transverse notches or grooves 70 in the bottom end faces of the legs or sides 45 and 46 of the die and with the lower face or end of the blade 52 of punch 44, when the slide 30 is in its foremost position, a block 92 of substantially the same width as mandrel 32, is mounted on the slide 30 at a point midway between the side edges of the latter and adjacent the rear end of the mandrel. The block 92 has a suitable guide for the wire extending entirely across the same at the front end thereof, this guide being provided by an angular recess 93, which intercepts the front end and bottom surfaces of said block and also the surfaces of both of its sides, or which, in other words, is open at the front and bottom sides and at both ends. This recess 93 flares towards that end thereof which is opposite the front end of the guide tube 89, and its other end is of substantially the same size as a section of the wire W.

The plates 6 and 27 are provided with horizontal slots 94 which extend rearwardly from the front ends of such plates a distance sufficient to accommodate the wire W in all positions of slide 30, when such wire projects or is being or is about to be projected from the adjacent front end of guide tube 89 over and across the mandrel 32. The lower edge of slot 94 in plate 6 is slightly below the top of slide 30, as is also the bottom edge of slot 94 in plate 27 for the major part of its length. A small angular knife 95 is removably secured, as by a screw, to the plate 6 with its short horizontal arm closely overlying the front end of the bottom edge of slot 94 in said plate, the edge of the inner end of said arm constituting the cutting edge of the knife with which the adjacent edge of the lower end of the die member 46 is adapted to coact, when the die is depressed, to shear the wire. The bottom edge of slot 94 in plate 27 is provided, at a point slightly rearwardly of the knife 95, with a raised portion or cam 96 having beveled or inclined ends, the function of which cam will presently be described.

The front web 7 of frame A is cut away or notched at its lower end as indicated at 97, and the plates 5 and 26 are cut away or horizontally slotted at their lower front end portions as indicated at 98. The cut-away construction described enables the user of the

machine readily to view the front end portion of the feeding slide 30 with its mandrel 32 and the guide block 92 thereon and the actions of cutting the wire and of forming and driving the staples; it also facilitates the removal of pieces of wire which may become caught or trapped in the mechanism.

The anvil 4 is provided intermediate its side edges and directly below the plunger device, with a transverse groove or depression 4', the form of which is best shown in Fig. 5. This groove is adapted to receive and upset the ends of a staple towards each other as such staple is being forced by the punch of the plunger device through superposed sheets of material supported on the anvil, to thereby clench the said ends against the lowermost of said sheets.

The springs 11 and 12 normally act to maintain the main frame A together with the auxiliary frame and the slide 30 mounted on the latter, in their raised uppermost positions with respect to the base 1; and the spring 68 normally acts to maintain lever 60 and thereby the plunger device in their raised uppermost positions with respect to the main and auxiliary frames. The slide 30 is then in its foremost position with its mandrel 32 directly beneath the plunger device, and both the die 43 and the punch 44 of the plunger device are at the upper limit of their vertical movement with the lower ends of notches 48 in the die 43 engaging the fixed lugs 49, the pin 59 of punch 44 engaging the upper end of the slot 58 in the die, the teeth of pawl 53 engaging the notches 55 in the die, and the tooth 57 of block 51 engaging the upper of the two spaced teeth 40 and 41 on the lever 37. These normal positions of the various parts as described, are those in which they are disposed at the end of the up stroke of the machine. Such of the parts of the machine as appear in each of Figs. 1, 3, 5 and 6 are shown therein in their normal positions. A very deep gap is then provided between the anvil 4 and the mandrel 32 for insertion of sheets to be fastened or stapled together, such gap, as clearly shown in Fig. 1, extending from the anvil and mandrel almost to the pivot pin 10. If the machine is now in operative condition, wire will have been threaded through the machine from spool S and will extend from the latter through the clutch devices C' and C and guide tube 89 with an end portion W' thereof of proper length to be formed into a staple, projecting from the front end of said tube over the knife 95 and mandrel 32 and through the guide notch 93 of block 92 substantially to the plane of the inner surface of plate 5.

In the use of the machine, starting with the parts in their normal positions and the wire threaded therethrough as described above, the sheets to be fastened are first inserted in the gap between the anvil 4 and mandrel 32

to bring the points in said sheets where it is desired to locate a staple directly over the groove 4' in the anvil and beneath the mandrel and plunger device. Pressure is then applied to the handle 62 of lever 60 sufficient to impart thereto a complete down stroke, such stroke being limited by the engagement of the wrist pin 66 with the upper end of die 43. It may here be noted that as the handle 62 of lever 60 is located a considerable distance forwardly of the point of connection between such lever and the plunger device, less pressure need be exerted in actuating the plunger device through its complete down stroke, because of the gained leverage obtained, than where the manual pressure is applied directly to and in line with the plunger device as has been customary in machines of this type heretofore produced. Upon so applying pressure to the handle 62, the frame A together with the plunger device and all other parts mounted on such frame, including lever 60, are first moved as a unit about the pivot pin 10 against the tension of springs 11 and 12, the combined strength of these springs being less than that of spring 68, until the front end of the bottom web 28 of the auxiliary frame engages the sheets to be fastened with a pressure sufficient to securely hold the same in position. Thereafter lever 60 is moved downwardly with respect to frame A about pivot 61 against the action of spring 68, the lever, through the links 64 and wrist pin 66 then imparting downward movement to the punch 44 of the plunger device. During the first part of the downward movement of punch 44 the die 43 is positively moved therewith because of the engagement of the teeth of pawl 53 with the notches 55 in the die. The positive downward movement thus imparted to the die continues until the lower ends of the members 45 and 46 thereof are almost down in engagement with the uppermost of the sheets being fastened together; at this point the pawl 53 is moved about its pivot against the action of spring 54, by reason of the engagement of its lug 56 with the upper screw 29, and the pawl teeth are thus disengaged from the notches 55. Thereafter the punch 44 continues to move down independently of the die until the lower end of its driving blade 52 is substantially flush with the lower ends of the die members 45 and 46, when further relative downward movement of the punch is prevented by the wrist pin 66 striking the top of the die. The said lower ends of blade 52 and die members 45 and 46 are now in engagement with the uppermost of the sheets being fastened, and the lugs 49 of plates 26 and 27 are nearly engaged by the upper ends of notches 48 in the die. By the simple construction described a constant throw and uniform action of each of the parts of the plunger device are obtained in the successive down strokes of the machine, and this regardless

of the aggregate thickness of the superposed sheets being fastened together. Also by limiting the downward movement or throw of the punch and its blade 52, as described, any danger of the end of said blade forcing the base of a staple through all or any of the superposed sheets being secured together, no matter how thin the separate sheets or how little the aggregate thickness of the sheets may be, is entirely eliminated. In the downward movement imparted to die 43 as described, the lower end of the member 46 thereof first coacts with knife 95 to cut off the transversely extending forward end section W' of the wire, and both die members 45 and 46 then bend the end portions of said wire section down over the sides of the mandrel 32 to form the legs of a staple, the notches 70 in the lower ends of the die members at the same time acting to line up said end portions or legs with and guide them into the inner grooves 50 of such members. At the completion of the down stroke of the die, the staple is thus completely formed and is located between the lower spaced end portions of the die members 45 and 46 with its legs disposed in the grooves 50 and with the lower ends of said legs and said members substantially flush. Somewhat before the completion of the down stroke of die 43, the projection or tooth 57 on the punch member 51 is moved into engagement with the lower tooth 40 on the upper end of lever 37 and effects movement of the latter about pin 38 in a clock-wise direction (referring to Fig. 1) and thereby rearward movement of slide 30, the construction and arrangement being such that the mandrel 32 is wholly withdrawn from the path of the plunger device and the confines of the formed staple substantially as the down stroke of the die is completed. In the continued and independent downward movement of the punch 44, the lower end of punch blade 52 engages the base of the formed staple, pushes the staple from grooves 50, drives the legs of the staple through the sheets disposed over anvil 4, and forces the ends of said legs against the bottom of groove 4' in the anvil to thereby bend over and clench the same against the lowermost of said sheets. Meanwhile the projection 57 of the punch has moved lever 37 still farther in a clock-wise direction and thereby has effected further rearward movement of slide 30; and upon completion of the down stroke of the punch, the parts will be positioned as shown in Fig. 2 with the slide at the limit of its rearward movement. In the rearward movement of slide 30, the clutch device C exerts no gripping action on the wire and such clutch device and the guide tube 89 therefore slide or travel freely back along the wire, the latter then being held against rearward movement by the gripping action of clutch device C'. Accordingly at the end of the rearward reciprocatory movement of

slide 30 the forward end section of the wire will be projecting from the front end of tube 89 and will extend from the latter transversely over the slide and through the recess 93 in the guide block 92. The construction is such that the said projecting section of wire will be of substantially the same length as the section W' from which a staple has just been formed. The wire, of course, is being advanced through the tube 89 and projected from the front end of the latter throughout the rearward movement of slide 30; and as the slide is moving back past the cam 96 the latter will act to raise the end of the wire and guide the same transversely over the mandrel 32; any interference of the end of the wire with the adjacent side of the mandrel 32 and the catching or trapping of the wire between the slide and the guideway therefor being thus effectually prevented. Upon now removing the pressure from handle 62, the frame A and the parts carried thereby will be automatically returned to their normal positions as shown in Fig. 1, the springs 11 and 12 acting to raise said frame about pin 10 and spring 68 acting to raise lever 60 and thereby move the plunger device through its up stroke and reciprocate the slide 30 to its foremost position in which the transversely extending end section of the wire is lined up beneath the plunger device. In the forward reciprocatory movement of the slide 30, all the wire in advance of the clutch device C will be moved forwardly with the slide, as the said clutch device will then grip the wire and clutch device C' will exert no gripping action thereon, and an amount of wire equal in length to such movement of the slide will thus be withdrawn or unreeled from the spool S. The machine is now ready to be again actuated to produce, drive and clench another staple.

The machine shown and specifically described herein is merely illustrative of a preferred embodiment of my invention, and it is to be understood that the same is subject to numerous changes and modifications without departure from the spirit of the invention or the scope of the appended claims.

Having now described my invention what I claim as new and desire to protect by Letters Patent, is as follows:

1. In a machine of the class described, a base member having an anvil, a frame member pivotally mounted on said base member at a point rearwardly of said anvil and carrying mechanism adapted to coact with said anvil to staple together material disposed between said members, the pivotal mounting for the frame member comprising pairs of lugs respectively provided on said members and a pivot pin mounted in one of said pairs of lugs and extending loosely through openings provided in the other pair, the said lugs on the frame member having forwardly ex-

tending arms disposed beneath the base member and coacting therewith to limit the upward pivotal movement of the frame member, and tensioned spring means connected to said arms and also to the base forwardly of such arms.

2. In a machine of the class described, a frame, a slide mounted on said frame for reciprocatory movement between two extreme positions, means comprising a guide for wire movable with and terminating adjacent the slide for directing the wire transversely of the slide as the latter is moved from one of said positions, and means located between said guide and the slide for raising the wire as it is so directed to insure that the same will pass over the slide.

3. In a machine of the class described, a slide mounted for movement between two extreme positions, a guide from which wire is adapted to be advanced in a direction transverse to the slide as the latter is moved from one of said positions, and means between said guide and the slide adapted to raise that portion of wire first so advanced from the guide to insure that the same will pass over the slide.

4. In a machine of the class described, a slide mounted for movement between two extreme positions, a guide from which wire is adapted to be advanced in a direction transverse to the slide as the latter is moved from one of said positions, and a fixed cam between said guide and the slide adapted to be engaged by that portion of the wire first so advanced from the guide and to raise the same to insure the passage of the wire over the slide.

5. In a machine of the class described, a frame having a guideway, a slide mounted in said guideway for reciprocatory movement between two extreme positions, a guide movable with the slide, said guide having one end terminating adjacent to but spaced from one side of the slide and from which wire is adapted to be advanced in a direction transverse to the slide as the latter is moved from one of said positions, and a cam provided on said guideway between the said end of the guide and the slide adapted to raise that portion of the wire first so advanced from the guide to insure the passage of the wire over the slide.

6. In a fastening machine of the class described, a base having an anvil over which material to be fastened is adapted to be positioned, a frame pivotally connected to said base at a point rearwardly of the anvil, spring means biasing said frame to a position in which the front end thereof is in raised spaced relation to the anvil, mechanism mounted on said frame for advancing wire, for forming staples from the wire and for driving formed staples through material so positioned over the anvil and against

the latter, said mechanism comprising a plunger device mounted on the front portion of the frame, a lever pivoted to the frame rearwardly of the plunger device and extending forwardly beyond the latter, means positively connecting said plunger device to said lever intermediate the ends of the latter, and spring means of greater strength than said first mentioned spring means, biasing said lever and thereby said plunger device to predetermined raised positions with respect to said frame.

7. In a fastening machine of the class described, a base having an anvil, a frame movably associated with said base and having a portion normally in spaced relation to said anvil to permit material to be fastened together to be inserted between such portion and the anvil, mechanism mounted on said frame for advancing wire, for forming staples from the wire and for driving formed staples through material positioned over the anvil and against the latter, and means for actuating said mechanism comprising a member pivotally mounted on said frame and operatively and positively connected to said mechanism and an operating handle for said member which is more remote from the pivotal mounting of the member than is the point of connection thereof with such mechanism, said member having a resilient connection with said frame whereby upon pressure being applied to the member in a given direction the frame will be actuated so as to move its said portion towards said anvil.

8. In a fastening machine of the class described, a base having an anvil over which material to be fastened together is adapted to be positioned, a frame pivotally connected to said base at a point rearwardly of said anvil and biased to a position in which the front end portion thereof is in raised spaced relation to the anvil, means for forming staples and for driving the same through such material when so positioned comprising a plunger device mounted on the front end portion of the frame for vertical reciprocatory movement, said plunger device comprising a forming die and a driving punch capable of relative vertical movement, actuating means operable to first move the frame downwardly into engagement with such material when so positioned, to then effect downward movement of said die to form a staple and to thereafter effect downward movement of said punch relatively to the die to drive a staple, the downward movement of said die being adapted to be limited by direct engagement thereof with said material, means having positive connection with the punch and adapted to coact with the die to limit the downward movement of the punch relative to the die, means limiting the upward movements of said die and punch,

and means biasing the die and punch to their uppermost positions.

9. In a fastening machine of the class described, a base having an anvil, a source of wire supply, means for producing staples from the wire and for driving such staples comprising a plunger device mounted above said anvil for vertical reciprocatory movement and biased to a raised inoperative position, a slide mounted for horizontal movement between two extreme positions, said slide having a mandrel with which the plunger device is adapted to coact and which is located beneath said device in one extreme position of the slide, means whereby upon each operation of the machine said slide withdraws wire from said source, a guide movable with the slide, said guide having one end terminating adjacent said mandrel and from which wire is adapted to be advanced in a direction transverse to and over the slide as the latter is moved from one of said positions, and a guide member provided on said slide in such a position with respect to the said end of the guide as to be engaged by the wire so advanced and to so position the wire over the mandrel as to insure that the same will be properly lined up with the plunger device when the mandrel is beneath the latter.

10. In a machine of the class described, a slide mounted for reciprocatory movement between two extreme positions, a guide movable therewith, said guide having one end terminating adjacent to one side of the slide and from which wire is adapted to be advanced in a direction transverse to and over the slide as the latter is moved from one of said positions, a plunger device movable in a direction transverse to the movement of the slide and adapted when the latter is in a predetermined relation thereto to act on a section of wire so advanced to produce a staple therefrom, and means for insuring the proper lining up of such a section of wire with the plunger device when the slide is in said predetermined relation comprising a guide member carried by the slide in a position to be engaged by wire as it is advanced from the said end of the guide.

11. In a machine of the class described, a slide mounted for movement between two extreme positions, a guide movable with the slide and from which wire is adapted to be advanced in a direction transverse to and over the slide as the latter is moved between said extreme positions, and guiding means carried by the slide and adapted to be engaged by wire so advanced from said guide and to act thereupon to locate the same in a certain transverse position with respect to the slide.

12. In a machine of the class described, a slide mounted for reciprocatory movement, a guide movable with the slide, said guide having an end terminating adjacent to but

spaced from one side of the slide and from which wire is adapted to be advanced in a direction transverse to and over the slide in the movement of the latter, and a member
 5 mounted on the slide and having a guideway flaring in a direction towards the said end of the guide, said guideway being adapted to be engaged by wire so advanced from said guide and to act thereupon to locate the same in a
 10 definite transverse position with respect to the slide.

13. In a machine of the class described, a frame, a plunger device for producing staples from wire and for driving such staples, said
 15 device being mounted on said frame for vertical reciprocatory movement, a wire-feeding slide device mounted on said frame for horizontal reciprocatory movement between two extreme positions in one of which
 20 it is adapted to cooperate with the plunger device to form a staple, and means whereby movement of one of said devices is adapted to impart movement to the other comprising a lever pivotally mounted on said frame, said
 25 lever being operatively connected at one end with one of said devices and having a lost-motion connection at the other end with the other of said devices.

14. In a machine of the class described, a
 30 frame plunger device for producing staples from wire and for driving such staples, said device being mounted on said frame for vertical reciprocatory movement, a wire-feeding slide mounted on said frame for hori-
 35 zontal reciprocatory movement between two extreme positions in one of which it is adapted to cooperate with the plunger device to form a staple, and means whereby movement of the plunger device is adapted to
 40 impart movement to the slide comprising a bell crank lever pivotally mounted on said frame, said lever being operatively connected at one end with the slide and having spaced teeth at the other end and a projection on the
 45 plunger device extending into the space between said teeth.

15. In a fastening machine of the class described, a frame, a plunger device comprising a punch member and a die member mounted
 50 on said frame for vertical movement, said members having a pin and slot connection providing for limited relative movement thereof, said punch member being spring-biased to a raised inoperative position in
 55 which the pin of said connection engages one end of the slot thereof, said frame and die member each having means adapted directly to coact to positively and definitely limit the upward movement of the die member, and
 60 means comprising a pawl mounted on one of said members and biased to a position where it operatively engages the other member whereby positive movement is imparted to the die member from the punch member upon
 65 movement of the latter from said position,

said frame having a part arranged to be engaged by said pawl so as to move the latter to inoperative position, after the die member has been so positively moved a certain distance, and thereby permit continued and independent vertical movement of the punch member. 70

16. In a fastening machine of the class described, a frame, a plunger device comprising a punch member and a die member mounted
 75 on said frame for vertical movement, means comprising a pin on the punch member and a slot in the die member with which said pin is engaged whereby such members are connected for limited relative movement, said
 80 members being biased to raised inoperative positions in which said pin engages the upper end of said slot, and means comprising a spring-pressed pawl mounted on the punch member and a notch in the die member with
 85 which said pawl is normally operatively engaged whereby positive movement is imparted to the die member from the punch member upon movement of the latter from its said inoperative position, said frame having a
 90 part arranged to be engaged by said pawl so as to disengage the latter from said notch after the die member has been so positively moved a certain distance, and thereby permit continued and independent vertical movement of the punch member. 95

17. In a fastening machine of the class described, a frame, a plunger device comprising a punch member and a die member mounted
 100 on said frame for vertical movement, said members having a pin and slot connection providing for relative movement thereof, said punch member being biased to a raised inoperative position in which the pin of said
 105 connection engages one end of the slot thereof, means comprising a pawl mounted on one of said members and biased to a position where it operatively engages the other member whereby positive movement is imparted to the die member from the punch member
 110 upon movement of the latter from said position, said frame having a part arranged to be engaged by said pawl so as to move the latter to inoperative position, after the die member has been so positively moved a certain distance, and thereby permit continued and independent vertical movement of the punch member, and manually operable means for actuating the punch member to impart downward movement thereto, said members having
 115 coacting means in addition to said pin and slot connection for limiting the downward movement of the punch member with respect to the die member. 120

18. In a fastening machine of the class described, a frame, a plunger device comprising a punch member and a die member
 125 mounted on said frame for vertical movement, said members having a pin and slot connection providing for limited relative movement thereof, said die member and 130

frame having means adapted directly to co-act to positively and definitely limit the upward movement of the die member on the frame, said punch member being biased to a raised inoperative position in which the pin of said connection engages one end of the slot thereof, and means comprising a pawl mounted on one of said members and biased to a position where it operatively engages the other member whereby positive movement is imparted to the die member from the punch member upon movement of the latter from said position, said frame having a part arranged to be engaged by said pawl so as to move the latter to inoperative position, after the die member has been so positively moved a certain distance, and thereby permit continued and independent vertical movement of the punch member.

19. In a fastening machine of the class described, a base having an anvil, a source of supply of wire, means disposed above said base for withdrawing wire from said source and for feeding the same towards and over said anvil comprising a reciprocatory device and one-way wire clutch means, and clutch release means comprising a member mounted on said base for movement into operative position so as to effect the release of said clutch means and permit free passage of the wire therethrough, said member being biased to inoperative position.

20. In a fastening machine of the class described, a base having an anvil, a source of supply of wire, means disposed above said base for withdrawing wire from said source and for feeding the same towards and over said anvil comprising a reciprocatory slide and a one-way clutch device carried by the latter and through which the wire is adapted to extend, a one-way wire clutch device disposed between said source and slide and fixed with reference to the direction of the reciprocatory movement of the slide, and clutch release means comprising a member disposed below said base and pivotally mounted thereon, said member being biased to inoperative position and having portions which, when the member is moved to operative position, extend upwardly through apertured portions of said base and respectively engage and release said clutch devices to permit free passage of wire through the latter in either direction.

21. In a fastening machine, a base member having an anvil, a frame member pivotally mounted on said base member at a point rearwardly of said anvil and carrying mechanism adapted to coact with said anvil to staple together material disposed between said members, the pivotal mounting for said frame member comprising a pair of lugs respectively provided on said members and a pivot pin mounted on one of said lugs and extending loosely through an opening pro-

vided in the other lug, the said lug on the frame member having a forwardly extending arm disposed beneath the base member and adapted to coact therewith to limit the upward pivotal movement of the frame member, and tensioned spring means connected to said arm and also to the base forwardly of such arm.

This specification signed this 27th day of January 1930.

VICTOR A. SVENSSON.

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