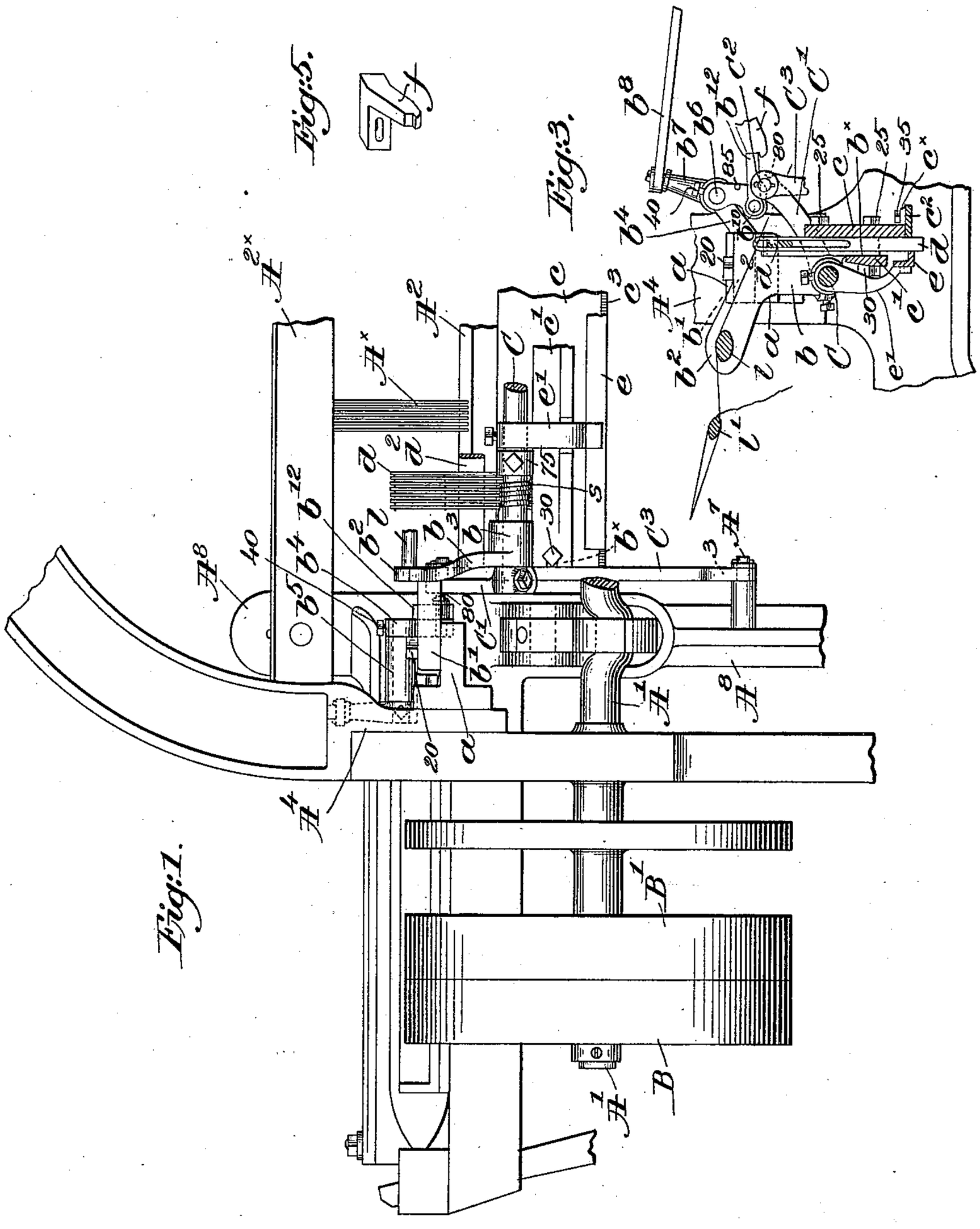
(No Model.) 2 Sheets—Sheet 1.

C. F. ROPER.

WARP STOP MOTION FOR LOOMS.

No. 545,728. Patented Sept. 3, 1895.



Witnesses:
A. C. Harmon.
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

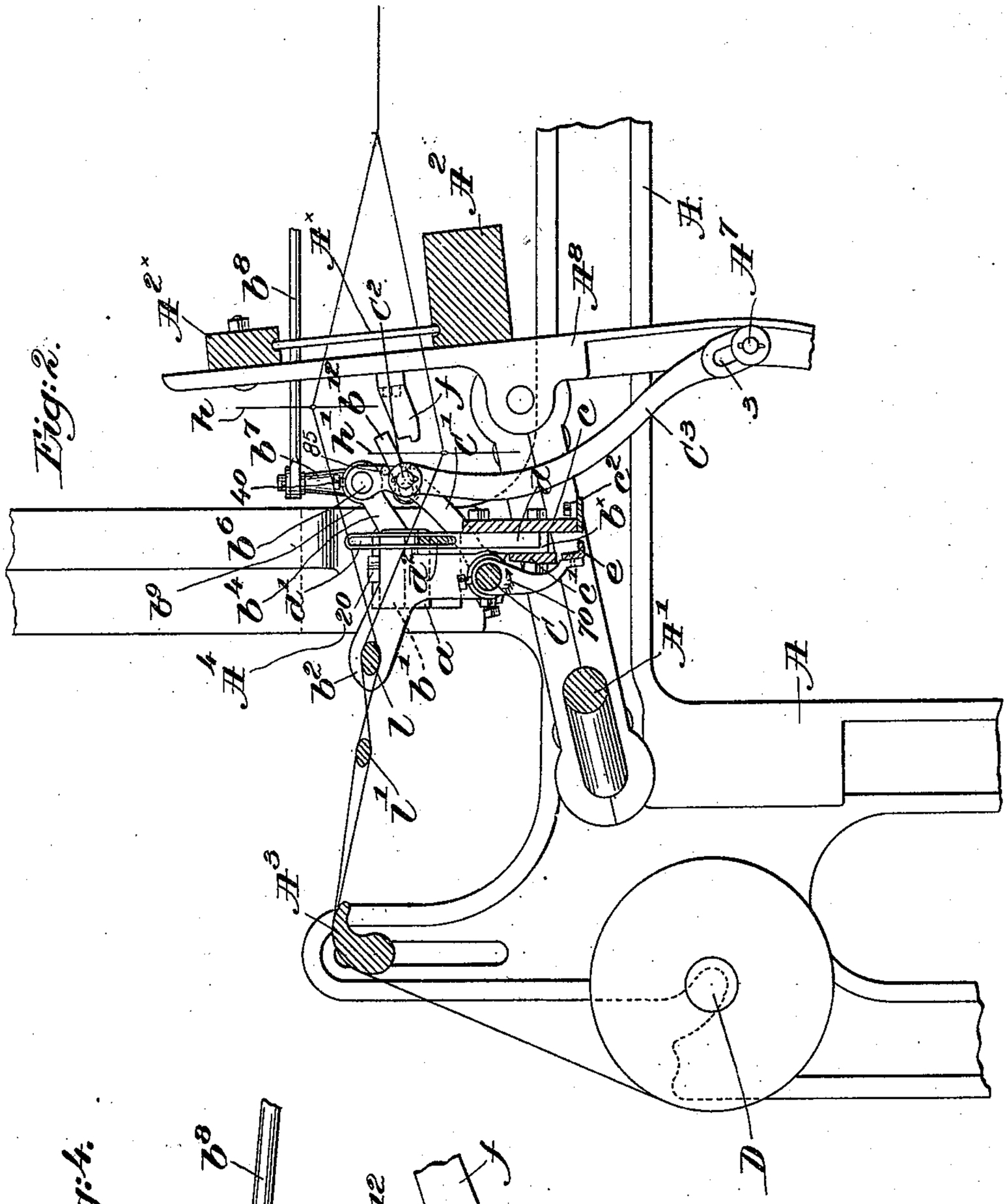


Fig. 4.

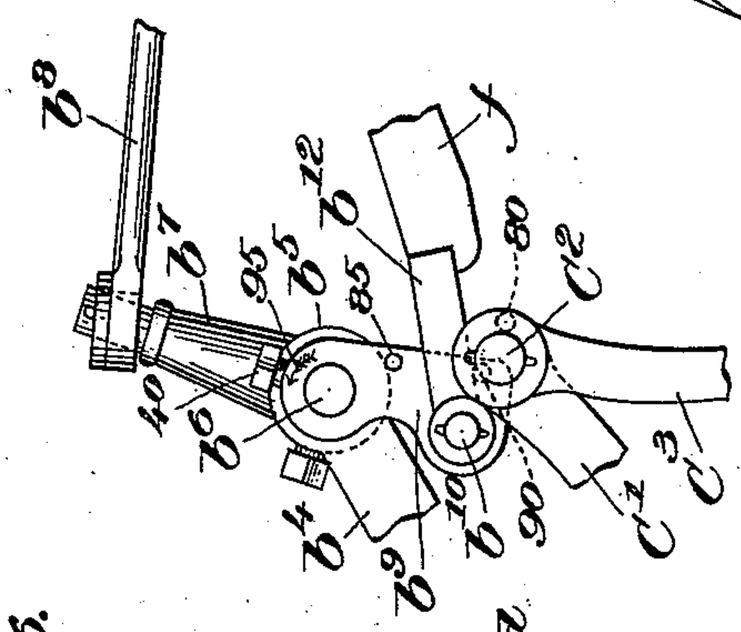
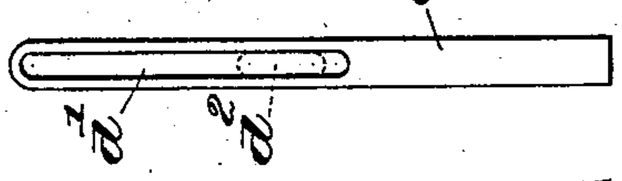


Fig. 6.



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UNITED STATES PATENT OFFICE.

CHARLES F. ROPER, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO GEO. DRAPER & SONS, OF SAME PLACE.

WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 545,728, dated September 3, 1895.

Application filed February 4, 1895. Serial No. 537,171. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. ROPER, of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Warp Stop-Motions 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 the production of a warp stop-motion for looms wherein a series of detectors are controlled by the taut or unbroken warp-threads, each detector co-operating with and detecting the slackening or breakage of either of two warp-threads or any one of a series of as many warp-threads as may be used co-operatively with each detector, the warp-threads being separated by shed-forming devices in such manner that of the plurality of threads co-operating with a detector but one thread at a time will be raised, if intact, into the upper plane of the shed, to thereby move a detector into abnormal position out of the path of a vibrating feeler. In this invention the detectors are moved into abnormal position out of range of a vibrating feeler by the formation of the shed, one thread at a time in each group of warp-threads being raised, while the other thread or threads in each group are lowered, whereby the "active-thread," as I shall hereinafter term it, will act upon and move its detector into abnormal position, so long as such active-thread is taut or unbroken. Slackening or breakage of an active-thread prevents the movement of its particular detector into abnormal position when the shed is formed, and the vibrating feeler will engage with a detector in normal position, and, through suitable stopping mechanism, act to stop the loom before the formation of another shed. Preferably and in most instances two warp-threads will co-operate with each detector, so that each thread while intact will move the detector at the formation of alternate sheds, but if more than two warp-threads are used with a detector one thread after another in each group will become the active-thread. If there are more than two warp-threads in each group, it will be obvious that the movement of the harnesses will be so timed that every thread in each group will be given an opportunity to move a detector into abnormal position. I have located the detectors entirely independent of the lay, between the shed-forming devices and the lease-rods, slotting the detectors for the passage therethrough of the co-operating warp-threads. The detectors, being turned edgewise to the front and back of the loom, serve to comb the warp, as it were, and also prevent snarls and breakage of threads. The detectors are made as flat slotted strips of metal, placed face to face and longitudinally movable in a suitable guide back of the harness-frames secured to the loom sides, the guide being open at its bottom and at the lower part of its rear side from one to the other end to permit the entrance of the feeler when the detectors are in abnormal or lifted position. The thread is held in proper relation to its detector at all times by the slot through which it is passed. Upon the slackening or breakage of the active thread of a group of warp-threads its detector will drop into normal position below the open lower portion of the guide to engage and stop the vibration of the feeler, and to prevent the escape of the detector through the open bottom of the guide, in case all the threads which it governs should break, I provide a fixed support which passes transversely through the slots of the detectors, limiting the descent of a dropped detector until the attendant can correct the fault in a defective thread.

My invention accordingly consists in the construction, arrangement, and operation of parts hereinafter fully described, and particularly pointed out in the claims.

Figure 1 in elevation represents the back of a sufficient portion of a loom to be understood, with my invention applied thereto, the whip-roll and warp-beam being omitted to show parts which would be otherwise hidden. Fig. 2 is a side elevation thereof and partially in section, looking to the left of Fig. 1, showing the shed-forming mechanism, the detectors in abnormal position, and the feeler at the forward end of its path of movement. Fig. 3 is a similar view of a portion of the mechanism shown in Fig. 2, with a detector in normal position, due to breakage of the

active thread, and with the controlling devices for the stopping mechanism in position to stop the loom. Fig. 4 is an enlarged detail of a portion of the controlling device in the position shown in Fig. 3. Fig. 5 is a perspective detail of the actuator detached, and Fig. 6 is a side elevation of one of the detectors enlarged.

The loom-frame A, the crank or lay-shaft A′ therein, having suitable fast and loose pulleys B and B′, (shown only in Fig. 1,) adapted to receive a belt under the control of a suitable belt-shipper, (not shown,) the lay A^2, carrying a reed $A^\times$, the lay-cap, the whip-roll A^3, and the shedding mechanism, are and may be all as common in looms.

A bracket *a* is secured to the inner side of the part A^4 of the frame at each side of the loom, to which are attached by suitable bolts 20 lateral ears or flanges b' of standards *b*, (see Figs. 1, 2, and 3,) each standard having a rearward extension b^2 to support one of the lease-rods *l*, the other rod *l′* (shown only in Fig. 2) being supported in the usual manner, the main portion of the standard having a hub-like bearing b^3 for the ends of a rock-shaft C, extending across the loom at the back of the lay and below the shed. Plates or webs *c* and *c′*, secured to the edges of depending portions $b^\times$ of the standards by suitable bolts 25 and 30, respectively, form the front and back of the detector-guide, open at top and bottom and extending substantially the length of the reed, the back plate *c′* being quite narrow, as clearly shown, and with its bottom edge higher than the corresponding edge of the plate *c*. Bolts 35 are passed through lugs $c^\times$ on the plate *c* and into a flat bar c^2, to hold it tightly against the lower edge of the front plate, the inner face of said bar being preferably serrated or milled, as at c^3, Fig. 1, for a purpose to be described.

In the guide formed by the front and back plates I have placed a series of detectors *d*, and in the form in which I have embodied my invention in this application each detector is composed of a flat strip or piece of metal having a long slot or opening *d′* therein, and a support, shown as a flat bar d^2, is extended through the slots in the series of detectors to prevent them from falling entirely out of the support, the said support being held on edge by its ends entering suitable recesses in the standards *b*. The detectors are placed side by side in the guide with their flat faces adjacent, and they are adapted to be readily moved up and down therein, the support d^2 being so located that the front longitudinal edges of the detectors rest against the inner face of the front plate *c*, and the milled or serrated edge of the bar c^2 assists in keeping the detectors from being twisted when acted on by the vibrator. The number of detectors will depend, of course, upon the number of warp-threads, and also upon the number of threads which will be led through the slot *d′* in and to cooperate with each detector, the detectors being located between the lease-rods and the harnesses *h* and *h′* of the shed-forming devices, (not shown,) and which may be of any usual construction, the loom also being provided with the usual take-up and let-off.

In practice, the warps contained on a warp-beam or equivalent device D, Fig. 2, will be led forward over the whip-roll A^3, around the lease-rods *l* and *l′*, by which the warp-threads will be separated, and to the harnesses *h* and *h′*, two harnesses only being herein shown. Between the lease-rods and the harnesses the warp-threads will be led through the long slots or openings *d′* in the detectors, and after passing through the eyes of the heddles or harnesses they will pass between the dead-spaces of the usual reed $A^\times$ and to and over the breast-beam. The length of the slots *d′* in the detectors is such that the warp-threads therein may cross each other and be fully opened or shed above the support d^2, as clearly shown in Fig. 2, and while each detector-slot is herein shown as containing two warp-threads it will be understood that more may be used, according to the particular class of work done, so long as the movement of the harnesses is such that one thread at a time in each group will be raised into the upper plane of the shed during its formation, the other or inactive threads remaining in the lower plane of the shed, there being as many harnesses, consequently, as there are threads in each group.

In the formation of the sheds the active warp-threads of each group, as they rise into the upper plane of each shed, act upon the detectors at the upper ends of the slots *d′*, and lift or move said detectors into abnormal position, so that their lower ends are above the path of movement of the feeler *e*, herein shown as an angle-bar secured to arms *e′*, fast on the rock-shaft C at suitable points and movable by oscillation of said shaft toward and away from the open bottom and rear side of the detector-guide, the feeler being shown in Figs. 1 and 2 at the front end of its path of movement when the loom is running properly. In case the active warp-thread about to be lifted into the upper plane of the shed should slacken or break, it is obvious that the detector in the slot in which the said warp-thread lies would not be lifted from its normal position, and the lower end of the detector will stay down in the path of movement of the feeler *e*. A dropped or depressed detector acts to prevent the movement of the feeler toward the lay, as clearly shown in Fig. 3.

The stand *b*, at one side of the loom, is provided with an extension b^4, having a sleeve-like bearing b^5 for a short rock-shaft b^6, to one end of which is secured an arm b^7, connected by a link b^8 with and to control the shipper-handle of any suitable stopping mechanism for the loom. (Not shown and forming no part of this invention.) A depending arm b^9 (best shown in Fig. 4) is secured, as

by a set-screw 40, to the other end of the rock-shaft b^6, and it has loosely pivoted thereon at b^{10}, a dagger b^{12}, adapted at times to be engaged by the end of an actuator *f*, (shown separately in Fig. 5,) and secured to the rear side of the lay-support A^8, to turn at such times the rock-shaft and its attached arms into the position shown in Figs. 3 and 4 by the backward stroke of the lay. The rock-shaft C is turned in the direction of the arrow 70, Fig. 2, by a strong spring *s*, (shown clearly in Fig. 1,) secured at one end to a collar 75, fast on the rock-shaft, and at the other end to the bearing b^3, the spring normally moving the feeler into the position shown in Fig. 2. An arm C′, extended upwardly and toward the front of the loom, is secured to the rock-shaft C, and has pivoted thereto at C^2 the upper end of a link C^3, slotted at its lower end at 3 to receive the end of a stud A^7 on the lay-support A^8, and of such length that in the forward or beating stroke of the lay the link will depress the arm C′ and turn the rock-shaft C in opposition to the spring *s*, moving the feeler *e* back and away from the bottom of the detector-guide. A pin or projection 80 (see dotted lines, Fig. 4,) on the outer side of the arm C′ extends under and turns the dagger b^{12} on its pivot b^{10} whenever the spring *s* is free to turn the shaft and elevate the arm, to thereby lift the free end of the dagger out of the path of movement of the actuator *f* in the backward stroke of the lay. If, however, a detector is in the position shown in Fig. 3, stopping the vibration of the feeler *e*, and supported at its front edge by the front *c* of the guide, the arm C′ will be depressed, as shown in Figs. 3 and 4, and the dagger will remain in the position shown in said figures to be engaged by the actuator *f* as the lay completes its backward stroke, pushing the dagger before it to turn the rock-shaft b^6 into the position shown in Fig. 4, and, by the link b^8, causing the stopping mechanism to stop the loom, the slot 3 in the lower end of the link permitting the completion of the backward stroke of the lay when the actuator *f* is in engagement with the dagger without lifting the arm C′. A stop 85 on the arm b^9 prevents undue lifting of the dagger, and when the pin 80 is moved out of engagement with the dagger it will rest on a pin 90, (shown in dotted lines, Fig. 4,) as also on the arm b^9. It will be seen that the support d^2 prevents any of the detectors from falling out of the bottom of the guide in case all the threads governed by the detector should break, and the attendant can readily lift the lowered detector into position to re-thread it and connect the ends of the broken thread or remedy the defect therein if it is due to slackness. When the loom is to be started, the movement of the rock-shaft b^6 in the direction of the arrow 95, Fig. 4, will carry the arm b^9 into the position shown in Fig. 2, and as soon as the detector which stopped the movement of the feeler has been moved out of engagement therewith the spring of the rock-shaft C will elevate the arm C′, lifting the dagger from engagement with the actuator *f*, and the loom will be in condition to start.

I have not shown any mechanism to effect the automatic stopping of the loom or the transfer of the driving-belt from the fast to the loose pulley, as I may incorporate with the loom containing my improvements any well-known form of such mechanism.

I claim—

1. A warp stop motion for looms containing the following instrumentalities, viz;—a series of slotted detectors each adapted to be moved into abnormal position by one thread at a time of a plurality of co-operating warp threads passing through the slot of each detector when the active thread is taut and unbroken and lifted in the formation of the shed, a support extended transversely through slots in the detectors, a feeler to engage a detector in normal position, and a stopping mechanism for the loom controlled by said feeler, substantially as described.

2. A warp stop motion for looms containing the following instrumentalities, viz;—lease rods, harnesses, a series of slotted detectors between the lease rods and harnesses, each adapted to be lifted by one thread at a time of a plurality of warp threads passed through its slot when the active thread is taut and unbroken and raised by the harnesses, a guide for the longitudinal edges of the detectors, a feeler to engage a detector if the latter is depressed when the shed is formed, and a stopping mechanism for the loom controlled by said feeler, substantially as described.

3. A warp stop motion for looms containing the following instrumentalities, viz;—harnesses, a series of slotted detectors adjacent thereto, each adapted to be moved into abnormal position by any one of a plurality of warp threads passed through its slot, a support extended transversely through slots in the detectors, a guide for the front and back edges of the detectors, in which the detectors are vertically movable, a stopping mechanism for the loom, and a feeler controlling said mechanism and adapted to engage a detector in normal position, substantially as described.

4. A warp stop motion for looms containing the following instrumentalities, viz;—a lay, a rock-shaft turned in one direction by a spring, a feeler and an arm vibrated by said shaft, a link connecting the arm and the lay, to turn the rock-shaft in opposition to the spring, a rocking arm, a dagger pivoted thereon and held inoperative when the spring is free to turn the rock-shaft, and a series of detectors moved out of the path of movement of the feeler while the warp threads are intact, engagement of a detector by the feeler permitting the dagger to move into operative position, a stopping mechanism for the loom, and connections between it and the dagger, substantially as described.

5. In a warp stop motion for looms the fol-

lowing instrumentalities, viz;—the lay, a series of slotted detectors controlled by the warp threads and moved into abnormal position by intact threads in the upper plane of the shed, a guide for the longitudinal edges of said detectors, a support extended transversely through the slots of the detectors, a vibrating feeler adapted to engage a detector in normal position due to slackening or breakage of its active warp thread, a dagger, an actuator on the lay to move the dagger when the feeler is engaged by a detector, stopping mechanism for the loom, and connections between it and the dagger, substantially as described.

6. In a warp stop motion for looms the following instrumentalities, viz;—the lay, a series of slotted detectors moved into abnormal position by intact warp threads in the upper plane of the shed, a rock-shaft, an attached feeler to engage a detector in normal position, an arm on said shaft, a link connecting said arm and the lay, to rock the shaft in one direction, a spring to rock it in the other direction, a dagger normally moved into inoperative position by the arm of the rock-shaft, stopping mechanism for the loom, controlled by the dagger, and an actuator on the lay to move said dagger and stop the loom when the feeler engages a detector, substantially as described.

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

CHARLES F. ROPER.

Witnesses:

GEORGE OTIS DRAPER,

WALTER HASTINGS.