No. 614,369. Patented Nov. 15, 1898

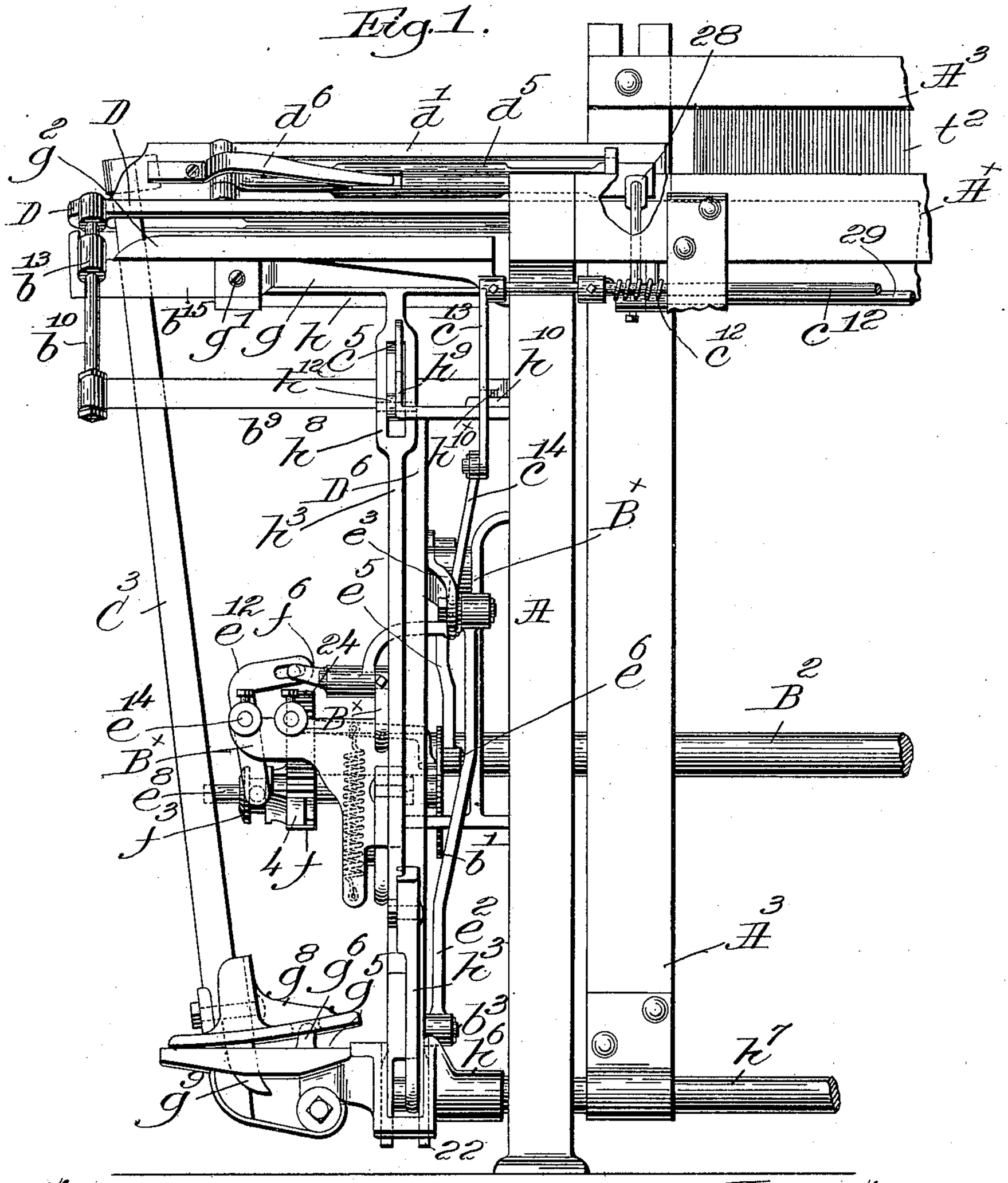
R. CROMPTON & H. WYMAN.

SHUTTLE CHANGING MECHANISM FOR LOOMS.

(Application filed Jan. 24, 1898.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



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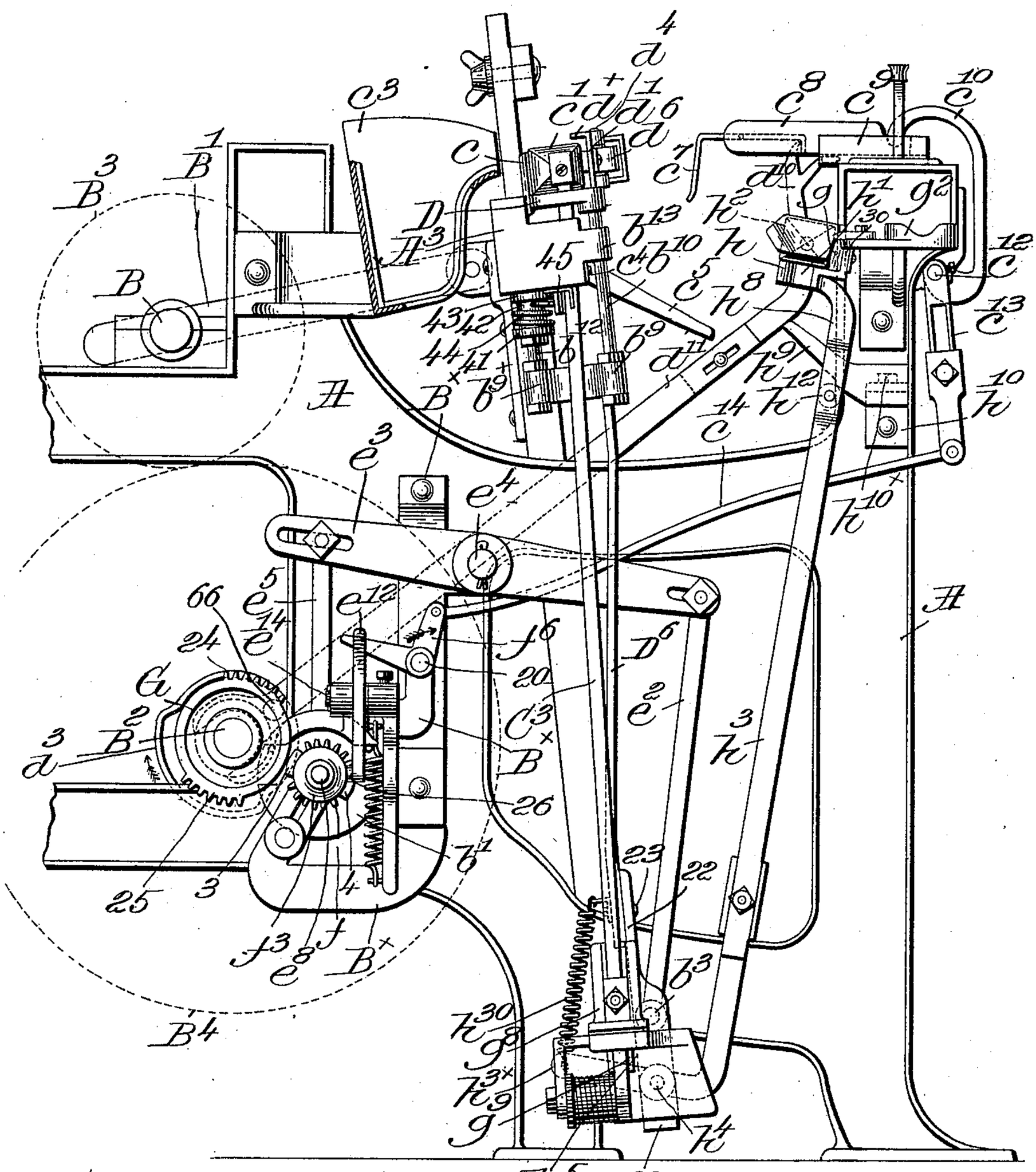
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

Fig. 3.

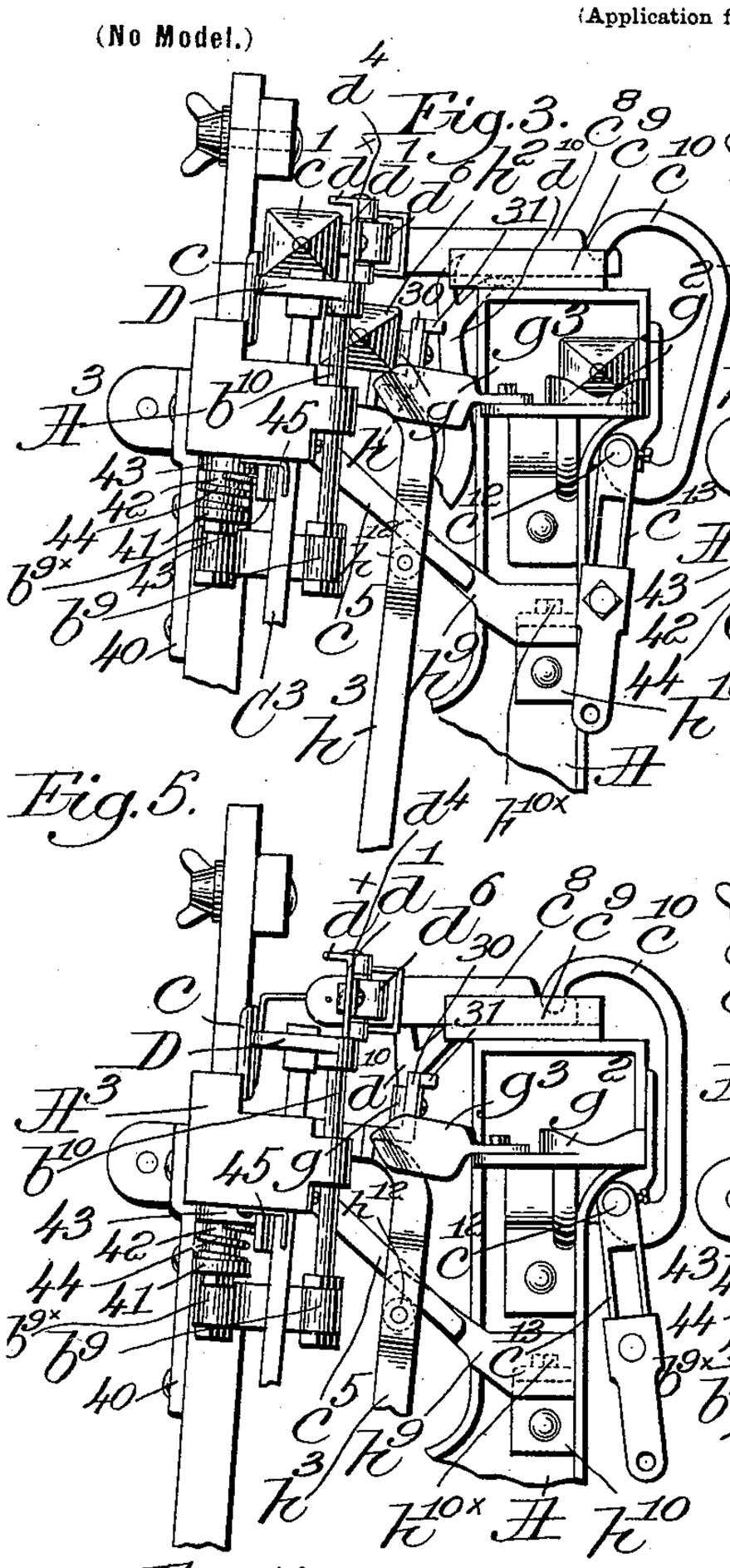


Fig. 4.

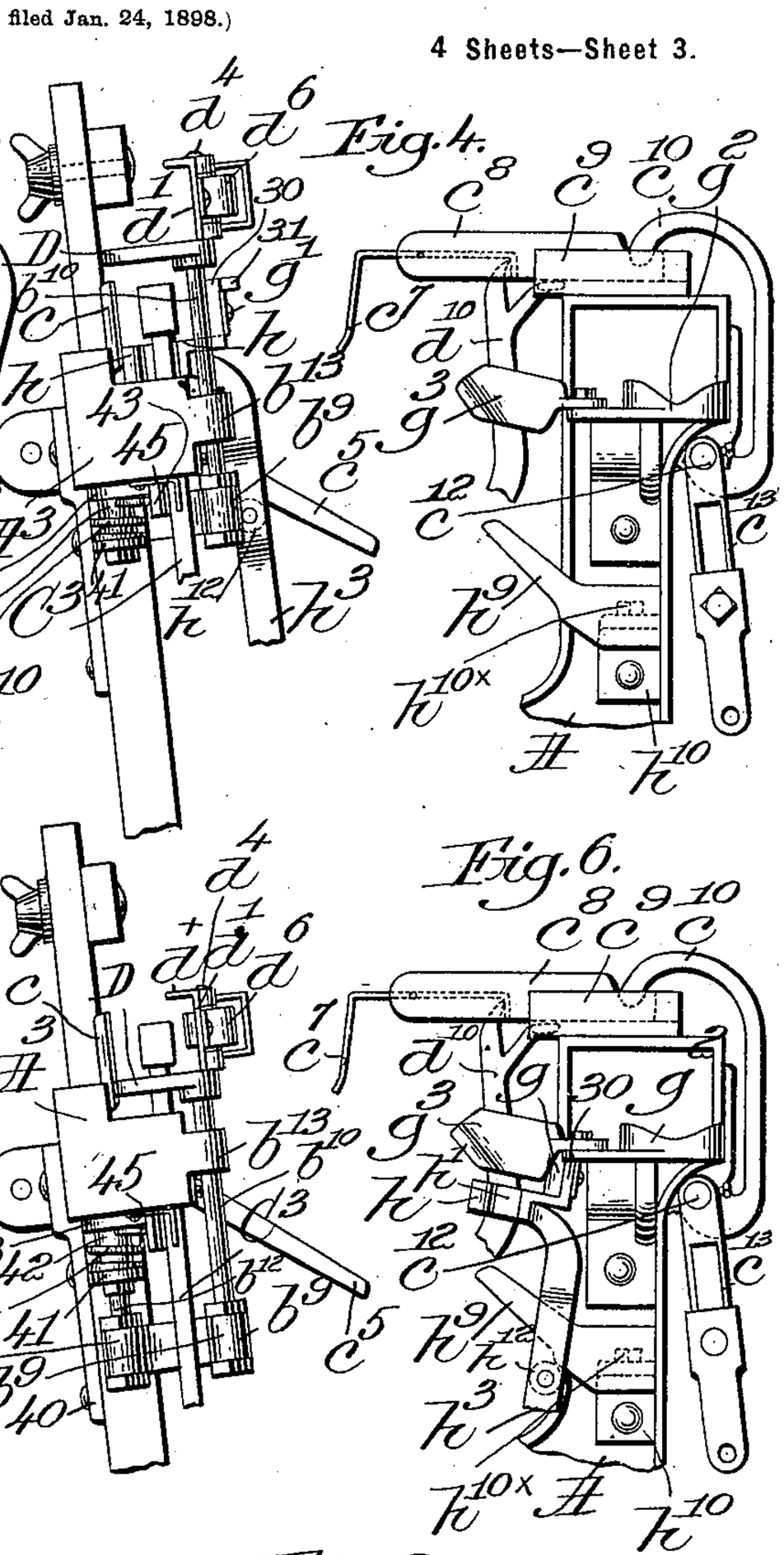


Fig. 5.

Fig. 6.

Fig. 7.

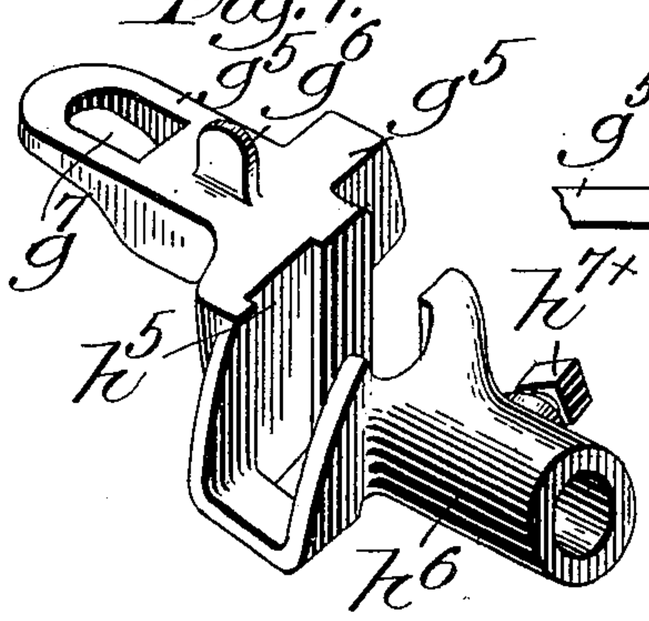


Fig. 8.

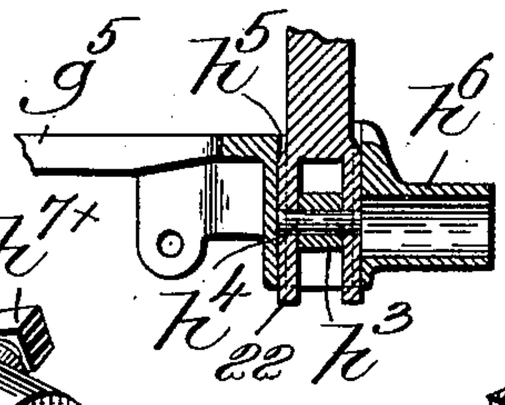
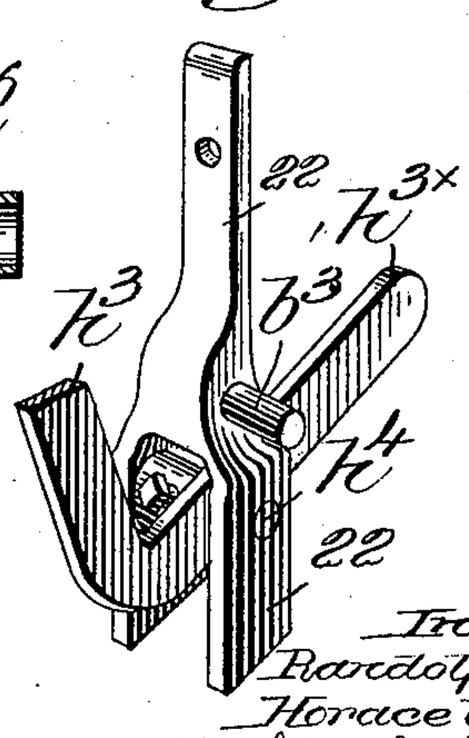


Fig. 9.



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(No Model.) 4 Sheets—Sheet 4.

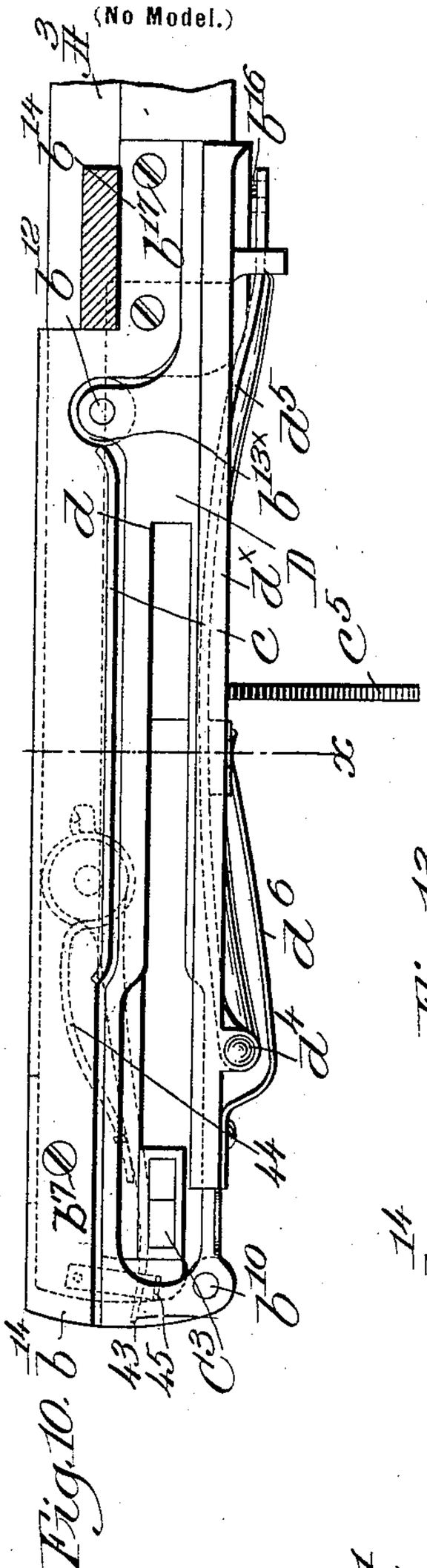

Fig. 10.

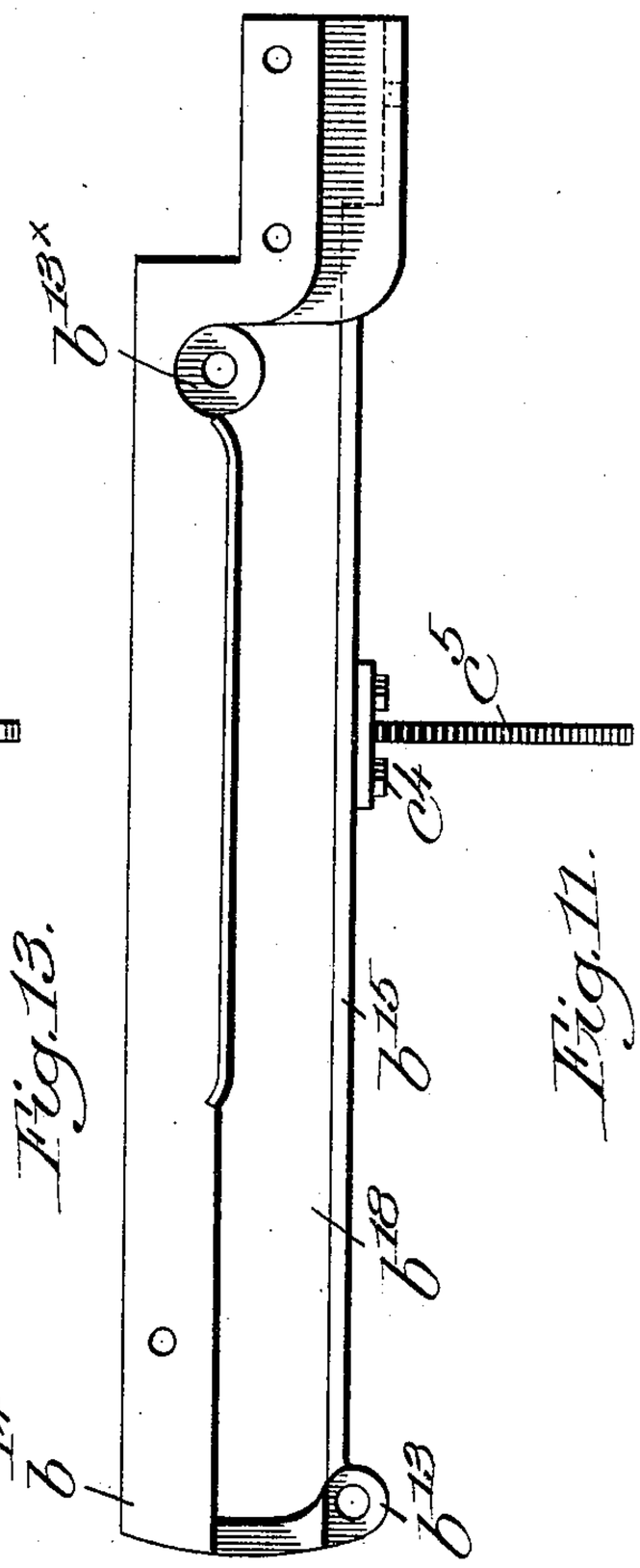

Fig. 13.

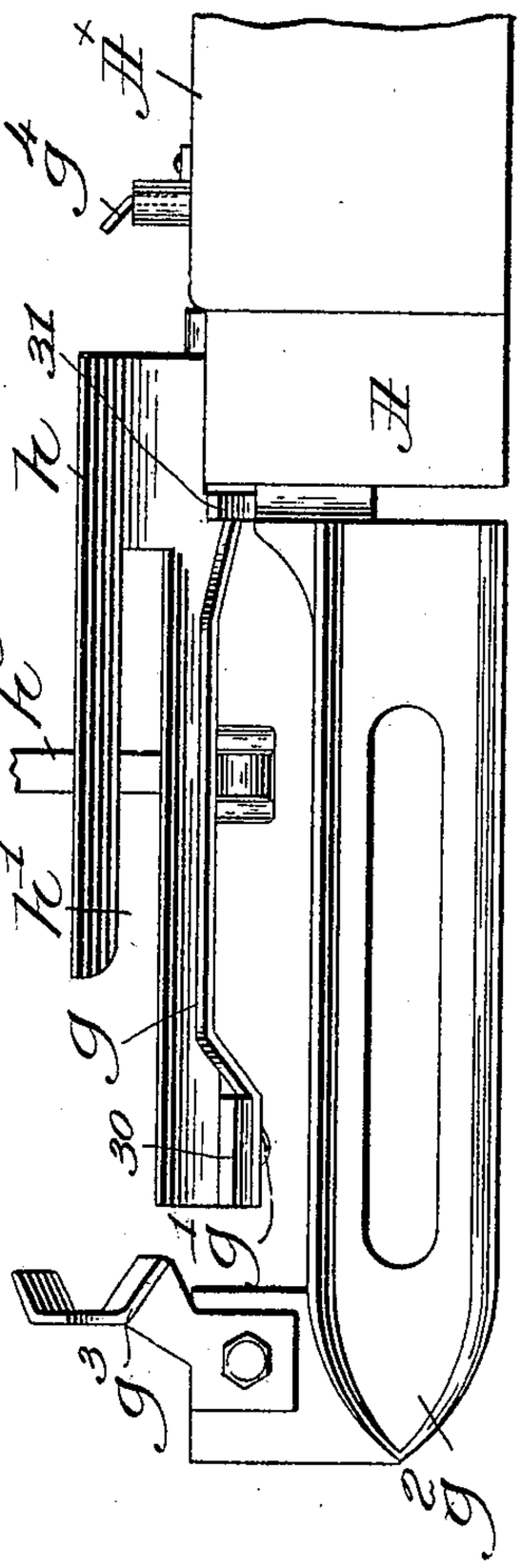

Fig. 11.

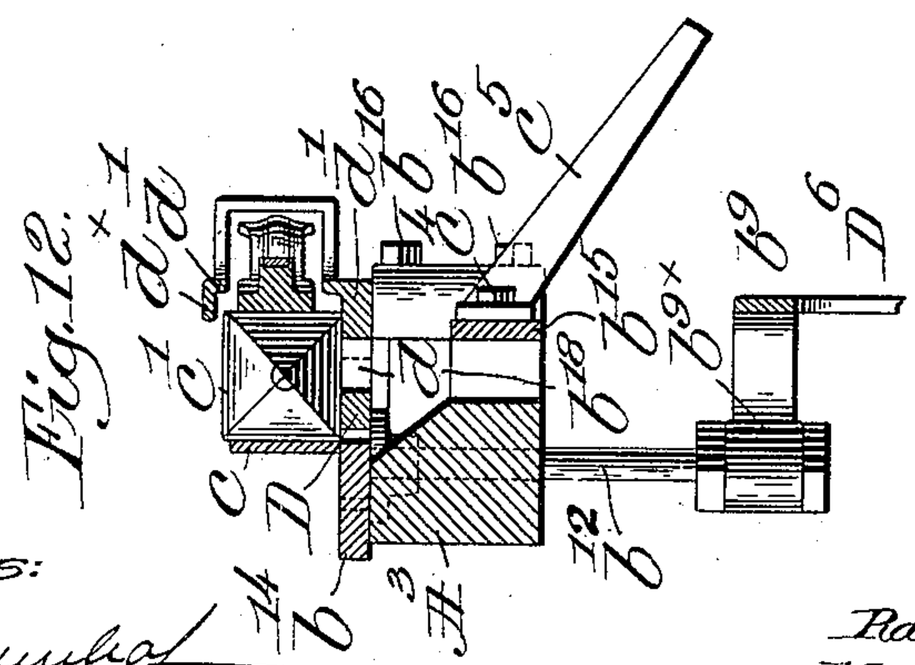

Fig. 12.

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UNITED STATES PATENT OFFICE.

RANDOLPH CROMPTON AND HORACE WYMAN, OF WORCESTER, MASSACHUSETTS, ASSIGNORS TO THE CROMPTON & KNOWLES LOOM WORKS, OF SAME PLACE.

SHUTTLE-CHANGING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 614,369, dated November 15, 1898.

Application filed January 24, 1898. Serial No. 667,679. (No model.)

To all whom it may concern:

Be it known that we, RANDOLPH CROMPTON and HORACE WYMAN, of Worcester, county of Worcester, State of Massachusetts, have invented an Improvement in Shuttle-Changing Mechanism for Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object to improve that class of looms wherein a spare shuttle is placed automatically at the level of the race of the lay to be thrown through the shed after the filling has been exhausted or run off from the filling-carrier in the running shuttle-box to a predetermined amount. Herein the lay is provided with a running shuttle-box, it containing the shuttle which is used to furnish filling for the cloth being woven, and coöperating with this running shuttle-box is a spare shuttle-feeder, which at the proper time supplies a spare shuttle to the lay to take the place of the shuttle in the running shuttle-box, said spare shuttle-feeder being normally held stationary in its inoperative position at the loom side near the breast-beam. When the filling on the filling-carrier in the running shuttle-box indicates, from breakage or otherwise, that the shuttle in the running shuttle-box should be changed, then the shuttle-feeder, it constituting a second shuttle-box, at such time held in its inoperative stationary position is automatically placed vertically in line with the running shuttle-box, the said shuttle-feeder or second shuttle-box on its arrival in said vertical line occupying its operative position at the level of the race of the lay, the running shuttle-box having in the meantime been put into its inoperative position to enable the shuttle contained in it to escape from the entirely open rear side of said shuttle-box into a suitable receptacle made for it and located at the loom side.

The invention herein contained is an improvement on the loom shown and described in United States Patent No. 600,490, dated March 8, 1898.

Figure 1, in front elevation, represents a sufficient portion of a loom embodying our invention to enable the same to be understood. Fig. 2 is a left-hand end view of a portion of said loom with the parts represented in the position they will occupy when the loom is running regularly. Fig. 3 is a detail showing the lay in its forward position, with the running shuttle-box substantially in its inoperative position and the shuttle-feeder as coming into its operative position. Fig. 4 is a detail of the same parts at the succeeding back stroke of the lay, the running shuttle-box being yet in its inoperative position, the shuttle which was carried by it having been discharged over the wall carried by the lay, and in this position the spare shuttle acted upon by the picker is thrown from the shuttle-feeder, it then being in its operative position. Fig. 5 shows the said parts at the third forward stroke, as herein described, Fig. 6 at the end of the third backward stroke. Fig. 7 is a detail of the rocker-iron especially devised for use in this loom. Fig. 8 is a sectional detail of said iron, together with the block or lower end of the rod carrying the running shuttle-box. Fig. 9 is an enlarged detail of the lower end of the rod carrying the running shuttle-box, together with the lower end of the lever carrying the spare shuttle-feeder. Fig. 10 is a much enlarged top or plan view of the end of the raceway, it showing the running shuttle-box in its operative position. Fig. 11 is an enlarged detail showing in plan view the shuttle-feeder and part of the bar or lever carrying it. Fig. 12 is a sectional detail in the line x, Fig. 10. Fig. 13 is a top view of the casting carried by that end of the lay in which the running shuttle-box works, but with said shuttle-box removed.

Referring to the drawings, A represents the loom-frame; $A^{\times}$, the breast-beam; A^3, the lay; B, the crank-shaft; B′, the pitman connecting the crank-shaft with the lay; B^2, the under or cam shaft; B^4, a toothed wheel thereon, which engages the teeth of a toothed wheel B^3, fast on the crank-shaft.

The cam-shaft may be rotated in any usual manner, and it carries a gear G, having two sets of teeth 24 and 25, (see Fig. 2,) separated one from the other, said shaft B^2 rotating once to every two rotations of the crank-shaft.

The loom-frame has mounted upon it near the said cam-shaft a stand $B^{\times}$, having suitable bearings for a shaft e^8, having at its inner end a disk b', provided with a crank-pin e^6, over which is fitted one end of a link e^5, adjustably connected with one end of a lever e^3, having its fulcrum at e^4 on the loom side, said lever having connected to its other end in an adjustable manner a link e^2, which in turn fits over a stud b^3, extended laterally from the lower end of the shuttle-box rod D^6 or from a block 22, attached to the lower end of said rod by a screw 23.

The rod D^6 supports, in manner to be described, a running shuttle-box h, hereinafter to be more fully referred to.

The shaft e^8 has fast on it a mutilated gear f, it having removed from one side of it two teeth to leave a space or groove, and at a point diametrically opposite said space, as herein represented, said gear has a large tooth 4. The shaft e^8 has fitted on its outer end to slide thereon a fork f^3, having a leg provided with a tooth 3, said leg being free to be slid in said groove to put its tooth 3 in line with the remaining teeth of the gear f or out of line with relation to said teeth. The tooth 3 normally stands out of line with relation to said teeth and out of the line of movement of the teeth 24 and 25 so long as the running shuttle-box, to be described, remains in its operative position; but as soon as the said running shuttle-box is to be put into its inoperative position, due to failure of the weft in the shuttle carried by it, then said tooth 3, it standing close to the teeth 24 of the gear G, which is rotating continuously, is moved outwardly to put the said tooth 3 into position to be engaged by the said teeth 24. This movement of the sliding fork f^3 is effected by or through the backward motion of a filling-fork slide or carrier c^8, it carrying a filling-fork c^7 and being moved backwardly in usual manner on the failure of the filling by a hammer device d^{10}, shown as on a sliding bar d^{11}, actuated by a cam d^3 on shaft B^2, said cam having a groove in it at one side to receive a pin 66 of the hammer device. The slide or carrier c^8, when moved toward the front of the breast-beam, acts on and turns a lever c^{10}, connected with a rock-shaft c^{12}, having an arm c^{13}, to which is attached a rod c^{14}, joined to an elbow-lever f^6, pivoted at 20 on the stand $B^{\times}$, one end of said lever f^6 entering a slot in a second elbow-lever e^{12}, mounted on a stud e^{14} of said stand and having at its lower end a roller or other stud 26, which enters an annular groove in the said sliding gear f^3. The lever e^3, herein designated as a shuttle-box-moving lever, having been turned to raise the running shuttle-box, the teeth 24 of the gear G run out of mesh with one of the series of teeth of the mutilated gear f, and said gear f and the shaft e^8 remain stationary until in the continued rotation of the gear G the teeth 25 thereof come in position to meet the tooth 4, fixed, as herein stated, to the said gear f, when the gear f and shaft e^8 are again given a semirotation to move the lever e^3 and also the running shuttle-box, and this lowering of the shuttle-box having been effected the lever e^{12} is moved by or through the shaft c^{12}, controlled through the filling-fork mechanism to move the forked gear f^3 inwardly toward the loom side and put the tooth 3 thereof out of range of movement of the approaching teeth 24 of gear G, and thereafter the lever e^3 will remain inactive so long as the filling is properly delivered from the shuttle in the running shuttle-box.

The devices so far described and specifically referred to, with the exception of the block f^{22}, are and may be all as provided for in said patent, so their action need not be herein further described.

Instead of the particular devices herein shown and described for operating the lever e^3 we may use any other usual shuttle-box-lever-moving devices, and, if desired, the forked lever f^3 may have two legs, each having a tooth, as in United States Patent No. 600,489, dated March 8, 1898, said teeth coming into line with the teeth of the mutilated gear one after the other, according to the direction of movement of the said sliding fork.

The upper end of the rod D^6, hereinbefore referred, to is herein represented as provided with a permanent cross-bar b^9, which is bent backwardly at $b^{9\times}$, (see Fig. 2,) away from the breast-beam at its end next the loom side. (See Fig. 2.) The opposite ends of this cross-bar b^9 have attached to them by suitable nuts rods b^{10} and b^{12}, and the upper ends of said rods slide in suitable bearings b^{13} and $b^{13\times}$ in a casting b^{14}, connected with the lay and projecting beyond the loom side at that end of the lay containing the running shuttle-box. The upper ends of these rods are located one in front and the other back of a slot b^{18}, in which plays back and forth the picker-stick C^3. The upper ends of these rods have attached to them the running shuttle-box, it consisting, as herein shown, essentially, of a flat plate D, the shape of which is best represented in Fig. 10, said plate having an open slot d, in which may play the said picker-stick C^3, and at its front side this plate has an upright wall d', the inner face of which is parallel, or substantially so, with relation to the faces of the dents of the reeds t^2, said front wall having at its upper edge an overhanging lip $d^{\times}$.

As shown herein, the wall d' has pivoted upon it at d^4 a binder d^5, which is normally acted upon by a suitable spring d^6, that serves to keep the inner or bulging faces of the binder in the path of movement of the shuttle in the running shuttle-box. The free end of this binder may in practice be acted upon by any suitable binder-finger 28, carried by a binder-operating rock-shaft 29, mounted in bearings at the under side of the race of the lay, said rock-shaft in practice being provided with a spring acting in usual manner to normally

keep the binder-finger against the free end of the binder.

The rear side of the plate D is entirely unobstructed, and the under side of the shuttle in the running shuttle-box is supported directly on the plate D at both sides of the slot *d* therein.

The casting b^{14}, applied to the lay, has, however, rising from it, as herein shown, a shuttle-alining wall *c*, the front face of which stands substantially in the vertical plane occupied by the faces of the dents of the reed t^2, said alining-wall serving not only to aline correctly the rear side of the shuttle *c'*, operating in the running shuttle-box with relation to the dents of the reed, so that said shuttle may be thrown in a straight line across the lay, but it also serves that other most important purpose—viz., it constitutes the back for the running shuttle-box when the latter is in its operative position in line with the race of the lay; but when the said running shuttle-box is put into its inoperative position by lifting the rod D^6, as stated, after the failure of the filling in the shuttle of said box, then said wall no longer constitutes the rear side of said box, and the running shuttle in the running shuttle-box then in its inoperative position is free to escape laterally from the said running shuttle-box over the wall *c* and into a receptacle c^3, suitably placed for that purpose, said shuttle being thrown from said running shuttle-box on the second back stroke of the lay or that stroke following that forward stroke during which the running shuttle-box was put into its inoperative position.

The casting b^{14} is attached at its end to the lay by bolts b^{16} b^{17}, and said casting presents a bar b^{15}, the top of which is located below the level of the race of the lay, and behind this bar is the slot b^{18}, hereinbefore referred to, in which the picker-stick C^3 is moved to and fro. The bar b^{15} has connected to its front side by suitable bolts c^4 an inclined finger c^5, which projects forward from the lay, said finger constituting a bridge or guide to determine the line of motion of the shuttle-feeder *h* when coming from its stationary inoperative position (shown in Fig. 2) at the loom side near the breast-beam into its operative position, as shown in Fig. 4.

The shuttle-feeder or second shuttle-box *h* consists, essentially, of a flat plate having, as best shown in Fig. 11, a slot *h'*, open at its end to enable the picker-stick C^3 to enter said slot and throw the spare shuttle h^2 from said shuttle-feeder across the lay, said shuttle-feeder being then in its operative position at the level of the race of the lay.

The plate *h* of the shuttle-feeder is mounted upon a lever or bar h^3, pivoted on a stud h^4, (see dotted lines, Fig. 2, and full lines, Figs. 8 and 9, held in the forked lower end of a block 22,) secured, as herein shown, by a suitable bolt 23 to the rod D^6, carrying the running shuttle-box; but instead of this block being detachable from the lower end of said rod it might be formed integral therewith. The block 22 is shaped to enter, substantially fit, and be guided by grooves h^5, made in the rocker-iron h^6, which is attached by set-screw $h^{7\times}$ to one end of the rocker-shaft h^7, on which are mounted the swords A^3 of the lay, the said block rising and falling in said grooves as the lever e^3 is turned in one or the other direction to lift or depress the rod D^6. The lever h^3, carrying the shuttle-feeder, owing to its connection with the said block, rises and falls in unison with the running shuttle-box. The short arm $h^{3\times}$ of the lever h^3 has connected to it a spring h^{30}, the opposite end of the spring being fixed to the rod D^6, so that said spring normally acts to hold the shuttle-feeder in its inoperative position, as shown in Fig. 2, and in such position a slotted or bifurcated part h^8 on the lever carrying said shuttle-feeder embraces a stationary inclined guide or finger h^9, supported by a set-screw $h^{10\times}$ on a suitable bracket h^{10}, fixed to the loom side, said finger extending toward the lay. The lever h^3 at the lower end of said bifurcated portion h^8 has a suitable roller or other stud h^{12}, which, as the lever h^3 is lifted with the rod D^6 by the lever e^3, acts against the under inclined side of the finger h^9 and causes said shuttle-feeder to move toward the lay, the latter being supposed at that time to be advancing toward the breast-beam, and as said shuttle-boxes are being lifted the said bifurcated portion passes from the finger h^9 upon the end of the inclined guide or finger c^5, extended from the lay, and the latter finger thereafter continues to act alone as a guide for the lever h^3 as the shuttle-feeder comes into its operative position in a line vertical with relation to the line in which the running shuttle-box moves on the lay, said finger c^5 also acting as a locking device to insure the movement in unison back and forth with the lay of the said shuttle-feeder. These two fingers, when the lay is substantially forward, coincide, forming a sort of bridge, so that the lever h^3 may pass readily from one to the other.

The spare shuttle-feeder has at its front side a spring-plate *g*, held at one end by a screw *g'*, said plate acting as a binder against the outer side of the spare shuttle and compressing said shuttle, when the spare shuttle-feeder is in its operative position at the level of the race of the lay, against the said alining-surface *c* of the lay. The loom side has a suitable shelf or holder g^2, upon which may be laid a second spare shuttle, and the spare shuttle resting upon the shuttle-feeder may have its ends or tips located properly with relation to the space below the plate D of the running shuttle-box by means of positioning devices g^3 and g^4, the positioning device g^3 being connected with said holder, while the one g^4 is shown as connected with the inner side of the breast-beam.

The rocker-iron h^6 has a substantially hori-

zontal seat g^5, from which rises a lug g^6, said face also having an opening g^7. The lug g^6 enters a slot in the picker-shoe g^8, and a downwardly-projecting lug g^9 from said shoe enters the opening g^7 in said seat. This shoe and the picker-stick are of usual construction, and the picker-stick will be operated in usual manner; but prior to this our invention the rocker-iron has never to our knowledge been provided with any means whatever below its face, on which the rocker-shoe rests and turns, to guide the lower end of a shuttle-box rod D^6 or a block attached to said rod in its vertical movement. The provision of making the grooves h^5 in this rocker-iron, rather than projecting upwardly from the lay-rocker-shaft arms, to constitute a guideway to receive the shuttle-box rod greatly lessens the cost of the loom and simplifies the operation of the parts, and it also insures greater accuracy of movement.

We will briefly describe the operation of the loom. Let it be supposed that the filling in the running shuttle-box is exhausted or broken and that said filling, it not being present in the shed at a forward motion of the lay, causes the filling-fork and its slide to be moved back across the breast-beam in usual manner to, through the rocker-shaft c^{12}, start the shuttle-box-lever-moving mechanism into operation, as described. The filling-fork is located between the dents of the reed of the lay and the plain shuttle-box at the opposite end of the lay, and as the lay goes back from that stroke in which the filling failed, which we will call the "first" stroke, the failed shuttle is thrown back into the running shuttle-box, yet in its operative position at the race of the lay; but by the time that the next or second forward motion of the lay commences the shuttle-box-shifting mechanism begins to work, and about as the lay arrives in its forward position, Fig. 3, the lever e^3 will have been moved far enough to start the lever h^3 on its upward movement, which causes the roll h^{12}, acting on the under side of the guide or finger h^9, to start said lever and the shuttle-feeder toward the advancing lay, so that in said advancing movement the lever e^3, yet continuing its movement, causes the lever h^3 to pass from the guide or finger h^9 onto the guide or finger c^5, and by the time that the lay completes this forward movement the running shuttle-box will have been lifted substantially into its inoperative position and the shuttle-feeder will have come nearly into its operative position at the level of the race of the lay, and by the time that the second back stroke is completed (see Fig. 4) the running box will have been put into inoperative position and the shuttle-feeder fully into its operative position. On this second backward stroke of the lay the shuttle in the running shuttle-box will be thrown from the open rear side of said running shuttle-box over the top of the wall c into the box c^3, and as the lay reaches the proper position in its second back stroke (see Fig. 4) for the shuttle to be picked the picker-stick C^3 acts in the slot h' of the shuttle-feeder and throws the spare shuttle from the shuttle-feeder onto the race of the lay. During the next or third forward stroke of the lay (see Fig. 5) both shuttle-boxes are emptied, and at this time the shuttle-box lever e^3 is again moved, this time, however, to lower the running shuttle-box and the shuttle-feeder and moving the bifurcated portion of the lever h^3 from the finger c^5 onto the finger h^9, (see Fig. 5,) leaving the shuttle-feeder in its inoperative position, so that by the time that the lay arrives at the end of its third back stroke (see Fig. 6) the said running shuttle-box will receive the shuttle just thrown from the shuttle-feeder at the previous back stroke of the lay.

The bottom plate h of the shuttle-feeder has at its outer edge, next the operator and near its opposite ends, two uprights 30 and 31. The spring g is connected at one end to the upright 30, the upright 31 acting as a stop against which the free end of the spring is normally pressed, the top of said spring at its end being overlapped by a short lip extended backwardly from the upright 31. (See Figs. 3 and 4.)

To the rear side of the lay (see Figs. 3 and 5) we have connected a stand 40, provided with an ear 41, carrying a stud which enters the hollow hub 42 of a lever 43, (see Fig. 10,) a part of the face of which is normally kept in the path of movement of the picker-stick by a suitable spring 44, (see dotted lines, Fig. 10,) said lever acting as a picker-stick check. The position of said lever as regards the line of motion of the picker-stick is controlled by a stop 45.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a loom, a lay; a running shuttle-box, its rod, and means to move it in the lay; combined with the lay rock-shaft, and the rocker-iron having a seat for the picker-shoe and provided between the said seat and the loom side with a guide extended below said seat to receive and guide the end of the rod carrying the said running shuttle-box, substantially as described.

2. In a loom, a lay, a running shuttle-box, its rod, and means to move it in the lay, a spare shuttle-feeder carried by a lever jointed to said shuttle-box rod; combined with the lay rock-shaft, the rocker-iron connected thereto having a seat for the picker-shoe and provided with a groove extended below said seat to receive and guide the lower end of said box-rod, substantially as described.

3. In a loom, a lay, a lay rock-shaft, a casting connected to one end of said rock-shaft and presenting a guideway extended across the axis of motion of said lay rock-shaft, combined with a shuttle-box rod fitted to said guideway and carrying a shuttle-box, a spare shuttle-feeder jointed to said box-rod, a shut-

tle-box lever connected with said box-rod, means to move said shuttle-box lever to operate said box-rod and slide its lower end up and down in said guideway, substantially as described.

4. In a loom, a lay, a running shuttle-box, its rod, and means to move it on the lay, a spare shuttle-feeder carried by a lever jointed to said shuttle-box rod, and a spring acting on said lever to normally turn it toward the breast-beam, combined with the lay rock-shaft, the rocker-iron connected thereto having a seat for the picker-shoe and provided with a groove extended below said seat to receive and guide the lower end of said box-rod, substantially as described.

5. The lay provided with an inclined guide or finger extended toward the breast-beam, the loom-frame provided with an inclined finger extended toward the lay, a running shuttle-box, its rod; a spare shuttle-feeder presenting a lever having a notch or opening which is normally engaged by the inclined guide or finger connected with the loom side, means to move said running shuttle-box and with it said shuttle-feeder vertically in unison, and during such movement force the lever carrying the shuttle-feeder from one onto the other of said fingers, the finger extended from the lay serving temporarily as a locking device to retain the shuttle-feeder in its operative position at the lay, substantially as described.

6. A lay having a vertical slot in its raceway for the reception of a picker-stick, a vertical picker-stick movable in said slot, a running shuttle-box having a slot in its under side for the reception of said picker-stick, means to lift said shuttle-box, and a second shuttle-box adapted to be lifted in unison with said running shuttle-box, said second shuttle-box having a slot in its under side in which said picker-stick may operate to throw a shuttle therefrom, substantially as described.

7. The running shuttle-box composed of a slotted bottom plate, a front side wall having a top lip or flange, rods attached to said plate, a lay having a plate to aline the rear side of the shuttle in the said running shuttle-box, combined with a shuttle-box rod, and means to move it vertically from its operative into its inoperative position, the shuttle in said running box being permitted to escape from the open rear side of said running shuttle-box when the latter is in its inoperative position, substantially as described.

8. The lay having the inclined guiding and locking finger; an inclined finger extended from the loom side and lying in a vertical plane substantially parallel with the guiding-finger of the lay, combined with a lever carrying the spare shuttle-feeder, said lever having a notch or opening for the reception of both of said inclined fingers, and means to lift said lever and force it laterally from one onto the other of said fingers, substantially as described.

9. The lay having the inclined guiding and locking finger; an inclined guide or finger extended from the loom side and lying in a vertical plane substantially parallel with the guiding-finger of the lay, combined with a lever carrying the spare shuttle-feeder, said lever having a notch or opening for the reception of both of said inclined fingers, a roller located in said opening to ride on said inclines, and means to lift said lever and force it laterally from one onto the other of said fingers, substantially as described.

10. The lay, the casting b^{14} bolted thereto and presenting at its front side a bar located below the rear side of said casting and presenting behind said bar a slot for the working picker-stick; a wall rising from the said casting at its higher level and standing substantially parallel with the dents of the reed of the lay; a running shuttle-box composed of a bottom plate slotted for the passage of the picker-stick and having a wall rising from it at the front side of the lay, said wall having a lip at its upper edge to partially overlap the running shuttle in said running shuttle-box; a box-rod for said running shuttle-box; a spare shuttle-feeder normally held stationary in its inoperative position and composed of a slotted bottom plate and a spring or side wall and a lever carrying said plate and jointed to said box-rod; combined with means to raise and lower in unison said running shuttle-box and said spare shuttle-feeder, putting said running shuttle-box in its inoperative position with its open rear side above the wall carried by the lay, so that its shuttle may be discharged over said wall; the shuttle-feeder when coming into its operative position being carried over the top of said bar in position vertically with relation to said running shuttle-box, whereby the spare shuttle in said box may be acted upon by the picker moving in the slot in the said bottom plate and behind said bar to throw the spare shuttle from the spare shuttle-feeder, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

RANDOLPH CROMPTON.
HORACE WYMAN.

Witnesses:
GEO. W. GREGORY,
MARGARET A. DUNN.