(No Model.) 2 Sheets—Sheet 1.

W. EVANS.

LOOM.

No. 281,476. Patented July 17, 1883.

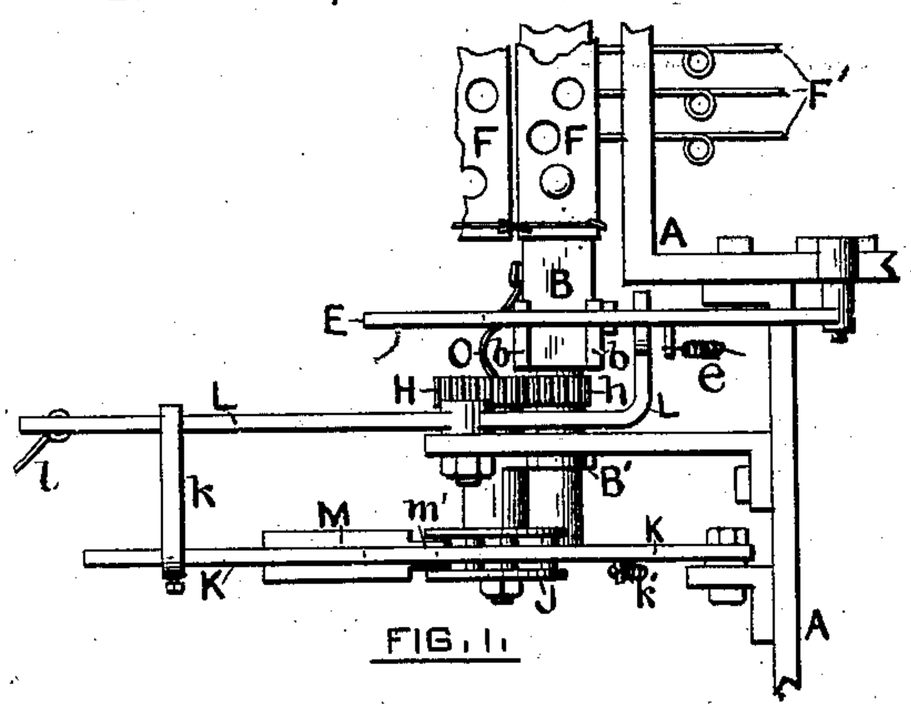

FIG. 1.

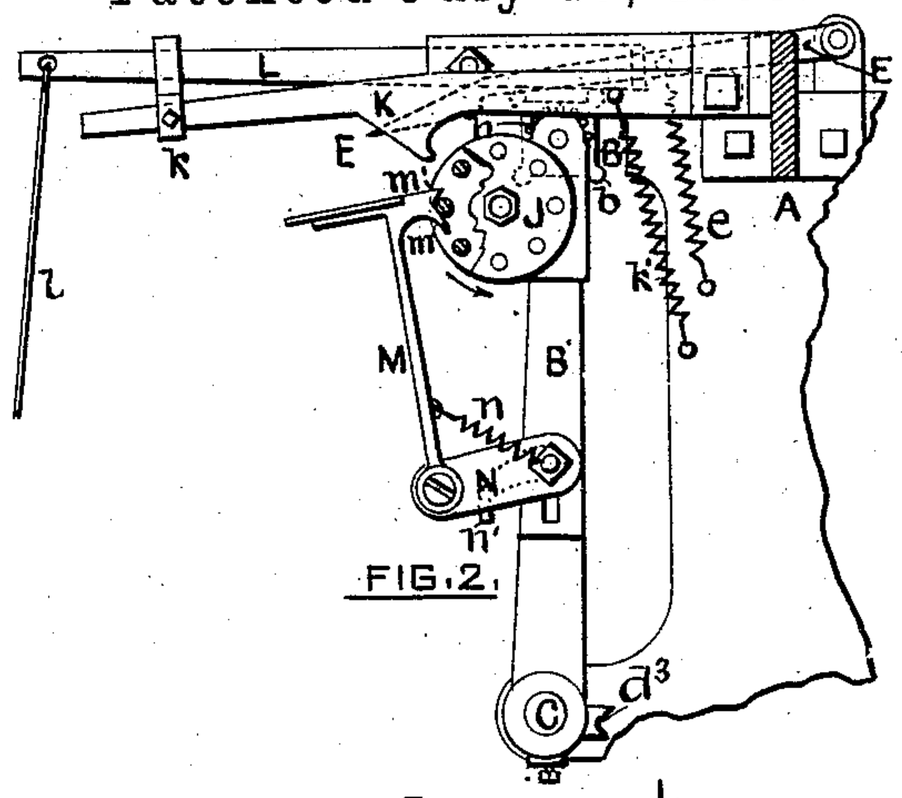

FIG. 2.

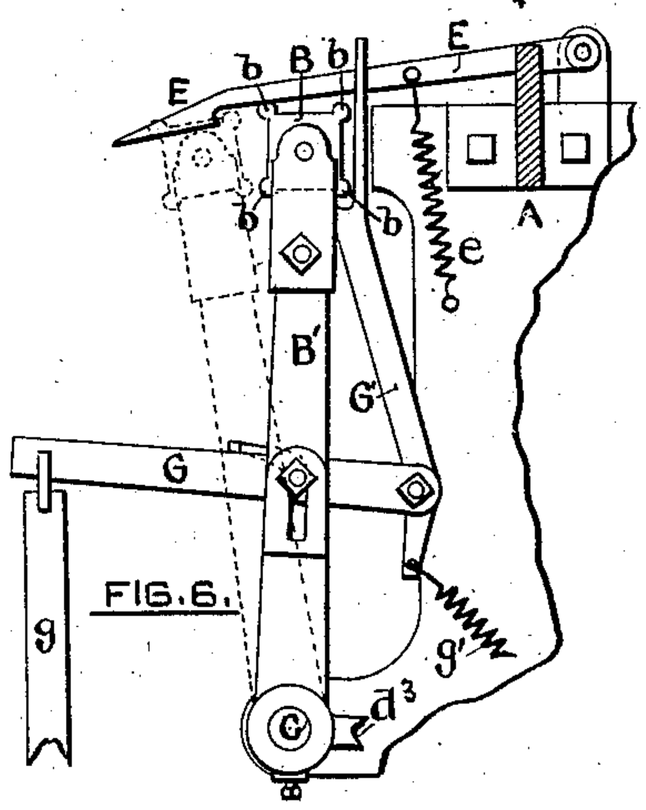

FIG. 6.

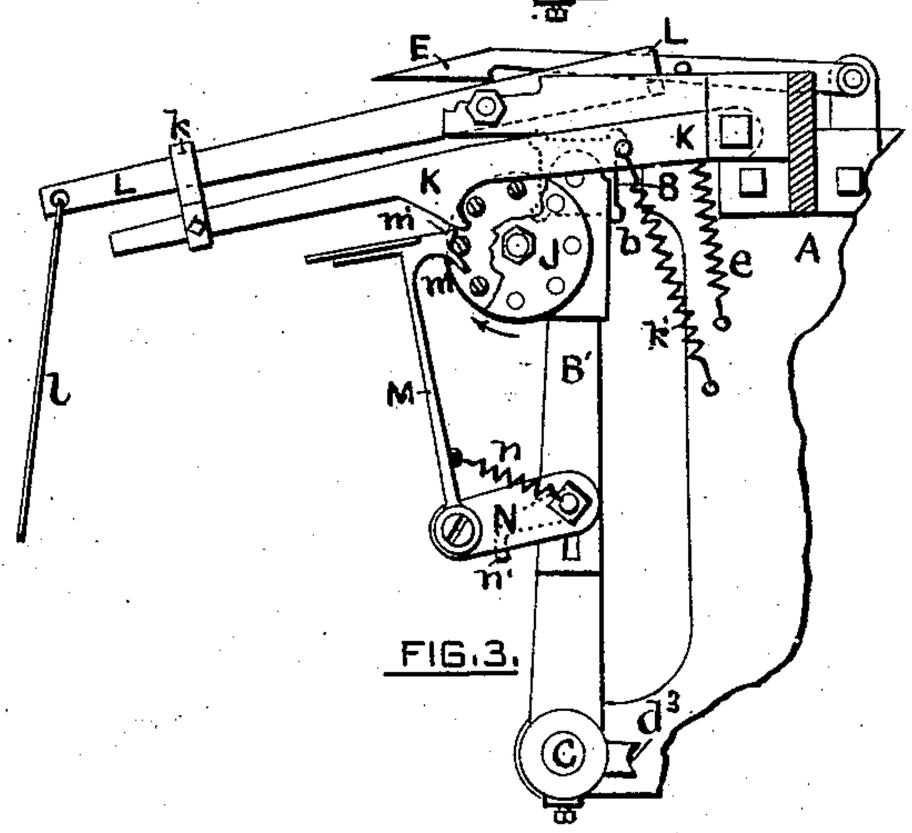

FIG. 3.

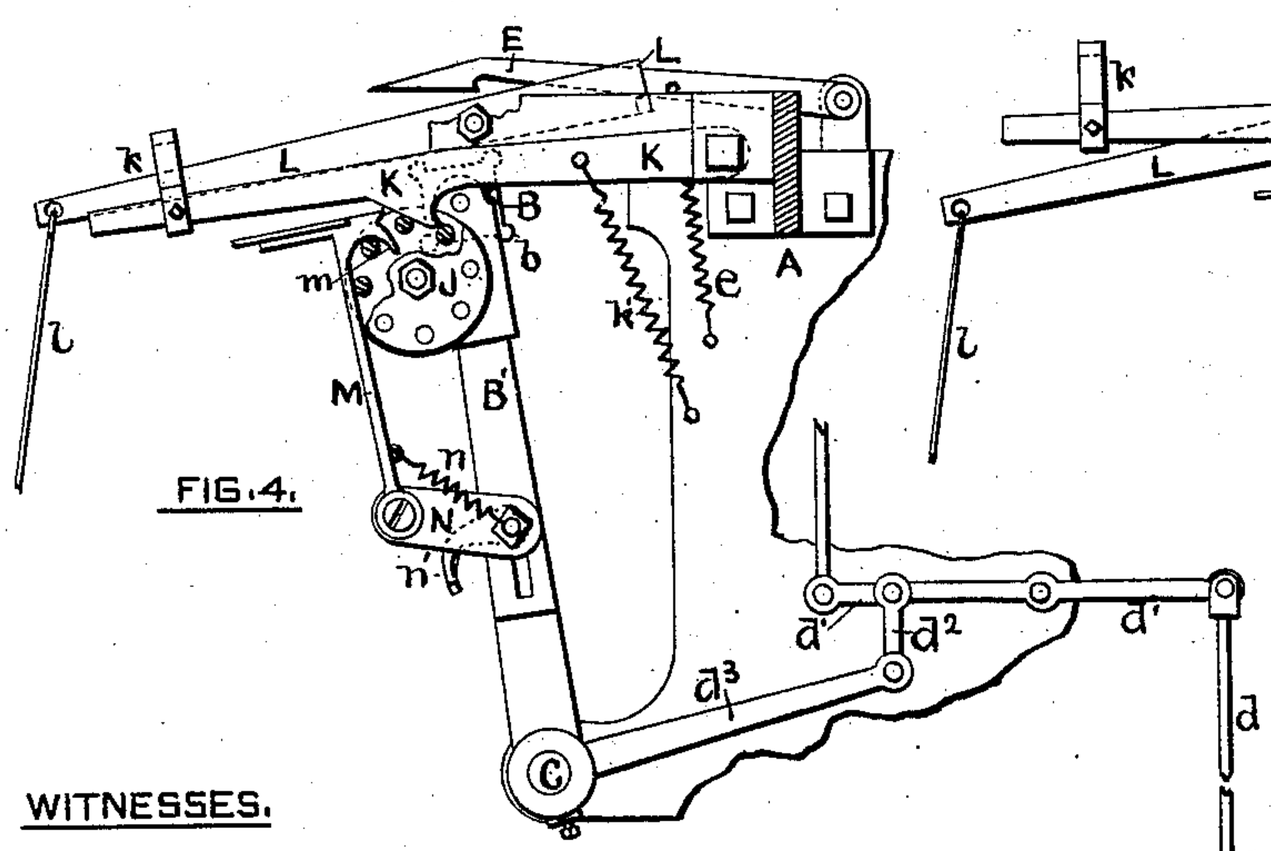

FIG. 4.

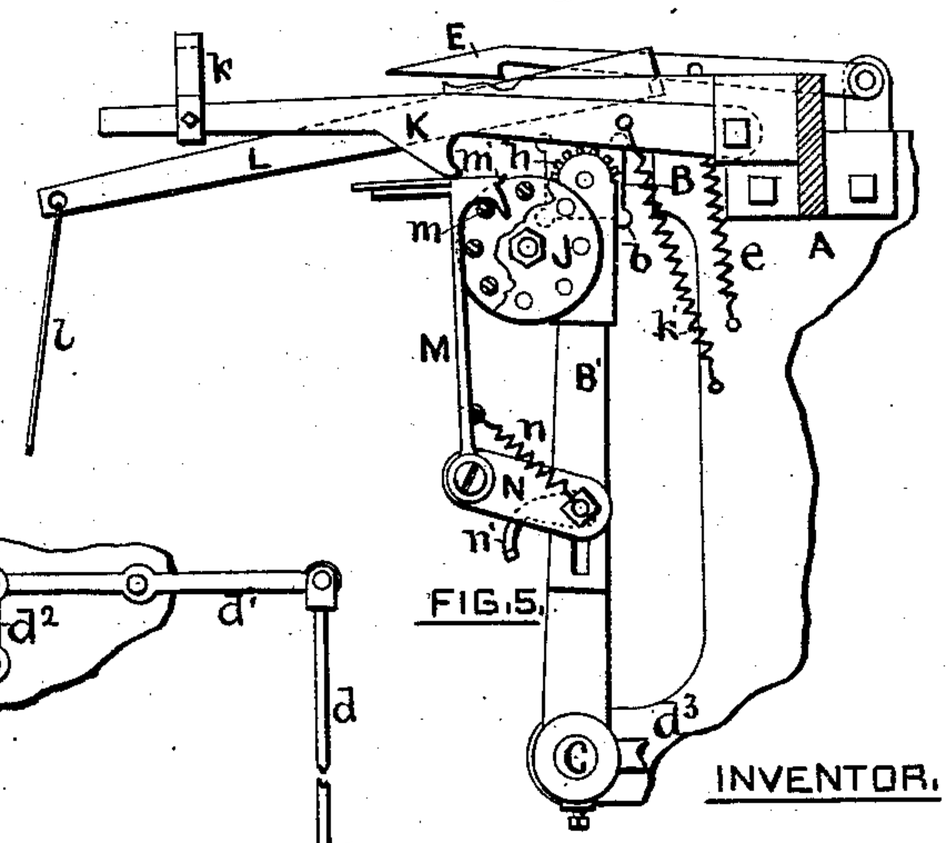

FIG. 5.

WITNESSES.

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2 Sheets—Sheet 2.

W. EVANS.

LOOM.

No. 281,476.

Patented July 17, 1883.

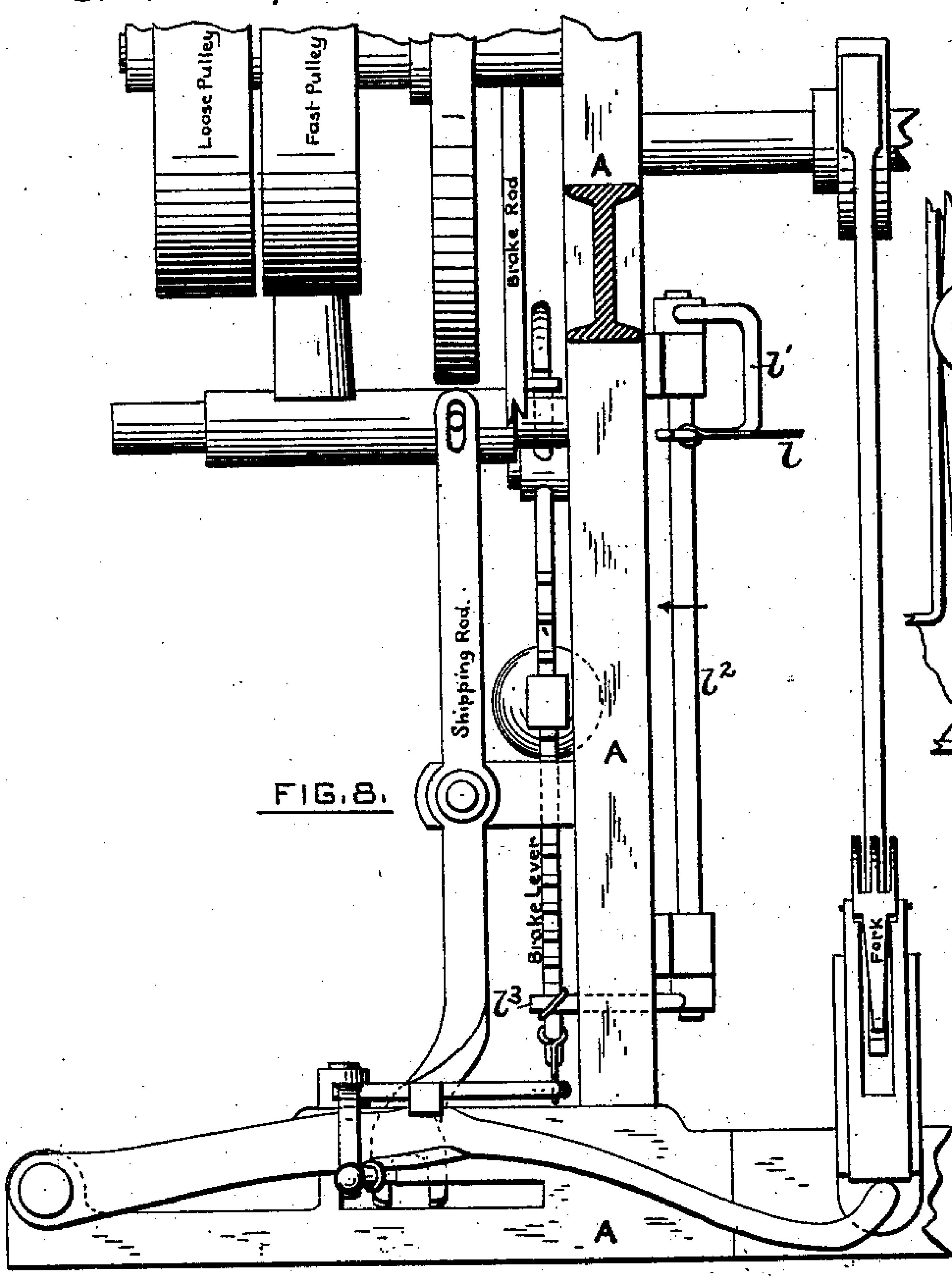

FIG. 8.

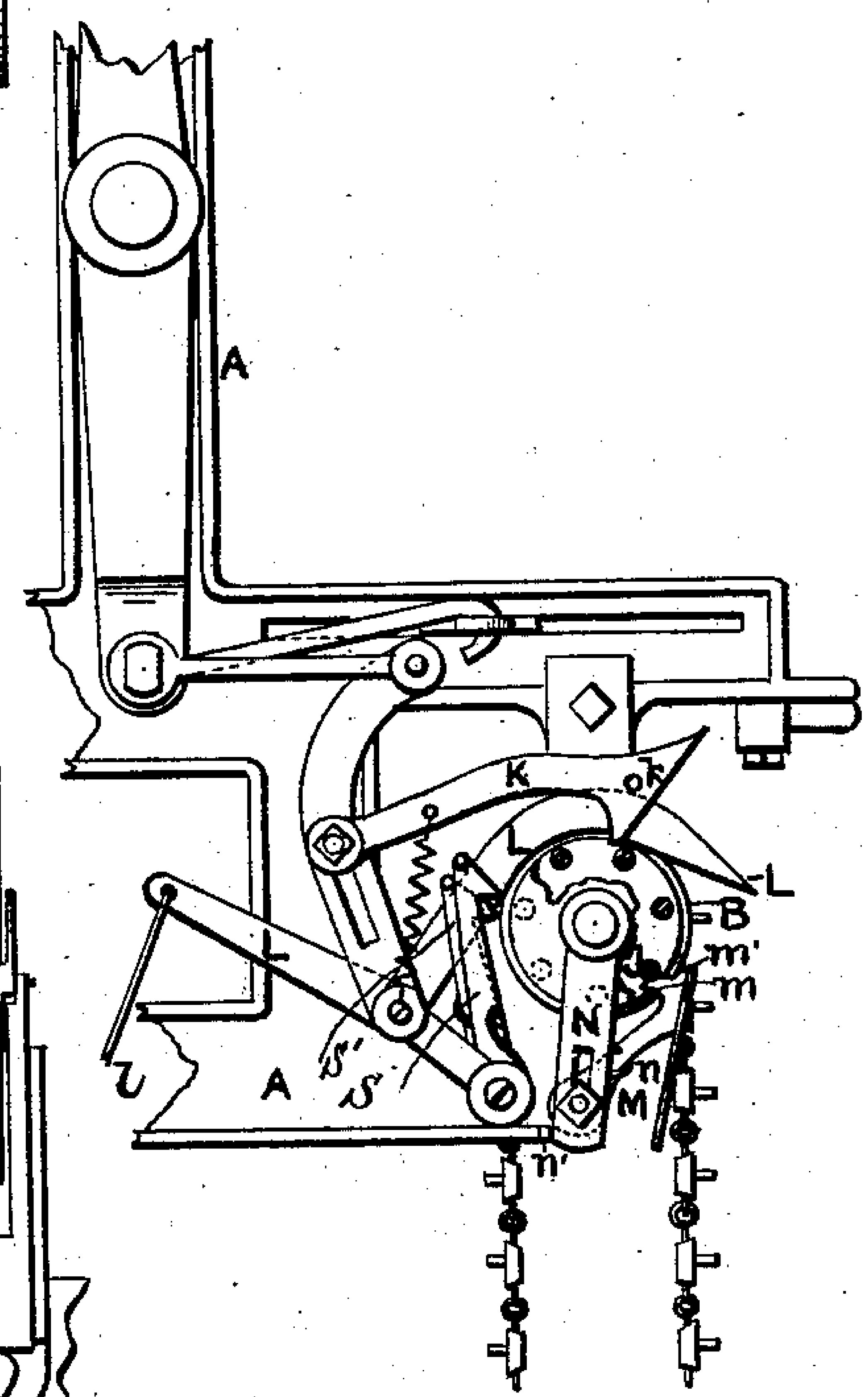

FIG. 10.

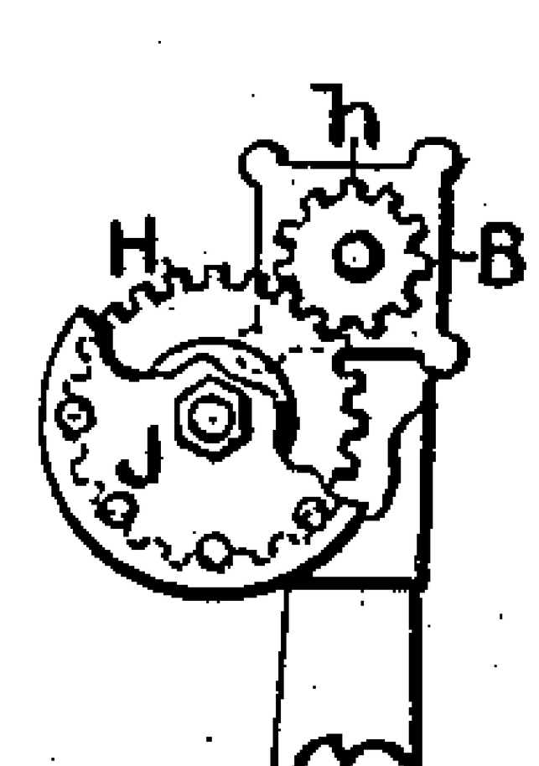

FIG. 7.

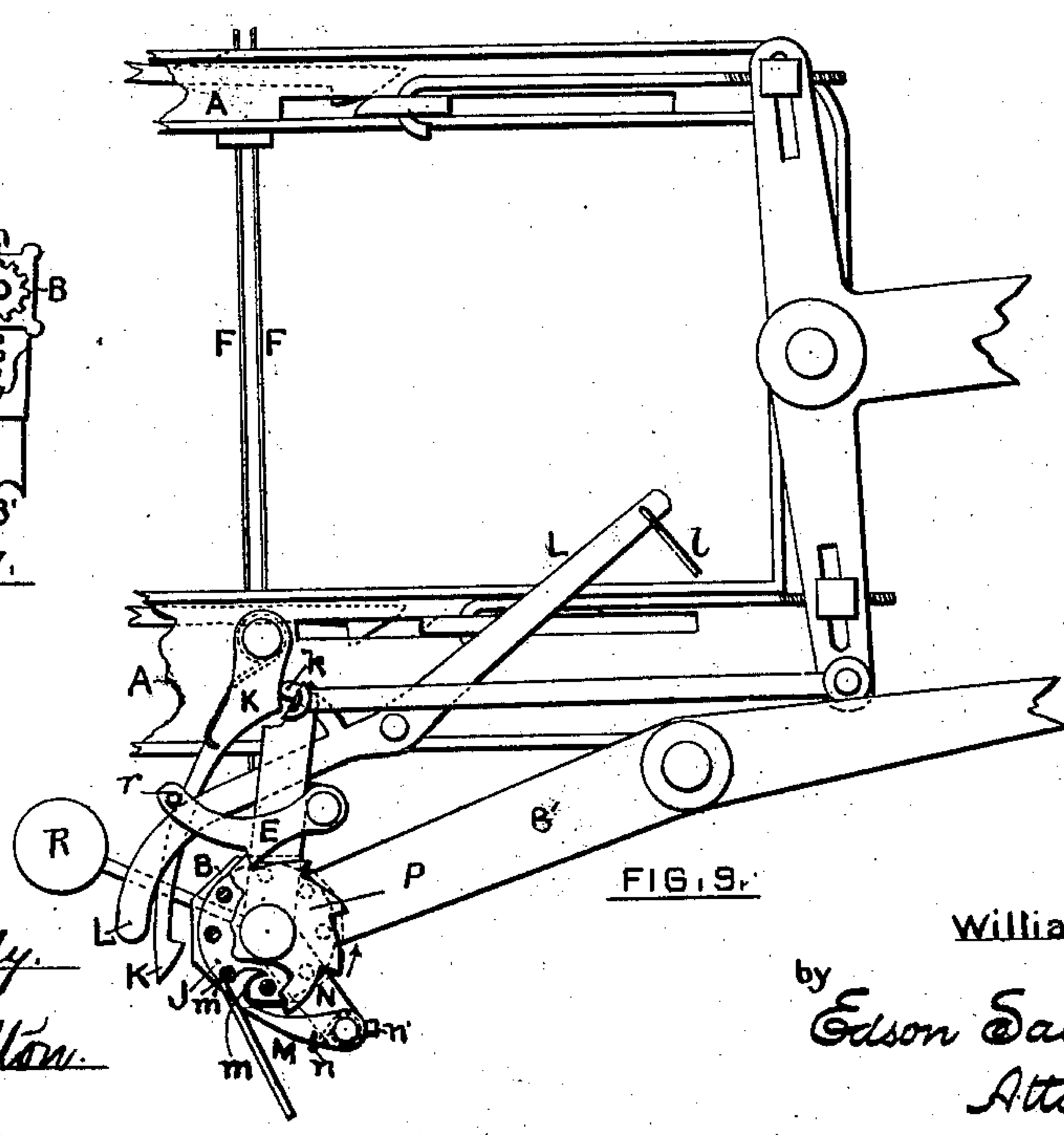

FIG. 9.

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N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM EVANS, OF PROVIDENCE, RHODE ISLAND.

LOOM.

SPECIFICATION forming part of Letters Patent No. 281,476, dated July 17, 1883.

Application filed September 1, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM EVANS, of the city and county of Providence, and State of Rhode Island, have invented a new and useful Improvement in Looms; and I do hereby declare that the following specification, taken in connection with the accompanying drawings, forming a part of the same, is a full, clear, and exact description thereof.

My invention relates to means for setting the pattern card or chain of a loom when the filling-thread breaks or runs out, so that when the loom is started again that section of the pattern which governed that shed of the warp-threads in which the filling-thread broke or ran out will be presented to the mechanism which produces the shed of the warp, thereby insuring the proper continuation of the design being woven.

My invention consists in improved mechanism which automatically produces this result, as will hereinafter be described, and pointed out in the claims.

As is well known to persons familiar with the art of weaving, it is necessary to set the pattern card or chain when the filling-thread breaks or runs out, for, although the stop-motion may act promptly, the momentum acquired by the moving parts of the loom is sufficient to carry the pattern one or more sections ahead before the loom stops, the number of sections thus moved varying in different looms and in the same loom at different times. In the majority of looms as heretofore constructed the pattern has been set by hand by turning it back beyond the section sought and then working the loom by hand until that shed of the warp is produced in which the defective pick is found, thereby causing considerable loss of time and consequently increasing the cost of weaving. Means have been devised heretofore for preventing the continued intermittent forward revolution of the card-cylinder of a loom after the stop-motion operates, and for reversing said cylinder one flat at each of its outward beats until the loom stops. My invention is an improvement upon such means, in that by it the card-cylinder is reversed the proper number of flats during one outward beat, and is not disturbed during subsequent beats.

My improvement is applicable to all fancy-looms which employ a vibrating or non-vibrating card-cylinder or an intermittingly or continuously revolving pattern-chain cylinder.

Referring to the drawings, Figure 1 represents in plan my improved mechanism attached to a portion of a loom having a vibrating card-cylinder and employing a single-pick card. Figs. 2, 3, 4, and 5 show the same in side elevation and illustrate the mode of operation. Fig. 6 represents in side elevation a portion of a loom as usually constructed, without my improvement. Fig. 7 shows certain details of construction. Fig. 8 represents in plan a portion of a loom provided with an ordinary form of stop-motion. Fig. 9 shows in side elevation a portion of a loom provided with a vibrating card-cylinder and employing a two-pick card. Fig. 10 represents in side elevation a portion of a loom employing a continuously or an intermittingly revolving pattern-chain cylinder supported in fixed or stationary bearings.

As shown in Figs. 1, 2, 3, 4, 5, 6, and 7, A is the frame of the loom. B is the intermittingly-revolving card-cylinder, which is mounted on a pair of arms, one of which, B′, is shown in the drawings. These arms are secured to a rock-shaft, C, which is journaled in the frame A, and are vibrated by a crank, D, secured to the driving-shaft D′ of the loom, through a pitman, *d*, lever *d′*, link *d²*, and arm *d³*, secured to the rock-shaft C, as shown in Fig. 4. At one end and upon its edges the card-cylinder B is provided with projecting ribs *b*, which, as the cylinder moves outwardly or away from the loom-frame under control of the vibrating arms B′, are engaged successively by a stationary pawl, E, pivoted to the frame A and held in position to engage the cylinder by a spring, *e*. The engagement of the pawl E with a rib *b* partially rotates the cylinder and successively brings each of the series of cards F which compose the pattern into position before the needles F′, Fig. 1.

The customary means by which the pattern-card has been reversed by hand heretofore are shown in Fig. 6. The mechanism consists of a lever, G, pivoted to the arm B′, and having a strap or cord, *g*, depending from its outer

end, and a pawl, G′, pivoted to the inner end of said lever and normally held out of engagement with the ribs *b* on the card-cylinder by a spring, *g′*. When the pattern is to be reversed, the strap *g* is pulled downward for the purpose of bringing the pawl G′ into engagement with a rib *b*, thereby turning back the cylinder one flat for each pull upon the strap.

Referring to my improved mechanism for automatically reversing and setting the pattern-card, it will be seen that upon one end of the card-cylinder B is secured a pinion, *h*, which meshes with a gear, H, Figs. 1 and 7, mounted upon a shaft journaled in a bracket secured to the arm B′. At the opposite end of this shaft is secured a sprocket or ratchet wheel, J, which vibrates with the arms B′; but instead of the wheel J, constructed as shown, I may substitute a toothed wheel or other equivalent device. Overlying the wheel J is a pawl, K, pivoted to a bracket on the frame A, and provided with an arm, *k*, which overlies a lever, L, pivoted to a bracket on the loom-frame. The outer end of this lever is connected to the stop-motion of the loom by a wire, *l*, and its inner end is bent and engages the pawl E on the under side. The normal positions of the pawl K and lever L are as shown in Fig. 2, which positions are maintained during the proper running of the loom by a spring, *e*. This spring depresses the free end of the pawl E, and, owing to the engagement of this pawl with the bent end of the lever L, the outer end of said lever is elevated, and since the arm *k* overlies and engages said lever, the pawl K will be raised and held out of engagement with the wheel J.

The rim *l* may be connected to the stop-motion in various ways, one of which is shown in Fig. 8, where the wire is attached to a bent arm, *l′*, secured to a rock-shaft, *l²*, which bears an arm, *l³*, connected to the outer end of the usual weighted brake-lever. When the stop-motion operates, this end of said lever falls, rocks the shaft *l²* in the direction of the arrow, and causes the wire *l* to depress the outer and elevate the inner end of the lever L, thereby raising the pawl E out of a position to engage the cylinder B, and allowing the spring *k′* to lower the pawl K into a position to engage the wheel J, as shown in Fig. 3. When the vibrating arms B′ move outward, as they will do, owing to the momentum of the moving parts of the loom, the tooth of the pawl K will engage the wheel J and turn it one-fourth of a revolution. As shown in Fig. 7, the gear H is twice the size of the pinion *h;* therefore the card-cylinder will be turned one-half a revolution, or two flats, backward. The object of reversing the card-cylinder two flats will now be explained. The outward and inward movements of the card-cylinder take place during the respective backward and forward movements of the lay of the loom, the movements of said cylinder in most looms being slightly in advance of those of the lay. The card or section of the pattern which is to govern a definite warp-shed is in engagement with the needles F′ when the lay is approaching the end of its forward stroke to beat up the pick put into the previous warp-shed, which was governed by the previous card.

The shed of the warp is formed during the earlier part of the backward movement of the lay. At such time the card-cylinder is moving outward and is turned one flat forward, the pattern thereby being advanced one card. The shuttle passes through the shed during the latter part of the backward movement of the lay. Let it be supposed that the shuttle has put in a perfect pick, and that the lay is moving forward to beat it up. The card-cylinder will then be moving inward to present the card (say No. 1 of the pattern) which is to govern the shed of the warp for the next pick, the said card having been turned into position by the last outward beat of the cylinder, and before the shuttle put in the perfect pick above mentioned. Card No. 1 having performed its office, the cylinder will move outward and card No. 2 will be turned into position, the lay will move backward, and that warp-shed which was governed by card No. 1 will be formed. Suppose the shuttle now moves toward that end of the loom where the weft-fork is located, and leaves a defective pick in this shed, and the lay moves forward to beat it up. The pick being defective, the stop-motion will be thrown into operation; but before it can raise the pawl E the cylinder will have swung outward, been engaged by said pawl, and been turned a flat forward, thereby bringing card No. 3 into position. Since the defective pick was put into that shed of the warp governed by card No. 1, the cylinder must be turned back two flats and the pattern be reversed two cards in order that card No. 1 may be presented to the needles, and thereby cause a shed of the warp to be made where the defective pick is. This reversal will take place when the cylinder next moves outward, which it will do immediately, owing to the momentum of the moving parts of the loom. This reversal of two flats will be necessary, whether the loom is supplied with a stop-motion at one end, in the center, or at both ends. One case arises, however, when three flats are required to be turned, and that is when the stop-motion is located at one end of the loom only, and the shuttle leaves a defective pick when going toward that side of the loom having no stop-motion. In such a case, however, a glance at the fabric shows the weaver that the reversal of a third flat is necessary, which he can accomplish immediately by pulling the strap *g*, Fig. 6, and thereby working the hand mechanism for reversing the cards, which is preferably left on the loom for use in such a case.

Since the arms B′ are liable to vibrate several times after the stop-motion operates, it is desirable that means be provided for prevent-

ing a second engagement of the pawl K with the wheel J, in order that the pattern shall not be further reversed. This is accomplished by a hook, M, pivoted to an arm, N, which arm is pivoted to the arm B′, and is capable of swinging thereon. Normally the hook M and arm N occupy the positions shown in Figs. 2 and 3, the said positions being maintained by a spring, *n*, which holds the arm N in contact with an adjustable stop, *n′*, and brings the notched face *m m′* of the hook M into engagement with the teeth of the wheel J. The member *m* of the notched face constitutes the point of the hook M, and this member is externally engaged, and the free end of the hook is swung outward by each tooth of the wheel J as it normally revolves in the direction of the arrow shown in Fig. 2. When the wheel J is moved in an opposite direction by the pawl K, however, as indicated by the arrow in Fig. 3, that tooth of the wheel J which is in contact with the notched face of the hook M will act on the member *m′*, will raise the hook and allow the succeeding tooth of the wheel J to engage the inner face of the hook-point *m* and elevate the hook to the position shown in Figs. 4 and 5. The head or upper end of the hook M is flat and extended, as shown in the several figures. When, therefore, the arms B′, carrying the cylinder B and wheel J, move toward the loom-frame, the tooth of the pawl K will ride upon the head of the hook M, as shown in Fig. 5, and will be prevented from descending so as to engage another tooth of the wheel J, and thereby further reverse the pattern. As ordinarily arranged, a spring, O, Fig. 1, bears upon one side of the cylinder B with sufficient force to retain it in position after it has been turned. The spring *n* is weaker than the spring O, so that when the parts are in the positions shown in Fig. 5 the force of the spring O is sufficient to prevent the spring *n* from causing the hook M to rotate the ratchet-wheel J, and thereby advance the pattern. When the card-cylinder is reversed and set, therefore, the spring O holds the pattern in its proper position until the pawl E engages the cylinder and turns the pattern forward. When the loom is started, the lever L, pawl K, and pawl E will be returned to their normal positions by the adjustment of the stop-motion, which will raise the rod or wire *l*, thereby elevating the outer ends of the lever L and pawl K and allowing the pawl E to be lowered for engagement with the cylinder B by the spring *e*. Until the card-cylinder is partially rotated by its engagement with the pawl E the hook M will remain in the position shown in Fig. 5; but when the cylinder is moved by the pawl E the hook M will be caused to assume the position shown in Fig. 2 by the action of the spring *n*.

In the loom as above described the card-cylinder has four flats or sides and the wheel J has eight teeth; but if the cylinder has more or less than four sides the number of teeth in the wheel can be varied so as to produce the requisite rotation of the cylinder, or the gear H may be proportioned to the pinion *h*, so as to secure the desired result.

In looms employing pattern-cards which are arranged for two picks each, the card-cylinder is vibrated twice before being turned, and it is usually supplied with a ratchet which is worked by a pawl vibrating to engage said ratchet every two picks. A portion of a loom of this variety and of well-known construction, which is provided with a card-cylinder, B, of eight sides, is shown in Fig. 9. The cylinder is journaled in arms B′, which vibrate every pick, and said cylinder is turned one flat forward for each two picks by the vibrating pawl E, which engages a ratchet, P, attached to the cylinder. The pawl K is pivoted to the frame of the loom, and is held out of engagement with the ratchet-wheel J by an arm, *k*, attached to the lever L. When the stop-motion operates, that end of the lever L to which the wire *l* is attached is depressed and its opposite end is raised, thereby elevating the pawl E by engagement with a pin, *r*, secured to the pawl and overlying said lever, and allowing the pawl K to swing into engagement with the wheel J. The arm N is pivoted to one of the arms B′, and said arm N and its hook M are returned to and are held in normal positions by a spring or a weight, R. The gear H and pinion *h*, hereinbefore described, are dispensed with, and the wheel J is attached to the card-cylinder. The operation of all the parts is substantially as hereinbefore described, with the exception that the pawl K turns the cylinder but one flat. In looms of this character only one flat needs to be turned backward, because the pattern-card advances only one section for two picks, and the cylinder will be only one flat ahead when the stop-motion operates.

An adaptation of my improved mechanism to a loom employing a pattern-chain passing over a continuously or intermittingly revolving cylinder supported in fixed or stationary bearings is shown in Fig. 10. As shown in said figure, the wheel J is attached to the chain-cylinder or its shaft and the arm N is journaled to swing on said shaft. The lever L is of the bell-crank form, and is pivoted at its angle to the frame of the loom. The rear end of the pawl K is pivoted to a lever which is pivoted at its lower end to the frame of the loom, and is connected by a link at its upper end to the usual vibrating arm, which reciprocates the sliding bar operating the hooked harness-jacks. Under normal conditions the pawl K is held out of engagement with the wheel J by an arm or pin, *k*, projecting from the pawl and riding on the lever L. When that end of the lever L to which the wire *l* is attached is elevated by the action of the stop-motion, the opposite end of the lever will be depressed, and the pawl K will be brought into engagement with the wheel J, and will reverse the

pattern-cylinder when the lever to which the said pawl is pivoted is moved rearward. The action of the hook M and its associated parts will be the same as hereinbefore described. In this variety of looms it is desirable that the forward rotation of the cylinder should be stopped as soon as possible when the stop-motion operates. This may be done by causing the stop-motion to unship the friction-clutch which drives said cylinder, but is preferably accomplished by a hook, S, which is normally held out of engagement with the wheel J by a pin projecting laterally from the upper end of said hook and riding upon the lever L. When this lever is tilted by the stop-motion, the hook S swings forward and engages one of the teeth of the wheel J and stops the revolution of the cylinder. It will be observed that a second hook, S′, is located a little below the hook S. The object of the hook S′ is to hold the cylinder after it has been reversed by the pawl K, which will turn the cylinder backward in the majority of cases, so that a tooth of the wheel J will be a little below the point of the hook S. The hook S′ may be omitted, however, and the hook S be made to engage teeth formed on the periphery of one of the heads of the wheel J and properly spaced.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, with a stop-motion, a pattern card or chain cylinder, and means for supporting and means for actuating said cylinder, of mechanism, substantially as described, whereby, when the stop-motion operates, the forward rotary motion of said cylinder is arrested, the cylinder is reversed or turned back, and the reversing mechanism is prevented from further action until the stop-motion again operates, substantially as set forth.

2. The combination, with a stop-motion, a pattern card or chain cylinder, and means for supporting and means for actuating said cylinder, of the wheel J, means for connecting said wheel with the cylinder, the pawl K, and lever L, substantially as and for the purposes specified.

3. The combination, with a stop-motion, a pattern card or chain cylinder, and means for supporting and means for actuating said cylinder, of the lever L, pawl K, wheel J, means for connecting said wheel with the cylinder, and the hook M, substantially as and for the purposes specified.

4. The combination, with a stop-motion, a pattern card or chain cylinder, and means for supporting and means for actuating said cylinder, of the lever L, pawl K, wheel J, gear H, pinion *h*, and hook M, substantially as and for the purposes specified.

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Witnesses:
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GEORGE G. BELL.