(No Model.) 9 Sheets—Sheet 1.

J. MATHISON.

MACHINE FOR MAKING SHEET METAL BUTTONS.

No. 479,823. Patented Aug. 2, 1892.

FIG. 1.

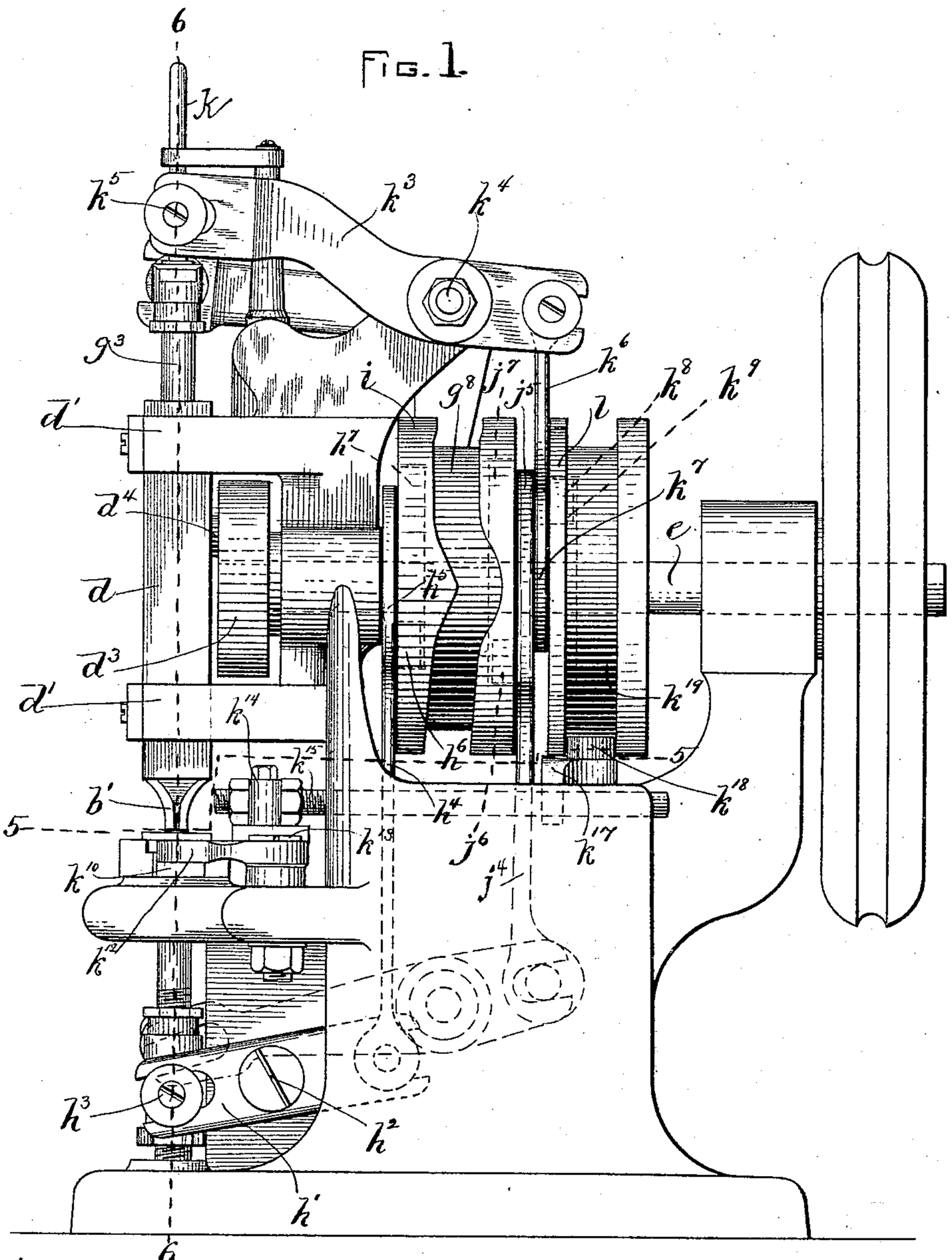

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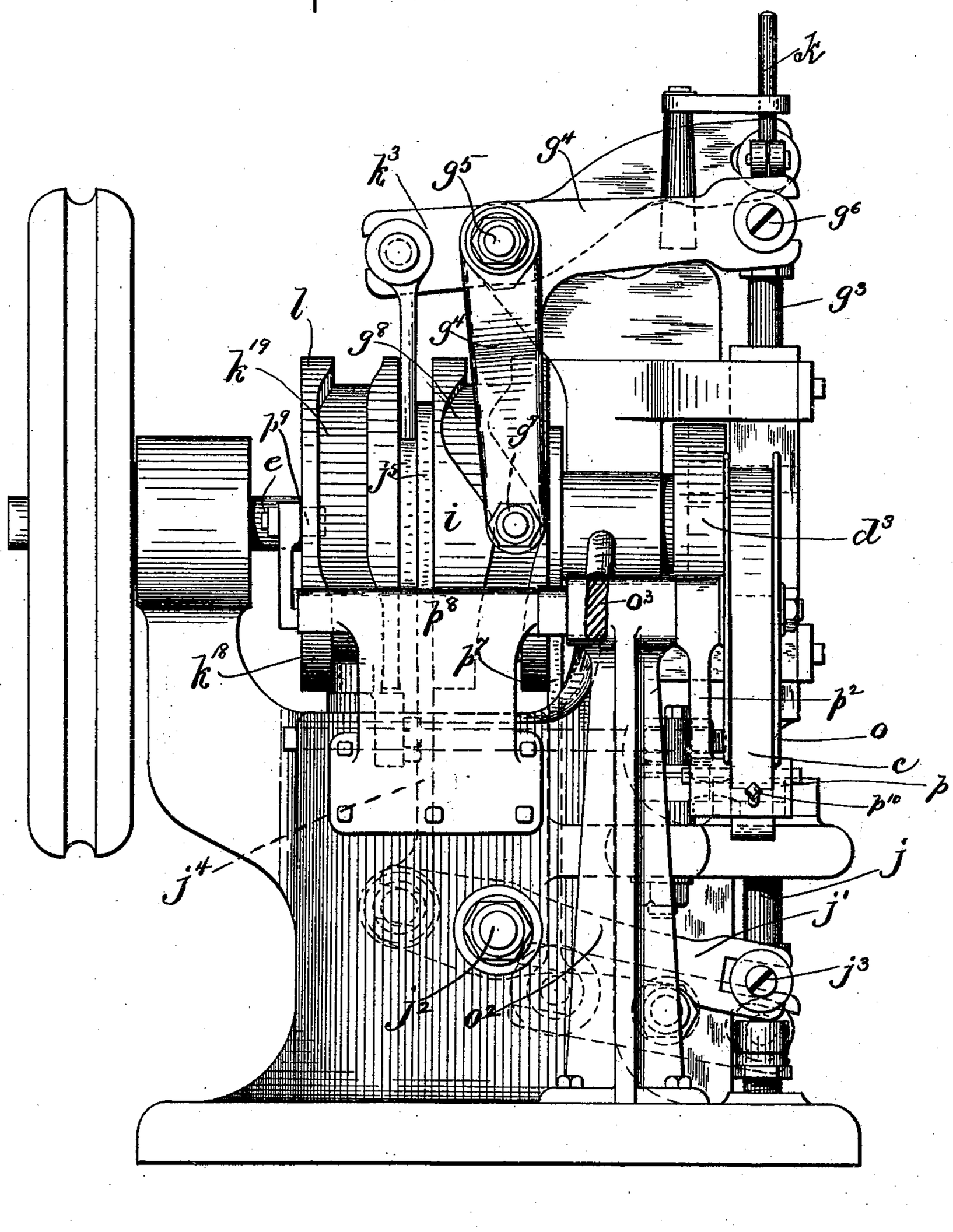
FIG. 2.



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MACHINE FOR MAKING SHEET METAL BUTTONS.

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FIG. 3a.

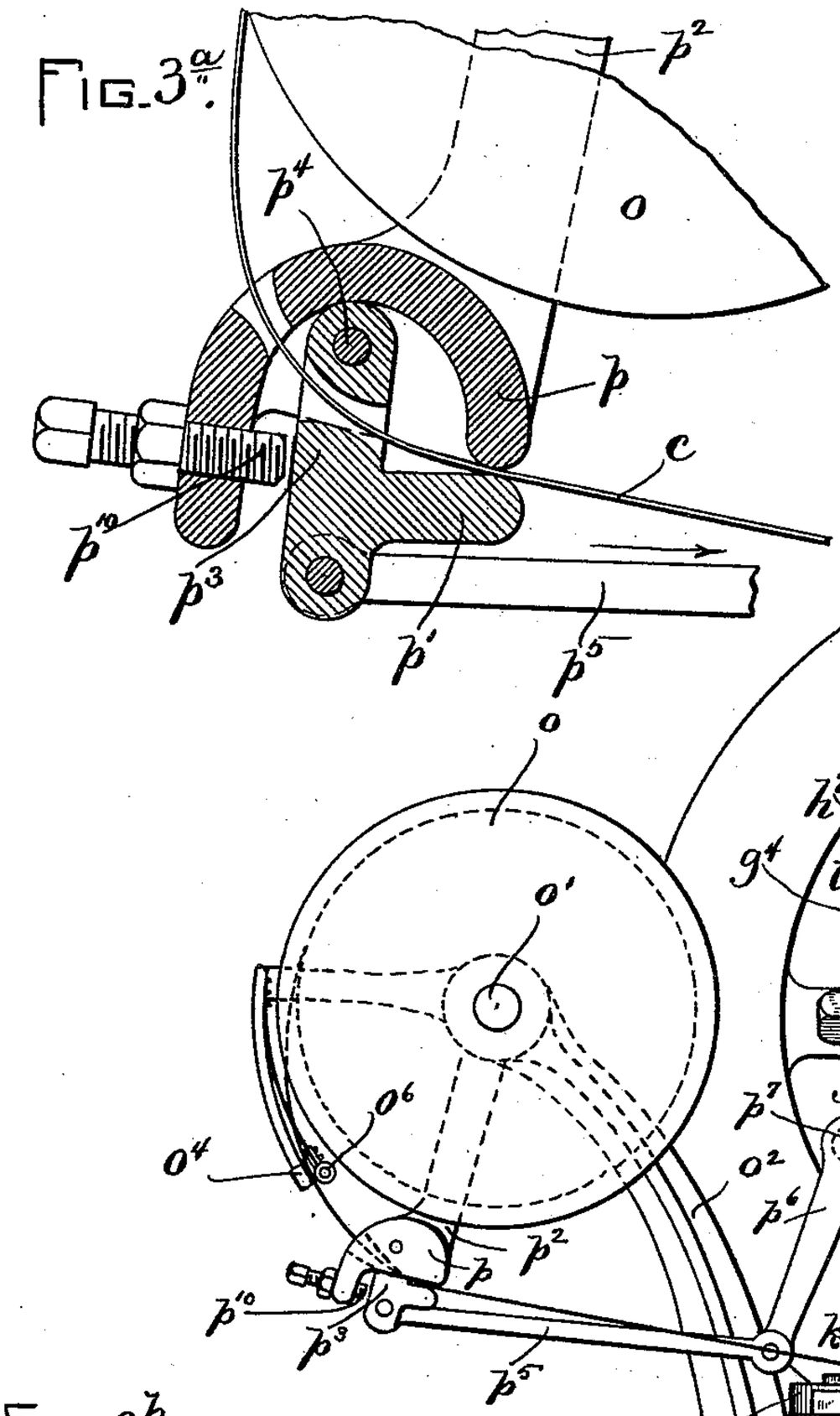
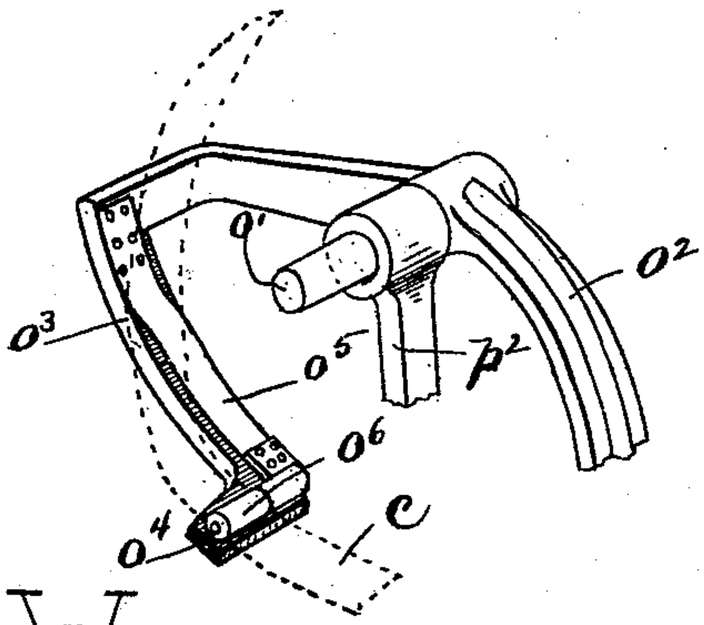


FIG. 3.

FIG. 3b.



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(No Model.) 9 Sheets—Sheet 4.

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MACHINE FOR MAKING SHEET METAL BUTTONS.

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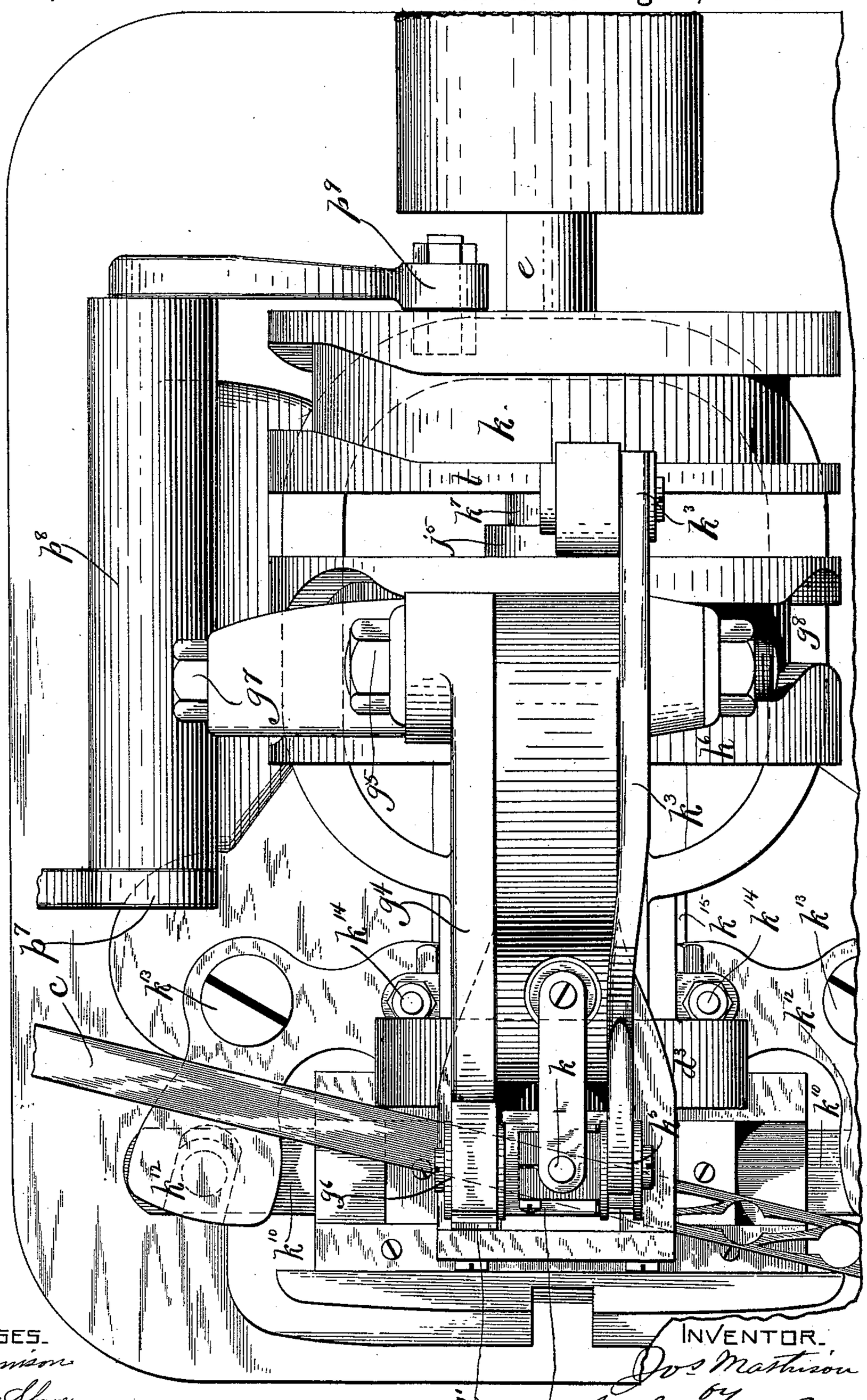

FIG. 4.

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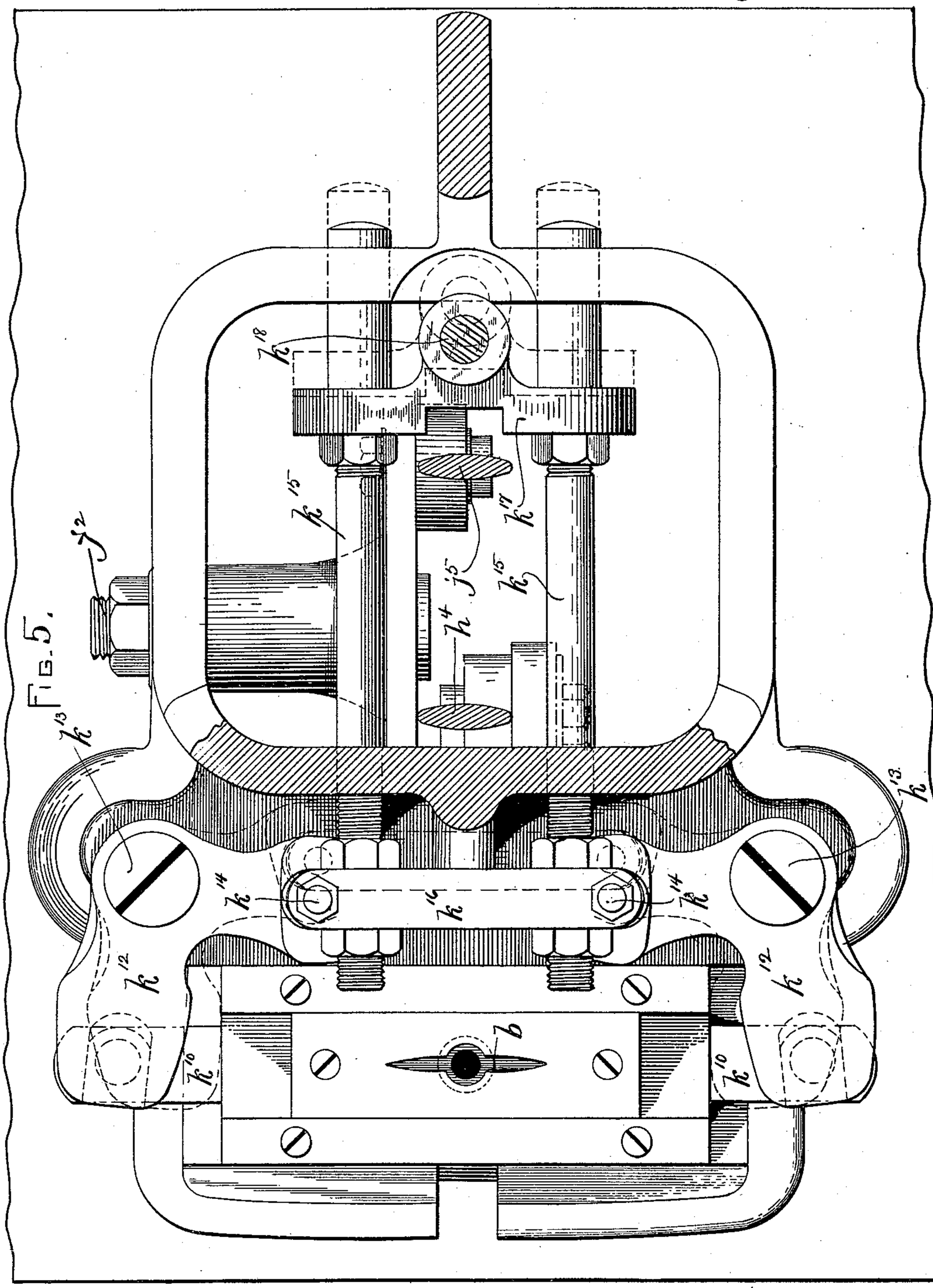
J. MATHISON.

MACHINE FOR MAKING SHEET METAL BUTTONS.

No. 479,823. Patented Aug. 2, 1892.



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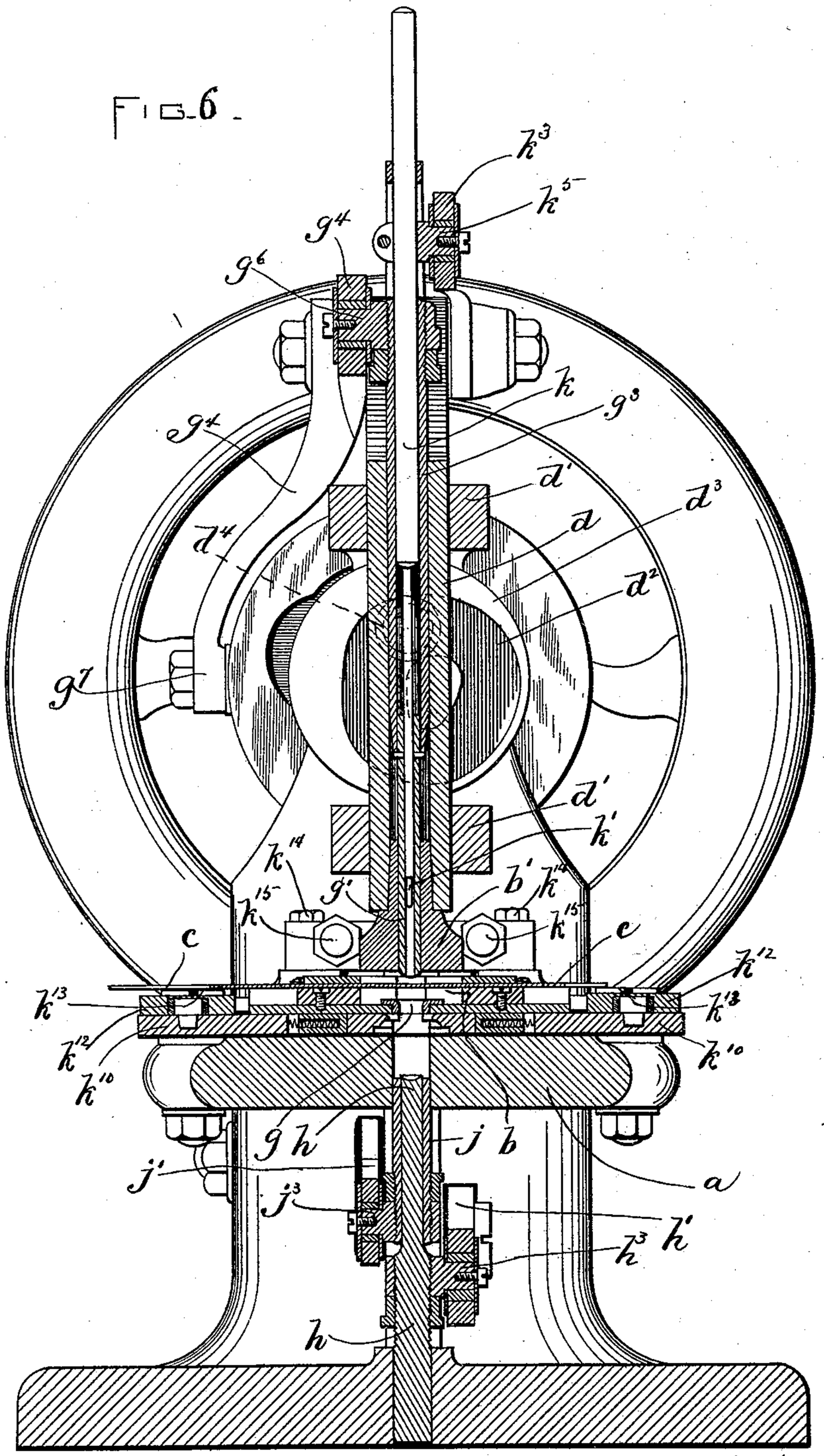
MACHINE FOR MAKING SHEET METAL BUTTONS.

No. 479,823. Patented Aug. 2, 1892.

FIG. 6.



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MACHINE FOR MAKING SHEET METAL BUTTONS.

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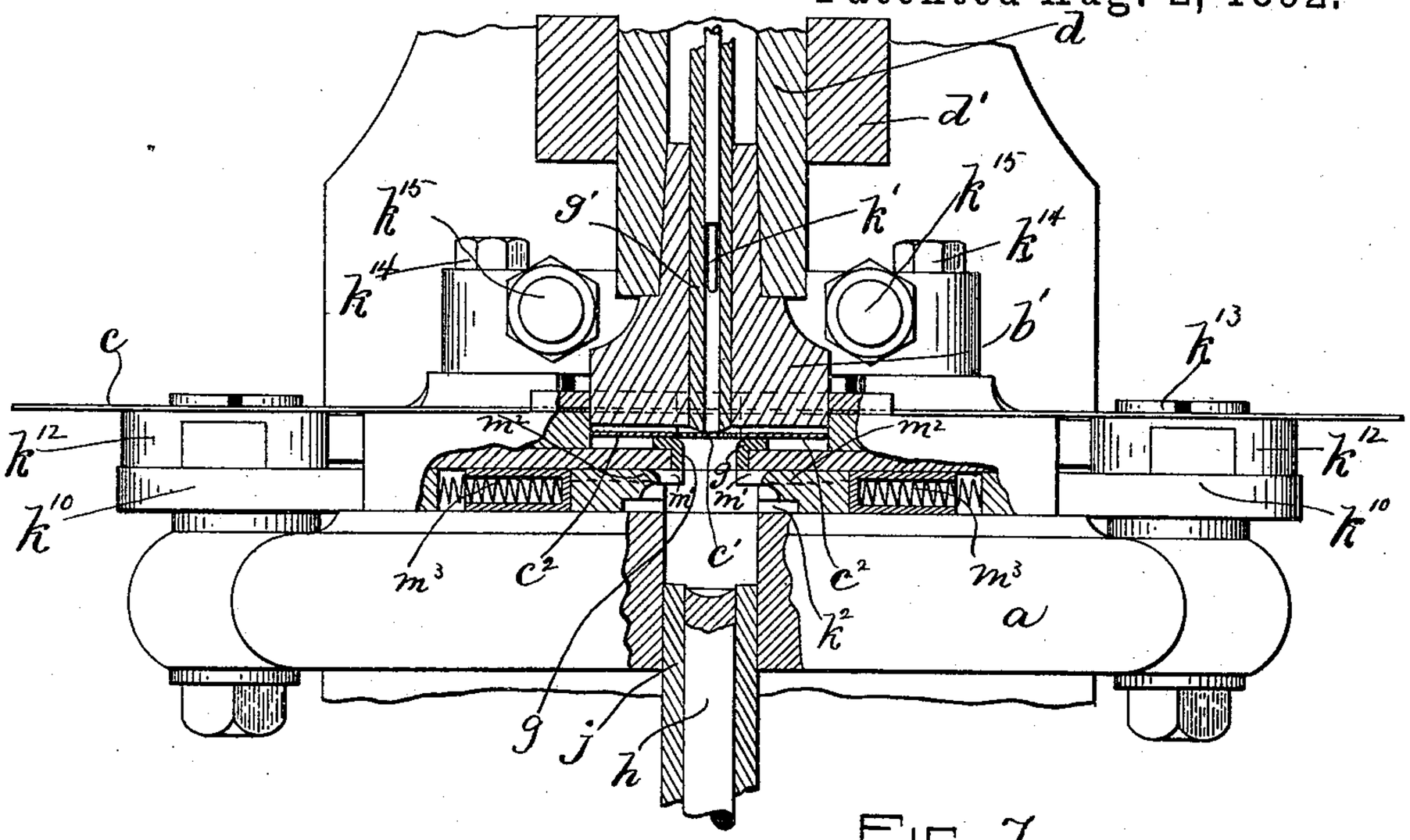

FIG. 7.

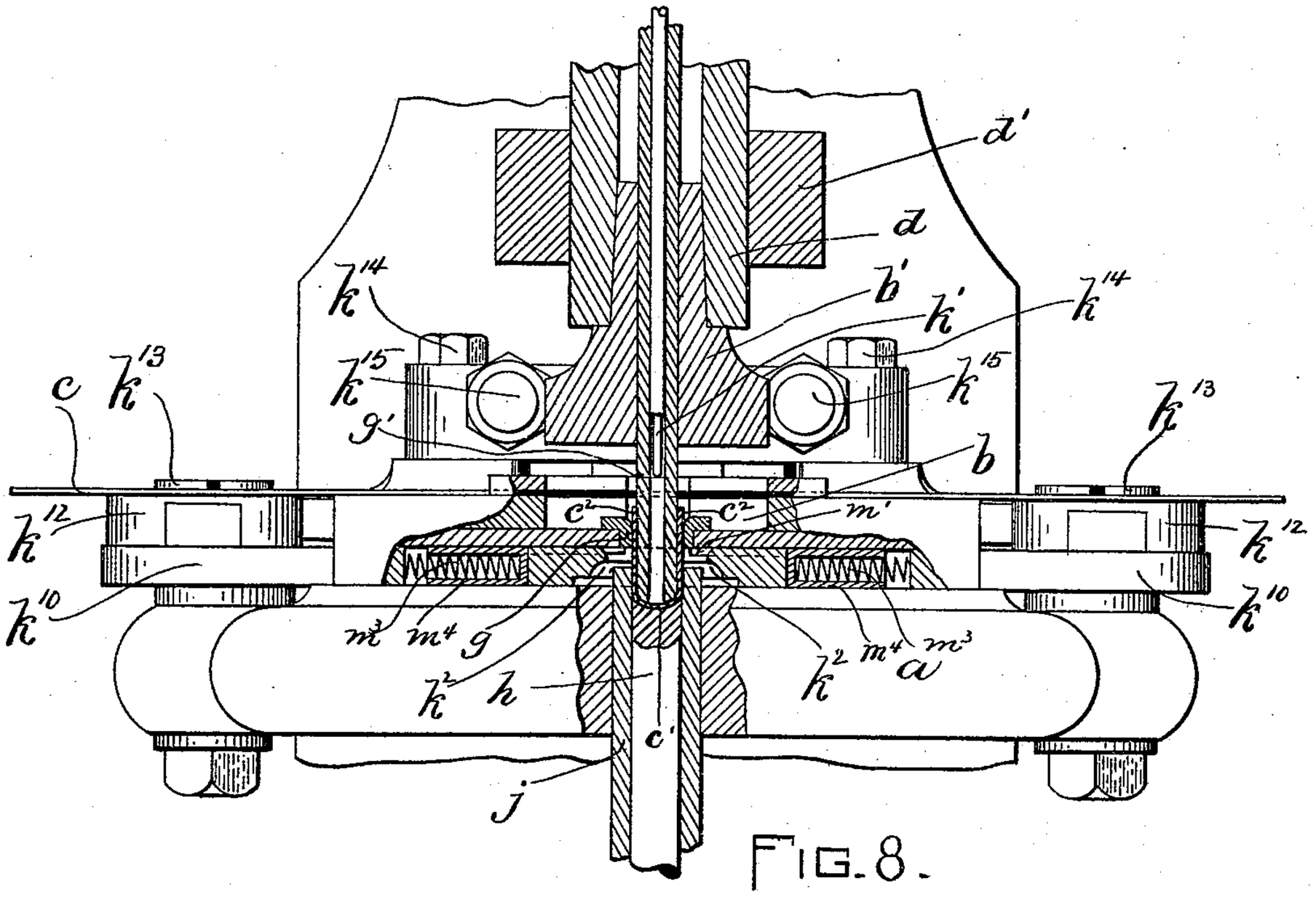

FIG. 8.

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MACHINE FOR MAKING SHEET METAL BUTTONS.

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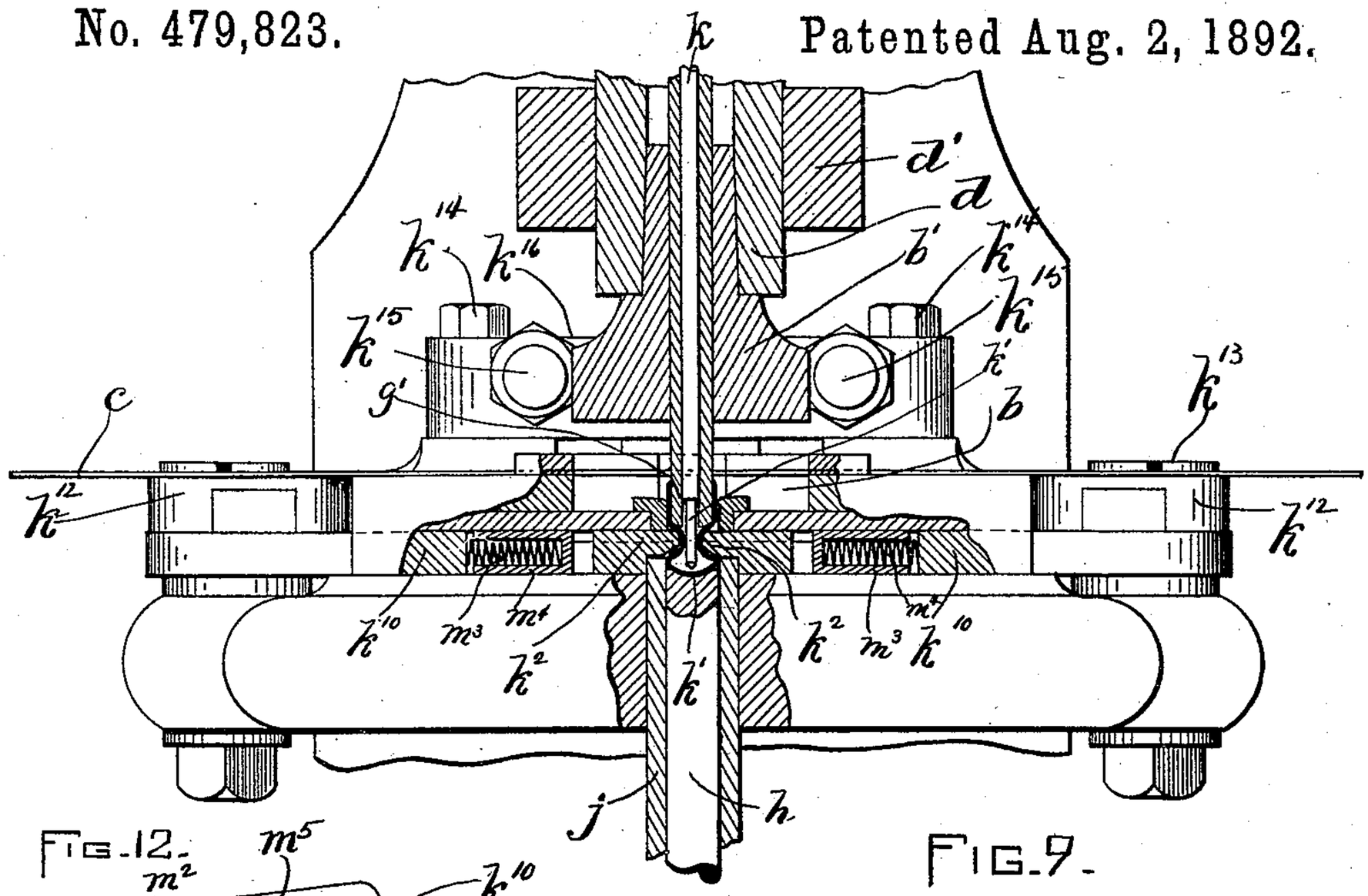

FIG. 9.

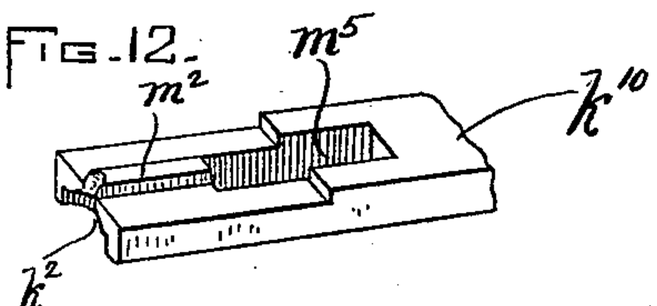

FIG. 12.

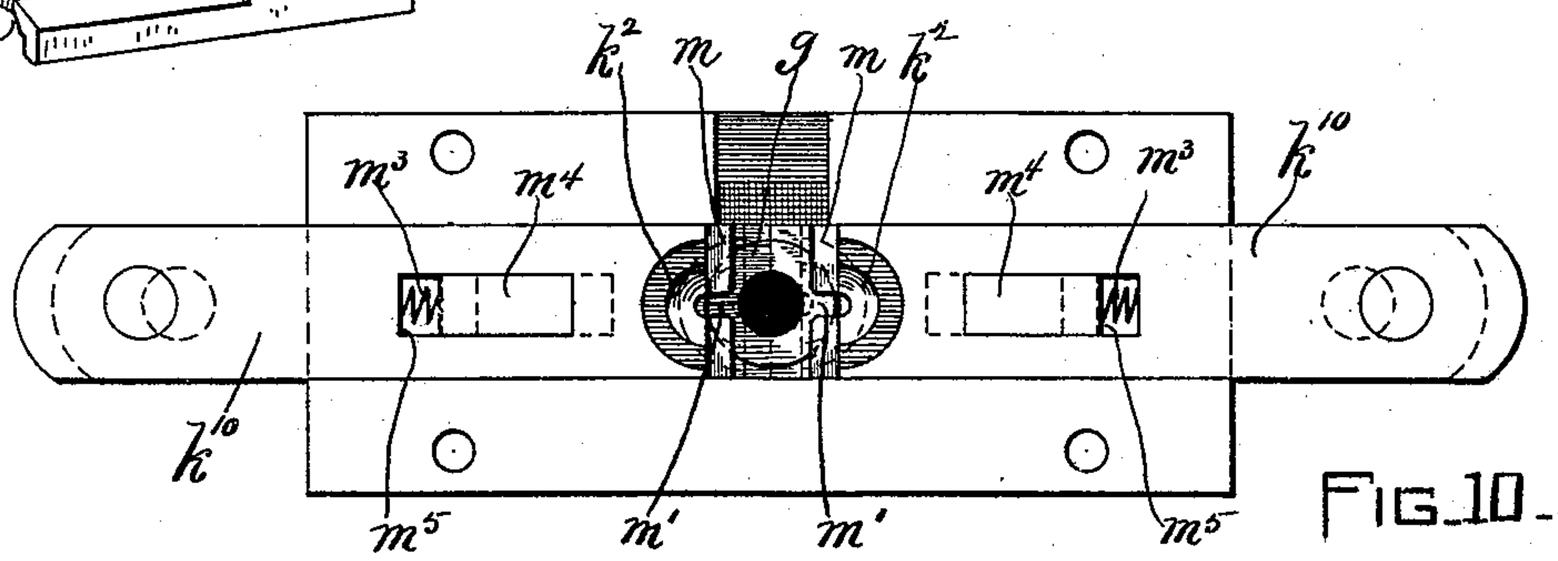

FIG. 10.

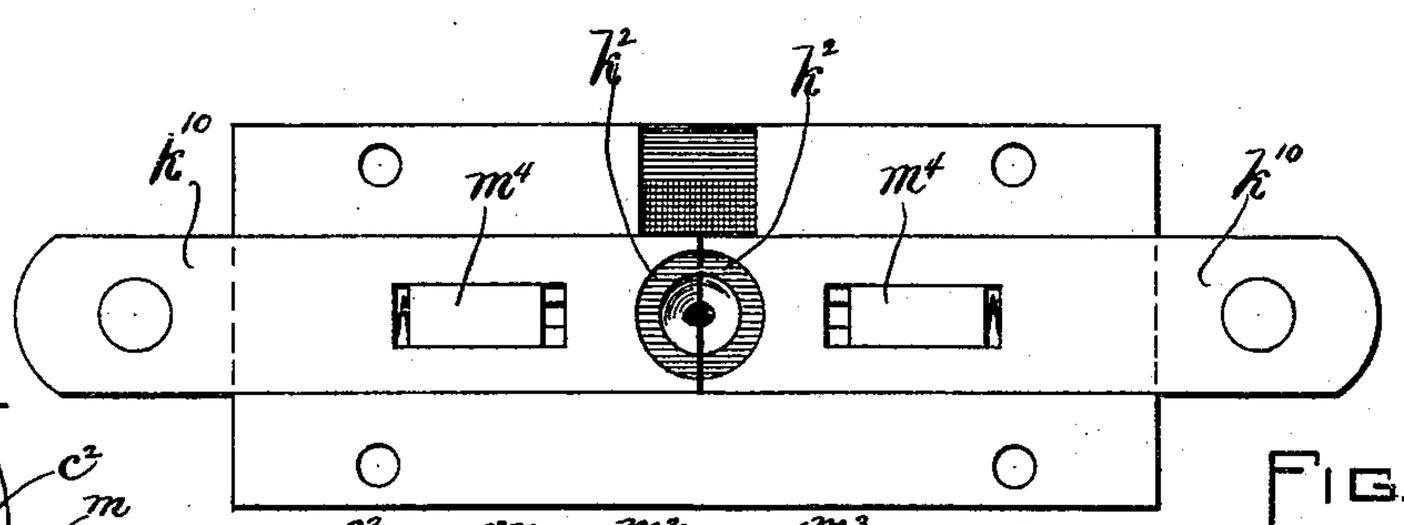

FIG. 11.

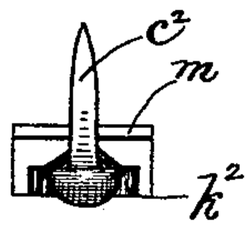

FIG. 15.

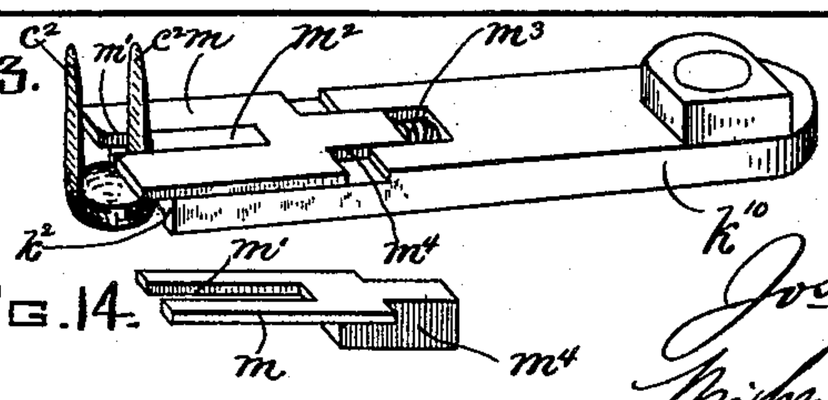

FIG. 13.

FIG. 14.

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MACHINE FOR MAKING SHEET METAL BUTTONS.

No. 479,823. Patented Aug. 2, 1892.

Fig. 16.

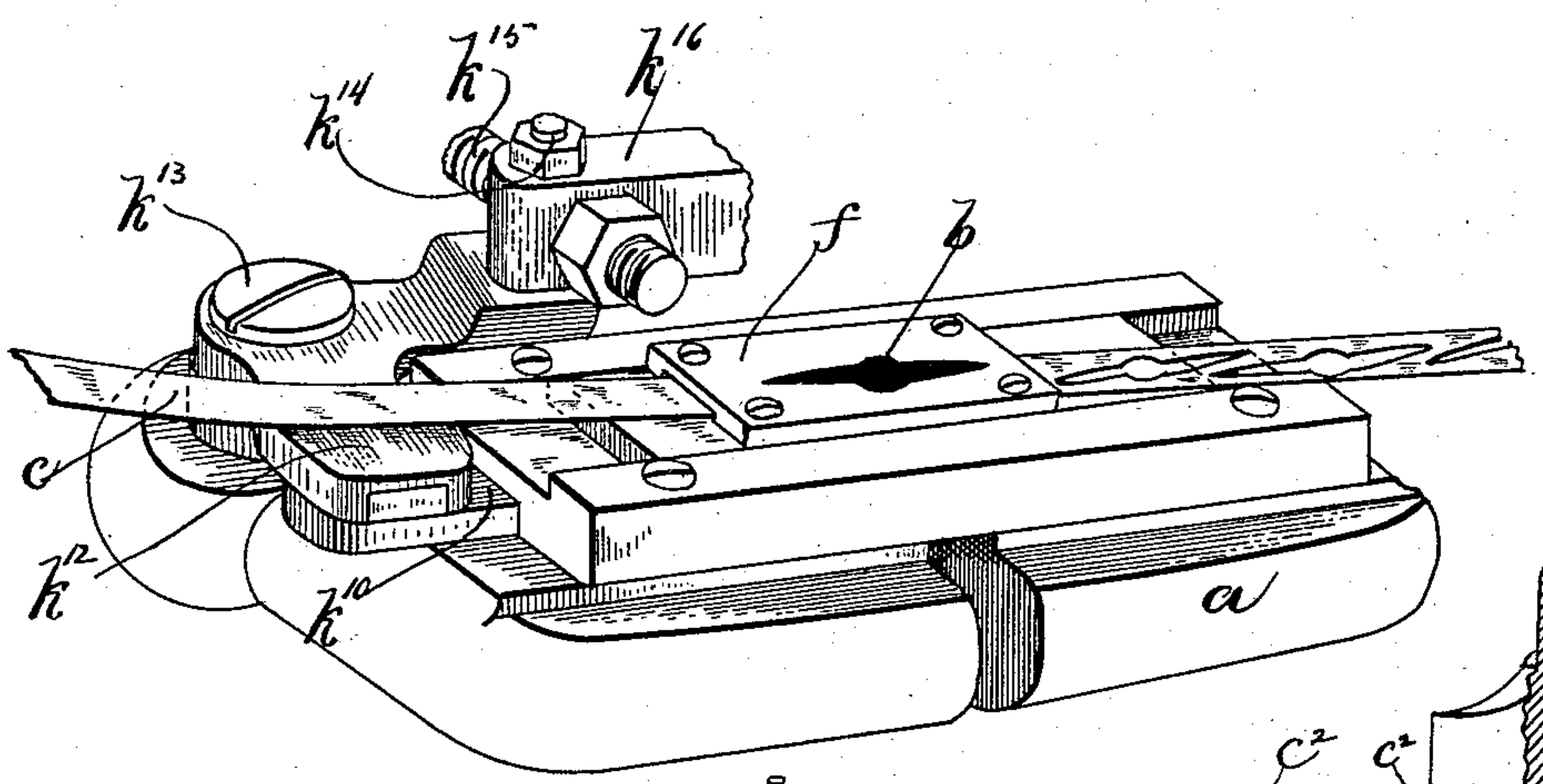


Fig. 17.

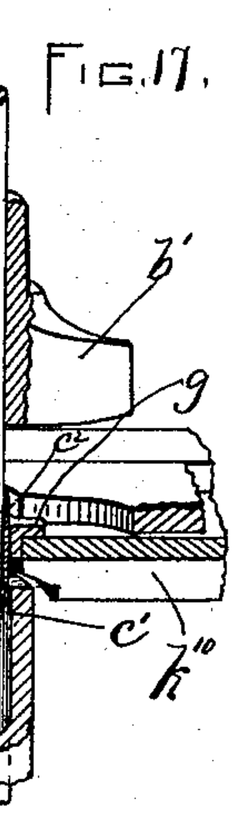


Fig. 17a.

Fig. 18.

Fig. 18.

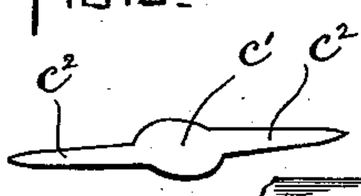
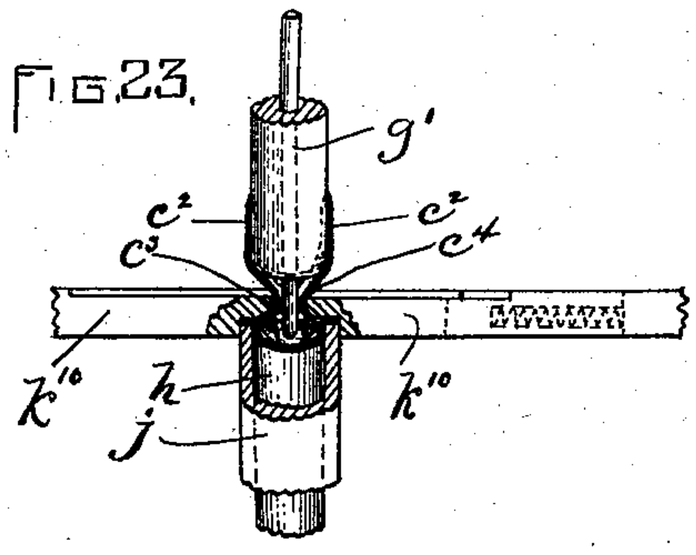


Fig. 20.

Fig. 21.

Fig. 22.

Fig. 23.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING SHEET-METAL BUTTONS.

SPECIFICATION forming part of Letters Patent No. 479,823, dated August 2, 1892.

Application filed June 26, 1891. Serial No. 397,605. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH MATHISON, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Machines for Making Sheet-Metal Buttons, of which the following is a specification.

This invention has for its object to provide a machine adapted to cut out blanks from a strip of sheet metal, each blank being composed of a circular central portion and two pointed arms or wings integral with the central portion and projecting from opposite sides thereof, and forming said blanks by successive steps into shoe-buttons, each button having a dome-shaped head formed by imparting a concavo-convex form to the central portion of the blank, a two-part shank formed by imparting a concavo-convex form in cross-section to the inner portions of the two arms or wings and bending said arms inwardly under the head, so that the edges of the arms meet under the head and form a substantially tubular shank, said arms being bent outwardly below the body of the shank to form feet to rest on the material to which the button is attached, and prongs adapted to penetrate said material and be clinched on the under side thereof.

The invention consists in the improvements which I will now proceed to describe and claim.

In the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of my improved button-making machine. Fig. 2 represents an elevation from the opposite side. Fig. 3 represents an end elevation. Figs. 3^a and 3^b represent details of the feed mechanism shown in Fig. 3. Fig. 4 represents a top view, portions of the machine being broken away. Fig. 5 represents a section on line 5 5 of Fig. 1. Fig. 6 represents a section on line 6 6 of Fig 1. Figs. 7, 8, and 9 represent views of portions of the section shown in Fig. 6, showing different stages of the operation. Figs. 10 to 23, inclusive, represent views hereinafter referred to.

In the drawings, *a* represents a fixed bed or table, on which is mounted a female die *b*, formed, as shown in Fig. 5, to co-operate with a corresponding male die *b'* in cutting from a strip *c* of sheet metal blanks of the general form shown in Fig. 19, each blank being composed of the circular central part *c'* and the two arms or wings c^2 c^2, projecting in opposite directions from said central part. The male die *b'* is fixed to a vertical plunger or carrier *d*, which is movable in guides *d' d'*, affixed to the supporting-frame, and is reciprocated vertically by means of a cam-groove d^2 in a disk d^3, affixed to the driving-shaft *e*, and a trundle-roll d^4, secured to the carrier *d* and entering the groove d^2. Each descent of the male die into the female die causes it to punch a blank from the strip *c*, as shown in Fig. 7. The strip *c* is guided across the die *b* by means of a guide or holder *f*, (best shown in Fig. 16,) said guide having an orifice formed in it of suitable shape to receive the male die *b'*. When the male die descends, the blank cut thereby from the strip *c* is forced downwardly upon an annular die *g*, which co-operates with a cylindrical plunger *g'*, movable in an orifice in the die *b'*, said plunger *g'* being adapted to pass through the die *g*, and thus force the central part *c'* of the blank downwardly through said annular die, at the same time giving said central portion a concavo-convex or cup shape and bending the arms or wings c^2 c^2 upwardly, as shown in Fig. 8, the blank being thus given a form such as is represented in Figs. 8, 13, and 17^a. The plunger *g'* is affixed at its upper end to a tubular holder or carrier g^3, which is vertically movable in the carrier *d* and is vertically reciprocated by means of a bell-crank lever g^4, pivoted at g^5 to the supporting-frame and having one of its arms engaged with a stud g^6, secured to the tubular holder g^3, its other arm having a trundle-roll g^7, Figs. 2, 3, and 6, which enters a cam-groove g^8 in the wheel or disk *i* on the shaft *e*. It should be here stated that there is a cylindrical anvil *h* below the annular die *g*, said anvil having a concave upper end, which co-operates with the lower end of the plunger *g'*, the latter being convex, in imparting the concavo-convex form to the central portion of the blank, said anvil being forced upwardly to cause it to act on the blank by means of a lever *h'*, Fig. 1, pivoted at h^2 to the supporting-frame and engaged at one end with a stud h^3, secured to the shank of the anvil *h*, and at the other end with a vertical rod h^4, on the upper end of which is

formed a yoke or head h^5, having a trundle-roll h^6, which engages a cam-groove h^7, Figs. 1 and 3, in a wheel or disk i, affixed to the shaft e, the rotation of said shaft causing the lever h' to oscillate, and thus vertically reciprocate the anvil h in a manner that will be readily understood.

j represents a tubular holder, which surrounds the anvil h and projects above the upper end of the latter, said holder being formed to fit closely upon the exterior of the blank when the latter is in the position shown in Figs. 8 and 17, the object of said tubular holder being to hold a blank in a fixed central position and to assist in forming its exterior, as will be seen by reference to Figs. 8 and 17. The tubular holder j is vertically reciprocated by means of a lever j', which is pivoted at j^2 to the supporting-frame and is engaged at one end with a stud j^3, affixed to the tubular holder j, and at its other end with a vertical rod j^4, having at its upper end a yoke or head j^5, on which is a trundle-roll j^6, (see dotted lines in Fig. 1,) engaged with a cam-groove j^7 in the wheel or disk i.

k represents a vertical rod, which is fitted to slide in a central orifice in the tubular holder g^3, to which the die g is affixed. Said rod has affixed to its lower end a small finger or mandrel k', which projects below the plunger g' when the rod k is depressed, as shown in Fig. 9, and is in position to co-operate with a pair of shank-forming dies k^2 k^2, presently described, in acting on the arms c^2 c^2 of the blank and bending said arms inwardly toward each other at a point close to the head of the button, and thus forming a two-part shank c^3, which is an important feature of the button shown in Fig. 21. The rod k is reciprocated vertically by means of a lever k^3, Figs. 1, 2, and 6, pivoted at k^4, Fig. 1, to the supporting-frame and engaged at one end with a stud k^5, affixed to the rod k, and at its other end with a vertical rod k^6, which has a yoke or head k^7, provided with a trundle-roll k^8, (see dotted lines in Fig. 1,) which enters a cam-groove k^9 in a wheel or disk l, affixed to the shaft e. The dies k^2 k^2, which co-operate with the mandrel k' in forming the button-shank, are provided with concave acting faces, which are formed to indent the arms c^2 c^2 when the dies k^2 k^2 are forced inwardly or toward each other, thus imparting a concavo-convex form to each arm at a point close to the head of the button by bending the metal of said arms laterally around the mandrel k'. The plunger g' is raised to the position shown in Fig. 9 when the dies k^2 k^2 are operating, so that the lower end of the plunger forms a shoulder to co-operate with said dies in forming the shoulders c^4 c^4 on the completed button below the two-part shank c^3, Fig. 21. The dies k^2 k^2 are affixed to slides k^{10} k^{10}, which are movable in guides provided for them on the supporting-frame and are moved simultaneously toward and from each other by means of bell-crank levers k^{12} k^{12}, Figs. 4 and 5, pivoted at k^{13} k^{13} to the supporting-frame and engaged with the slides k^{10} and with studs k^{14} k^{14} on a sliding frame composed of parallel rods k^{15} k^{15}, fitted to slide horizontally in guides in the supporting-frame, and cross-heads k^{16} k^{17}, connecting said rods. The cross-head k^{17} is provided with a trundle-roll k^{18}, entering a cam-groove k^{19} in the wheel or disk l, said cam-groove being formed to impart a short reciprocating motion to the cross-head k^{17} and the frame to which said cross-head is affixed and of which it is a member, thus causing the bell-crank levers k^{12} to oscillate on their pivots and reciprocate the slides k^{10} and the dies k^2 thereon.

To maintain the blank in the proper position while the dies k^2 are operating upon it, I provide two slotted holding-plates m m, the slots m' of which are formed to receive the arms c^2 of the blank. There are two plates m, one for each die k^2, and said plates are movable independently on said dies to a limited extent, each die having on its upper side a guiding rib or projection m^2, which projects into the slot m' of the corresponding holding-plate m and governs the direction of the independent movement of said plate. The holding-plates m are pressed forward by springs m^3, interposed between shoulders formed on the slides k^{10} and the ends of spring-holding pockets formed in offsets m^4 on the plates m, the dies k^2 being provided with slots m^5 to receive said offsets. (See Figs. 12, 13, and 14.) One of the plates m engages one arm c^2 and the other plate m engages the other arm c^2 of the blank, said plates co-operating in keeping the arms in the proper position relatively to the dies k^2 and preventing the blank from turning during the operation.

The operation of the machine is as follows: The strip c is fed to place over the female die b and under the male die b' while the latter is raised, as shown in Fig. 6, by intermittently-operating feeding mechanism, presently described, and is then held stationary while the male die b' descends and cuts out a blank from the strip, the blank being forced downwardly by the male die onto the annular die g, as shown in Fig. 7. The male die then rises, and at the same time or immediately after the plunger g' descends and gives to the blank the form shown in Figs. 8, 17, and 17^a. The anvil h and tubular holder j are at the lowest extreme of their movement while the blank is being cut out, as shown in Fig. 7, and they rise while the plunger g' is descending, so that the anvil meets the lower end of the plunger and co-operates therewith in imparting a concavo-convex form to the central portion of the blank, while the tubular holder j rises higher and receives the central portion of the blank and portions of the arms c^2 thereof, as shown in Fig. 8. The plunger g' is now raised to a point above the upper surfaces of the dies k^2, as shown in Fig. 9, and the said dies k^2 are moved inwardly upon

the arms c^2 c^2 of the blank, the mandrel k' remaining depressed below the lower end of the plunger. The slotted plates m m, the outer ends of which project outwardly beyond the acting faces of the dies k^2, are caused by the forward movement of the said dies to engage the arms c^2 of the button, as indicated in Fig. 13, so that the button is securely held in the proper position for the action of the dies. The dies are moved inwardly, as before stated, and are thus caused to bend inwardly the portions of the arms adjoining the head or central portion of the blank, thus forming a shank c^3, and at the same time cooperating with the lower end of the plunger g' in forming the shoulders c^4, said shoulders constituting the feet in the completed button, which bear upon the material to which the button is affixed. The anvil h rises to co-operate with the dies k^2 k^2 in bending the arms of the blank, the movement of said anvil being such that it continually supports the head or central portion of the blank. The formation of the button is now completed, and the button is now released by the separation of the dies k^2 k^2, the depression of the anvil h and tubular holder j, and the descent of the plunger g', the plunger descending after the dies have separated and the anvil and holder have been depressed. The descent of the plunger g' carries the button below the annular die g, so that the lower edge of said die will prevent the button from being carried upwardly by the plunger g' when the latter next rises, the upper ends of the prongs of the button catching on the lower end of the annular die g, so that the button is thus detached from the plunger. The mandrel k' may remain depressed after the plunger g' rises, the mandrel being thus caused to knock the button from the plunger when the latter rises. The strip c is fed diagonally between the dies b and b', as shown in Fig. 4, so that each blank is cut in a diagonal direction, the object of this arrangement being to minimize the waste of material. The strip c is preferably of a width barely exceeding the diameter of the central portion of the blank.

The strip-feeding mechanism, which I have shown in the present instance in Figs 3, 3^a, and 3^b, comprises a reel o, mounted to rotate on a stud o' on a fixed arm or bracket o^2, two jaws p and p', between which the strip c passes on its way from the reel to the dies b b', (the strip c being wound upon the reel o,) and means for reciprocating or oscillating said jaws, the latter being constructed to close upon and feed the strip while moving in one direction and to slip loosely on the strip without moving it while moving in the opposite direction. The jaw p is fixed rigidly to an arm p^2, which is hung to oscillate loosely on the stud o', while the jaw p' is formed on a short lever p^3, which is pivoted at p^4 to the arm p^2.

p^5 represents a connecting-rod, which connects the lever p^3 with one arm of a two-armed lever p^6, which is pivoted at p^7 to a fixed arm or bracket p^8 on the supporting-frame, the other arm of said lever having a trundle-roll or stud p^9, (see dotted lines in Fig. 3,) which enters a cam-groove (not shown) in the rear side of the wheel or disk i. The lever p^6 is oscillated by the rotation of the wheel i and when the connecting-rod p^5 is moving in the direction indicated by the arrow in Fig. 3^a causes the jaw p' to co-operate with the jaw p in grasping the strip c, the jaw p' being pressed toward the jaw p by said movement of the connecting-rod p^5, so that the jaws are closed upon the strip. When the connecting-rod p^5 is moved in the opposite direction, the lever p^3 is swung backwardly against a stop-screw p^{10}, the jaw p' being depressed or separated from the jaw p, so that the jaws move idly over the strip.

o^3 represents a curved arm affixed to the arm or bracket o^2, said arm o^3 having a jaw o^4 on its lower end, arranged to bear on one side of the strip c at a point behind the jaws p and p'.

o^5 represents a spring attached to the arm o^3 and carrying on its free end a roller-jaw o^6, which bears upon the strip c at a point opposite the jaw o^4. The object of the jaws o^4 and o^6 is to prevent the strip from running backwardly or uncoiling on the reel while the feeding-jaws are moving backward.

I do not limit myself to the particular strip-feeding mechanism here shown, as I may employ any other suitable mechanism to intermittently feed the strip and hold it between the feed movements.

My invention is not limited to the various details and devices for forming the button hereinbefore described, and I may depart from the construction and general arrangement of said devices and may employ other mechanism to actuate the parts that operate on the blank without departing from the spirit of my invention.

The machine may be constructed to make buttons for use on various articles besides shoes, such as gloves, &c.

It will be observed that the annular die arranged below the female cutting-die, so as to receive the central portion of the blank from said die, the plunger that enters the annular die, and the instrumentalities that follow said annular die and plunger in acting on the blank constitute blank folding and shaping devices, whereby the blank is taken at the point where it is delivered by the cutting-dies and without handling is converted into a pronged button.

I believe myself to be the first to combine blank-cutting dies, a feeding device adapted to feed sheet metal to said dies, and blank folding and shaping devices, which convert the blanks cut by said dies into a pronged button without handling of the blank. I therefore desire to cover as broadly as possible within legal bounds the combination of said elements—viz., cutting-dies, a material-feeding device, and blank folding and shaping

devices—without limiting myself to the particular construction and organization of said elements hereinbefore shown and described.

I do not limit myself, however, to the conjoint use of the cutting-dies, material feed, and blank-folding devices, since it is possible to cut out the blanks in a separate machine and feed them to the folding and shaping devices.

Each of the above-described elements or component parts of the folding and shaping mechanism may be used in connection with other elements differently constructed. For example, the annular die and plunger may be used in connection with any suitable substitute for the shank-forming dies and mandrel, and said dies and mandrel may be used with any other suitable means for imparting to the blank the shape shown in Fig. 17ª before the formation of the shank and for forming the shoulders c^4 c^4, Fig. 21, during or after the formation of the shank.

The tubular holder *j*, surrounding the anvil, is intended, mainly, to prevent the circular margin of the button-head from breaking or buckling at the intersection of the arms c^2 c^2 with said head when the blank shown in Fig. 17ª is being converted into the pronged and shanked button shown in Fig. 21, and when it is not important that such breaking or buckling be prevented said tubular holder may be omitted.

I claim—

1. In a machine for making pronged buttons from sheet metal, the combination of blank-cutting dies, feeding mechanism arranged to feed a strip of sheet metal to said dies, a plunger and anvil for shaping the central portion of the blank, and dies for bending the ends of the blank to form prongs.

2. In a machine for making pronged sheet-metal buttons, the combination of a fixed female cutting-die, a reciprocating male cutting-die, feeding mechanism for feeding a strip of sheet metal between said dies, and blank folding and forming mechanism comprising a fixed annular die located under the female cutting-die in position to receive a blank from the latter, a reciprocating plunger arranged to pass through both cutting-dies and co-operate with the annular die in imparting the preliminary shape to the blank, the anvil arranged to co-operate with the plunger in forming the button-head, the shank-forming dies arranged to act on the arms of the blank at a point between the anvil and plunger, the mandrel arranged to enter the space between the said arms and co-operate with the shank-forming dies in forming the shank, and the tubular holder surrounding the anvil and adapted to hold and prevent the displacement of the margin of the button-head during the operation of forming the shank, as set forth.

3. In a machine for making pronged sheet-metal buttons, the combination of an annular die and a plunger formed to enter said die and co-operate therewith in imparting a cup shape to the central portion of the blank hereinbefore described, and laterally-movable dies to co-operate with the annular die and plunger in bending the arms or wings of said blank to form prongs, as set forth.

4. In a machine for making pronged sheet-metal buttons, the combination of an annular die, a plunger formed to enter said die and partially form the button-head, and an anvil formed to co-operate with said plunger in perfecting the top of the button-head, and laterally-movable dies for forming the arms of the blank into prongs, as set forth.

5. In a machine for making sheet-metal buttons, the combination of an annular die, a plunger formed to enter said die and partially form the button-head, an anvil formed to co-operate with said plunger in perfecting the button-head, and a tubular holder surrounding the anvil and vertically movable relatively thereto, whereby it is adapted to co-operate with the plunger and anvil in shaping the marginal portion of the button-head, and mechanism for operating said plunger, anvil, and holder, as set forth.

6. In a machine for making sheet-metal buttons, the combination, with devices for holding a sheet-metal blank consisting of a concavo-convex head or central portion and arms or wings standing parallel with each other at opposite sides of said head, of a mandrel adapted to enter the space between said arms, shank-forming dies formed to co-operate with said mandrel in converting portions of said arms into a substantially tubular two-part shank, and mechanism for operating said mandrel and dies, as set forth.

7. In a machine for making sheet-metal buttons, the shank-forming dies adapted to close upon the two arms of the blank hereinbefore described and form portions of said arms into a shank, combined with the slotted arm-engaging plates yieldingly mounted on said dies and engaged with guides on the dies, as set forth.

8. In a machine for making sheet-metal buttons, the combination of a fixed annular die, a reciprocating plunger formed to enter said die and partially form the button-head, a reciprocating anvil which co-operates with the plunger in perfecting the button-head, the mandrel which enters the space between the arms of the blank, the shank-forming dies which are closed upon the arms of the blank at a point between the anvil and plunger and co-operate with the plunger and mandrel in forming the shank c^3 and shoulders c^4 of the button, and mechanism for operating said plunger, anvil, mandrel, and dies, as set forth.

9. In a machine for making pronged sheet-metal buttons, the combination of a fixed female cutting-die, a reciprocating male die formed to co-operate with the female die in cutting blanks of the form shown from sheet metal, a fixed annular die arranged to support the central portion of the said blank,

a reciprocating plunger movable in a guide or way formed for it in said male die, said plunger being arranged to pass through the female die and enter the annular die, and thereby force the central portion of the blank into the annular die, laterally-movable dies for bending the ends of the blank into prongs, and mechanism for reciprocating said male die and plunger, as set forth.

10. The combination of a fixed female cutting-die, a reciprocating male cutting-die, a fixed annular die arranged in line with the central portions of said dies, a reciprocating plunger movable in a guide or way in the male cutting-die and adapted to enter said annular die, a reciprocating mandrel movable in a guide or way in said plunger and adapted to project below the latter, a reciprocating anvil arranged to co-operate with the plunger in forming a button-head, a pair of reciprocating shank-forming dies arranged to act on the arms of a blank at a point between the annular die and the anvil, and mechanism for operating said reciprocating parts, as set forth.

11. The combination of the fixed female die, the movable male die, a carrier supporting the male die, means for reciprocating said carrier, the fixed annular die below the female die, the plunger movable in a way in the male die and carrier, the lever k^3, rod k^6, and cam k^8 for operating said plunger, and the laterally-movable dies k^2, as set forth.

12. The combination, with the male and female cutting-dies, the fixed annular die, the plunger, and means for operating said male die and plunger, of the reciprocating anvil h, the tubular holder j, surrounding said mandrel, the levers h' j', rods h^4 j^4, and cams h^7 j^7, whereby said anvil and holder are operated, the shank-forming dies arranged between the anvil and the plunger, and means for operating said dies, as set forth.

13. The combination of the fixed female die, the movable male die, a carrier supporting the male die, means for reciprocating said carrier, the fixed annular die below the female die, the plunger movable in a way in the male die and carrier, means for operating said plunger, the rod k, movable in a way in said plunger and provided at its lower end with the mandrel k', the lever k^3, rod k^6, and cam k^{10}, whereby said rod and mandrel are operated, the shank-forming dies arranged to co-operate with the mandrel, and means for operating said dies, as set forth.

14. The combination, with the anvil and the plunger for holding a partly-formed blank composed of a concavo-convex head and two parallel arms thereon, of the shank-forming dies arranged to bend portions of said arms inwardly, the bell-crank levers k^{12} k^{12}, engaged with said dies, the movable slide or frame engaged with said levers, and means for reciprocating said slide, as set forth.

15. The combination, with the cutting-dies and button-forming mechanism co-operating therewith, of the reel-support o^2, the swinging arm p^2 on said support, having the jaw p, the jaw p', pivotally connected to said arm, a rod p^5, connecting the jaw p' with a lever or arm reciprocated by the operation of the machine, whereby the arm p^2 is oscillated, and a stop carried by the arm p^2 to limit the backward movement of the jaw p, as set forth.

16. The combination, with the cutting-dies and button-forming mechanism co-operating therewith, of the reel-support o^2, the swinging arm p^2 on said support, having the jaw p, the jaw p', pivotally connected to said arm, a rod p^5, connecting the jaw p' with a lever or arm reciprocated by the operation of the machine, whereby the arm p^2 is oscillated, and a stop carried by the arm p^2 to limit the backward movement of the jaw p, and a pair of jaws, such as o^4 and o^6, whereby the strip is prevented from moving loosely backward, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 15th day of June, A. D. 1891.

JOSEPH MATHISON.

Witnesses:
C. F. BROWN,
EWING W. HAMLEN.