No. 622,650. Patented Apr. 4, 1899.

C. A. LITTLEFIELD.

PICK FINDING MECHANISM FOR LOOMS.

(Application filed Aug. 5, 1898.)

(No Model.) 4 Sheets—Sheet 1.

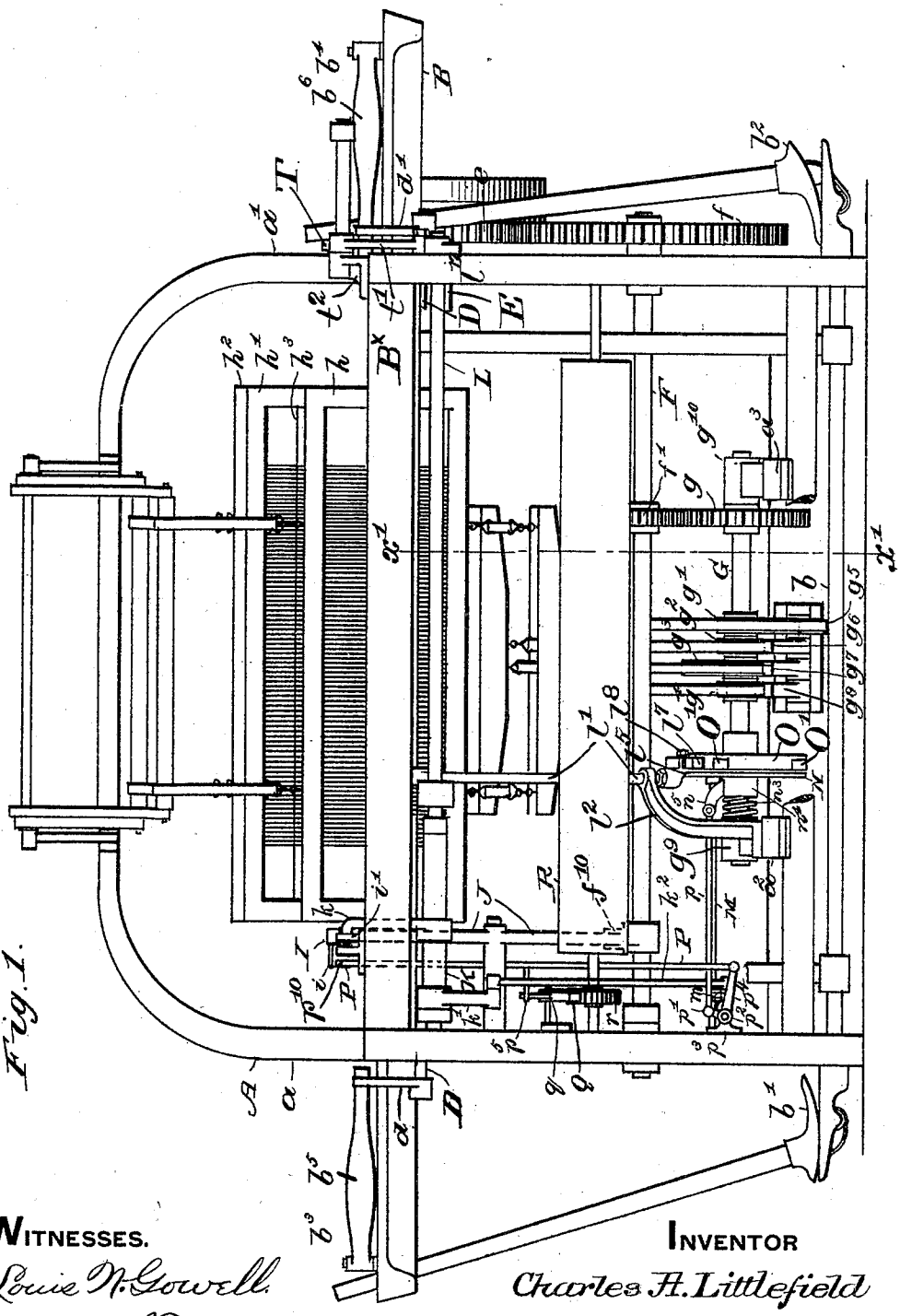

Fig. 1.

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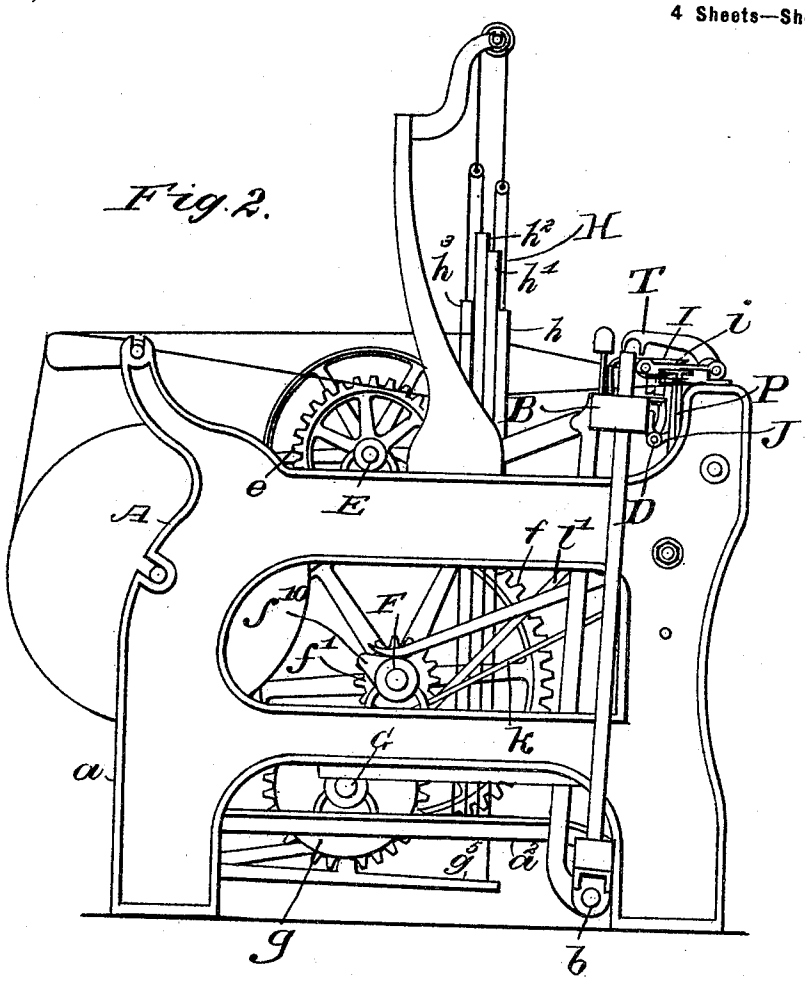
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

Fig. 3.

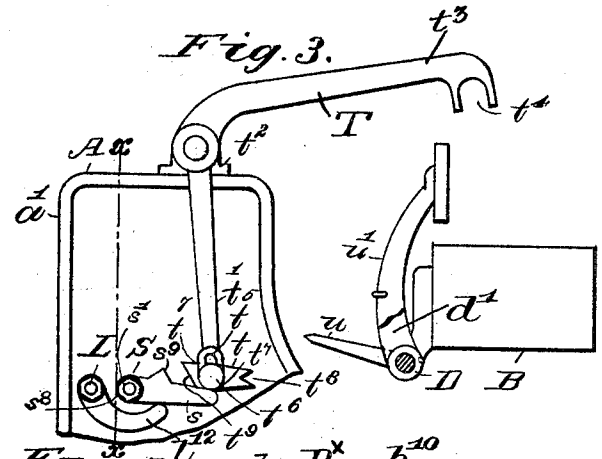


Fig. 4.

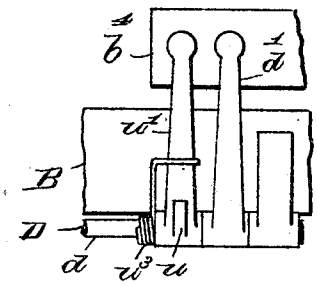


Fig. 5.

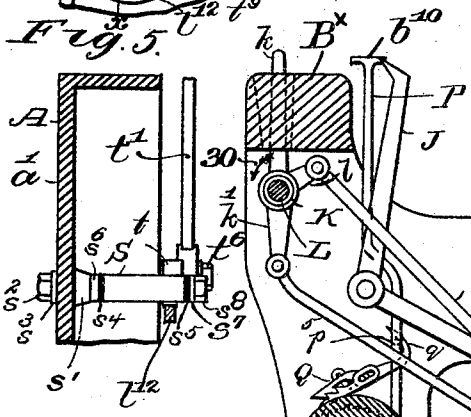
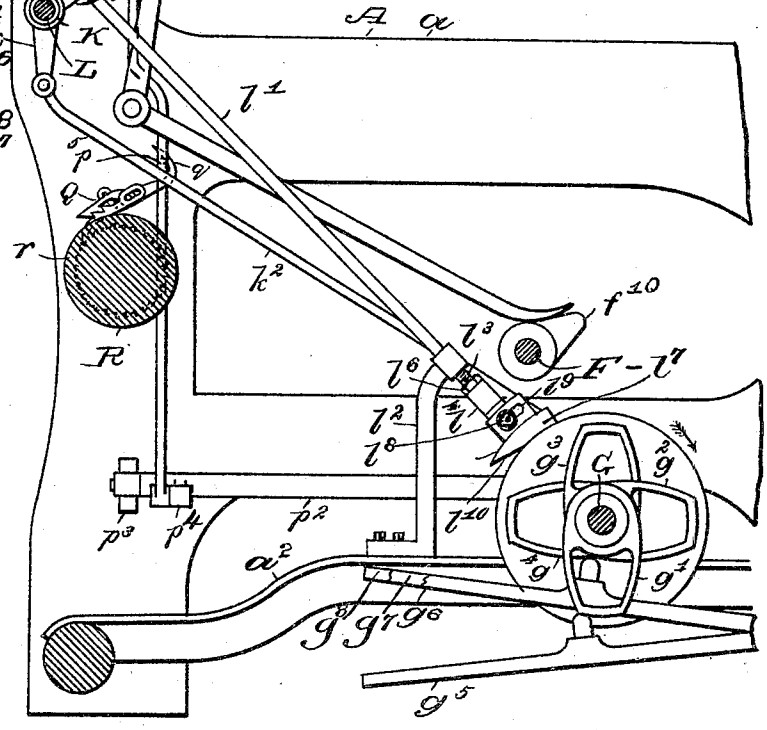


Fig. 6.



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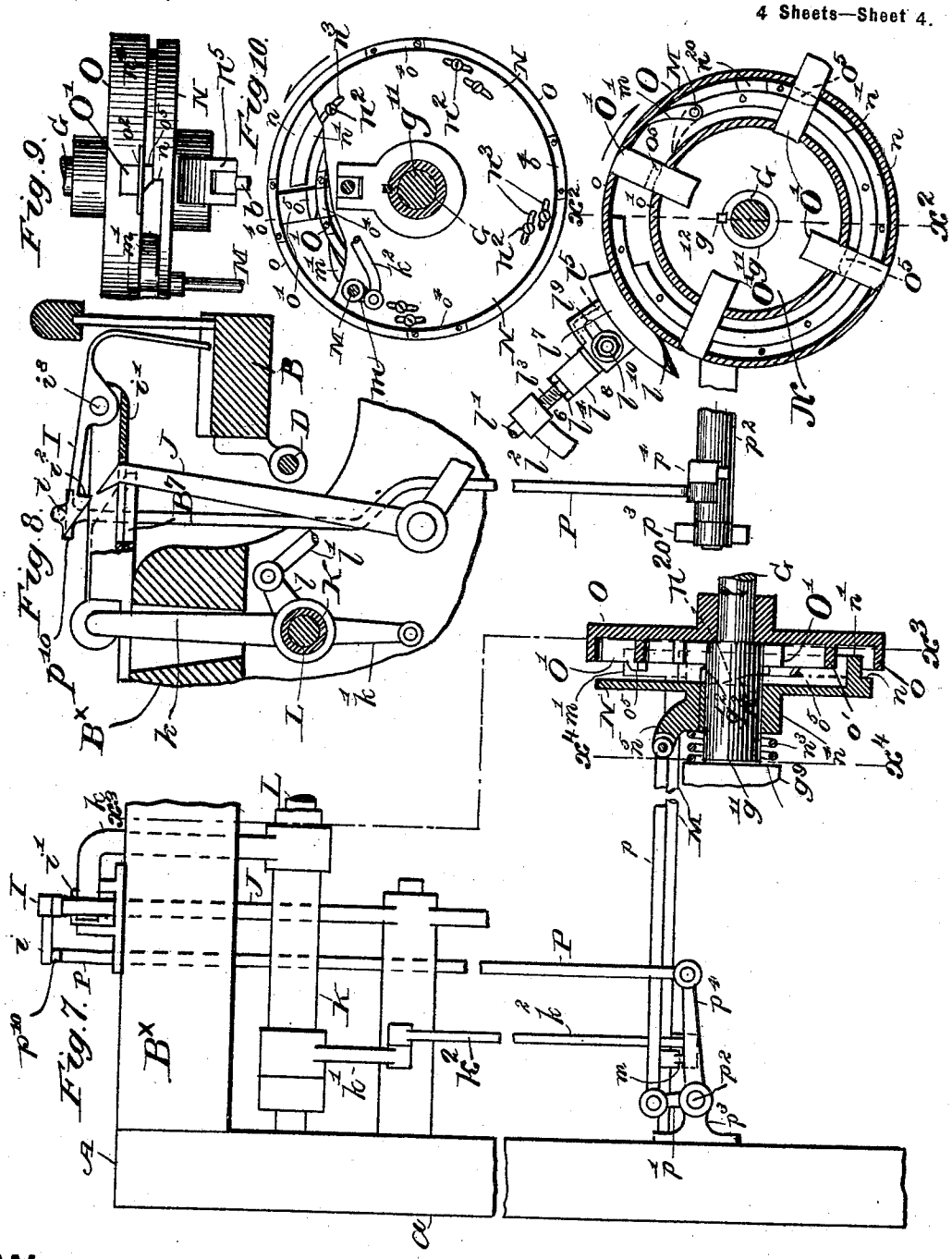
(No Model.)

4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

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PICK-FINDING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 622,650, dated April 4, 1899.

Application filed August 5, 1898. Serial No. 687,771. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. LITTLEFIELD, of Lowell, county of Middlesex, State of Massachusetts, have invented an Improvement in Pick-Finding Mechanism for Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates particularly to that type of looms for continuous weaving which are sometimes called "magazine-looms," wherein the breakage or exhaustion of the filling thread causes, by the operation of suitable mechanism, the introduction of a fresh or full filling-carrier or a shuttle into operative position without stopping the loom. Looms of such types, respectively, are shown and described in United States Patent to Northrop, No. 529,940, dated November 27, 1894, a fresh supply of filling being introduced to the shuttle upon failure of the filling, and in United States Patent No. 601,836, dated April 5, 1898, granted to me for shuttle-changing mechanism. With this type of loom it has not been possible hitherto to weave correctly figured goods, such as twills, by harnesses comprising three or more leaves, because the fresh supply of filling is always introduced without regard to the point at which the filling fails or to the position at such time of the harness-leaves and their actuating mechanism. Consequently the filling is thrown at the next pick from the magazine end of the lay to the other end, which for brevity may be called the "single" end. Now in magazine-looms the filling-detector and magazine are usually located at opposite sides of the cloth, so that at whatever point of the shuttle-traverse the filling breaks or is exhausted the detector becomes operative only when the shuttle is at the single end of the lay and the latter beats up one pick after failure of the filling, while the harness-leaves are shifted during that pick. The shuttle with the fresh filling enters a different shed from that one in which the thread failed and the regular order or succession of the parts of the figure is disturbed.

In my present invention I have provided means for automatically controlling and timing the change of filling, either by bobbins or shuttles, so that the change is effected at the recurrence of the same shed in which the previous failure of the filling occurred, the operation of the take-up mechanism being suspended correspondingly.

Figure 1 is a front elevation of a loom embodying my invention with parts omitted which are unnecessary to a proper understanding of the construction and operation of my invention, it being supposed that the magazine (not shown) is located at the right-hand side of the loom. Fig. 2 is a left-hand side elevation thereof. Fig. 3 is an enlarged right-hand side elevation of a part of the loom-frame with a part of the filling-supplying mechanism and its actuating means. Fig. 4 is a detail in front elevation of a portion of the lay and devices carried thereby to effect the operation of the filling-supplying mechanism. Fig. 5 is a partial sectional view of some of the devices shown in Fig. 3, taken on the line $x\ x$, looking toward the right. Fig. 6 is a partial vertical longitudinal section of the loom on the line $x'\ x'$, Fig. 1, looking toward the left. Fig. 7 is a front elevation, broken out to save space, of the left-hand portion of the loom to more clearly show the mechanism for temporarily rendering the filling-detector inoperative, a portion of said mechanism being shown in section on the line $x^2\ x^2$, Fig. 8. Fig. 8 is a partial vertical sectional view taken on the line $x^3\ x^3$, Fig. 7, some of the parts being broken out. Fig. 9 is a partial top or plan view of the detector-controlling mechanism; and Fig. 10 is a sectional view thereof on the line $x^4\ x^4$, Fig. 7, looking to the right and partly broken out.

The loom-frame A, comprising the sides a a' and cross-girths $a^2\ a^3$; the lay B, with its rock-shaft b, rockers $b'\ b^2$ for the picker-sticks, shuttle-boxes $b^3\ b^4$, and their respective binders $b^5\ b^6$, the operating or dagger rod D, mounted on the lay, and its fingers $d\ d'$; the main or crank shaft E, with fast gear e; the intermediate shaft F, with fast gear f, driven by gear e, and the cam-shaft G, with fast gear g,

driven by the pinion f' and rotated once for every four revolutions of the latter, may be and are all of substantially the usual construction and operation, except as hereinafter stated.

The cam-shaft G is herein represented as provided with four cams g' g^2 g^3 g^4, adapted to operate a corresponding number of treadles g^5 g^6 g^7 g^8 and to thereby form the proper sheds with a harness H, having four leaves h h' h^2 h^3 of heddles. The shaft G turns in suitable journal-boxes g^9 g^{10}, supported on the cross-girths a^2 a^3 of the frame A.

The filling detector or fork I (see Figs. 1, 2, 7, and 8) is also of common form, except that it is provided with a laterally-extended stud i (see Figs. 7 and 8) for a purpose hereinafter stated, and is pivoted at i^8 on a slide i' in well-known manner, so that when the filling is absent or breaks the hook i^2 of the detector is engaged by the upper end of a bent lever J, and is thereby drawn forward with the slide i', the lever J being vibrated in the usual well-known manner by a wiper-cam f^{10}, fast on the intermediate shaft F. I use the fork I, lever J, and wiper f^{10}, but in connection with other devices, for a different purpose.

I have not herein shown or described any device for automatically stopping the loom when the magazine or hopper is emptied, as such devices are well known and form no part of this invention.

The loom will in practice be provided with the ordinary means for stopping the loom at the will of the operator, such means being herein omitted for the sake of clearness in the drawings.

The only distinctive part of a magazine-loom as heretofore used which I have thought it necessary to show in the drawings is the transferrer or pusher (see Figs. 1 and 3) which introduces the new bobbin or shuttle, as the case may be, from the magazine.

When the filling is broken or exhausted and the shuttle reaches the single end of the lay, or that one adjacent to the filling-detector I, the latter will not be tilted at the next forward beat of the lay and the hook i^2 will be engaged by the fork-lever J, and through the action of the wiper f^{10} the slide i is forced forward, as will be obvious. A transverse horizontal rock shaft or rod L is supported in suitable bearings in the loom-frame and a sleeve K is mounted to rock upon it, said sleeve having an upturned arm k, which at its upper end is pivotally connected with the slide i', so that movement of the latter will rock the sleeve, the arm k being extended through an opening in the breast-beam B×. (See Fig. 8.) A second depending arm k' on the sleeve is pivotally connected by a link k^2 with a short rocker-arm m, Figs. 1 and 7, of a rock-shaft M, having a bearing at one end in the loom side a and at its other end extending loosely through and being supported by a disk N, connected by a spline g^{12} with a lateral extension or boss g^{11} of the cam-shaft journal-box g^9, said disk being adapted to slide on said extension without rotation. The disk N has secured to its inner face two circular tracks or guides n n', Figs. 7, 8, and 10, which are held in angular adjustment on the disk by means of bolts n^2, which pass through arc-shaped slots n^3 in the disk, (see Fig. 10,) the inner track or guide n' being extended laterally beyond the outer track n.

A circular plate O, somewhat larger than the disk N, is rigidly secured to the cam-shaft G adjacent said disk and has on its face nearest thereto two annular flanges o o', concentric with the shaft G and of greater and less radius, respectively, than the track or guide n', (see Fig. 7,) said flanges being radially slotted to receive a series of sliding tappets O', (four being shown,) corresponding to the number of harness-leaves used, the plate O serving as a tappet-carrier, caps o^4, Fig. 10, retaining the tappets in the carrier. Each tappet has a transverse cam-rib o^5 on its face adjacent the disk N, the latter being so near the tappet-carrier O that its track n' will at all times extend over one or the other side of the said cam-ribs o^5, the leading ends of the latter being preferably slightly beveled to facilitate engagement by the switch, to be described.

On the end of the rock-shaft M, extended through the disk N, a switch m' is secured, located at the rear end of the track n' and forming a movable continuation thereof, the connection described between the filling-detector, slide i, and rock-shaft M being such that when the said slide is in its normal position said switch m' occupies the position shown in full lines in Fig. 8, and in the rotation of the tappet-carrier O the switch will pass over or outside of the ribs o^5, to thereby draw the tappets inward and cause their ribs to pass between the track n' and the inner flange o' of the tappet-carrier; but when the shaft M is rocked by the forward movement of said filling-detector slide and the turning of the sleeve K the switch m' is thrown into the position shown by dotted lines in Fig. 8 and runs under the rib o^5 of an approaching tappet O' and throws said tappet radially outward, one of the tappets being so shown in Fig. 8, its rib traveling upon the outer convex surface of the track n' until the cam-shaft G and tappet-carrier have made nearly a complete revolution, it being seen that the ends of said track are about ninety degrees apart. As soon as the wiper-cam f^{10} on the intermediate shaft F passes the lever J and allows the slide i to move back to its normal position the shaft M is rocked to the right, Fig. 8, and the switch m' resumes the position shown in full lines in said figure, so as to pass over or outside of the rib o^5 of any subsequently-passing tappet and insure the travel of the rib between said track n' and the flange o', as above described. The switch m' after projecting a tappet returns to its normal position before the next tappet reaches said switch in the rotation of the car-

rier O; but a projected tappet continues to project during almost an entire revolution of the cam-shaft G and tappet-carrier, or until it is retracted by the switch m'. The projecting tappet O' almost immediately after being thrown outward, as described, reaches the outer track n, the adjacent end of which is laterally beveled at n^{20}, (see Fig. 8 and dotted lines, Fig. 7,) so that the pressure of the rib o^5 of said tappet pushes the disk N away from the tappet-carrier O, but not sufficiently to carry the rib o^5 beyond the track n', which latter extends beyond the disk N farther than the track n.

The disk N is normally pushed toward the tappet-carrier O by a suitable spring n^3, surrounding the extension g^{11} and held compressed between the hub n^4 of said disk N and the body of the journal-box g^9. The hub n^4 of the disk is provided with an arm n^5, to which is jointed one end of a link p, the other end of said link being jointed to a short upturned rocker-arm p' of a rock-shaft lever p^2, fulcrumed on brackets p^3, secured to the loom side a, one of such brackets being shown. To another longer and substantially horizontal arm p^4 of the rock-shaft p^2 is jointed an upturned rod P, the upper end of which is enlarged to form a shoe p^{10} under the stud i, which, as described, projects laterally from the filling-detector I, the rod P being guided in the plate b^7, on which the slide i' is supported. When the disk N is moved laterally away from the tappet-carrier O, as described, the rod P will be lifted so that its shoe p^{10} will engage and lift the stud i, and thereby the front end of the filling-detector is raised out of the path of the actuating-lever J and is maintained lifted until the rib o^5 of the projecting tappet O' reaches the end of the track n and the disk N is again forced toward the tappet-carrier by the spring n^3. The rod P is provided with a lateral projection or pin p^5, which engages the tail q of the compound take-up pawl Q (of usual construction) when the rod is raised and moves said pawl out of engagement with the ratchet-wheel r of the sand-roll R (see Fig. 6), during the time the front end of the filling-detector is held up by said rod P to stop the take-up of the cloth while the loom is running without any filling being laid in the shed, thereby avoiding "thin stripes" in the cloth.

One complete revolution of the shaft G is in the present instance required for the beating up of four picks, and the four cams for operating the like number of harness-leaves control the formation of four sheds in regular succession. Now when one of the four tappets O' is projected, as described, the filling-detector will be held inoperative for four picks, it being remembered that the tappet-carrier O rotates with the cam-shaft G, and after the disk N is permitted to move toward the tappet-carrier the detector is permitted to return to normal operative position, and on the recurrence of that pick or shed wherein the filling failed the fresh supply of filling will be inserted by means now to be described and weaving will continue. The tappets may be termed "actuating members," corresponding to the number of harness leaves and forming part of the controlling means for the filling-supplying mechanism, as said controlling means depends for its operation upon one or other of the actuating members or tappets.

The rod or rock-shaft L, hereinbefore mentioned, is provided with an arm l, to which is joined a rod l', Fig. 6, supported and sliding in a stand l^2, secured on the cross-girt a^2, the lower end of said rod being preferably screw-threaded at l^3 to enter an internally-threaded boss l^4 of a foot l^5, (see dotted lines, Fig. 8,) and by turning the boss in one or the other direction the foot may be adjusted longitudinally on the rod l', said foot being held in adjusted position by a check-nut l^6 on the rod l' above the boss.

A shoe l^7 is secured to the foot by a screw l^8, passing through a transverse slot l^9 in an upturned portion of said shoe, the slot being of sufficient length to permit any required lateral adjustment of the shoe on the foot. The under face of the shoe is slightly curved in the direction of its length to correspond to the curvature of the flange o, and at its forward end it is beveled at l^{10} to ride easily over the projecting tappet O', which in passing beneath the shoe l^7 moves the rod l' longitudinally upward and forward and rocks the shaft L by raising the arm l.

Referring to Figs. 3 and 5, a horizontal stud s', Fig. 3, is secured to the loom side a' by suitable means, as a nut s^2 and washer s^3, and projects outwardly from the loom side, the magazine being herein supposed to be mounted at the right-hand side of the loom, and on this stud is mounted a sleeve S, provided with an arm s, the sleeve being held frictionally in any position on the stud by washers s^4 s^5, of leather or other suitable material. The washer s^4 is held between the sleeve and a shoulder s^6 on the stud, and the washer s^5 is held between the other end of the sleeve and a metal washer s^7, adjustably pressed against it by a nut s^8 on the threaded end of the stud.

The rock-shaft L extends through the loom side a' and has fast upon it a finger l^{12}, (see Fig. 3,) which is located beneath the arm s of the friction-sleeve S, so that when the rock-shaft L is rocked in the direction of arrow 30, Fig. 6, the arm s will be lifted. When the arm s is thus raised, its free end strikes and raises a bunter t, supported on the lower arm t' of a transferrer or pusher which transfers the new filling-carrier or shuttle from the magazine, as hereinafter described.

The transferrer is shown as a bent lever t' T, having its fulcrum on a stand t^2 on the frame of the loom and having the free end of its upper arm T shaped at t^4 to fit over a shuttle or bobbin. The depending arm t' of the transferrer T is provided at its lower end with a slot t^5, and the bunter t is supported by a

headed stud t^6, which passes loosely through the slot into the bunter, allowing the latter to rise and fall on the arm t'. The bunter t is grooved at t^7 to receive the arm t', and thereby prevent the bunter from turning. The inner end of the bunter is notched at t^8 to receive the front end of a dog or dagger u, which projects from a supplementary binder-finger u', arranged to turn loosely on the dagger-rod D, but pressed against the binder b^4 by a spring u^3, the entrance of the shuttle into the right-hand shuttle-box depressing the dog from the position shown in Fig. 3.

If the dog u were rigidly secured to the rod D, it would be depressed with the shuttle in either shuttle-box, as the forward swing of either binder would act on the corresponding binder-finger on the rod D and rock the latter; but the finger u' will be swung forward only when the shuttle presses forward the binder against which said binder u' bears. This finger u' is arranged to press against the binder of the shuttle-box at the magazine side of the loom, and the dog u will then be moved into position to engage the bunter t when a shuttle is in the said shuttle-box and the bunter has been moved into its highest position by the finger l^{12}. When the dog u strikes the bunter t in the forward beat of the lay, the lower arm t' of transferrer T is forced forward and the transferrer itself is depressed, pushing a new bobbin or shuttle from the magazine into place on the lay. The rear end of the bunter t is beveled at t^9 and in its backward movement strikes an incline s^9 on the arm s and returns the latter and the friction-sleeve S back to their normal positions. (Shown in Fig. 3.) It will be remembered that the transfer of the fresh filling thus effected from the magazine will take place on that pick or shed of the series forming the pattern corresponding to the one in which the filling failed, if the failure takes place when the shuttle is traveling from right to left, and there will be a full and a partial length of filling in the same shed. If the failure occurs while the shuttle travels from left to right, there will be a partial length of filling in that shed, and the operation of the mechanism herein will effect the insertion of the new filling in the shed next following after the harnesses have completed one entire cycle. Thus in no case will an entire shed be left without a partial filling or a partial and a complete length of filling.

From the foregoing description, taken in connection with the drawings, the operation of the apparatus will be fully understood, each of the harness-leaves having a corresponding movable tappet in the tappet-carrier, the tappet which is automatically moved into operative position being determined by that one of the harness-leaves which opens the shed in which the failure of the filling is detected.

The switch m' may be termed a "selecting device" to determine which of the tappets shall be moved into operative position, the selecting device being controlled by the movement of the slide i due to the detecting operation of the filling-detector, and after such movement of the selected tappet the detector-retarding means is thereby brought into operation to retain the detector and its slide inoperative until the completion of the shedding cycle.

Modifications and changes may be made in the construction and arrangement herein shown without departing from the spirit and scope of my invention.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a loom, a filling-detector, filling-supplying mechanism, normally inoperative means for controlling and actuating said mechanism, connections intermediate said means and the detector, to bring said means into operation upon detection of failure of the filling, and means to retain the said detector itself inoperative after its detecting movement until the operation of the filling-supplying mechanism has been effected.

2. In a loom, harness mechanism including three or more leaves, filling-supplying mechanism, controlling means therefor including a plurality of actuating members corresponding to the number of harness-leaves, a detector to detect the absence of filling, a selecting device controlled thereby to select and effect movement of one of the actuating members into operative position according to that pick on which failure of filling is detected, and means to retain the detector inoperative until such actuating member has effected the actuation of the filling-supplying mechanism.

3. In a loom, filling-supplying mechanism, controlling means therefor including a plurality of normally inoperative actuating members, a selecting device to determine and effect movement of a member into operative position, a detector to detect the absence of filling, connections between said detector and the selecting device, to operate the latter upon detection of failure of the filling, and means to thereafter maintain the detector inoperative until the recurrence of that pick in which the failure of the filling was detected.

4. In a loom, harness mechanism including three or more leaves, filling-supplying mechanism, controlling means therefor including a plurality of actuating members corresponding to the number of harness-leaves, a detector to detect the absence of filling, a selecting device controlled thereby to select and effect movement of one of the actuating members into operative position according to that pick on which failure of filling is detected, and means governed by the operative position of such actuating member to retain the detector inoperative until the filling-supplying mechanism has operated.

5. In a loom, harness mechanism including three or more leaves and their controlling-

cams, filling-supplying mechanism, controlling means therefor including a plurality of actuating members corresponding to the number of harness-leaves, a carrier therefor rotating in unison with the harness-cams and on which carriers said members are radially movable, a filling-detector, a selecting device controlled thereby to select and effect movement of one of said actuating members into operative position upon detection of filling failure, and means, including a disk adjacent and laterally movable relative to said rotating carrier, to retain the filling-detector inoperative for a predetermined number of picks after its detecting movement, the actuating member in operative position effecting lateral movement of the disk.

6. In a loom, the lay, a filling-detector, filling-supplying mechanism including a bunter, a dog on the lay to at times engage said bunter and operate the filling-supplying mechanism, normally inoperative means for moving the bunter into the path of the dog, connections between said means and the detector, to bring said means into operation upon detection of filling failure, and means to engage and retain the filling-detector itself inoperative after its detecting movement until the filling-supplying mechanism has been operated.

7. In a loom, the lay, a dog thereon adapted to be moved into operative position by entrance of the shuttle into one of the shuttle-boxes, a transferrer to introduce a fresh supply of filling to such shuttle-box, a bunter connected with the transferrer, a filling-detector, means controlled thereby to effect movement of the bunter into the path of the dog a predetermined number of picks after detection of failure of the filling, to operate the transferrer, and means to retain the detector inoperative after its detecting movement until the fresh supply of filling has been transferred.

8. In a loom provided with mechanism to effect a fresh supply of filling upon failure or exhaustion of the filling-thread, a filling-detector, a rotating carrier provided with a plurality of radially-movable tappets each having a rib on its inner face, an adjacent non-rotative and laterally-movable disk having two concentric arc-like tracks of unequal height upon its inner face, a switch carried by the disk and controlled by the filling-detector, to select and move one of said tappets outwardly with its cam-rib exterior to the higher track on the disk, the cam-rib acting upon the other track during rotation of the carrier, to move the disk laterally, a detent to engage the detector and maintain it inoperative, and connections between said detent and the disk, lateral movement of the latter moving the detent into operative position.

9. In a loom, filling-supplying mechanism, means to control its operation, including a rotatable carrier provided with a plurality of radially-movable tappets each having a cam-rib, an adjacent non-rotative disk movable laterally relative to the carrier, two concentric non-continuous tracks upon its inner face, to lock a tappet in operative or inoperative position, and to be engaged by the rib of a tappet to move the disk, respectively, a filling-detector, means controlled thereby to move one of said tappets into operative position upon detection of filling failure, and a detent controlled by movement of the disk to retain the detector inoperative while the tappet is locked in operative position.

10. In a loom, mechanism to control its operation, operating means therefor including a series of normally inoperative tappets corresponding to the number of harness-leaves, and a rotating tappet-carrier, combined with a filling-detector, a selecting device controlled thereby to select and move a tappet into operative position upon detection of filling failure, means to lock said tappet in operative position for a predetermined time, and a detent to retain the detector from subsequent operation for a predetermined number of picks, said detent being controlled by abnormal positioning of the tappet.

11. In a loom, take-up mechanism, a filling-detector, filling-supplying mechanism, normally inoperative means for controlling the operation of said filling-supplying mechanism, connections intermediate said means and the detector, to effect the operation of the former upon detection of filling failure, and means to stop the take-up and to engage and retain the detector itself inoperative after its detecting movement until the operation of the filling-supplying mechanism has been effected.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES A. LITTLEFIELD.

Witnesses:
ALBERT M. MOORE,
FRANK E. JEWETT.