C. H. DRAPER.

PICK MATCHING MECHANISM FOR AUTOMATIC WEFT REPLENISHING LOOMS.

APPLICATION FILED MAR. 23, 1906.

964,501. Patented July 19, 1910.

5 SHEETS—SHEET 1.

FIG. 6.

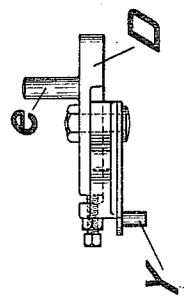

FIG. 1.

Witnesses:
Eugene W. Bond
Catherine Winifred Grey

Inventor:
Clare H. Draper
by Arthur S. Browne
his Attorney

THE NORRIS PETERS CO., WASHINGTON, D. C.

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FIG. 7.

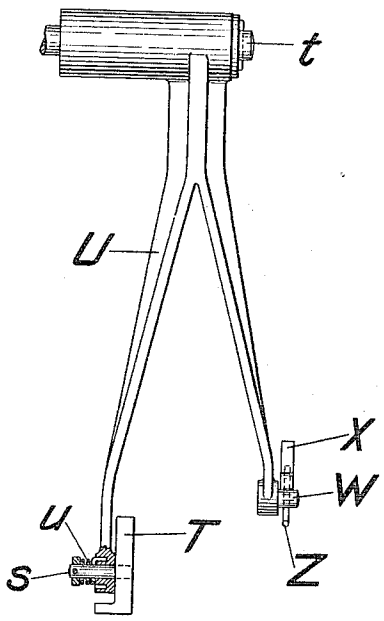
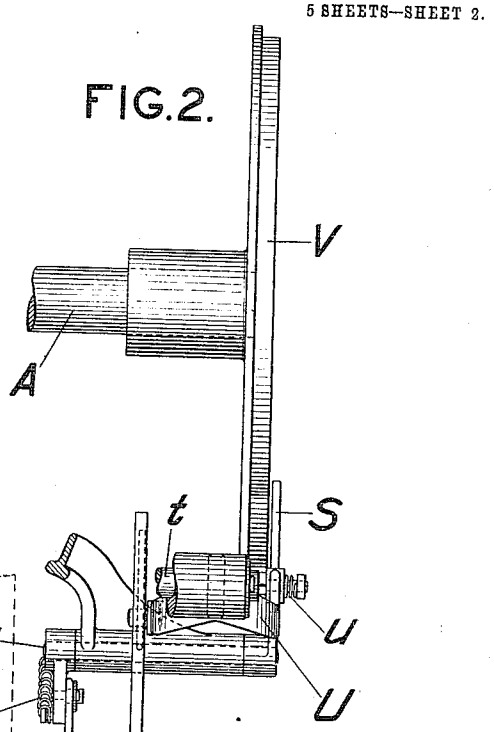


FIG. 2.



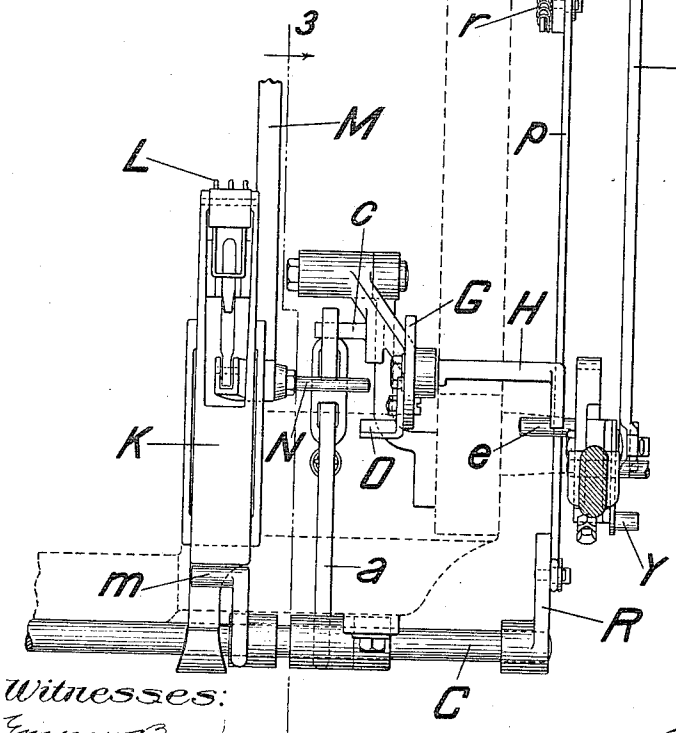


FIG. 9.

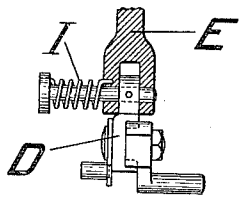
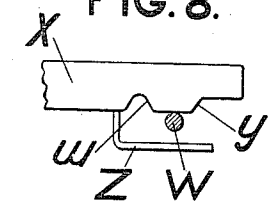


FIG. 8.



Witnesses:
Eugene W. Bond.
Catherine Winsor Reg

Inventor:
Clare H. Draper
by Arthur J. Browne
his Attorney

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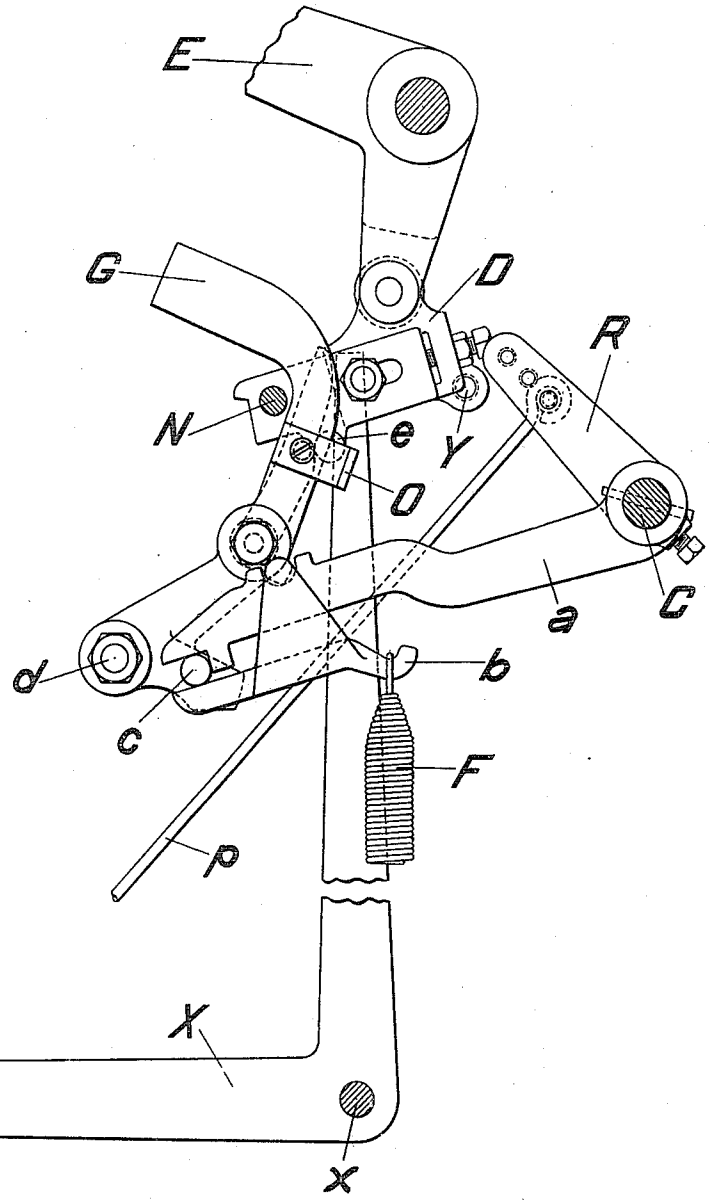
FIG. 3.



Witnesses:
Eugene W. Boyd.
Catherine Winifred Gray

Inventor:
Clare H. Draper
by Arthur Browne
his Attorney

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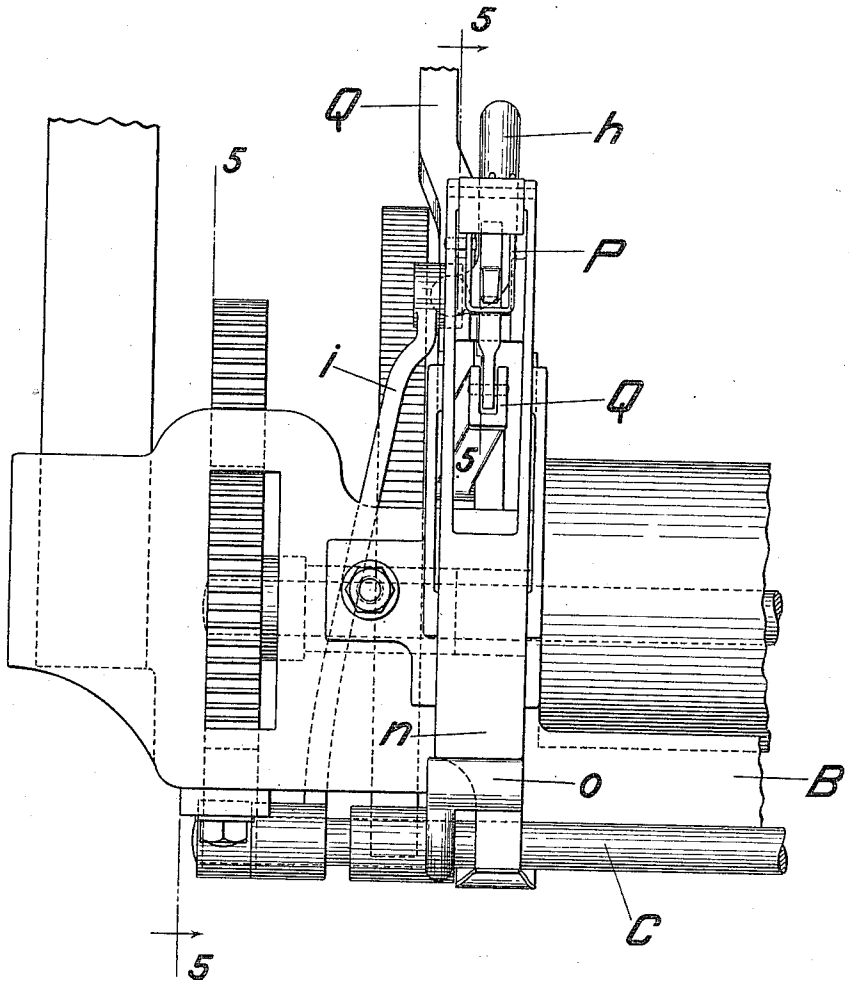
FIG. 4.



Witnesses:
Eugene W. Bond
Catherine Winifred Grey

Inventor:
Clare H. Draper
by Arthur S. Browne
his attorney

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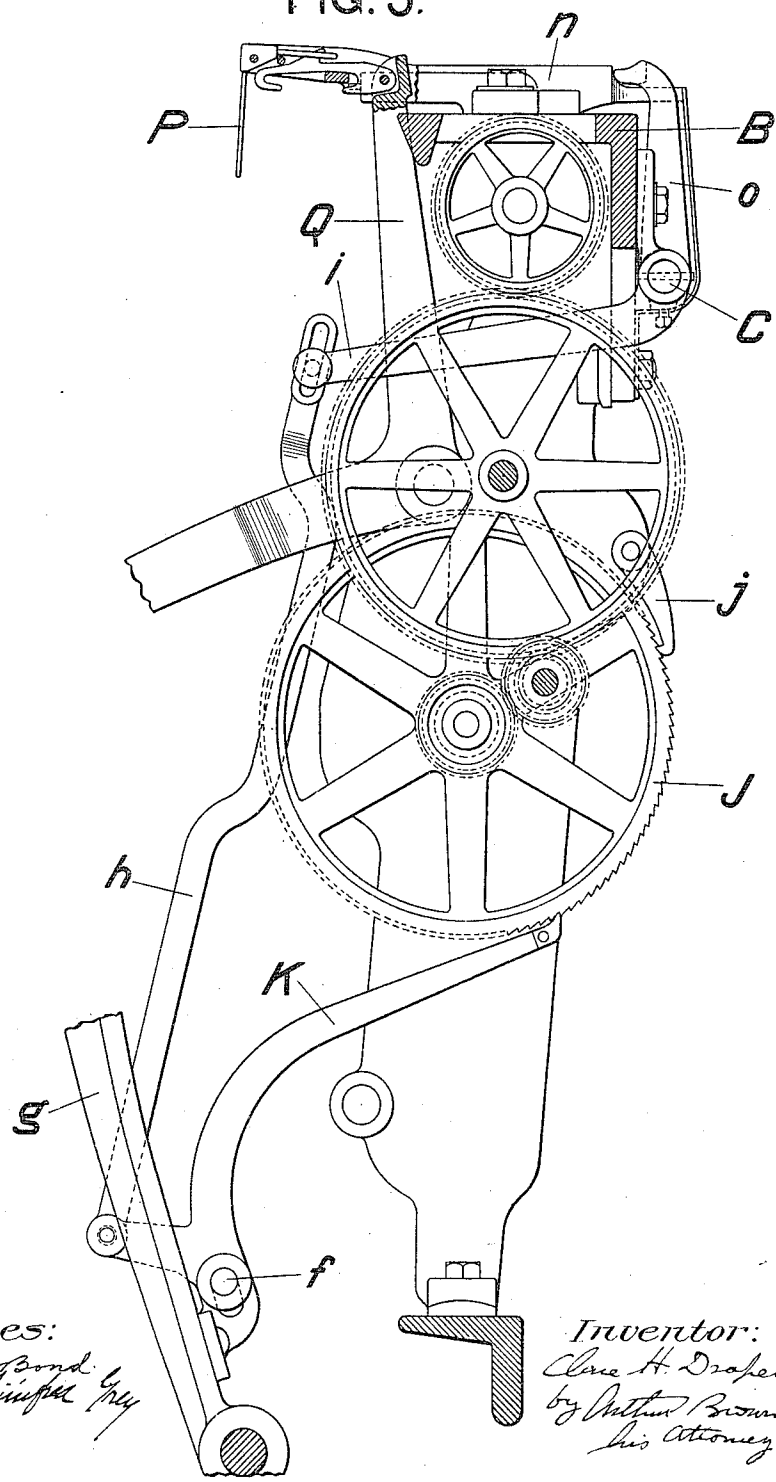
5 SHEETS—SHEET 5.

FIG. 5.



Witnesses:
Eugene M. Bond.
Catherine Kimpel Gray

Inventor:
Clare H. Draper
by Arthur Browne
his Attorney

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CLARE H. DRAPER, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

PICK-MATCHING MECHANISM FOR AUTOMATIC WEFT-REPLENISHING LOOMS.

964,501. Specification of Letters Patent. **Patented July 19, 1910.**

Application filed March 23, 1906. Serial No. 307,693.

To all whom it may concern:

Be it known that I, CLARE H. DRAPER, of Hopedale, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Pick-Matching Mechanism for Automatic Weft-Replenishing Looms, of which the following is a specification.

In automatic weft-replenishing looms wherein the replenishing mechanism is called into action by the breaking or complete exhaustion of the active weft, the weft may run out when the shuttle is running in either direction; and, since the weft supply is at one side only of the loom and as the first pick of the fresh weft comes from that side, there is involved a difference of one in the blank picks which occur before the first pick with the fresh weft. In looms having but two harnesses this is relatively unimportant, but where more than two harnesses are employed a blemish in the cloth may result.

The object of the present invention is to furnish a remedy by a pick matching mechanism which insures the first pick of the fresh weft being laid in the same shed formation as that wherein the deficiency occurred irrespective of the direction in which the shuttle was then traveling.

In accordance with the present invention two detectors, or weft-forks, are employed at opposite sides of the loom; and, whichever fork first detects, the replenishment of weft is retarded until the succession of harness changes or shed-formations has continued sufficiently to bring into position the same shed-formation for the reception of the first pick of fresh weft as that which was open when the shuttle made its flight immediately preceding the detection of weft absence. In case the detector or fork at the weft supply side of the loom first detects the absence of weft, the replenishment is delayed until the same shed is next opened in the round of shed-formations; but, if the other detector or fork first detects weft absence, then the replenishing is delayed an additional amount equal to a complete round of shed-formations or harness changes.

In the specific embodiment of the invention hereinafter described, the improved pick-matching mechanism is arranged for a loom having three harnesses, and hence, involving a round of three harness changes or shed-formations. In case the "magazine" detector or fork first detects weft absence, two idle picks of the shuttle take place, and hence two shifts of the harnesses, before the weft replenishment; whereas, if the other, or "companion" detector or fork first detects weft absence, three additional idle picks, and a complete round of additional harness changes takes place before weft-replenishment, that is to say, there are then five idle picks, and five shifts of the harnesses before weft-replenishment. As the result the pick of fresh weft is always laid in the desired shed, and no shed-formation has ultimately an absent or only a partial pick.

In the accompanying drawings the present improvements are shown as applicable to a loom having three harnesses, and in which the replenishment is effected by ejecting the spent bobbin, cop or analogous weft-carrier from the working shuttle, and by automatically inserting a fresh weft-carrier, as in the well-known "Northrop" loom, and, as shown, for example, in United States patent of Northrop, No. 529,940, Nov. 27, 1894. So much only of the loom is shown as is necessary for an understanding of the present improvements.

In these drawings Figure 1, is a side view of the weft-supply, or magazine, side of the loom, partly in section, and shortened in height to enable the parts to be shown on a large scale. Fig. 2, is a horizontal section in the plane indicated by the line 2—2 in Fig. 1, showing the pertinent parts at the supply side of the loom. Fig. 3, is a vertical section in the plane indicated by the line 3—3 in Fig. 2. Fig. 4, is a plan view at the other side of the loom. Fig. 5, is a vertical section in the plane indicated by the lines 5—5, in Fig. 4. Fig. 6, is a plan view of the transferrer latch or dog detached. Fig. 7, is a rear view, partly in section, of the "cam-runner" lever. Fig. 8, is a side view of the rear end of the transferrer stop lever, showing the relation of its cam-inclines to their actuating stud. Fig. 9, is a section of the lower end of the transferrer and a rear view of the transferrer latch or dog.

Certain features illustrated are now well known, and require but brief description.

A, is the shaft for controlling the shift and change of the harnesses, in this instance being the usual cam or low shaft of the loom which makes one revolution for two complete reciprocations of the lay. The harnesses are three in number and are not shown because they may be of any known construction and actuated from the controlling shaft in any of the well-known ways so as to run in regular order only. Their movements are not disturbed by the presence of the present improvements.

B, is the usual breast-beam at the front of the loom.

In front of the breast-beam and extending across the same is the horizontal rocking starting-shaft C, which by its rocking governs the action of the weft-replenishing mechanism. Owing to its rocking a latch or dog D, (Fig. 3) pivoted to the rocking transferrer E, is swung upwardly into the path of the usual "bunter" on the lay, so that as the lay beats forward the latch or dog is struck and the transferrer E, is rocked, thereby replacing the spent weft-carrier with a fresh one, as is common in the Northrop loom.

The intermediate mechanism illustrated in Fig. 3, between the starting shaft C, and the latch or dog D, is substantially the same as that shown in the United States patent of Stimpson, No. 718,587 Jan. 13, 1903. There is an arm *a*, fast to shaft C, from which is loosely suspended a stirrup *b*, which is pulled down by restoring spring F. This stirrup and the rear end (at the left in Fig. 3) of the arm *a*, grasp between them a horizontal pin *c*, on a lever G, fulcrumed at *d*. This lever acts as a shuttle "feeler" (in a well-known way) to ascertain if the shuttle is properly boxed at the supply side of the loom; and, in case of improper boxing, the feeler does not swing its full extent, this being permitted by the yielding connection afforded by stirrup *b*, and spring F. The feeler lever G, has an arm H, (Figs. 1, and 2) which extends immediately behind a horizontal pin *e*, (Figs. 2, and 6) on the latch or dog D. Normally, the restoring spring F, holds the parts in the position shown in Fig. 3, with the arm H, pressing against the pin *e*. When the starting shaft C, rocks, the feeler lever G, is swung rearwardly toward the lay, thus withdrawing arm H, from pin *e*, whereupon the rear end of the latch or dog is swung upwardly (by its usual spring I, Fig. 9, connected with it and the transferrer) into the path of the bunter on the lay. After the transfer of weft-carriers has been effected, and after the lay has retreated beyond reach of the latch or dog, the spring F, restores all parts to their original condition. Whenever the starting shaft C, is rocked, the take-up is put out of action so that the cloth and warp will not be advanced while no weft is being laid. The take-up is illustrated in Fig. 5, and is substantially that shown in United States patent to Jamieson, No. 729,593, June 2, 1903. The ratchet wheel J, of the take-up is moved step by step by a take-up pawl K, which swings on an adjustable stud *f*, on the adjacent lay-sword *g*. This pawl is connected by a link *h*, with an arm *i*, extending rearwardly from and fast to the starting shaft. A slot and pin connection between links *h*, and arm *i*, compensates for the swing of the sword *g*. When the starting shaft C, rocks, the link *h*, is lifted, and the driving pawl K, is disconnected from the take-up ratchet J. A click *j*, prevents backward rotation of the take-up ratchet.

The improved devices are shown as combined with the foregoing known parts.

L, is the "magazine" weft-fork or detector at the supply side of the loom. It is pivoted to a reciprocating spring-pushed weft-fork slide *k*, (Figs. 1, and 2) and cooperates with the hook, of a pivoted weft-hammer M, actuated as usual by a cam on the shaft A. Whenever the magazine fork detects weft absence, its slide is moved forward by the weft-hammer M, and, through an arm *m*, fast on the starting shaft C, said shaft is rocked thus stopping the take-up and starting the swing of the shuttle-feeler G. The swing of the feeler G, is, however, stopped before it is effective to permit the transferrer latch or dog D, to move into operative position. This is effected by a horizontal stop pin N, on the weft-hammer M (see Figs. 2, and 3), which encounters a stop-lug O, on the feeler G, thereby preventing the replenishing action. This stopping of the feeler G, is permitted by the yield of the spring F, and stirrup *b*. Looking now at the other end of the loom, as shown in Figs. 4, and 5, there is a second or "companion" weft-fork or detector P, pivoted to its spring-pushed slide *n*, and coöperating with its own pivoted weft-hammer Q, actuated in alternation with weft-hammer M, by its own cam on the shaft A. When the companion fork detects weft absence, its slide *n*, encounters an arm *o*, fast on the starting shaft C, thereby rocking the starting shaft. After the magazine fork has detected weft absence, but without initiating weft replenishment, the empty shuttle makes an idle excursion across the lay, and the companion fork P, then detects weft absence, thus stopping the take-up and swinging the shuttle-feeler G, through the rock of the starting shaft. The empty shuttle then makes a second idle excursion across the lay, thus reaching the supply side of the loom. In the meantime the timing of the two weft-hammers is such that the stop-pin

N, of the magazine hammer no longer obstructs the swing of the feeler G; and the companion weft-hammer Q, through its action on the starting shaft and controlled parts, puts the transferrer E, into action. Fresh weft is thus introduced, and its first pick is laid in the desired shed. Assume, on the other hand, that the companion weft-fork P, first detects weft absence. The empty shuttle then passes to the supply side of the loom, and its weft-hammer Q, rocks the starting shaft C, stops the take-up and rocks the shuttle-feeler G. The transferrer does not, however, act because delaying mechanism intervenes to prevent. The starting shaft C, at its end at the supply side of the loom has a crank-arm R, (Figs. 1, 2, and 3) connected by a link p, to a latch S, pivoted at q, and pressed by a spring r. This latch normally holds stationary a cam runner T, pivoted at s, to a forked lever U, hung from pivot t. Normally the latch S, holds the runner T, against the tension of a spring u, (Fig. 7) so that said runner occupies the position shown in Fig. 1, at which time it is beyond the control of cam-paths in a cam-wheel V, fast on the harness controlling shaft A, which constitutes a differentially delaying governor. When, however, the latch S, is swung by the rocking of the starting shaft C, the cam-runner T, is released and its spring u, swings its upper end or point against the periphery of the cam-wheel V. This release of the runner T, takes place just before an entrance 10, of the cam-paths in the cam-wheel V, reaches the runner as said wheel rotates in the direction of the arrow v. When this entrance 10, reaches the point of the runner, the runner spring u, causes the runner to enter the outer cam-path 11, and thereby to be clutched to the cam-wheel V. As the entire runner completes its occupation of this cam-path 11, the lever U, is swung toward the shaft A, and a stud W, on it (Figs. 1, and 7), encounters an incline w, (Fig. 8) on the rear end of a stop-lever X, pivoted at x, thereby swinging said lever, and bringing its upper end or stop against a stud Y, (Figs. 1, 6, and 8) on the transferrer latch or dog D. This prevents the swing of said latch or dog by its usual spring I, and hence no transfer takes place. The empty shuttle then continues its idle flight across the lay until the stop afforded by the stop-lever X, is removed from the path of the stud Y, on the latch or dog D. At each flight, the take-up is stopped by the detecting action of the two weft-forks in turn, so that the fell of the cloth is maintained at the proper position.

As shown in Fig. 1, the runner T, occupies the cam-path 11, for nearly one revolution of shaft A (and hence for nearly two beats of the lay), and then passes into the second cam-path 12, thus moving the lever U, nearer the shaft A, but not far enough to affect the stop lever X. It occupies this second cam-path 12, for nearly two additional beats and then enters the third and inner cam-path 13, whereupon the lever U, swings still farther toward shaft A, and this time far enough to let the stud W, pass beyond the second incline y, on the stop lever X. The stop lever then swings by gravity back and away from the dog, thus permitting the dog to be swung by its spring up into the path of the bunter on the lay, so that a transfer of fresh weft into the loom is effected. The delay in the action of the transferrer is determined by the arrangement of the cam-paths 11, 12, and 13, added to the delay incident to the weft-hammer Q, and is such that altogether five idle picks of the empty shuttle take place after the companion fork first detects weft absence. This brings the empty shuttle to the supply side of the lay, and gives time for an additional complete round of harness changes over those which occur when the magazine-fork first detects weft absence. This brings the first pick of the fresh weft into the desired shed in the case of a three harness weave whichever fork first detects weft absence. After the replenishment of weft has been effected, the cam-runner T, is unclutched from the cam wheel V, and is returned to its normal idle position by escaping from the inner cam-path 13, through the pass 14, and exit 15, during which passage the lever S, and stop V, are restored to their positions shown in Fig. 1.

In case the magazine-fork first detects weft absence it is important that the following detection of the companion-fork should not result in the clutching of the runner to cam-wheel V, through the entrance 10, since that would then unduly delay weft replenishment. To prevent this, the cam-wheel V, is provided with a second entrance 16, substantially opposite to the first entrance 10, into which enters the runner when the starting shaft C, is rocked through the initial detection of the magazine fork, it being noted that the latch S, is released from the runner whenever the starting shaft is rocked. When the runner enters through this entrance 16, it passes quickly into the inner path 13, through the passages 17, and 18, thus putting the stop X, into position where it does not prevent the effective action of the transferrer latch or dog, this occurring before the transferrer should act. The runner stays in this path 13, until after the replenishment has been accomplished and then escapes to its normal unclutched position through pass 14, and exit 15, just as in the case of the initial detection by the companion fork. A guard z, on the stop-lever V, extending beneath the stud U, pre-

vents the undue swing of said lever through momentum. The result of matching the pick is effected in this specific embodiment of the invention by the provision of a stop which prevents the action of the transferrer until the timing of the cam-paths of the cam-wheel acting on the clutched cam-runner has removed the stop and permits the transferrer to act in case the companion fork first detects; and, in providing another stop on the weft-hammer coöperating with the magazine fork which delays the action of the transferrer the desired length of time in case the magazine fork first detects. In either case the transferrer does not act until the shuttle is in the correct box at the supply side of the loom. The harnesses run along in regular order during the period of delay occurring after detection and before the transferrer is free to act. The period of delay differs depending upon which detector first acts, so that the mechanism controlled by the detectors and governing the weft replenishing is a differential delaying mechanism.

The specific mechanism set forth is applicable to different odd numbers of harnesses by removing the cam-wheel V, and substituting one with different cam-paths, in some cases also a change in the stop-lever X, being desirable to make the dwell between the inclines *w*, and *x*, of corresponding length. Take for example the case of five harnesses, the cam-paths would be so arranged that the action of the transferrer would be delayed for four picks and four harness changes in case the magazine fork first detected weft absence; and, for an additional complete round of harness changes, that is to say, for nine harness changes in all, in case the companion fork first detected weft absence. The stop X, might be arranged without the incline *w*, so that normally the transferrer latch or dog D, would be held inoperative. It suffices that the said latch or dog should be held inoperative after detection of weft absence so as to prevent premature action.

If the stop X, is used without the notch or recesses where incline *w*, is located, the stop-pin N, on the magazine-hammer M, can be omitted since the pass 18, between the paths 12, and 13, in the cam-wheel V, will not permit the stop X, to be removed from the latch or dog D, until the proper time arrives. In fact, the stop-pin N, can be dispensed with in either case without affecting the operativeness. The stop-pin is desirable simply as a precautionary device to prevent premature transfer.

I do not herein claim anything which is claimed in the application for Letters Patent of the United States filed by Charles F. Roper May 24, 1907, Serial Number 375,461.

I claim—

1. An automatic weft-replenishing loom having, in combination, a weft-supplying mechanism at one side, two detectors, at opposite sides respectively, differential delaying mechanism controlled by weft absence which permits a different number of idle harness-changes after detection of weft absence and before weft-replenishment, depending on which detector first detects, the harnesses running in regular order only, and means for rendering the take-up inoperative between detection and replenishment.

2. An automatic weft-replenishing loom having, in combination, a weft-supplying mechanism at one side, two detectors at opposite sides respectively, differential delaying mechanism controlled by weft absence which permits a different number of idle harness-changes after detection of weft absence and before weft-replenishment, depending on which detector first detects, the harnesses running in regular order only, and means for rendering the take-up inoperative between detection and replenishment, said means being controlled by both detectors.

3. An automatic weft-replenishing loom having, in combination, a weft-supplying mechanism at one side, two detectors at opposite sides respectively, differential delaying mechanism controlled by weft absence which permits a different number of idle harness-changes after detection of weft absence and before weft-replenishment, depending on which detector first detects, the harnesses running in regular order only, and means for rendering the take-up inoperative between detection and replenishment, said means being controlled by each detector each time the shuttle is at its side of the loom.

4. An automatic weft-replenishing loom having, in combination, harnesses which run in regular order only, a weft-supply at one side, a starting-shaft, weft-supply devices controlled by the starting-shaft, two detectors, and differential delaying mechanism controlled by each detector to differentially delay the functional action of the starting-shaft upon the weft-supply devices.

5. An automatic weft-replenishing loom having, in combination, a weft-supplying mechanism at one side, a starting-shaft, a cam-actuated stop, a transferrer controlled by the starting-shaft and also by said cam-actuated stop, two detectors at opposite sides of the loom, each of which controls the starting-shaft and the cam-actuated stop, and harnesses running in regular order only.

6. An automatic weft-replenishing loom having, in combination, a harness-controlling shaft from which the harnesses are driven in regular order only, a cam-wheel thereon, a runner adapted to be clutched

to said wheel at different points in its revolution, a weft-replenishing controlling stop governed by said runner, and two detectors at opposite sides of the loom governing said runner, the runner being clutched to said cam-wheel at different points depending on which detector first detects weft-absence.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

CLARE H. DRAPER.

Witnesses:
GEORGE OTIS DRAPER,
ERNEST W. WOOD.