

W. V. Gee,

Button Hole Weaving.

$N^{\frac{0}{11}} 13, 571.$

Patented Sept. 18, 1855.

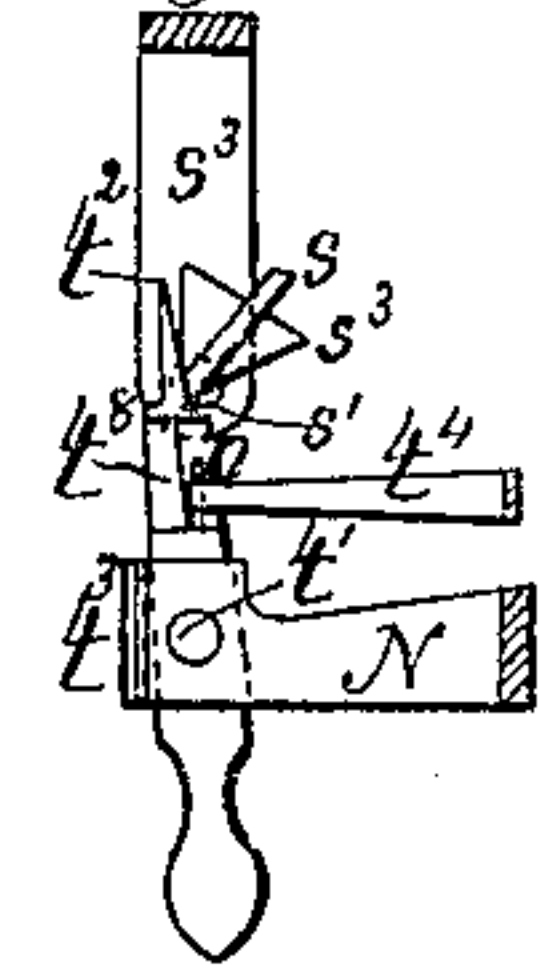
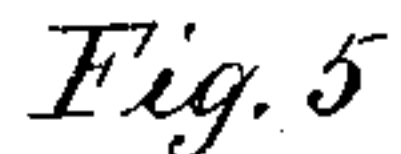
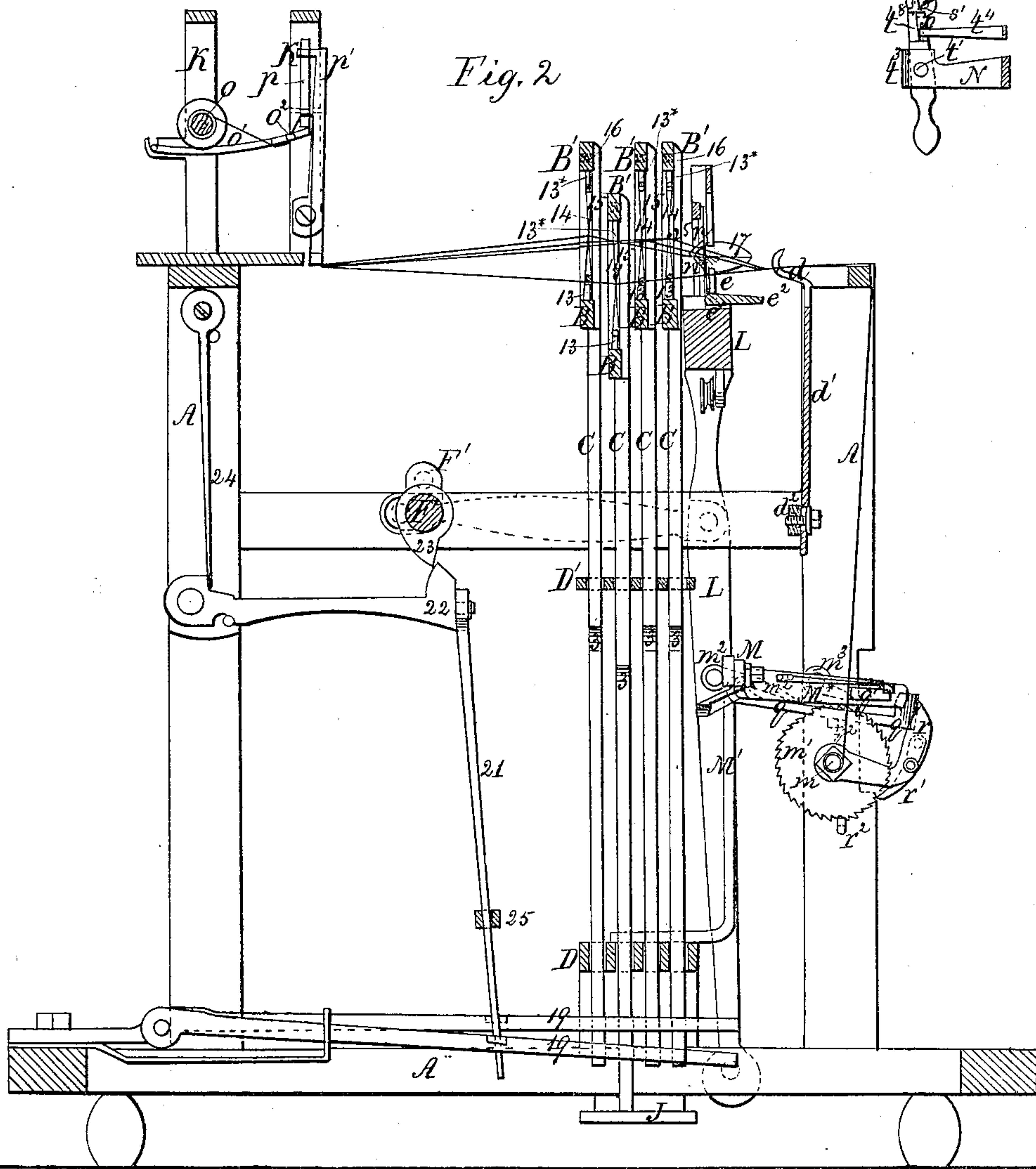


Fig. 2



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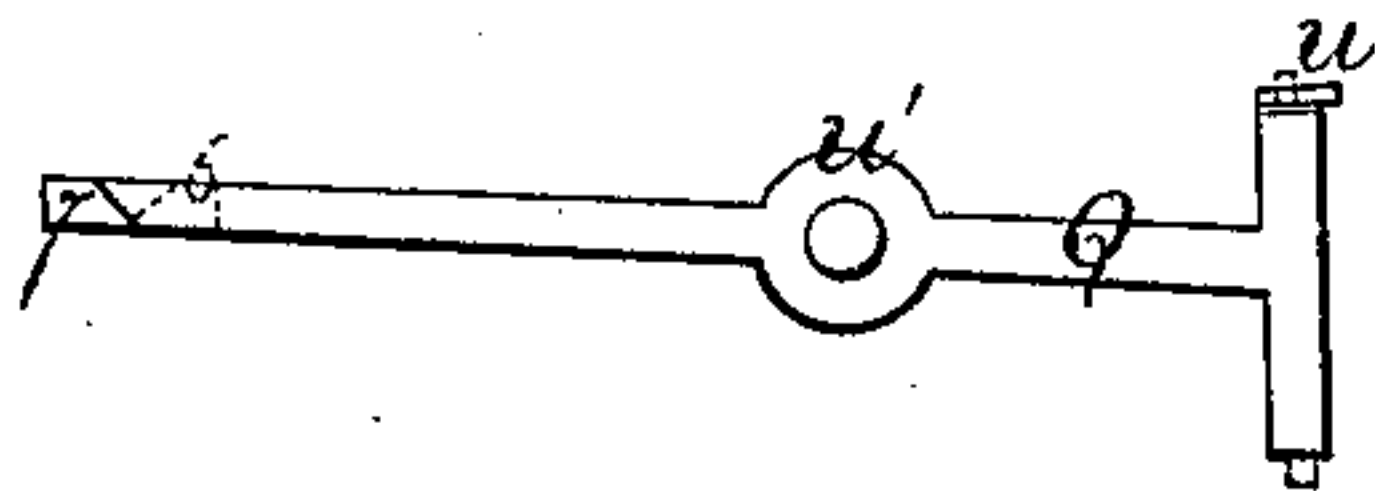
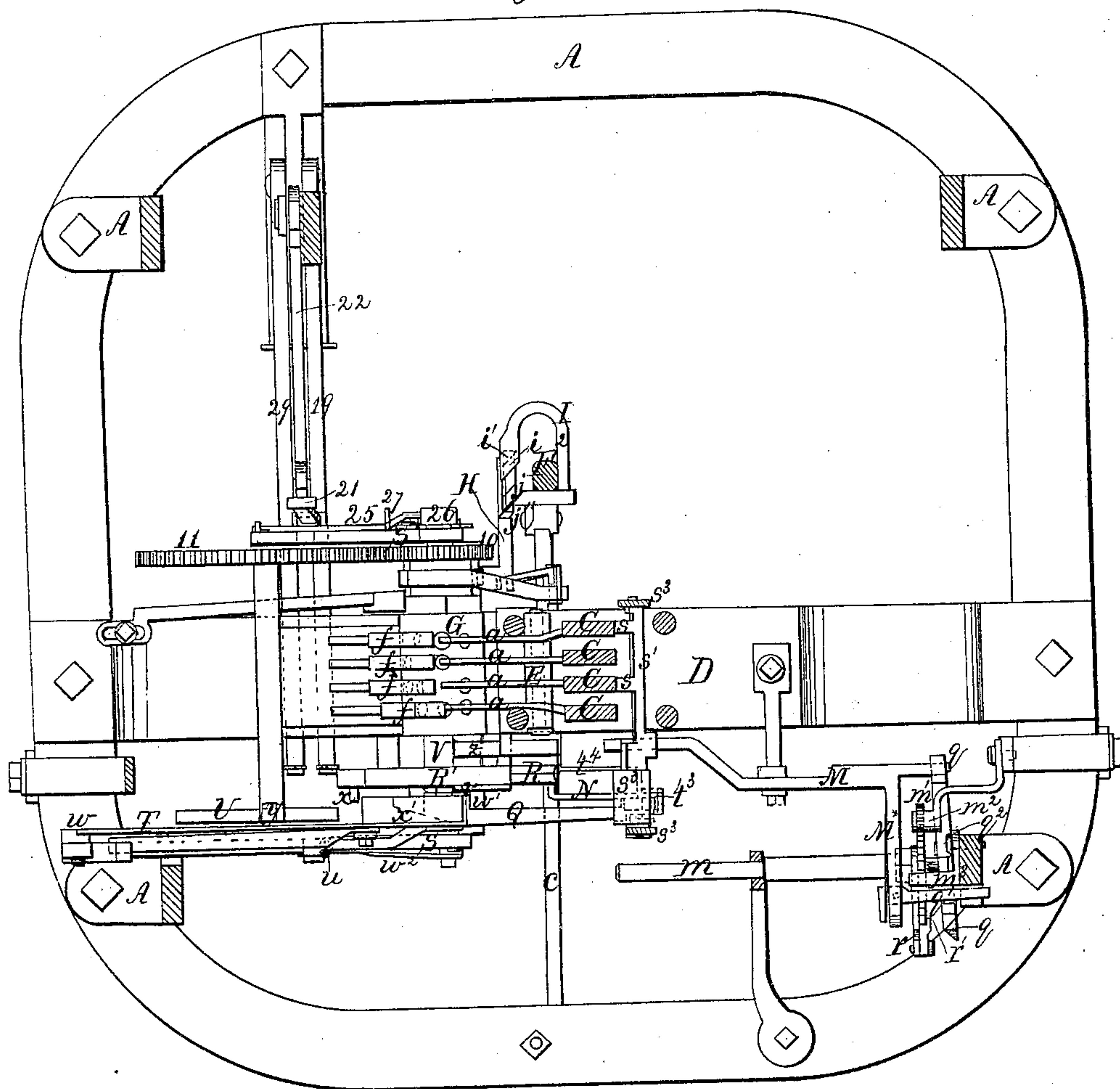


Fig. 3



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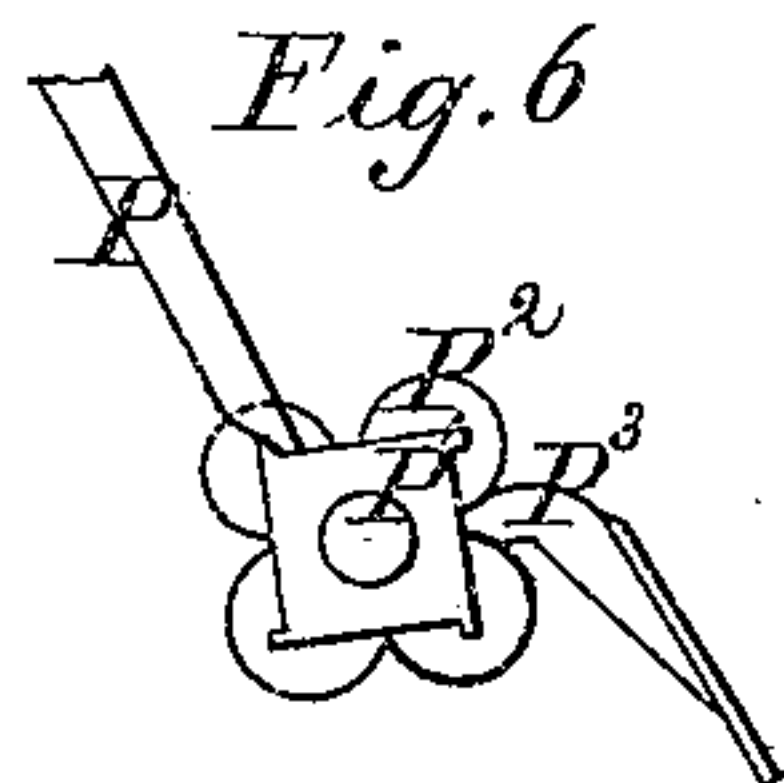
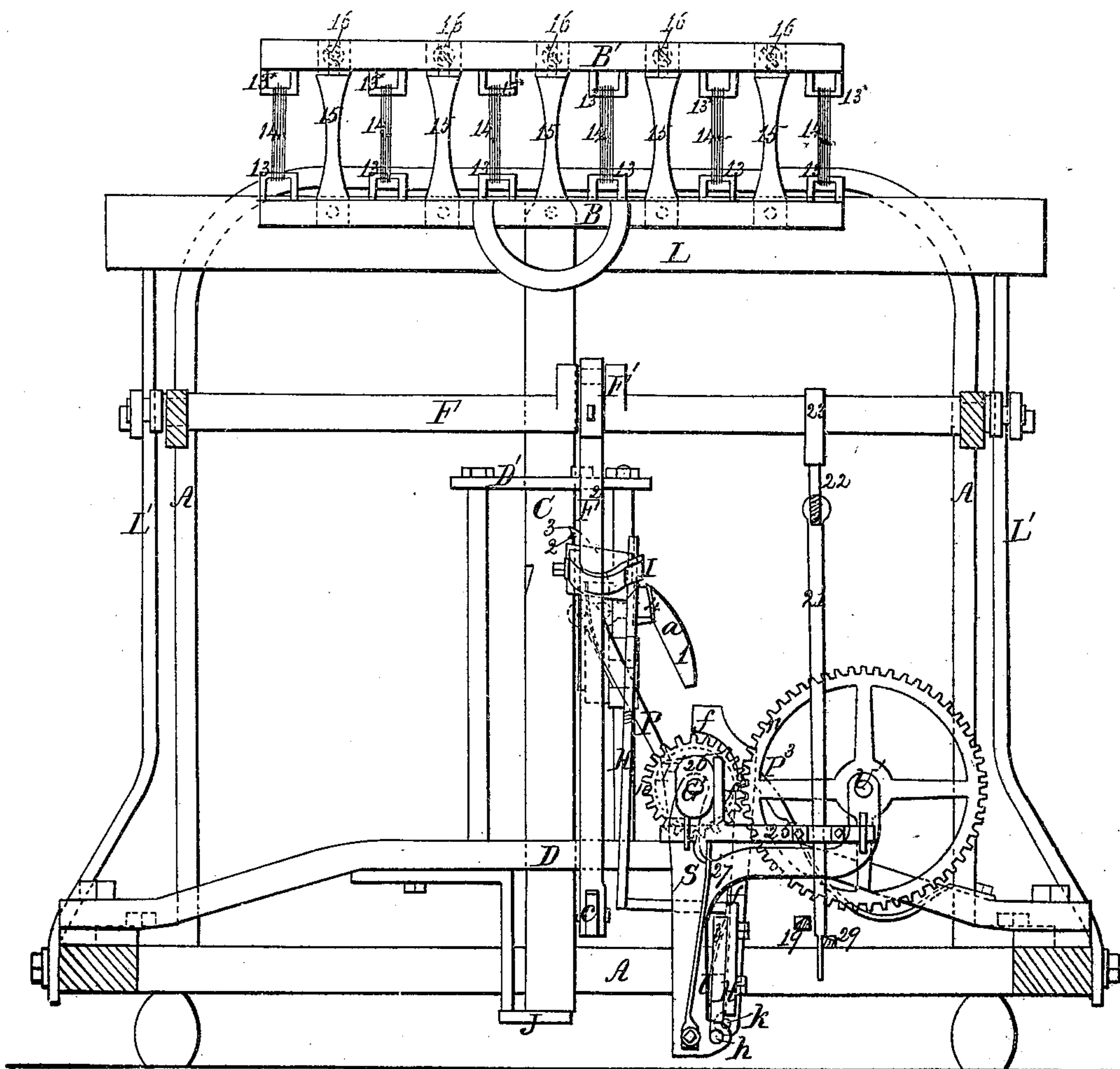


Fig. 4



UNITED STATES PATENT OFFICE.

WILLIAM V. GEE, OF NEW HAVEN, CONNECTICUT.

LOOM FOR WEAVING SUSPENDER-WEBBING.

Specification of Letters Patent No. 13,571, dated September 18, 1855.

To all whom it may concern:

Be it known that I, WILLIAM V. GEE, of the city and county of New Haven and State of Connecticut, have invented certain
5 new and useful Improvements in Looms for Weaving Suspender-Webbing and other Narrow Fabrics, part of which improvement may be also applied to looms for other kinds of weaving; and I do hereby declare that the
10 following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, is a front view of a power loom
15 embracing all my improvements. Fig. 2, is a vertical section of the same, taken parallel with the warp, but not confined to any plane. Fig. 3, is a horizontal section of the same in the plane of the line *, *, of Fig. 1.
20 Fig. 4, is a transverse section of the same, looking from the back of the loom, and showing only such parts as are not clearly shown in other figures. Figs. 5, 6 and 7 are detail views, showing portions of the mechanism detached from the loom.
25

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates for the most part to improvements in the mechanism by which
30 the harness of the loom is operated for the purpose of weaving button holes or other openings in suspender webbing or other fabrics. It also relates to the construction of the reed and to peculiar take-up and let-
35 off motions, for the same purpose.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A, is the framing of the loom.

40 B, B, are the several leaves of harness, each one being supported at the top of an upright bar C, which works freely in two fixed guides D, D', and each leaf receiving a portion of the warp, the same as the har-
45 ness of any common loom for weaving fancy goods. The leaves are severally raised as desired by means of catches, *a, a*, pivoted by a pivot *a**, to a vertically sliding carriage E, which may be called the lifting carriage,
50 which receives motion through a rod *b*, see Fig. 1, from a lever *c*, see Figs. 1 and 3, which is arranged near the bottom of the loom, and receives motion through a connecting rod F², from a crank F', on the main
55 shaft F, of the loom. The operation of the catches *a, a*, is regulated according to the

desired pattern by means of levers *f, f*, shown in Figs. 1, 3, and 4, corresponding in number with the catches and the leaves of harness, the said levers having their posi- 60
tion regulated by a pattern cylinder G, in such a manner as either to operate when the carriage E, ascends, upon the tails 1, 1, of the respective catches *a, a*, to throw the
65 tongues 2, 2, thereof out of the notches 3, 3, in the sides of the respective lifting bars C, and thus make the catches fail to lift the bars, or to stand out of the way of the said catches, and allow the
70 tongues to be forced into the said notches by springs 4, 4, applied to their tails. The pattern cylinder is of a kind used in many kinds of looms, having holes at proper dis-
75 tances apart all over its periphery and the levers *f, f*, have pins *f'*, permanently attached to them to fall into such of the holes in the cylinder as are left open. The pat-
80 tern is formed by plugging up a number of these holes. Every time the sliding carriage E, is raised and just as it arrives at the full extent of its upward movement, the levers
85 *f, f*, are all simultaneously thrown back away from the pattern cylinder, by the movement which is given to a larger or superior lever H, to which all the said levers
90 are attached. This throwing back of the levers is necessary to enable the pattern cylinder to be turned. The superior lever H, swings on a pivot *h*, near the bottom of the loom as shown in Fig. 4, and it derives its
95 movement from two inclined surfaces *i* and *j*, of a frame I, attached to the connecting rod F², acting upon two inclined surfaces *i'*, and *j'*, on its own upper part, the movement thus given to it being at right angles
100 to the vibration of the rod F². The inferior levers *f, f*, are all pivoted to the superior lever H, by a pivot or pivots *h*, nearly close to the pivot *h*, and they are all held in contact with the back of the superior lever each
105 by a separate spring *l*, with a degree of rigidity sufficient to enable them to operate on the catches *a, a*, when their pins *f'*, fall into the holes in the pattern cylinder with the return movement of the superior lever
110 in a forward direction or toward the pattern cylinder but not too great to offer any obstruction to the further movement of the superior and other inferior levers when one or more of the inferior levers are arrested
by coming in contact with a blank in the cylinder or with a plug inserted in one of

its holes. Those of the inferior levers whose pins f' , fall into holes in the pattern cylinder, occupy such a position at the commencement of the ascent of the sliding carriage E, which carries the catches a, a , that, as the said carriage rises, the tails 1, 1, of the catches, which are opposite the said levers, come in contact with them and cause the tongues 2, 2, of the said catches to be held off the lifting bars C, C, of the respective leaves of harness, till they pass the notches 3, 3, but all those of the said levers that are arrested by the blanks or plugs in the cylinder leave the respective catches free to act on the harness. The shed only opens one way, that is, by rising, and to close the shed the harness is lowered by the descent of the carriage E, and catches until the lifting bars C, C, are deposited on a fixed resting table J. The continued movement of the catch carriage E, below the point where the lifting bars are arrested gives the opportunity for the throwing out of the catches a, a , which must of course be done before they can take hold of the lifting bars in ascending. The turning of the pattern cylinder to effect the necessary changes for the pattern, is effected by a dog P, attached to the sliding carriage, acting upon a ratchet wheel P', on the end of the cylinder.

I have now described the operation of the harness in weaving the whole width of the fabric, and the next thing to be described is the manner in which the holes are woven. The first step toward forming the holes is to weave one half of the width of the fabric or that part on one side of the hole for the full length of the hole. To do this, one half of the harness or all that part which takes the warp on the side of the hole not to be woven, has to remain entirely inoperative, which is effected simply by a proper arrangement of the holes and blanks forming the pattern on the cylinder. During that part of the operation the take-up roll m , continues its operation the same as during the weaving of the whole width, but as soon as one side of the hole is completed, the take-up roll has to move backward far enough to let the web return a distance equal to the length of the hole. In order to prevent the reed obstructing the return of that half of the web which has been woven on the one side of the hole, there is a crook of sufficient depth made in the upper parts of all the dents n , of the corresponding half of the reed, as shown at n^* , in Fig. 2, and previously to letting back the web all the woven half of it is raised high enough to fall back into the crooks in the dents. In Fig. 2, of the drawing a portion of the web, which is represented in blue color, is shown raised up as high as the crooks n^* . Before describing the manner in which the raising of the web and the letting go of the take-up,

is effected, I will describe the let-off motion, which also serves as a backward take-up to take back the web to commence weaving the second side of the hole.

The yarn rolls, o, o , and the let-off mechanism are all arranged in a small frame K, K. The yarn rolls, of which two are shown in Fig. 1, have flanges at each end and a forked brake lever o' , is arranged under each roll, one side of the fork to bear against each flange. The yarn leaving the roll comes over the top, as shown in Fig. 2, and after passing downward through the fork of the lever it passes up again through a hole o^2 , near the end of the lever and then over the nearly horizontal arm of an elbow lever p , which stands over the end of the levers o' , the other arm of the said elbow lever, which stands nearly vertical, having a spring p' , applied in such a manner as to raise the first named arm. The drag on the yarn keeps the brake lever raised into contact with the flanges of the let-off roll, and thus, by the friction produced by the brake lever, the yarn is kept at a proper tension for weaving. While the weaving of the whole width of web and the first side of the button hole is proceeding, the horizontal arm of the lever p , except at the time of operation of the take-up roll, is drawn down by the tension of the yarn, so as to not quite touch the brake lever, which remains in operation and positively prevents the movement of the let-off roll; but when the take-up roll comes into operation, the pull which is given to the yarn draws down the arm of the elbow lever still farther and makes it come in contact with and slightly depress the brake lever, thereby leaving the let-off roll free to move far enough to give out the proper quantity of yarn, but the instant the tension of the yarn is reduced to a certain extent by the action of the let-off, the spring p' , overcomes the remaining tension and raises the lever p , sufficiently for the brake lever to rise, and come into operation again, in which condition it continues till the next operation of the take up roll. When the take-up cylinder is liberated on the completion of one side of the hole the backward take-up or carrying back of the yarn to commence the weaving of the other side of the hole is effected by the lever p , which as the tension is caused to diminish by the liberation of the take-up roll is thrown up by the spring p' , high enough to take back the whole length of the hole. Every time the take-up roll operates during the weaving of the second side of the hole, the lever p , descends a little, until, by the time the web is completed to the end of the hole, the said lever has arrived again in contact with the brake lever and the first described operation of the let-off is resumed.

The take-up roll m , carries a ratchet wheel

m' , to be operated by a pawl m^2 , attached to one of the swords L' of the lay L , and is thereby caused to act at every beat of the lay. The take-up is retained by a pawl m^3 , attached to one of the front uprights of the frame. The liberation of the take-up roll is effected by the means and in the manner described, as follows: M , is a bent lever (the form of which is shown distinctly in Figs. 1 and 3,) pivoted to a fixed standard M' . One extremity of this lever is made in the form of a pivot to attach the back end of a bar q , at the front end of which there is a square hook, as shown in Fig. 2, which, while the whole width of the web and the first side of the hole are being woven is caught by a spring catch piece q' , attached to a branch M^* , of the lever M , the lever being stationary during the whole of that part of the operation and the upper side of the bar q , standing just low enough for the pawls m^2, m^3 , to engage with the ratchet wheel m' .

It has been hereinbefore stated that when the first side of the hole is completed, the woven half of the warp is raised so that it may fall into the crooks n^* , in the dents of the corresponding half of the reed. This raising of the warp is effected by the harness motion already described, regulated by the pattern cylinder, and as soon as it has been effected all the harness thus raised is held up by a number of catches s, s , on a small rock shaft s' , which rests in a pair of fixed bearings s^3 , being thrown into operation to enter corresponding notches in the lifting bars C, C . This rock shaft stands just above the opposite end of the lever M to that carrying the bar q , and is provided with a small cam s^2 , shown in Fig. 1, which at the same time that the shaft is turned to throw the catches into operation is made to depress the contiguous end of the lever M , and raise the opposite end thereof together with the bar q , and thus to disengage both the pawls m^2, m^3 , from the ratchet wheel m' , and allow the web to be taken back by the spring p' , and lever p , of the let-off motion. The return or unwinding movement of the take-up roll is arrested by means of an arm r , which is attached to it, striking the spring catch piece q' , and driving it out of the hook of the bar q , allowing the hooked end of the bar to fall and thus allowing the pawls m^3, m^2 , to engage with the ratchet wheel. The proper distance of the return of the web is regulated by fitting the arm r , loosely to the take-up roll and effecting the connection with the roll, by a pawl r' , attached to the said arm to engage with the ratchet wheel m' . The distance of the movement of the arm r , starting from the catch piece q' , is regulated by a fixed stop r^2 , secured on the upright of the loom framing, the movement of the said arm being stopped when it comes in contact with that

stop and there remaining, allowing the ratchet to move on without it until the pawls m^2, m^3 , are disengaged, when the arm is carried back with the ratchet. It will thus be seen that the proper distance of the return of the web depends upon the position of the stop r^2 . If it is desired to vary the length of the holes this stop should be made adjustable. When the bar q , drops to allow the pawls m^2, m^3 , to come into operation again, it only falls far enough for that purpose, being arrested by a fixed rest q^2 , on the contiguous upright of the framing of the loom. When the catches s, s , are thrown out of operation, on the completion of the hole, to allow the harness to resume its proper operation for weaving the whole width of the web, the same movement of the rock shaft s' , that disengages the said catches throws the cam s^2 , out of the way of the lever M , and allows the other end of the lever carrying the bar q , to fall, by reason of its greater weight. When this falling action of the lever M , takes place, the bar q , becomes a lever, the rest q^2 , being the fulcrum and as the pivoted end of the said bar descends with the lever M , the hooked end is raised until the spring catch piece q' , enters the hook and the bar becomes attached by both ends to the lever. This entrance of the catch into the hook takes place on the first action of the take-up after the completion of the hole and resumption of the weaving the whole width of the web.

The movement of the rock-shaft s' , is effected by a small lever t , which is pivoted by a pivot t' , to an arm N , which is secured to the catch carriage E , by which the harness is operated. The upper part of this lever t , terminates in a pointed finger t^2 , which, according as it inclines to the right or to the left passes on one or other side of the center of the rock-shaft. The rock-shaft, at the part opposite or nearest to this finger, has a triangular projection or cam s^3 , shown in Figs. 1, and 5, and when the finger, in ascending with the carriage E , passes on the right side of this triangular piece, as shown in Fig. 1, it turns the shaft over to the left and throws the catches s, s , into operative positions, but when the finger passes on the other side of the triangle it throws the shaft over in the other direction and throws the catches out of operation.

The shifting of the lever t , to make it incline to the right or left to throw the catches into or out of operation is effected by the following means. Below the lever t , there is a horizontally vibrating lever Q , which has its fulcrum u , at one end and which has an eye u' , at some distance from the fulcrum, through which passes the pattern cylinder shaft. The other end of this lever has two inclined pieces 6 and 7, the former on the front side and the latter on

the back side, the inclination of the said pieces being in opposite directions. This lever Q, is only moved when it is necessary to change the position of the lever t , to operate on the rock-shaft s' , being moved backward at the completion of the weaving of one side of a hole and forward at the completion of the other side. When the lever Q, is forward the lever t , passes behind it as it moves up and down with the carriage E, and when it is thrown back the said lever t , passes in front of it. During the weaving of the first side of a hole, the lever t , stands inclined in the opposite direction to that shown in Fig. 1, but when that side of the hole is completed the lever Q, is thrown forward and the lower end of the lever t , on its next descent strikes the inclined piece f , and the said lever t , is thrown to the position shown in Fig. 1. When the other side of the hole is completed, the lever Q is thrown back and the lower end of the lever t , on its succeeding descent strikes the inclined piece b , which again effects the necessary change in its position. The movement of the lever t , is limited by a stop t^3 , on the end of the arm N, and the lever is confined in either position with sufficient security by a spring t^4 , whose point presses against one or other of two laterally inclined surfaces 8 and 9, on the back of the lever, shown in Fig. 5.

The movement of the lever Q, for the purpose above described, is effected in the following manner: There is a slide R, permanently secured to the pattern cylinder shaft G', and to this slide is fitted a slider R', having a wedge piece v , see Fig. 3, on its front face, which works, against the back of the eye u' , of the lever Q, the lever being held in contact with it by means of a spring u^2 , secured to the small frame S, which carries the pattern cylinder. The slider R', is operated to bring the wedge into action upon the lever and throw it forward by means of a lever T, working on a fixed fulcrum w , and a cam U, on a shaft U', which is parallel to and geared, by gearing 10 and 11, with the pattern cylinder shaft. The lever T, carries a stud y , which rests on the periphery of the cam. The cylinder makes three revolutions to one of the cam shaft, but this relative speed is not arbitrary, as it may make four or more if desirable. The slider R', has a pin x on its front side and the lever T, has a groove or passage x' , on its back side into which the pin x , enters every time the cylinder completes a revolution. The cam is divided radially, as shown in Fig. 7, by red lines, into a number of parts equal to the number of revolutions the cylinder makes for its one, and at the end of one of these divisions there is an inclined rise y' , at the end of the next a second inclined rise y^2 , and so on, according to the number of

divisions and at the end of the last division a sudden fall y^3 . At the end of the first revolution of the pattern cylinder, the first rise y' , of the cam raises the lever T, a little way, and the said lever catching the pin x , moves the slider R', a little way. At the end of the next revolution of the pattern cylinder, the next rise y^2 , comes into operation and raises the lever a little more, which gives the slider R', another movement. The action of this or the last rise of the cam brings the wedge piece v , on the slider into operation on the lever Q, and the said lever, which up to this time has been held back by the spring u^2 , is now thrown forward by the wedge piece, and by the action of the said lever on the lever t , the rock-shaft s' , is operated. During the revolution of the cam up to this point, the whole length of web from one hole to another, and one side of a hole are woven and during the remainder of the revolution of the cam, corresponding with a single revolution of the pattern cylinder, the second side of the hole is woven. At the end of the revolution of the cam and cylinder, the step y^3 , of the cam passes the stud y , of the lever T, and the lever drops or is thrown down suddenly by a spring U², to the lowest part of the cam carrying back the slider R', the whole way and allowing the spring u^2 , to throw back the lever Q, suddenly, ready to commence weaving the whole width of web again. In addition to the duty of operating the lever Q, the slider R', performs the duty of always returning the pattern cylinder at the termination of the weaving of a hole, to the position for commencing the pattern anew. In order to effect this the cylinder is fitted loosely upon its shaft and is only secured thereto by a spring catch z , attached to the slide R, engaging in one of a series of notches in a wheel V, which is secured permanently to the cylinder. The ratchet wheel P, and a wheel P², see Figs. 3 and 5, which is engaged by a spring catch P³, to keep the shaft from turning when not operated upon for the purpose of turning it, are both secured to the shaft. The wheel P², and the wheel V, have their teeth rounded in both directions so that the catches P³, and z , may be caused to slip over by the application of a certain amount of force in either direction but this does not prevent them holding the cylinder when it is not desired to move. The slider R' is made to turn the cylinder on the shaft to return it to the position for commencing the pattern by providing the said slide with a small fork z' , at one side to receive a pin z^2 , which is secured in the contiguous face of the wheel V, and by that means every movement of the slider turns the wheel and the cylinder a little way on the shaft, the two catches P³ and z , admitting of this

movement. The fall of the lever T, over the step y^3 , and return of the slider, gives the wheel and cylinder a backward movement and in whatever position the cylinder may be before the return of the slider, the slider always carries it back to a certain position viz: that for commencing the pattern. This action must be positive as the slider acts upon the cylinder altogether independently of its shaft.

The harness of this loom with the exception of the heddles is made entirely of iron. Its construction is exhibited in Figs. 2 and 4, each lower heddle rail B, is secured permanently by riveting, bolting or otherwise to the lifting bar C, and it has attached to it in any suitable manner a number of metallic loops 13, corresponding with the number of webs to be woven in the loom, the said loops being to attach the heddles 14. Between every two loops 13, there is an upright piece 15 secured rigidly to the lower heddle rail by riveting, bolting or otherwise. These upright pieces are slotted at their upper ends. The upper heddle rail B', is provided with a number of metal loops 13*, to correspond with the loops 13, of the lower rail and is bolted to the uprights 15, by screw bolts 16, passing through the slots in the said uprights and screwing into the rail itself. The slots allow the upper rail to be moved at any time to tighten up the heddles by simply unscrewing the bolts 16.

The shuttles are driven from the pattern cylinder shaft. Only one shuttle, 17, is shown. All are supposed to be driven simultaneously by a sliding rod fitted to the lay. This rod is not shown but will be understood as a similar rod is commonly employed to drive a number of shuttles for narrow weaving. The rod derives its movement from a cord or chain 18, see Fig. 1, which passes over a pulley or its equivalent under the lay, the ends of the said cord or chain being connected with two treadles, 29, 19, which are depressed in turn to move the cord in opposite directions, by means of a rod 21, which is suspended from a lever 22, which is depressed by a cam 23, on the main shaft, once during every revolution of the latter and raised again by a spring 24, after the cam has passed it. The rod 21, is moved to the right and left to depress the treadles, 29, 19, in regular alternate succession by means of a sliding piece 25, see Fig. 4, which is driven in one direction by a cam 26, on the back end of the cylinder shaft and driven back again by a spring 27, attached to the framing.

The loom has two stop motions, one of which is to stop it when the filling gives out or breaks, and the other when either of the shuttles fails to pass through the warp. The filling stop, of which there is one for every

web, differs materially from that employed in common looms. It consists of an upright fork e, e , placed in front of each reed or section of the reed, of sufficient width to allow the web to pass between its prongs, provided with pivots to fit small boxes e', e' , on the lay, and with a tongue e^2 , standing out in front something like the tongue of the protector of a common loom. The filling thread after the shuttle has passed through the warp lies across the front of the prongs e, e , of the fork and holds them back, thereby holding the tongue e^2 , so high that when the lay beats up, the said tongue will pass through without touching the fork d, d , of an arm d' , which is attached to the horizontal shaft d^2 , which also carries an arm d^3 , which lies against the shipper lever d^4 ; but if the filling thread gives out the tongue e^2 , falls below the fork e, e , and when the lay beats up strikes the arm d' , thereby driving the arm d^3 , against the shipper lever and throwing it out of the notch by which it is held in gear throws the loom out of gear. The forked arm d' , also serves to stop the loom when the shuttle fails to pass through the warp, the fork d, d , of the said arm being then struck by the shuttle as the lay beats up and the arm d^3 , being thereby caused to throw the shipper lever out of its notch. It need hardly be observed that there must be an arm d' , for every reed or section of the reed.

What I claim as my invention and desire to secure by Letters Patent, is,

1. The method herein described of forming button holes or other holes in suspender-webbing and other fabrics by weaving one side of the hole continuously from the weaving of the full width of the web, then running back the web, the length of the hole and proceeding with the other side of the hole.

2. The employment for operating the harness of a sliding lifting carriage E, furnished with a number of catches a, a , corresponding with the number of leaves of harness, said catches being employed below the harness, opposite the lifting bars C, C, thereof and being allowed to fall into the notches of the lifting bars of their respective leaves of harness, or being thrown out by a corresponding number of levers f, f , which are operated upon by a pattern cylinder G, or its equivalent, substantially as herein described.

3. The method of throwing off all the levers f, f , from the pattern cylinder at every stroke of the loom to admit of the turning of the cylinder, by attaching all the said levers to a superior lever H, which is operated upon by inclined surfaces i, j , upon the connecting rod of the lifting carriage E, substantially as herein described.

4. The mechanism by which the suspen-

sion of the operation of that part of the harness which carries that part of the warp which forms the side of the hole which is first woven is effected, consisting of a rock shaft s' , carrying catches s, s , to hold up the harness, and a finger lever t , attached to the lifting carriage E , to act on a cam s^3 , or its equivalent on the said rock shaft, the said finger lever having imparted to it by suitable means, a vibrating or side to side movement at the termination of the weaving of each side of the hole to actuate the rock shaft, to throw the catches s, s , in or out of operation, substantially as herein described.

5. The method of returning the pattern cylinder to the position for commencing the pattern, after the weaving of the hole, by fitting the cylinder loosely to its shaft and furnishing the end of the shaft with a fixed slide R , to receive a movable slider R' , which is raised at intervals by a lever operated by a cam on a shaft U , parallel to and geared with the cylinder shaft, and at the end of the formation of the hole suddenly falls over a step on the cam and throws down the slider and thereby causes a fork z' , on the slider to operate on a stud z^2 , on the cylinder and return it positively to the required position, substantially as herein described.

6. Forming those dents of the reed which correspond with that part of the warp which forms that side of the button hole which is to be first woven with a backward crook n^* , above or below the plane in which the closing of the sheds takes place in order that by raising or lowering that part of the warp

of which the first woven side of the hole is composed, the said woven side may be allowed to go back, the length of the hole, without obstructing the lay in weaving the other side of the hole, as herein fully set forth.

7. I claim the method of liberating the take up roll from the pawls m^2, m^3 , to allow the backward movement of the web and reengaging it with the said pawls, by means of the lever M , the hooked bar q , the catch q' , and the arm r , all operating substantially as described.

8. I claim fitting the arm r , loosely to the take up shaft and engaging it by means of a pawl r' , with the ratchet, and providing a fixed stop r^2 to arrest the said arm at a suitable point, whereby the take up shaft is caused to carry the said arm r , the requisite distance from the catch q' , corresponding with the length of the button hole and then the arm to become stationary till the ratchet is liberated, and then to return with the ratchet to throw out the catch q' , substantially as herein described.

9. The application in connection with each of the let-off rolls o, o , of the brake lever o' , and a spring lever q , the said levers operating as described to control the let off and the spring lever acting as a backward take up to take back the web to weave the second side of the hole, substantially as herein described.

WILLIAM V. GEE.

Witnesses:

JOHN CRAIG,
R. FITZGERALD.