

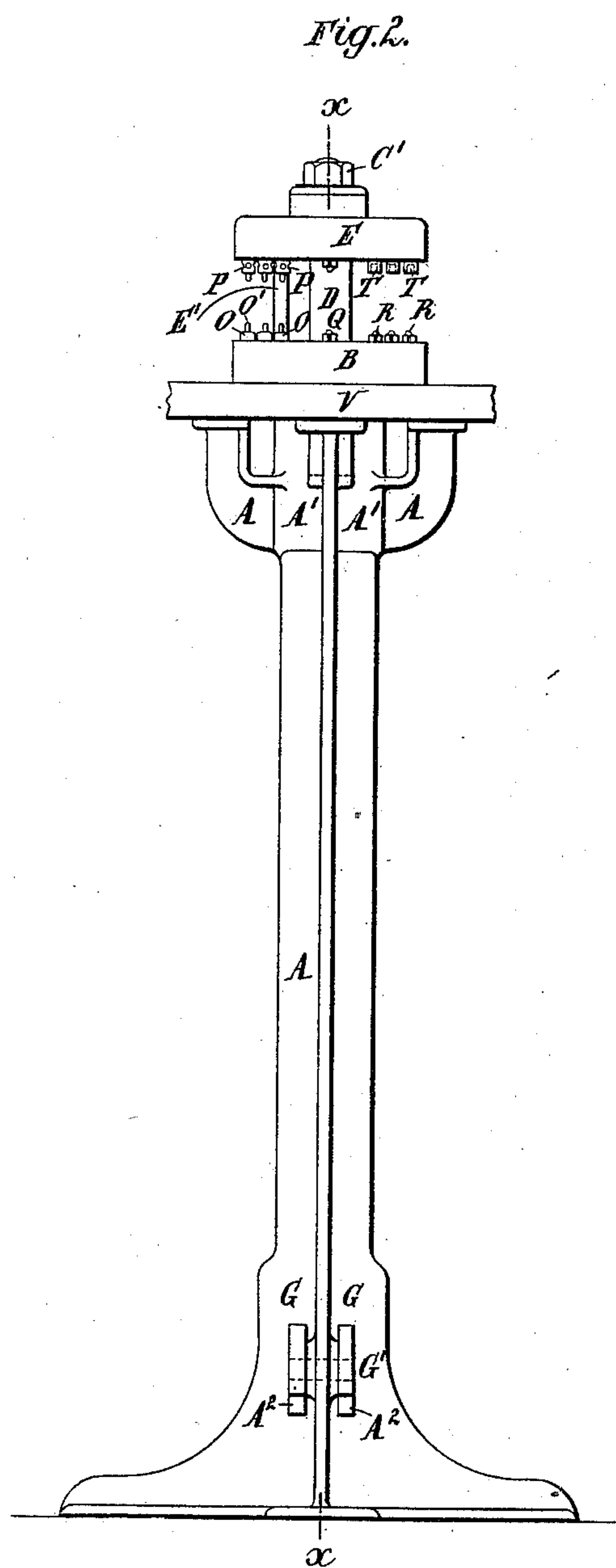
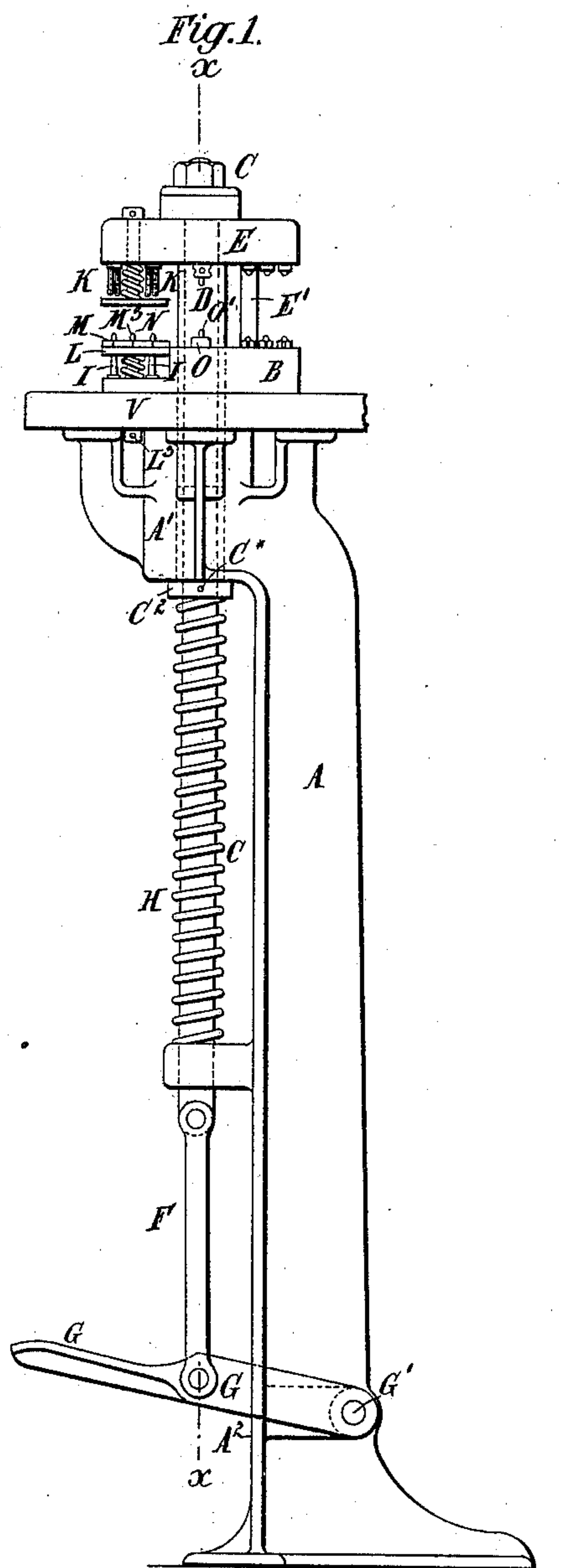
(No Model.)

4 Sheets—Sheet 1.

H. S. MAXIM.  
RIVETING MACHINE.

No. 401,708.

Patented Apr. 16, 1889.



Witnesses,  
Frank Hartley  
Ernest Hopkinson

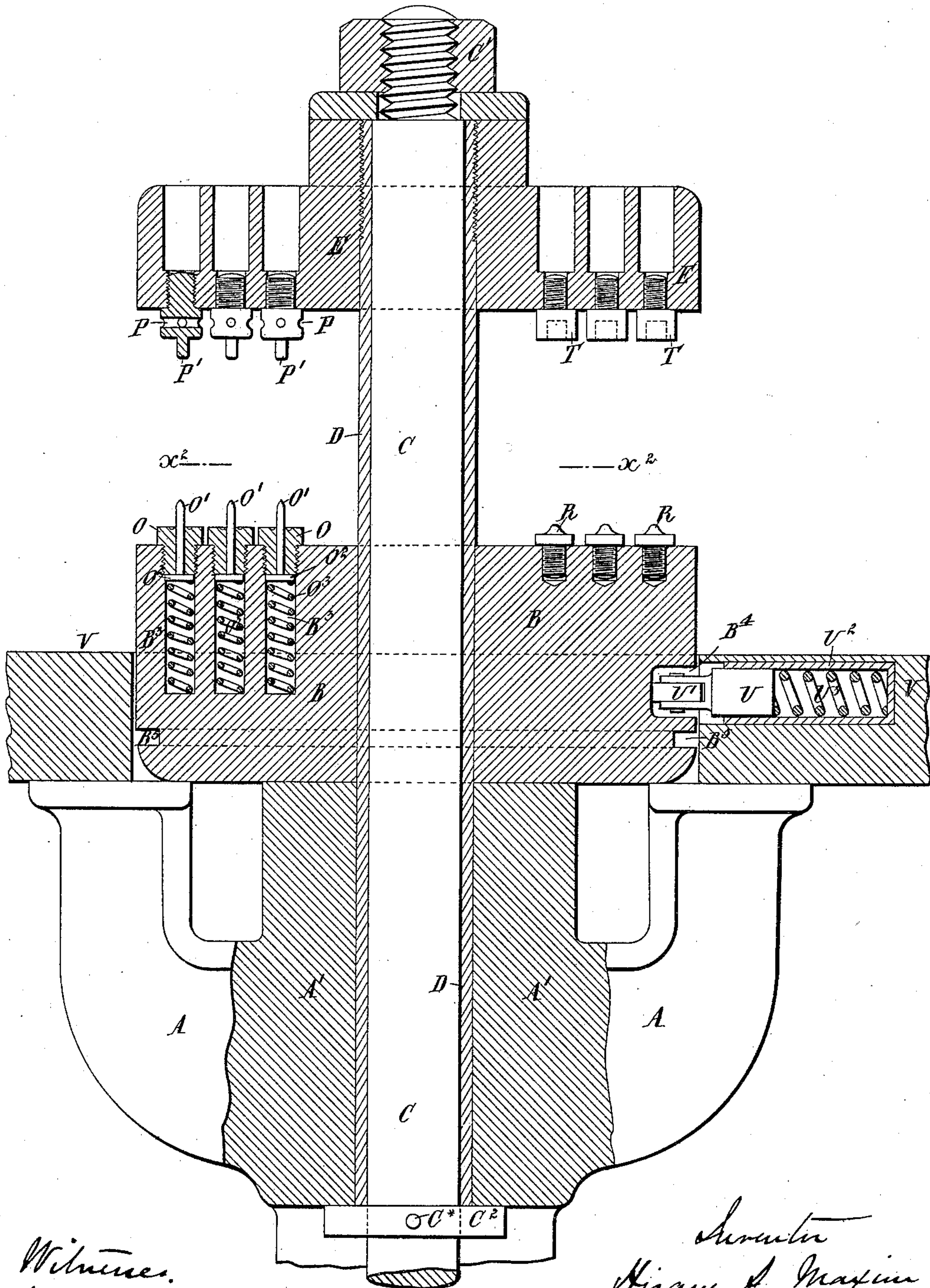
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H. S. MAXIM.  
RIVETING MACHINE.

No. 401,708.

Patented Apr. 16, 1889.

Fig. 3.



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(No Model.)

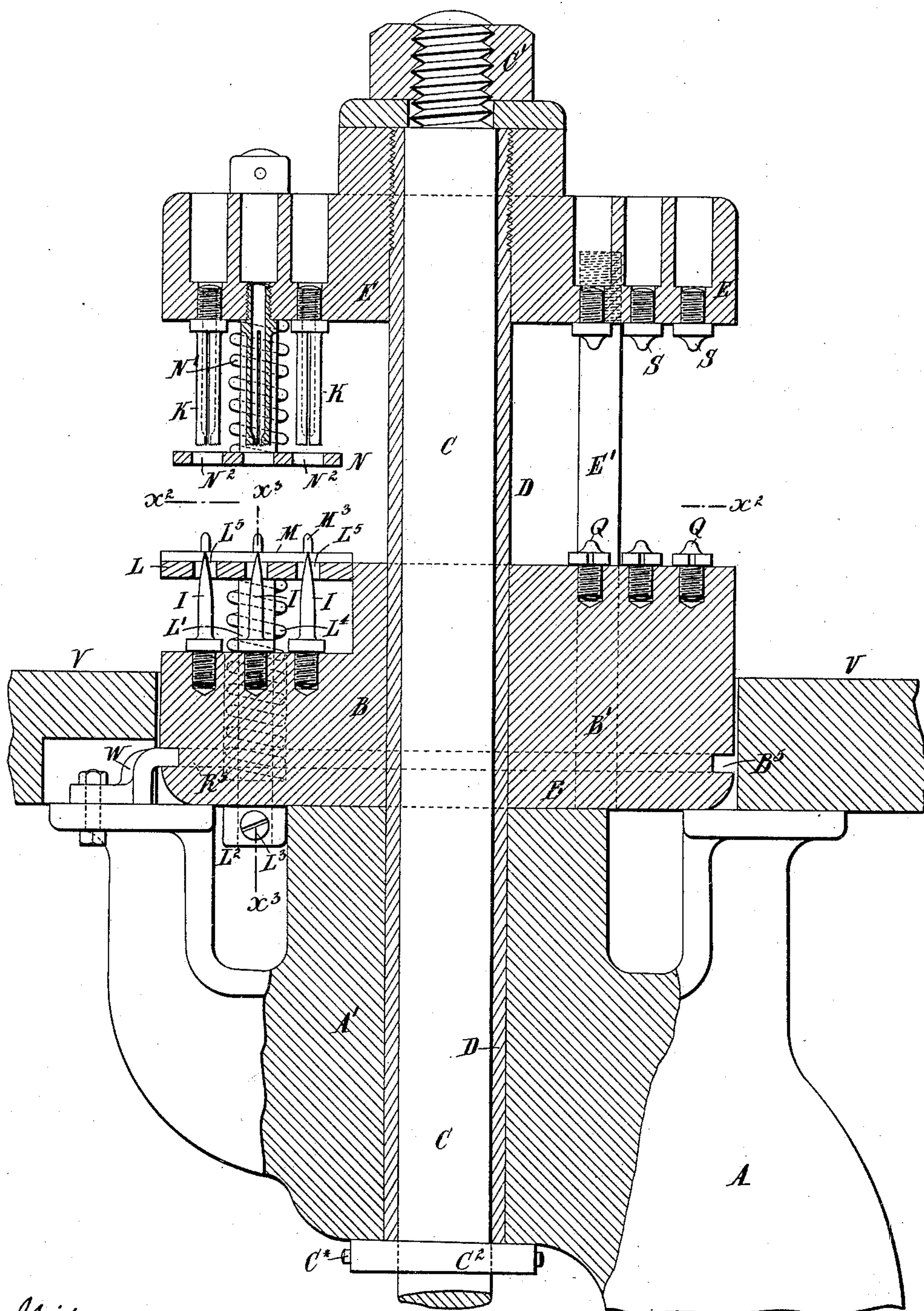
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H. S. MAXIM.  
RIVETING MACHINE.

No. 401,708.

Patented Apr. 16, 1889.

*Fig. 4.*



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(No Model.)

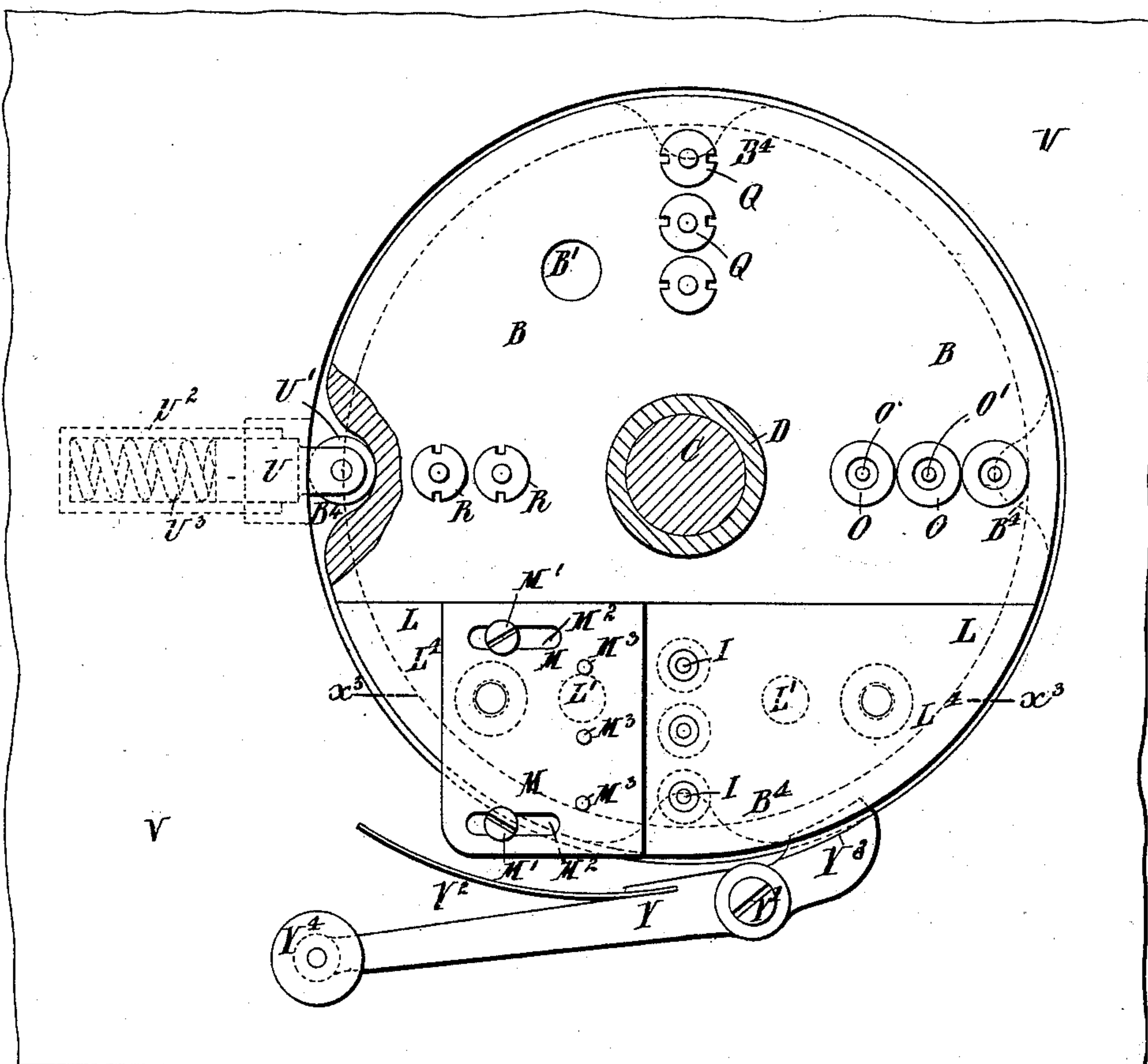
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H. S. MAXIM.  
RIVETING MACHINE.

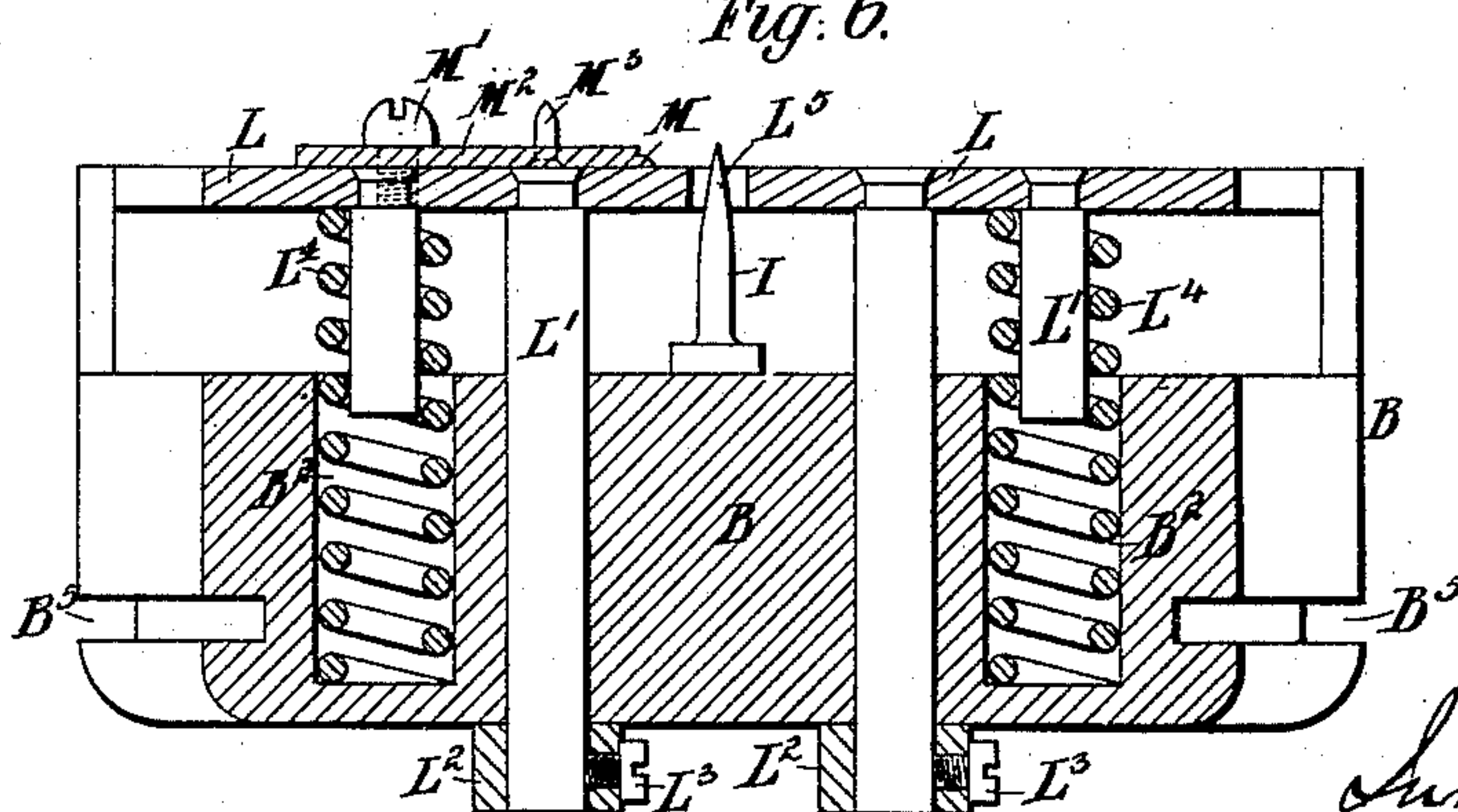
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*Fig. 5.*



*Fig. 6.*



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# UNITED STATES PATENT OFFICE.

HIRAM STEVENS MAXIM, OF LONDON, ENGLAND, ASSIGNOR TO THE MAXIM GUN COMPANY, (LIMITED,) OF SAME PLACE.

## RIVETING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 401,708, dated April 16, 1889.

Application filed August 24, 1888. Serial No. 283,632. (No model.) Patented in England August 20, 1886, No. 10,686; in France May 27, 1887, No. 183,853, and in Italy August 8, 1887, No. 22,144.

*To all whom it may concern:*

Be it known that I, HIRAM STEVENS MAXIM, mechanical engineer, a citizen of the United States of America, and a resident of London, England, have invented new and useful Improvements in Eyeleting and Riveting Machines, (for which I have obtained patents in the following countries: Great Britain, No. 10,686, bearing date August 20, 1886; France, No. 183,853, bearing date May 27, 1887, and Italy, No. 22,144, dated August 8, 1887,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to machines which are chiefly designed for perforating cloth, leather, or other materials, inserting eyelets therein, and riveting or clinching the said eyelets. My improved machines are, however, applicable for similar purposes—such as the securing of rivets in leather or other materials.

One object of my said invention is to provide for piercing or punching the cloth, leather, or other material and inserting an eyelet or group of eyelets therein by one operation. For this purpose, when the material is to be pierced without removing or cutting pieces therefrom, I employ pointed pins or studs upon which the eyelets are to be placed, and tubes or tubular dies which slide upon the said pins or studs and force the cloth, leather, or other material thereon, pressing it closely against the flanges of the said eyelets. These pointed pins or studs are very advantageous for perforating cloth or other woven fabrics, as they effect this operation without liability to injury of the threads and consequent weakening of the said fabrics. When pieces are to be cut or punched out of the material to admit the eyelets, I substitute for the said pointed pins or studs tubular punches adapted to enter the aforesaid tubes or dies.

Another object of my said invention is to provide for the simultaneous insertion of two or more eyelets in any desired relative positions. For this purpose I arrange two or more of the said pins, studs, or punches, and tubes or dies in groups, as required, and provide means for operating the same simultaneously, as hereinafter set forth. I also pro-

vide for simultaneously riveting or clinching two or more eyelets.

My said invention, moreover, comprises an adjustable gage for regulating the distance between the eyelets or groups of eyelets inserted in the cloth or other material. It also comprises various other improvements, hereinafter described.

In the accompanying drawings I have shown how my said invention may be conveniently and advantageously carried into practice.

Figure 1 is a side elevation, and Fig. 2 a rear elevation, of one form of my improved machine. Fig. 3 is a vertical central section on the line  $xx$ , Fig. 1, and Fig. 4 a vertical central section on the line  $x'x'$ , Fig. 2, both drawn to an enlarged scale, showing a portion of the said machine. Fig. 5 is a horizontal section on the line  $x^2x^2$ , Figs. 3 and 4; and Fig. 6 is a vertical section on the line  $x^3x^3$ , Figs. 4 and 5.

A is a standard or post which is to be secured to the floor of a room or to any other suitable support.

B is a disk or head which is supported upon the top of the said standard.

C is a vertical rod or shaft, which has a tube, D, fitted thereon and held in place by means of a collar,  $C^2$ , secured upon the rod or shaft C by a pin,  $C^*$ , passing through the same and through the said tube, so that, although the said tube is capable of rotation upon the said shaft, it will participate in any endwise movement thereof. The rod or shaft C and tube D are arranged to slide up and down in the projecting part or boss  $A'$  of the standard A and in the disk or head B.

E is another disk or head which is screwed upon the upper end of the tube D, and is securely held in place thereon by means of the nut  $C'$ . The vertical rod or shaft C is coupled at its lower end, by means of a link, F, to a forked lever or treadle, G, which is pivoted at  $G'$  to the standard or post A, the two parts of the forked end of the said lever passing through slots  $A^2$  in the said standard. By means of the said lever or treadle the upper disk, E, may be moved downward to insert the eyelets or to rivet or clinch the same, as hereinafter described. A pin or rod,  $E'$ , is



fixed in the disk E, and works in a hole, B', in the disk B, so that, although the disk E is free to move toward and away from the disk B, it will rotate therewith, as and for the purpose hereinafter specified. The shaft C is provided with a spring, H, for raising the same and the disk E when the treadle G is released.

I I are the pointed pins or studs for piercing the cloth or other material. These pins or studs are fixed in the disk B in a radial line equidistant from each other. K K are the tubes or tubular dies for forcing the material upon the said pins or studs I and upon the eyelets placed thereon. These tubes or tubular dies are fixed in the disk E above the pins or studs I. The said tubes or dies are slit longitudinally, so that they will expand when forced down upon the said pins or studs and upon the eyelets thereon. They will, therefore, at all times during their movement upon the said pins or studs fit closely around the same or around the eyelets thereon, and will consequently act very efficiently in pressing the material down against the flanges of the said eyelets. The lower ends of the said tubes or dies are preferably serrated or roughened, as shown, to increase their hold upon the material.

L is a plate in which are fixed two pins or rods, L'. These rods are fitted to slide vertically in holes in the disk B, in which they are retained by means of collars L<sup>2</sup>, secured upon them by means of screws L<sup>3</sup>. Two springs, L<sup>4</sup>, are inserted in recesses or cavities B<sup>3</sup> in the disk B, so that they support the plate L in the position shown. The said plate is made with holes L<sup>5</sup>, through which extend the pins or studs I. The object of this spring-plate is to push the material with the eyelets therein off the said pins or studs as soon as the treadle G is released.

M is an adjustable gage, which is attached to the plate L, for the purpose hereinafter specified. This gage is secured to the said plate by means of screws M', passing through slots M<sup>2</sup> therein, so that it can be adjusted toward or away from the pins or studs I. The said gage consists of a plate provided with pins or studs M<sup>3</sup>, so situated that when the cloth or other material has been perforated and a group of eyelets inserted therein the said eyelets can be placed upon the said pins or studs M<sup>3</sup>, and the material will then be in the proper position to be again perforated and to have another group of eyelets inserted therein. By these means the insertion of the groups of eyelets at regular intervals or at equal distances apart is effectually insured.

To prevent the lifting of the material off the eyelets by the tubes or tubular dies K in their upward or return movement, a spring plate or guard, N, is attached to the upper disk, E, substantially in the manner above described with reference to the plate L and lower disk, B. The said plate N is held in the position shown by means of springs N'. These springs will yield in the operation of

piercing or perforating the material and inserting the eyelets therein, and will then by their reaction cause the plate N to force the material away from the said tubes or dies K. The plate N is made with holes N<sup>2</sup>, through which the said tubes or dies will pass in the operation of the machine.

O O are anvils, which are firmly secured in the outer ends of recesses or cavities B<sup>3</sup> in the lower disk, B, and through which extend pins or rods O', provided with heads or flanges O<sup>2</sup>. Springs O<sup>3</sup> are placed in the recesses or cavities B<sup>3</sup>, which springs hold the said pins or rods in the position shown.

P P are dies, which are firmly fixed in the upper disk, E, and are provided with pins or studs P', adapted to enter the central holes in the anvils O, as and for the purpose hereinafter specified.

Q R are other anvils fixed in the lower disk, B, and S T are dies or hammers for operating in combination with the said anvils, as and for the purposes hereinafter specified.

In the apparatus shown in the drawings the different sets of tools for perforating the material and inserting the eyelets therein and for riveting or clinching the said eyelets are arranged radially, each set being at right angles to the adjacent sets. Therefore, by rotating the disks B E upon the shaft C through an angle of ninety degrees after the material has been perforated and a group of eyelets inserted therein the next set of tools for riveting or clinching the eyelets may be brought into suitable proximity to the operator to enable him to readily subject the eyelets to the action of the said tools.

A spring-catch is preferably arranged in combination with the lower disk or head, B, to facilitate the adjustment of the disks B E and to retain them in any desired position. This catch may consist of a forked rod, U, carrying an anti-friction roller, U', and fitted to slide in a tube or tubular casing, U<sup>2</sup>, secured in a recess or cavity in the table or platform V, which is supported upon the standard A and encircles the disk B. A spring, U<sup>3</sup>, is placed in the tube or casing U<sup>2</sup>, and acts upon the roller U', so that when the said disk is in either of its operative positions the said spring will cause the roller U' to enter the corresponding notch, B<sup>4</sup>, in the disk B.

A circumferential groove, B<sup>5</sup>, is formed in the disk B, and a guide-piece, W, is secured to the standard A and projects into the said groove, so that although the said disk is free to rotate yet upward movement thereof is prevented, thus obviating any liability to lifting of the said disk should the dies K stick upon the pins or studs I.

Y is a spring-catch for holding down the plate L while the upper disk, E, is repeatedly moved up and down to force the material properly upon the eyelets. This catch Y is pivoted at Y' upon a screw fixed in the table V, and is acted upon by a spring, Y<sup>2</sup>, whereby it is held in the position shown. It has an



inclined surface at  $Y^3$ , so that when the plate L is depressed it will force the said catch outward, and the said catch will then spring over the top of the said plate L, and will hold down the same. The said catch is provided with a handle,  $Y^4$ , whereby it may be disengaged from the plate L when required. This catch is not in all cases necessary, and may be dispensed with if desired.

The operation of the improved machine above described is as follows—that is to say, the disks B E are first so adjusted that the perforators or punches I are next the operator. Eyelets are then placed upon the said perforators, and the cloth or other material is placed in the desired position thereon. The treadle G is then rapidly depressed by the foot, so as to move the disk E downward. In this downward movement the dies K force the material upon the perforators or studs I and upon the eyelets thereon, the springs  $N'$  yielding to permit the necessary upward movement of the plate N relatively to the disk E, and the springs  $L^4$  yielding to permit the depression of the plate L. The catch Y then engages with the said plate and holds the same down, so that the treadle may, if necessary, be operated repeatedly to drive the material home upon the eyelets. When the treadle is released, the spring H, by its reaction, raises the disk E, and when the catch Y is disengaged from the plate L the springs  $L^4$  react and cause the said plate to rise and force the eyelets upward upon the said pins or studs I, so that the material, with the eyelets therein, may be easily removed from the said pins or studs. The material, with the eyelets therein, is then lifted, and the disks B E are rotated through an angle of ninety degrees to bring the anvils O and dies P next the operator. The eyelets are then placed upon the pins or rods  $O'$ , and the disk E is again depressed by means of the treadle G. In this downward movement of the said disk the pins or studs  $P'$  come in contact with the pins or rods  $O'$ , push the said pins or rods downward and enter the holes in the anvils O. The eyelets are then clinched or riveted by pressure or by impact between the dies P and the anvils O.

In some instances the cloth or other material is driven home or compressed upon the eyelets by means of the anvils R and the dies T, and the said eyelets are partially clinched by means of the anvils Q and the dies or hammers S, and the eyelets are then subjected to the action of the anvils O and dies P to complete the clinching or riveting of the said eyelets.

I sometimes so construct the machine that the riveting or clinching of one eyelet or group of eyelets will be effected simultaneously with the insertion of another eyelet or group of eyelets. In this case the various tools or sets of tools, instead of being arranged radially at right angles to each other, are arranged parallel to each other in a straight

row or series at equal distances apart, and the heads in which the said tools are fixed do not rotate. The adjustable gage above described is not required, as the pins or projections of the riveting or clinching tools serve as a gage for insuring the uniform spacing of the eyelets or groups of eyelets. The said riveting or clinching tools are sometimes fixed in adjustable plates, so that the length of the spaces between the eyelets or groups of eyelets may be increased or diminished. When two or more strips of material are to be united by means of groups of eyelets and stiffening plates or strips of metal or other suitable material placed thereon, the eyelets are first placed upon the aforesaid pointed pins or studs and the metal plate or strip is placed thereon, the cloth or other material is then laid upon the said pins or studs, and the upper disk or head is depressed to perforate the material and force the same upon the eyelets. Another metal plate or strip is sometimes placed upon the eyelets before riveting or clinching the same.

My improved machine is especially advantageous where strips of leather, canvas, cloth, or other material have to be secured together at regular intervals by groups of two or more eyelets, either with or without stiffening plates or strips of metal or other material. The said machine is moreover useful in cases where single eyelets are to be inserted in leather or other materials, and by inserting suitable tools in the aforesaid disks or heads it may be readily adapted for inserting and securing small rivets in such materials.

It is not essential that the perforating and riveting or clinching devices should be carried by disks, as above described. They may, if desired, be otherwise suitably arranged for the purposes of my invention.

What I claim is—

1. In an eyeleting or riveting machine, the combination, with one or more upwardly-projecting conical punches, each adapted to receive an eyelet, and a perforated spring-seated plate through which the punches extend, of a corresponding die or dies movable toward the punches and adapted to receive the punches and the eyelets thereon, whereby the punches will perforate the cloth or other material interposed between the punches and dies and force the eyelets therein, as set forth.

2. In an eyeleting or riveting machine, the combination, with a series of punches with conical ends adapted to receive eyelets upon them, a spring-seated perforated plate through which the punches extend, and corresponding dies for operating conjointly with the punches to perforate the cloth or other material and insert the eyelets therein, of a series of anvils or devices for riveting or clinching the eyelets previously inserted in the cloth by the punches, all of said devices being connected to simultaneously-moving supports, whereby the insertion of eyelets and



the riveting of others are performed by one operation, as set forth.

3. In an eyeleting or riveting machine, the combination of two rotating disks or heads provided, respectively, with studs or punches and corresponding dies and also with clinching or riveting devices, one of said disks being movable toward and away from the other, as set forth.

4. In an eyeleting or riveting machine, the combination, with the disks or heads, one movable toward and away from the other, of studs or punches set in one of the disks, and dies in the other, and spring-seated plates with perforations through which the studs and dies project, as and for the purpose set forth.

5. In an eyeleting-machine, the combination, with a perforating stud or punch, of a tubular die slit longitudinally and into which the stud projects when the machine is operated, as set forth.

6. In an eyeleting or riveting machine, the combination of a series of dies, a disk or head below the same, perforating studs or punches fixed therein, a spring-seated plate with perforations therein through which the studs project, and means, substantially as described, for locking or retaining the said plate when forced down against the force of the springs, as set forth.

7. The combination, with the movable heads or disks B E, of the anvils O, and the spring-seated rods or pins O', working in the same and set in one of said heads, and the dies P, with projecting pins or studs P' fixed to the other head, as set forth.

8. The combination, with the rotating disks or heads B E, provided with perforating and riveting or clinching devices, of the rod or shaft G, secured to head E, and passing through the head B, the lever G, connected to rod C for raising and lowering the same, and the spring H, surrounding the rod and acting to raise it when depressed, as described.

9. The combination, with the series of punches, of a gage-plate, M, adjustable with respect to the same and provided with studs or pins M<sup>3</sup>, adapted to be passed through the clinched or riveted eyelets in the material, and to so determine the points at which the next perforations are to be made, as set forth.

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

HIRAM STEVENS MAXIM.

Witnesses:

DAVID YOUNG,

PARKER W. PAGE.