

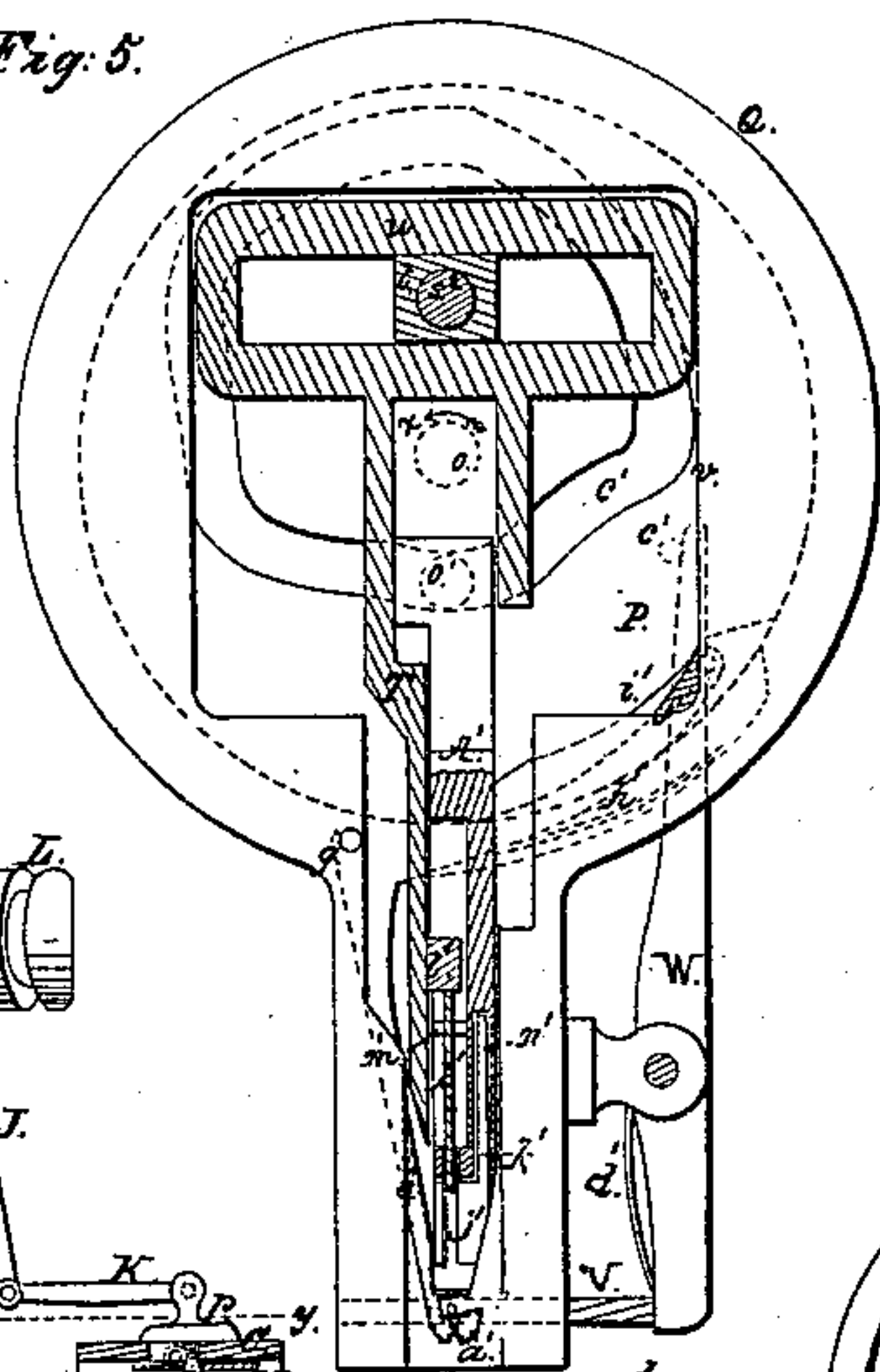
*A. M. White.*

*Brush Machine.*

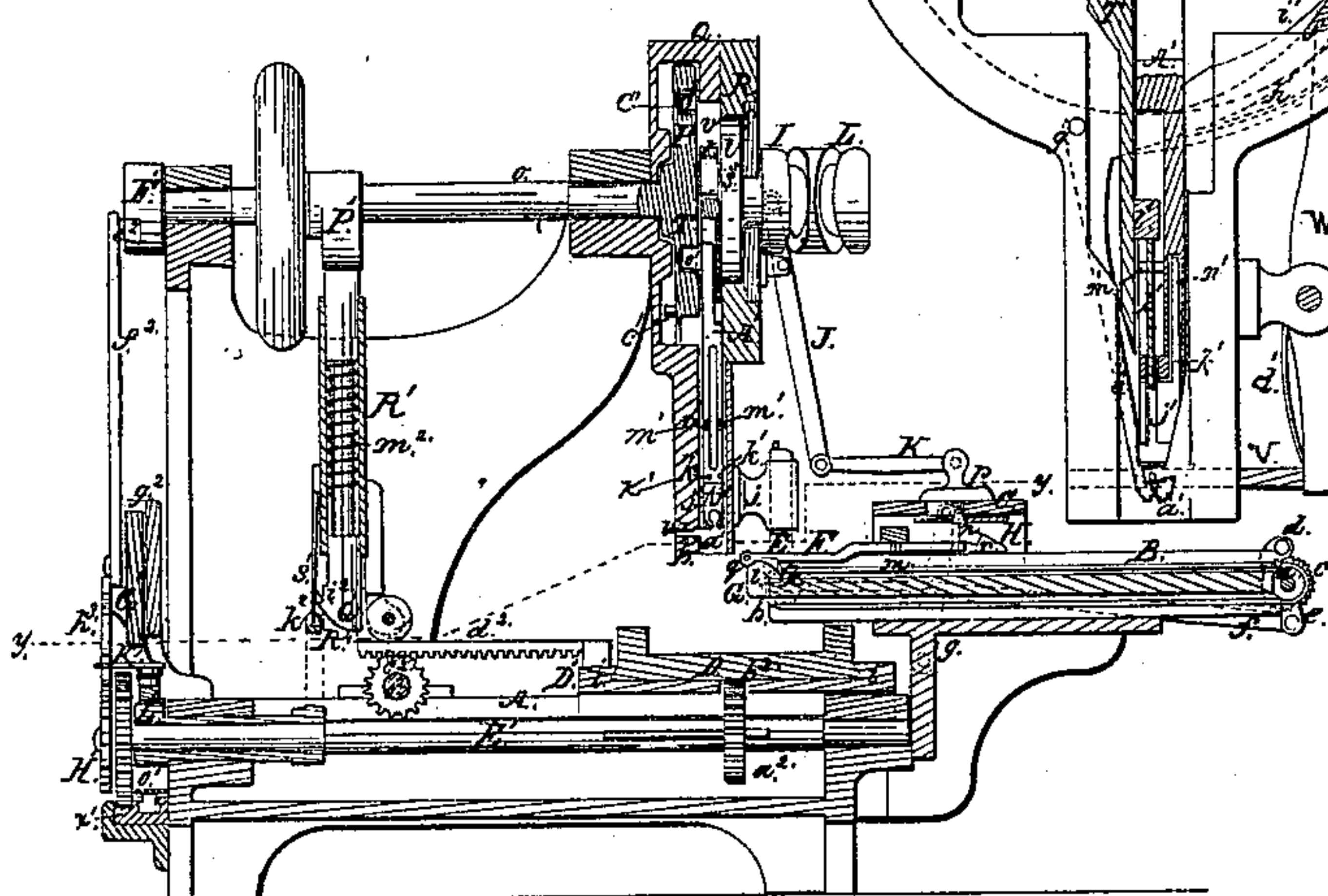
*N<sup>o</sup> 85,193.*

*Patented Dec. 22, 1868.*

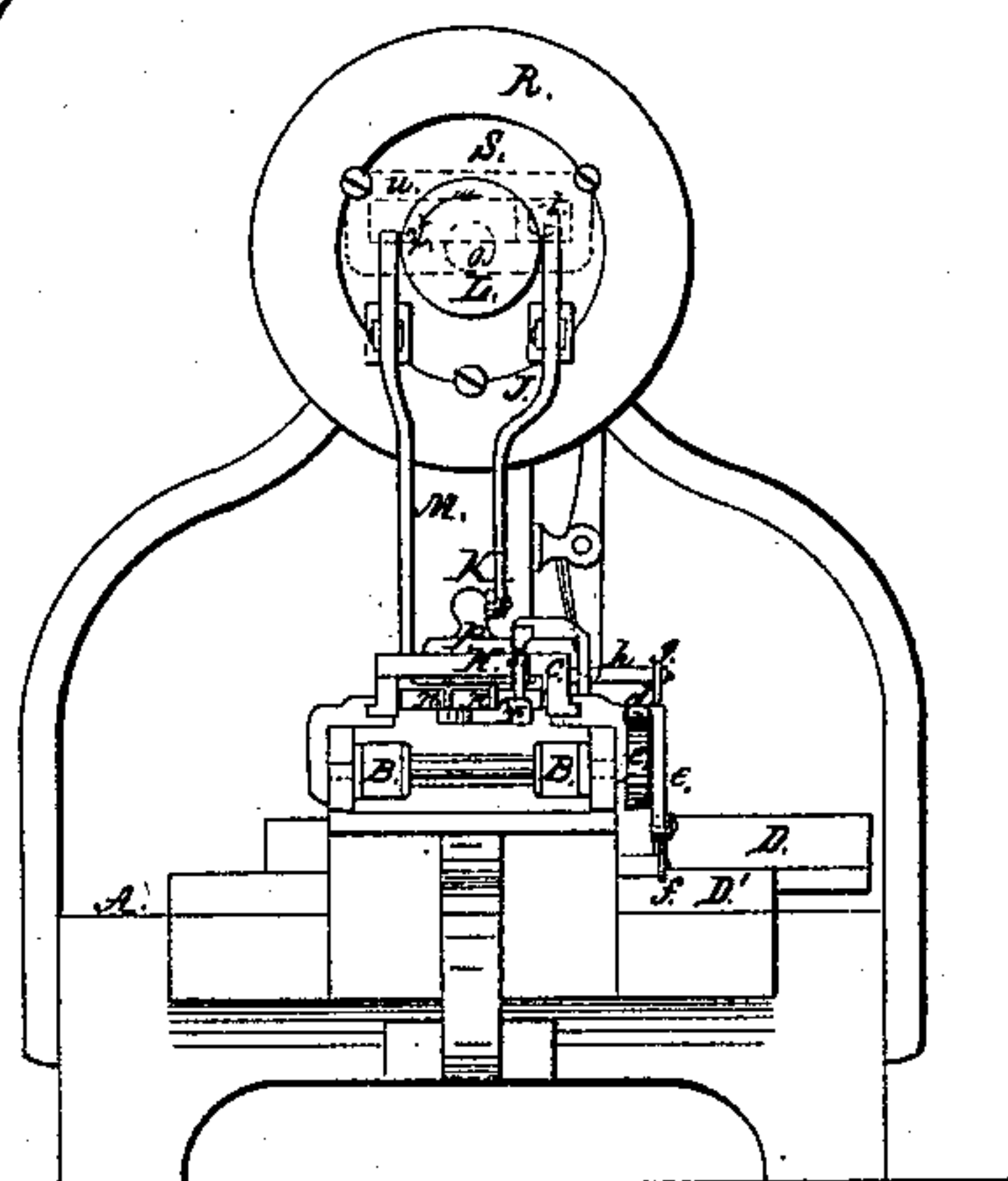
*Fig. 5.*



*Fig. 1.*



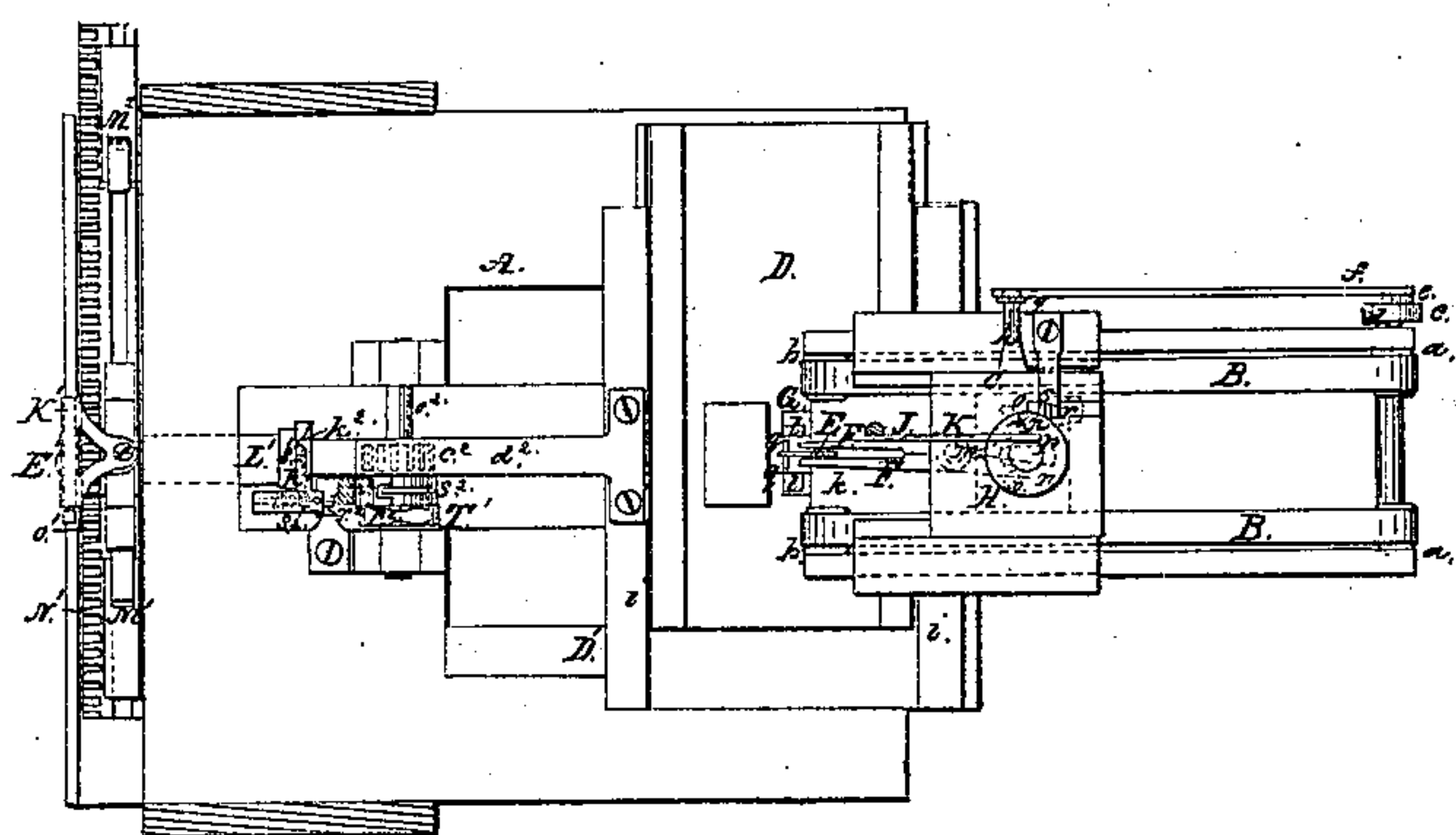
*Fig. 2.*



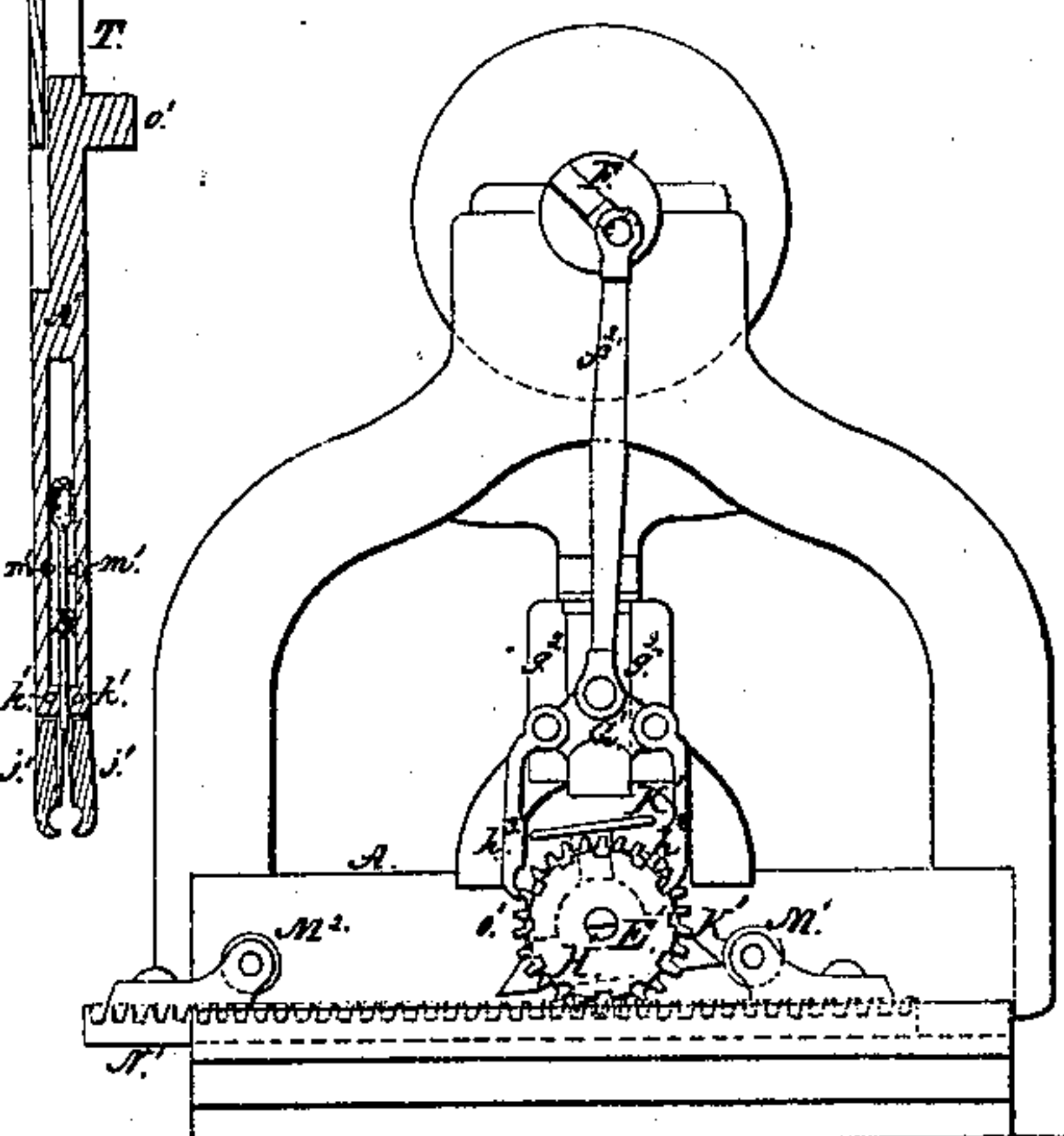
*Fig. 6.*



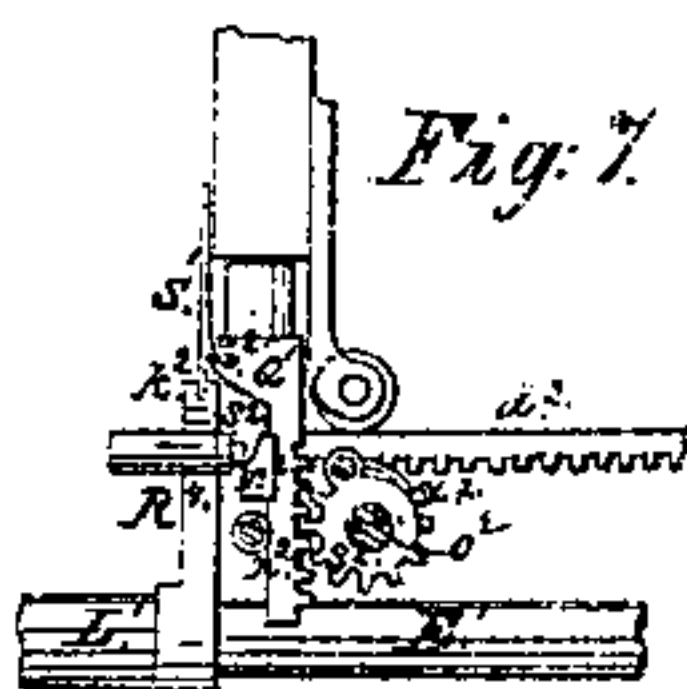
*Fig. 4.*



*Fig. 3.*



*Fig. 7.*



*Fig. 8.*



Witnesses:  
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Arthur Kinner

*Inventor:*

*A. M. White*  
*Crown & Co. atty*



# United States Patent Office.

ALBERT M. WHITE, OF THOMPSONVILLE, ASSIGNOR TO THE AMERICAN BRUSH COMPANY, OF NEW HAVEN, CONNECTICUT.

Letters Patent No. 85,193, dated December 22, 1868.

## IMPROVED BRUSH-MAKING MACHINE.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, ALBERT M. WHITE, of Thompsonville, in the county of Hartford, and State of Connecticut, have invented a new and useful Brush-Making Machine, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure 1 represents a vertical central longitudinal section of a brush-making machine, constructed in accordance with my invention;

Figure 2, an end view of the same;

Figure 3, an opposite end view thereof;

Figure 4, a sectional plan, taken as indicated by the line *y y* in fig. 1; and

Figures 5 and 6, a face view and transverse section, on an enlarged scale, of certain devices for inserting the loops or tufts of bristles into the brush-block or back, likewise others for forming the staples, and securing the loops by the latter.

Figure 7 is a view, in elevation, of certain gear detached, connected with the slide that controls the motions of the brush-back or block.

Figure 8 represents an elevation and lower end view, on an enlarged scale, of the punch used for forcing home the staple and tuft into the brush-back.

Similar letters of reference indicate corresponding parts.

The object of my invention is to supersede the hand-process, heretofore in use, of dividing the bristles into knots or tufts, and inserting or securing them into the brush-stock or back, by doing the same automatically or through the agency of machinery; and

My invention embraces mechanical means or devices for making brushes of the description secured to me by Letters Patent No. 47,157, bearing date of April 4, A. D. 1865, but portions of the invention are applicable to the manufacture of brushes, in which the knots or tufts are differently secured.

In this connection, said invention includes, as novel features, a divider, operating in connection with endless serrated belts, or their equivalents, for feeding forward the bristles, said divider, first, rising at intervals and then allowed to drop to enter the bristles, to space or open the latter; fingers, automatically operating to actuate the divider, also spreading laterally, to separate into tufts the bristles spaced by the divider; a cutter, operating in conjunction with a staple-slide, for cutting the wire of which the staples, used to secure the tufts in the brush-back or block, are formed into suitable lengths to produce the staples; also, a slide, and means, including a "former," for shaping the staple, straddling the tuft or knot with it, crossing or inclining the free ends of the staple to cross, and driving the doubled knot or tuft, and its holding-staple, into the perforations in the brush-back or block, and

finally, driving home the staple; likewise, means for feeding intermittently, or at intervals, the brush-back, to bring its perforations successively under the devices for inserting the doubled knots or tufts and their holding-staples, said means embracing devices for feeding the said back or block, hole by hole, in one direction, of its length or breadth, as the case may be; afterwards, or at the termination of one line of perforations, giving to the back or block a movement crosswise to the former motion, to bring the next row or line in line with the devices employed to insert the tufts and staples; and finally, reversing the motion of the back or block in line of such succeeding row of holes, and so on till the whole brush-back or block is filled with tufts or bristles, and same secured by the staples.

Referring to the accompanying drawing—

A represents the main bed of the frame, which is suitably constructed to carry the several working-parts of the machine, the construction and operation of which is as follows:

The bristles, designed to be inserted by knots or tufts in the brush-back or block, are laid or strewed crosswise on endless serrated, or otherwise suitably-constructed belts, B B, arranged parallel to each other, at the requisite distance apart to support the bristles at their ends, and, passing round or over rollers *a a* and *b b*, the one pair, *a a*, of which are made the drivers, to give to the belts an intermittent motion, into or towards, as regards its upper travel, the main body or portion of the machine, said belts carrying the bristles along with them.

The means for thus operating the rollers *a a* may consist of a ratchet-wheel, *c*; on the one end of said roller's shaft, worked by a pawl, *d*, pivoted to a vibrating or rocking arm, *e*, operated by a rod, *f*, attached to a lever, *g*, which is rocked by or through a wrist-pin or rod, *h*, secured to a slide, C, having an intermittently-reciprocating travel in direction of the belts.

D is the carriage, on which the brush-back or block, to have the bristles inserted in it, is laid or secured, said carriage travelling intermittently on or in ways *i i* crosswise of the belt-feed; also having, at intervals, a motion in line with the belts, as hereinafter more minutely described.

Prior to fixing said brush-back or block within the carriage D, it is suitably perforated for reception of the tufts or knots in succession, and, on commencing to operate, said back or its carriage is adjusted to bring its one outside end or corner hole in proper receiving-position for a tuft or knot, intermediately of the belts B B, as it were, but beyond them.

E is a vertical, loosely-dropping divider, arranged, say, to slide or play in a fixed bracket, *j*, and lying intermediately of the belts, at their inner ends, said divider being preferably pointed at its lower extremity, and, when down, resting on the bed *k*, which lies im-



mediately beneath the upper travel of the upper belts. The office of this divider is to open or space the bristles lying on the belts, for the purpose of forming them into knots or tufts immediately before the delivery of the bristles from the belts, the serrated construction of the belts serving to hold the bristles at their ends, during such division, or separation, and arrangement of the bristles into bunches or tufts, which is only in part effected by the divider E, fingers F F performing an important function in this connection. Thus, the divider E remains down on the bed *k* till the belt commences to give the bristles a forward feed, when it is momentarily or temporarily lifted by the fingers F F, which latter, formed with suitable pointers or downward projections, for entering the opening or space made by the divider in the bristles, afterwards spread or work out laterally, to complete the opening of the bristles into knots or tufts, the fingers, after having lifted the divider and allowed it to fall again, to accomplish a fresh spacing in the next feed of the bristles, dropping, by their pointers, into the space formed by the divider before they expand to complete the opening or formation of the tuft, and said fingers subsequently moving forward in their expanded condition, conjointly with an independent slide, G, provided with stops, *l l*, to hold and carry the tuft beneath the devices for inserting and securing the knots or tufts in the brush-back, after which the fingers F F contract and retire or work back, together with the slide G, to, in due course of time, renew the operation, in connection with the divider, on the next feed of the bristles by the belts.

The means by which these several motions or actions are effected may be as follows:

The fingers F F are of a pincers or tongs-construction, being pivoted, as at *m*, with freedom both of up-and-down and lateral play to the intermittently-reciprocating slide C, and their back legs or arms in gear, by projecting pins or studs *n n*, with oblique slots *o o*, made in a plate, H, connected with the interior or under side of the slide C, and moving conjointly with the latter, but also independently of it, said plate H being attached to a knob or protuberance, *p*, which has limited play through a longitudinal slot in the slide C, so that, on the protuberance *p* being reciprocated in direction of the belts, which is effected intermittently by a grooved cam, I, lever, J, and rod, K, the plate H, in the back movement of the protuberance *p*, is first slid back to close, by its slots *o o*, the front legs of the fingers F F, and afterwards to retire with the slide C, and, as the latter approaches the end of its back stroke, said fingers made to lift in front, carrying their points over the bristles, and, for the purpose of temporarily raising the divider, which they catch under ears or pins *q q*, such lift of the fingers being effected by an inclined plane, *r*, attached to one of the back legs of the fingers, coming in contact with and passing under a fixed arm, *s*, or arm hung to swing only in a forward direction, to permit of the free return of the incline *r* to the front again. After the incline *r* has passed in a backward direction under the arm *s*, the front legs of the fingers drop again, and, on motion being communicated to work forwards the protuberance *p*, it first pulls on the slide H, to expand the fingers F, to complete the opening of the bristles, and then, moving in common with the slide C, causes the tuft or bunch to be carried forward between the projections from the fingers, and the stops *l l*, that project from the independent slide G, which latter has its intermittently-reciprocating action given it by a grooved cam, L, lever, M, and rod, N, to cause it to move backwards and forwards, conjointly with the fingers, but so timed, in relation to the latter, as that the fingers first move forward, to carry the bunch or tuft up against the stop *l l*, then the slide G and fingers move conjointly in the same direction, to carry the tuft, thus

held, to or over its place of insertion, when a pause takes place in the movement of both fingers and slide, after which the fingers commence to retire, leaving loose the tuft, so as to facilitate its insertion, and immediately afterwards, that is, after insertion of the tuft has been effected, the slide G to work backwards, conjointly with the fingers, to repeat, in due course of time, their forward operation, in connection with the fingers, for the conveyance of a succeeding knot or tuft. Instead of the fingers retiring in advance, to effect release of the tuft, the slide G may have an additional forward movement given it.

It will now be necessary to describe the means by which the knots or tufts, thus fed forward in succession, are inserted, one by one, in the brush-back or block.

In or prior to effecting the insertion, the bunch or tuft is bent or doubled in the middle to give it a loop-form, and staple made to straddle the tuft prior to its being bent, for which purpose the slide G is recessed or cut away between the stop *l l*, and for a short distance in the rear of them, so that by pressing down on the tuft between such cut-away portions or staple, straddling the tuft or bunch, the latter, resting only at its ends on the slide, may be bent or doubled, as required, in the middle, and carried along with its staple to the hole or perforation in which such are required to be inserted.

On commencing the operation of inserting and securing the tufts in the brush-back or block, the latter, or its carriage D, as hereinbefore observed, is first adjusted, so as to bring the one outside end or corner perforation in the back, underneath the devices employed to insert and secure the tufts, each hole in the brush-back or block being brought successively, as hereinafter described, under said tuft-inserting and securing devices, and under the middle of the bunch or tuft at the extreme of its advance stroke or feed, by the fingers F F and slide G.

The means for forming the staple, locating it on or across the tuft, and inserting and securing the tuft and staple, are as follows:

O is the main or driving-shaft, made to rotate in the direction indicated by the arrow *x*.

This shaft has secured on, so as to rotate with it, a disk, P, that revolves within a fixed head, Q, having double front or cap-plates R and S.

Projecting from the front of this revolving disk, is an eccentric-pin, *s*<sup>3</sup>, on which is a loosely-fitted brass or block, *t*, that, in the rotation of the disk, serves to give an up-and-down motion, through a yoke, *u*, guided and working in a recess, *r*, made in the fixed head, to a slide, T, said pin *s*<sup>3</sup> also serving, by its gear with or eccentric projection into a disk, U, to rotate the cams I and L.

The wire to form the staples is fed, by any suitable means, from the back end of the machine, through a hole, *w*, in a lower extension, to the fixed head Q, till it is entered to a proper length or distance within a recess, *a*<sup>1</sup>, which is virtually a downward extension of the recess *r*.

This hole *w* has branching from it, at right angles to it, on one side, a cross-aperture, *b*<sup>1</sup>, in which works a cutter, V, operated by a lever, W, through a pin, *e*<sup>1</sup>, on the rear side of the disk P, so as to give the cutter V a short, quick stroke once in the revolution of said disk, for the purpose of cutting off the wire fed into the recess *a*<sup>1</sup>, as described, to form a staple, a spring, *a*<sup>1</sup>, afterwards throwing back the cutter.

Prior, however, to the wire being thus cut, a staple-former, X, is shot laterally into the recess *a*<sup>1</sup>, immediately below the wire, said former working, when it is required to shift it out of the recess *a*<sup>1</sup>, into a suitable side recess in the lower extension to the fixed head Q, and being formed of legs or arms, *e*<sup>1</sup> *f*<sup>1</sup>, working on a pivot, as at *g*<sup>1</sup>, a spring, *h*<sup>1</sup>, serving to shoot the "former"



into the recess  $a^1$  whenever a reduction,  $i^1$ , made in the periphery of the disk P, comes round to admit of the free end of the arm  $f^1$  entering it, the spring  $h^1$  causing said end of the arm  $f^1$  to bear against the periphery of the disk.

By these means the staple-former X is kept out of the recess  $a^1$  during the greater portion of the revolution of the disk P, so as not to be in the way of certain devices, connected with the slide T, and inner slide thereto, as hereinafter described, when said devices are required to cross the path of the "former," but said "former," by means of the reduction  $i$ , remains the requisite length of time within the recess  $a^1$  to perform its function.

The staple is formed by the bending of the cut wire in the recess  $a^1$ , over the former, X, through the action of jaws,  $j^1 j^1$ , pivoted, as at  $h^1 h^1$ , to a slide A', arranged to have vertical play within the slide T, and, at intervals, conjointly with the latter, said jaws bearing down in an open condition on the wire, to bend it over the former, and, on the "former" moving out of the way, carrying down within them, in a loose but secure manner, the staple down to and over the bunch or tuft of bristles lying on the recessed portion of the slide G, when the jaws  $j^1 j^1$  close, compressing, or partly crossing the legs of the staple over the tuft, and, in the further descent of the jaws, doubling or bending the tuft, and carrying it, together with the staple clasp ing it, down to the perforation in the brush-back, after which the jaws  $j^1 j^1$  open, and a punch, B', attached to the slide T, descends within and through the jaws, to force home to their place in the perforation the doubled tuft and staple, which latter, in the pressure brought to bear on it, and the resistance it encounters at the bottom of the perforation, has its legs properly or fully crossed, and made to enter or bite, laterally or obliquely, into the wood or other material, and so to fasten the looped or doubled tuft in an upright and secure manner within the perforation.

This punch B' is of peculiar formation at its lower end, being of a concave shape in directions at right angles to each other, for the purpose of snugly fitting on or over, and conforming to the shape of the bent end of the staple, and so preventing slipping of the punch off the latter in driving it home.

The jaws  $j^1 j^1$  are opened by the action of springs, applied to them in any proper manner, and are closed, when required, by a swell,  $l$ , on the top of the punch B', as, in the action of the punch, which has considerably greater vertical play than the jaws, it passes in between pins,  $m^1 m^1$ , projecting from the upper ends of the legs  $n^1$  of the jaws, and working within slots and recesses made in the sides of the slide A', the punch B', with its swell  $l$ , travelling in a vertical groove formed within the slide A'.

After the tuft has been inserted and secured, as described, the jaws  $j^1 j^1$  rise out of the way, to their original position above the former, X, and following them, to a greater extent, the punch B' also rises up beyond the jaws, to enable both the jaws and punch, in due course of time, to repeat the operation in their succeeding descent on the next tuft. The means for thus operating, in timely relationship to each other and the jaws, the punch B, "former" X, and wire-cutter V, have already been described.

To effect the timely and necessary action of the jaws  $j^1 j^1$ , as specified, the slide A' carrying said jaws has its requisite up-and-down motion given it by a pin or roller,  $o^1$ , arranged to project from said slide, and made to fit or enter an irregularly-formed or suitably-shaped cam-like groove, C', made in the face of the revolving disk P.

The following devices are or may be employed to give to the brush-back carriage D its requisite movements for insertion and fastening of the tufts within the perforations, as hereinbefore described, namely,

first, in an intermittent manner along the ways  $i i$ , to bring the holes successively in one row beneath the tuft-inserting and securing devices, and then a crosswise movement to adjust the next row in line with said devices, and afterwards a reverse intermittent travel along the ways  $i i$ , and so on till the perforations are filled. Thus, the ways  $i i$ , along which the carriage D moves in reverse directions, are arranged on a frame or bed, D', that is made capable of motion along or on the main or stationary bed A, in a crosswise relationship to the ways  $i i$ , as necessary to secure the several adjustments of the brush-back or block, as hereinbefore referred to.

The one movement or set of movements, that is, of the carriage D along the ways  $i i$ , is effected by a pinion,  $a^2$ , fitted by groove and feather on a shaft, E', and arranged to gear with or mesh into a rack,  $b^2$ , on the underside of the carriage, said shaft rotating first in one direction, in an intermittent manner, and afterwards, intermittently, in a reverse direction, and the pinion  $a^2$  sliding on the shaft D' which drives it, to admit of the travel of the frame D' along the bed A.

This frame D' has its movement or movements effected by an intermittently-revolving pinion,  $c^2$ , working into a rack,  $d^2$ , secured to said frame.

These several movements, as hereinbefore described, of the carriage D, and the bed or frame D', are automatically accomplished as follows:

On the back of the main driving-shaft O is a disk, F', carrying a wrist or eccentric-pin,  $e^2$ , which is adjustable thereon to vary the throw to suit different distances apart of the perforations in the brush-back in direction of the length of the carriage D. This eccentric-pin  $e^2$ , as it rotates, serves, by a pitman,  $f^2$ , to give an up-and-down motion to a slide, G', working in suitable ways,  $g^2$ .

Said slide G' carries two reversely-arranged freely-hung or pendent pawls,  $h^2 h^3$ , which, in the down-stroke of the slide, gear with a notched wheel, H, on opposite sides of the axis of the latter, only one of these pendent pawls thus gearing with the notched wheel H', according to the direction it is required to give the carriage D its intermittent movements.

The notched wheel H' is fast to the shaft E', so that either one of the pawls,  $h^2 h^3$ , according to which, in its down-stroke, is made to gear with the notched wheel, serves, as it is reciprocated repeatedly up and down, to act as a driver to the carriage D, to give to it its requisite intermittent motions in the one direction. Thus, supposing the pawl  $h^2$  to be set so that, in its down-stroke, it operates the notched wheel H', and the other pawl  $h^3$  to be switched from gearing with said wheel, then the carriage D will be caused to move intermittently toward the one end of the machine; but, on reversing the gear of the pawls, that is, allowing the pawl  $h^3$  to gear with the wheel H', and the other pawl  $h^2$  to be set so that it fails to gear therewith, then the intermittent travel of the carriage D is reversed. This reversal in the action of the pawls takes place after a suitable pause, as hereinafter described, at the termination of the intermittent travel of the carriage D in the one direction, to give said carriage intermittent travel in the opposite direction, for the purpose of filling the one row of perforations with tufts or bristles, and then the next adjacent row, as hereinbefore referred to.

This timely adjustment of the pawls  $h^2 h^3$ , so as to restrict either one to gear with the wheel H', is effected by a swinging shifter, K', hung by sleeve, L', loosely on the shaft E'. Said shifter is tripped or thrown to either side of the carriage D, and is so operated as that, in the first instance, or for a short interval of time, it, in shifting, simply trips and keeps both pawls during, say, one up-and-down-stroke of them, out of gear with the notched wheel. This, in reversal of the pawls, is necessary to give time for adjustment of the frame D', to bring the next row of the perforations in the brush-



back in line with the tuft-inserting and securing devices after the carriage D has completed its stroke along the ways *i i* in the one direction.

To establish this pause, or move the shifter K' so as to throw both pawls out of gear at the end of a carriage-stroke, said shifter is struck or operated by one or other of two roller-stops, M<sup>1</sup> M<sup>2</sup>, secured, in an adjustable manner to adapt the feed of the carriage D to different lengths of brush-backs, to opposite ends of a sliding rack, N', which is set in motion crosswise of the machine by a pinion, O', fast to the shaft E'. Thus, after the carriage D has travelled its requisite distance along the ways *i i*, in the one direction, the one stop, M<sup>1</sup> or M<sup>2</sup>, strikes the shifter K' to throw both pawls out of gear, and to keep them out of gear, till, by means hereinafter described, and after the frame D' has been moved to bring the next row of holes in line to receive the bristles, said shifter K' is further shifted in the same direction, to reverse the gear or action of the pawls, which establishes an opposite intermittent travel to the carriage D in its ways *i i*, till arrested by the action of the opposite roller-stop striking the swinging shifter.

This automatic movement of the shifter alternately in reverse directions is kept up until the whole brush-back has its tufts inserted and secured in it.

The pinion c<sup>2</sup> that, through the rack d<sup>2</sup>, gives the requisite intermittent motions to the frame D' to adjust the brush-back the distance one row of perforations lies from another, and which, as before observed, takes place at the termination of the travel in either direction of the carriage D, is operated as follows:

On the shaft C is arranged a cam, P', and beneath the latter a vertical slide, Q', working within a box or guiding-frame, R<sup>1</sup>, and locked, when down, by a spring-catch, S<sup>1</sup>, biting on or over a tooth, i<sup>2</sup>, projecting from the one side of said slide, near its bottom. When thus down, and locked, the slide Q' is not acted upon by the cam P', and this is the condition of said slide during the entire travel of the carriage D in its ways *i i*, in either direction, but, on the shifter K' being moved to adjust and keep both pawls h<sup>2</sup> h<sup>3</sup> out of gear with the wheel H' at the termination of the travel in one direction of the carriage D, then the spring-catch S<sup>1</sup> is tripped out of lock with the slide Q' by the action of an inclined projection, k<sup>2</sup>, on an arm, R<sup>4</sup>, attached to the shaft of the sleeve or shifter K', and, thus released, the slide Q' is shot upwards by a spring, m<sup>2</sup>, so that, when the cam P' again comes round, it depresses the slide Q', and with it a rack, n<sup>2</sup>, attached thereto, which sets in motion a pinion, S<sup>2</sup>, hung loose on the shaft o<sup>2</sup> of the pinion c<sup>2</sup>, and, by a pawl, p<sup>2</sup>, pivoted to the loose pinion S<sup>2</sup>, operates a ratchet-wheel, T', fast on the shaft o<sup>2</sup>, and so turns the pinion c<sup>2</sup>, to give the requisite feed to the sliding frame D' to bring the next row of holes in the brush-back in line with the tuft-inserting and securing devices. This done, and as the slide Q' reaches the end of its downward stroke, the spring-catch S<sup>1</sup> again shoots into lock, to hold down the slide free from operation by the cam till the carriage has reached the end of its travel in the opposite direction, when the operation of said slide is repeated to give further feed to the frame D', and so on in succession till the several rows of perforations are filled.

It will readily be seen that, by the ratchet-gear of the loose pinion S<sup>2</sup> with the shaft o<sup>2</sup>, the slide or rack n<sup>2</sup> thereof fails in its upward stroke to give a reversed or any action to said shaft, and so to prevent any back-stroke of the sliding frame D' till the brush is completed, when, by lifting the pawl p<sup>2</sup>, said frame may be run back by hand, or otherwise, to repeat the operation, as regards the intermittent movement of it by the slide Q', in connection with a new brush-back or block, as before.

Attached to the rack n<sup>2</sup> is a fixed cam or cam-shaped projection, r<sup>2</sup>, that, in the upward movement of the rack and its slide Q', simply presses on a spring-borne

bolt, s<sup>2</sup>, carried by a socket, t<sup>2</sup>, attached to the arm R<sup>1</sup> of the shifter K', but that, in its down-stroke, acts laterally on the side of the bolt s<sup>2</sup> shot outward towards the completion of the up-stroke of the slide, to move the shifter K' further in the direction it had previously been swung by the roller-stop M<sup>1</sup> or M<sup>2</sup>.

This further movement of the shifter establishes the reversed action of the pawls h<sup>2</sup> h<sup>3</sup>, by destroying the liberated relationship of the pawls to the notched wheel H', and throwing the opposite one of such pawls into gear with said wheel to that previously operating it. In this way, and at the termination of each opposite travel of the carriage D, is the motion of the latter reversed after the sliding frame D' has been adjusted to bring the next succeeding row of perforations in the brush-back in line with the tuft-inserting and securing devices.

What is here claimed, and desired to be secured by Letters Patent, is—

1. In combination with the belt or other suitable feed of the bristles, a divider, E, of any suitable construction, operating to space the bristles into knots or tufts, substantially as described.

2. The fingers F F, so constructed and operating as to spread out laterally, to effect or complete the separation of the bristles into knots or tufts, and afterwards to carry or push forward the same, for insertion in the brush-back or block, substantially as specified.

3. The combination of the divider E and fingers F F, for operation together, essentially as set forth, and whereby the fingers are made to lift and release the divider, to secure the spacing of the bristles, as specified.

4. The combination, with the fingers F F, of the slide G, or their equivalents, for operation together, essentially as and for the purpose or purposes herein set forth.

5. The combination, with the fingers F F, of the slides C and H, slots o o, pins n n, inclined plane r, and arm s, or the equivalents of these devices, in such manner as that the fingers are first expanded, afterwards moved forward, and, subsequently, in their back-stroke, made to rise for the purpose of lifting the divider which spaces the bristles into knots or tufts.

6. The combination, in a brush-making machine, of a wire-cutter, V, and staple-former X, for operation together, substantially as specified.

7. The jaws j' j', having a reciprocating movement, and opening and closing, as described, in combination with a reciprocating punch, B', for operation together, and on or relatively to the tuft, substantially as described.

8. The combination, with the recessed slide G, of the jaws j' j' and punch B', for action together, as herein set forth.

9. The punch B', constructed at its lower end of a concave form, in directions at right angles to each other, essentially as and for the purposes specified.

10. The combination of the jaws j' j', punch B', wire-cutter V, and a staple-former, X, or their equivalents, for action together, or relatively to each other, essentially as and for the purposes specified.

11. In combination with devices for inserting and securing the bristles in tufts, the brush-block carriage D, arranged to travel intermittently in the one direction, then crosswise of such motion for a distance corresponding to the width of the two adjacent rows of perforations apart, and subsequently to travel intermittently in a reverse direction to its first movement, substantially as described.

12. The combination of the slide G' with its pawls h<sup>2</sup> h<sup>3</sup>, notched wheel H', pinion O', rack N', stops M<sup>1</sup> M<sup>2</sup>, and shifter K', essentially as specified.

13. The combination of the cam P', slide Q', spring m<sup>2</sup>, spring-catch S<sup>1</sup>, and arm R<sup>4</sup> of the shifter K', constructed to release the catch, substantially as herein set forth.



14. The combination, with the pawl-shifter K', of mechanism, whereby the carriage-operating pawls are made first to be thrown out of gear with the notched wheel which they drive, afterwards to be reciprocated independently of the same, and, subsequently, either one of said pawls made to gear with such wheel, for the purpose of establishing the adjustment of the carriage in a crosswise direction, and afterwards reversing its action at right angles thereto, as herein described.

15. A combination of mechanism for spacing or separating the bristles into tufts, and suitably locating them over a perforated brush-back or block; also, serving automatically to insert and secure said tufts by staples within the back or block, essentially as herein set forth.

A. M. WHITE.

Witnesses:

WM. A. FOSKETT,  
E. LYMAN.