No. 646,903.

Patented Apr. 3, 1900.

H. I. HARRIMAN.

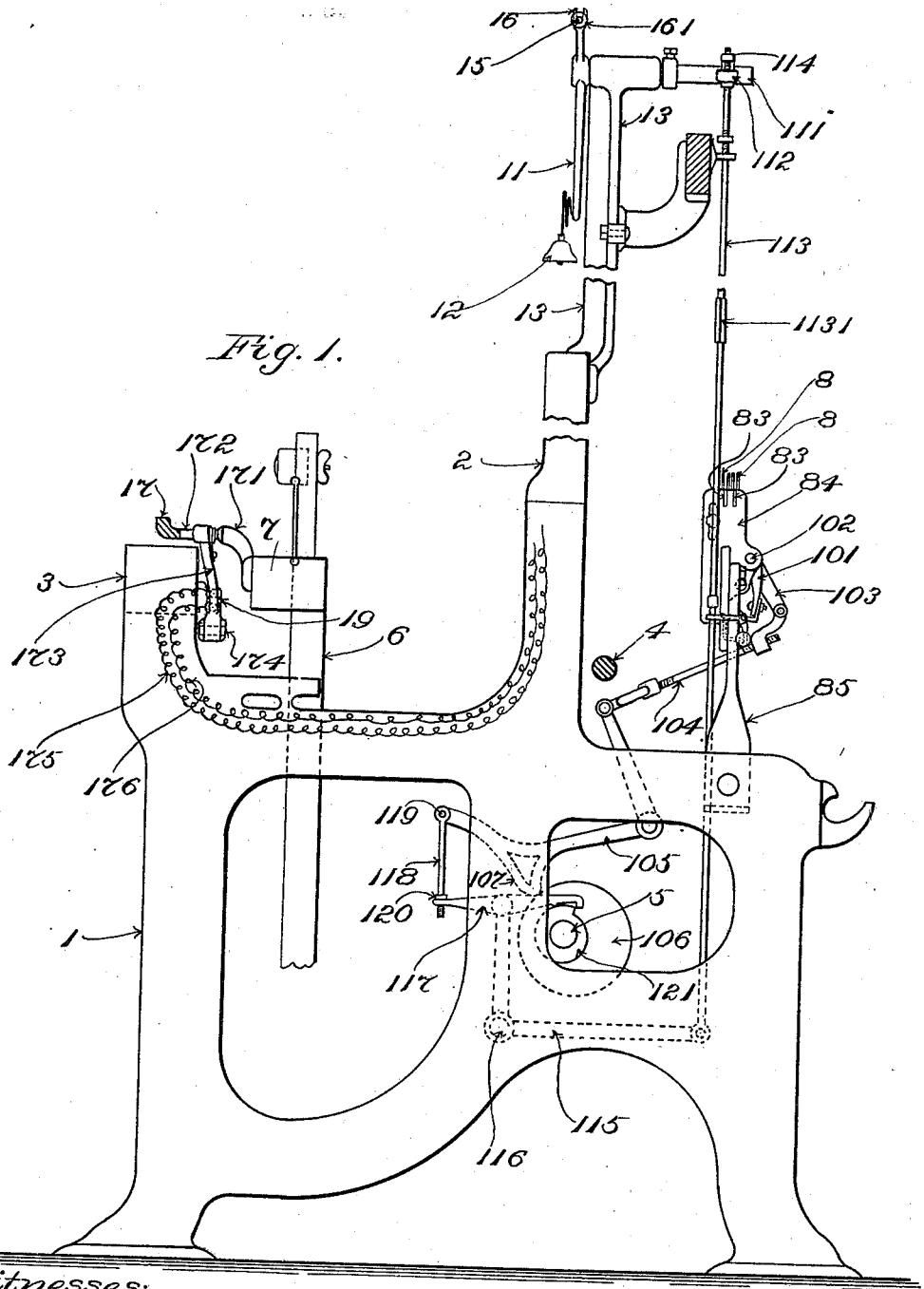
LOOM.

(No Model.)

(Application filed Feb. 7, 1900.)

5 Sheets—Sheet 1.

Fig. 1.



Witnesses:
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Robinson Hall & Rice

Inventor:
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his Attorneys.

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5 Sheets—Sheet 2.

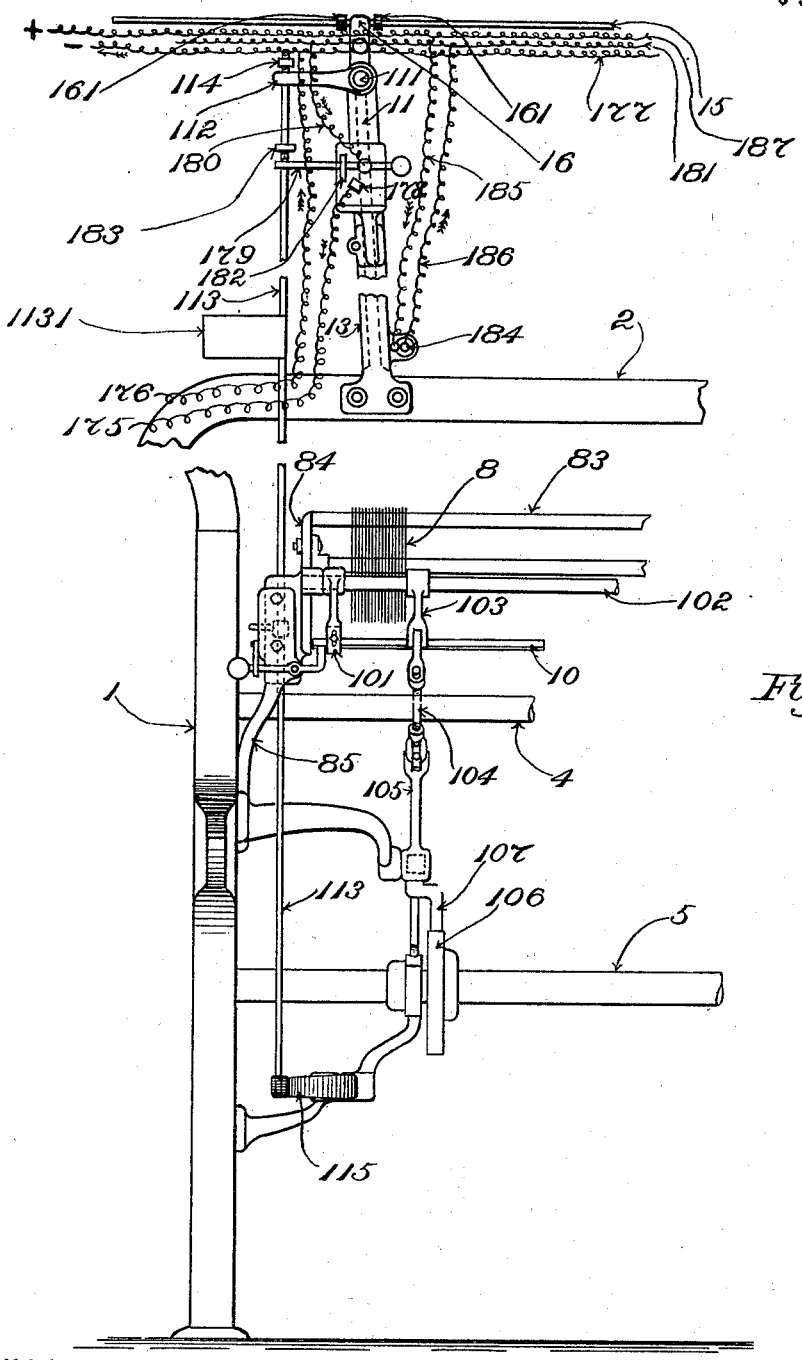

Fig. 2.

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5 Sheets—Sheet 3.

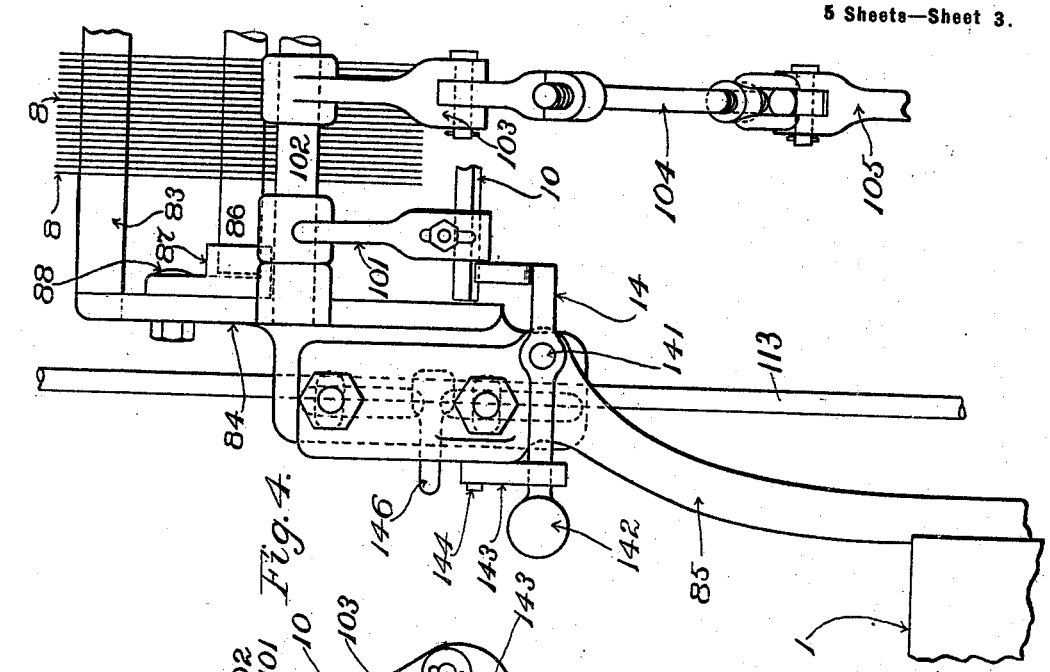

Fig. 4.

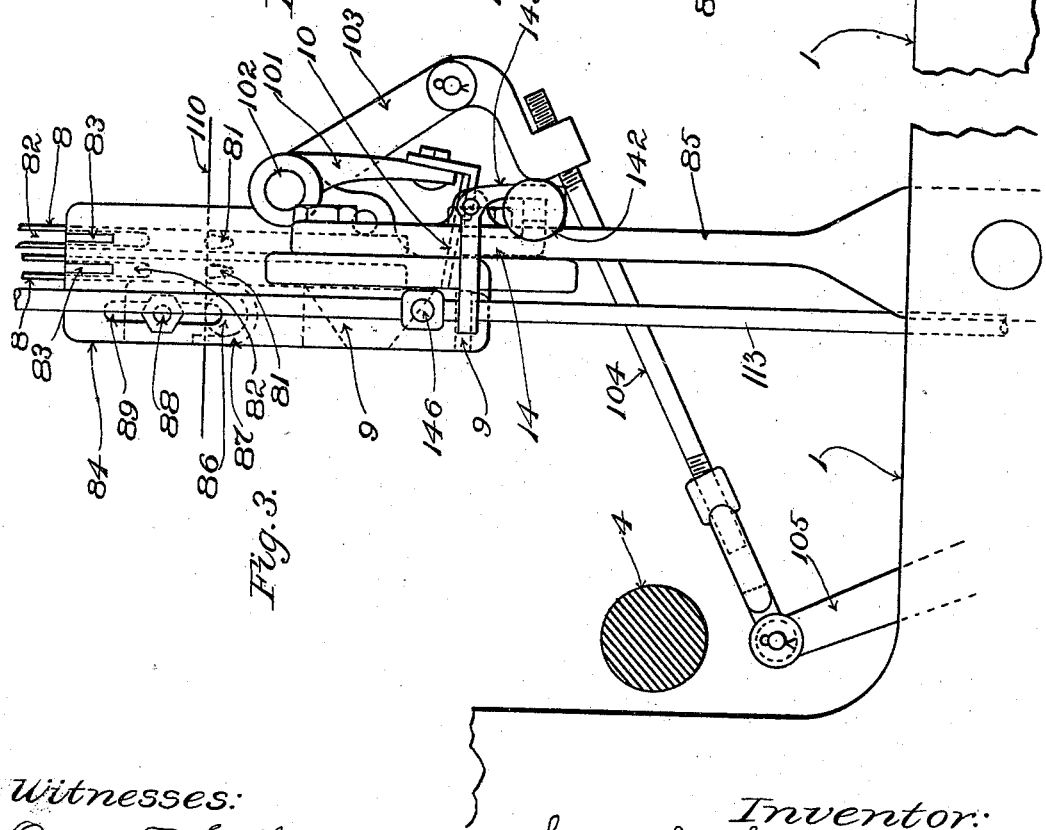

Fig. 3.

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(No Model.)

(Application filed Feb. 7, 1900.)

5 Sheets—Sheet 4.

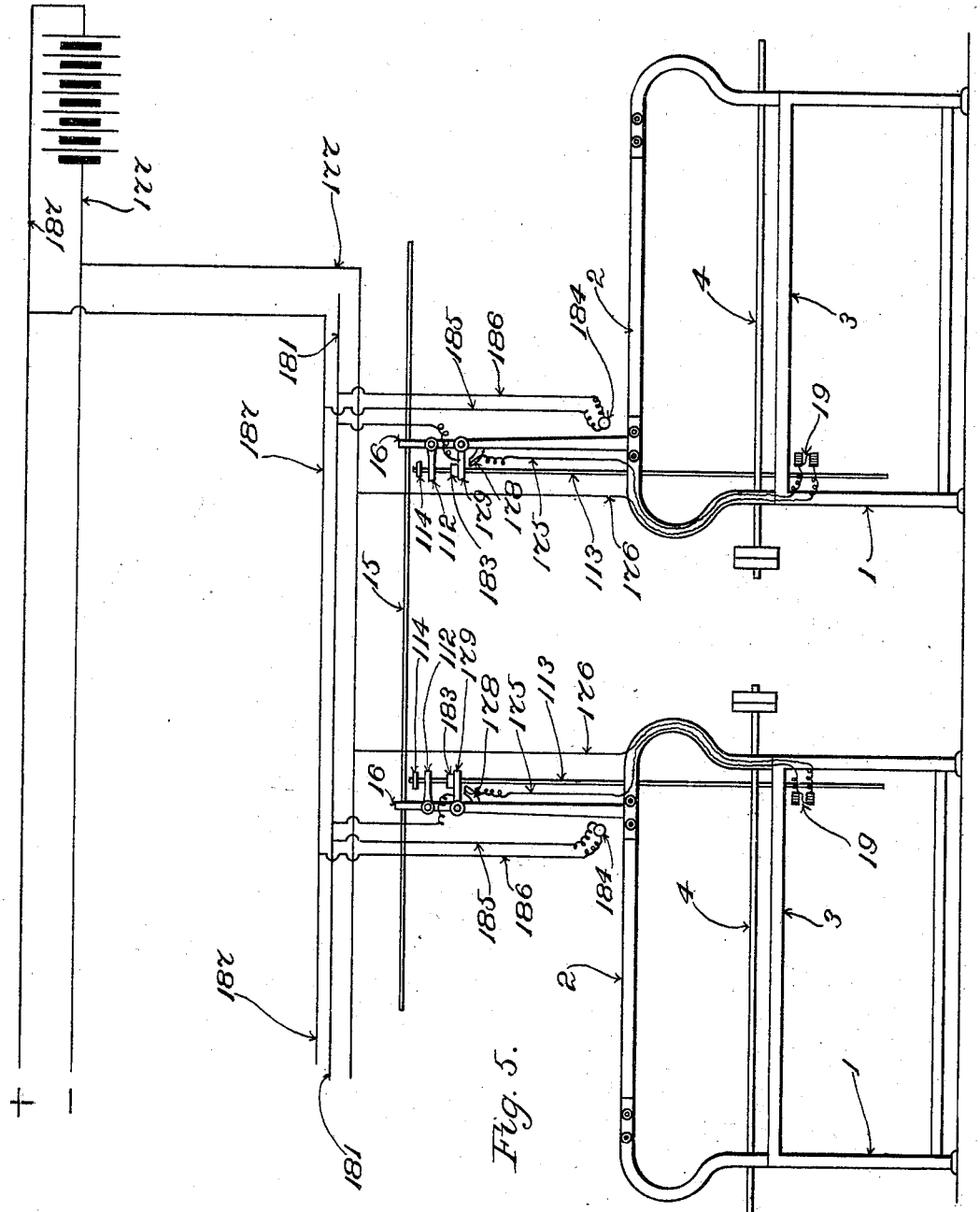

Fig. 5.

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(No Model.) (Application filed Feb. 7, 1900.)

5 Sheets—Sheet 5.

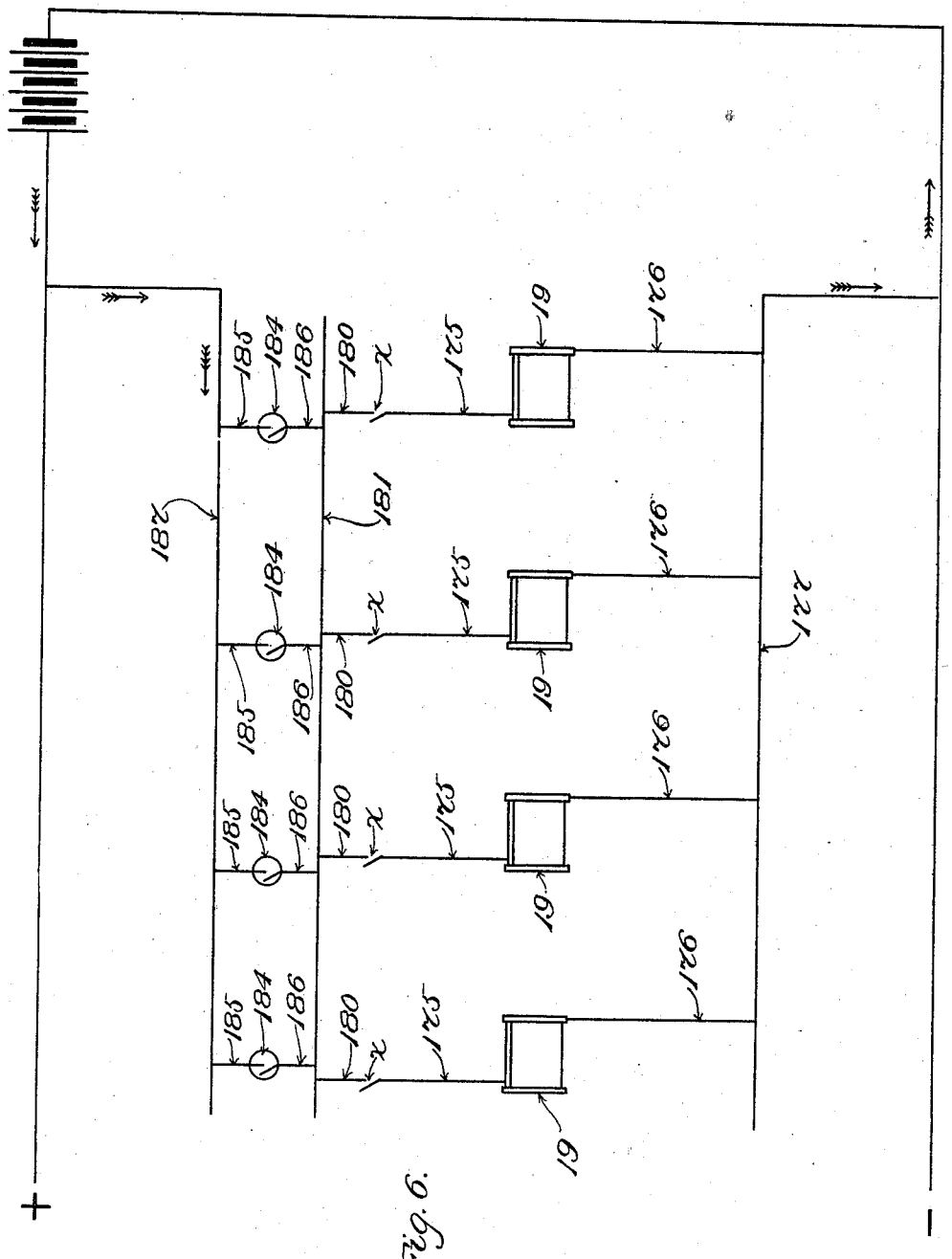

Fig. 6.

Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY I. HARRIMAN, OF NEW YORK, N. Y.

LOOM.

SPECIFICATION forming part of Letters Patent No. 646,903, dated April 3, 1900.

Application filed February 7, 1900. Serial No. 4,300. (No model.)

To all whom it may concern:

Be it known that I, HENRY I. HARRIMAN, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented a certain new and useful Improvement in Looms, of which the following is a specification, reference being had therein to the accompanying drawings.

Looms have heretofore been equipped with detector devices of different kinds which have been constructed and arranged to bring about the stoppage of a loom on the occurrence of a predetermined emergency or fault in the working thereof. The aim in general has been to occasion prompt automatic stoppage of the loom after the discovery of such emergency or fault without waiting for any intervention on the part of the attendant weaver. For example, it was proposed very early in the development of the power-loom to provide the latter with automatic stop-motion mechanism arranged to act upon breakage or failure of one or more warp-threads, and warp stop-motions for looms have been well known in the art for many years, many forms thereof having been from time to time contrived and patented.

An objection is raised in some quarters against the use of warp stop-motions in looms on the ground that they occasion an unnecessary loss of productive capacity, the reduction in the output of a loom due to the stoppages occasioned by the warp stop-motion thereof being regarded as more serious than the disadvantages which follow from allowing the loom to continue to weave with one or more broken warp-threads until the fact is observed by the weaver. It is well recognized that absence of a single warp-thread for a short distance is not a detriment to many kinds of woven fabrics. It happens frequently in practice that a loom is stopped by the action of its warp stop-motion and stands for some little time idle while the attendant weaver is occupied at some other loom. This time is lost for weaving purposes, while if no warp stop-motion were employed the loom might still continue to run and weave cloth, the defect due to the breakage of a warp thread or threads being remedied in the loom at the convenience of the weaver or subsequent to the removal of the woven web from the loom.

My invention has for its aim in general to provide means for automatically detecting the occurrence of a predetermined emergency or fault in the working of a loom and apprising the weaver of such occurrence by a signal device without, however, actually causing the immediate stoppage of the loom and in connection therewith to provide means for enabling the loom to be stopped by the aid of appliances which shall be normally inoperable for occasioning stoppage, but which when the detector devices ascertain the occurrence of such emergency or fault shall thereby be rendered operable at the will of the weaver to bring about the stoppage of the loom. The principle in view is this that the weaver shall be apprised promptly of the occurrence aforesaid by the signal device. This will enable him to take the steps which are necessary to be taken for supplying the needs of the loom or remedying the fault and in many cases without arresting the loom. In many cases the emergencies or faults which are to be provided for will be of a character which may be attended to without interfering with the regular working of the loom. It will enable him also at his discretion, and especially if he is occupied elsewhere, to permit the loom to run on undisturbed by him for the time being. Thus while he will have been made aware of the fact that, say, a warp-thread is broken the loom will continue to weave cloth without unprofitable or premature interruption of its work.

My invention has for its aim, further, to enable the group of looms which are under the charge of one weaver to be connected in a series by means of master connections extending throughout such series, which will enable the weaver, wherever he may happen to be located in the series at a given moment, to occasion at will the stoppage of the particular loom or looms and only such in which the detector devices aforesaid shall have ascertained the occurrence of the predetermined emergency or fault.

One manner in which the foregoing aims

are carried into effect will now be described with reference to the accompanying drawings, in which—

Figure 1 shows in end elevation, and Fig. 2 in rear elevation, certain portions of a loom and certain parts and appliances involved in the invention. Fig. 3 shows in side or end elevation, and Fig. 4 in rear elevation, certain portions of the warp-detector devices to which reference is made hereinafter. Fig. 5 is a view on the order of a diagram, illustrating two looms and certain connections which pertain to the invention. Fig. 6 is a diagram showing the electrical connections of a series of looms.

In the said drawings, 1 designates the loom-frame, 2 is the arch thereof, and 3 is the breast-beam.

At 4 is indicated the crank-shaft of the loom, and at 5 the cam-shaft.

6 designates part of one of the swords of the lay, and 7 the lay-beam.

The warp-detector devices employed in the illustrated embodiment of the invention include the so-called "drop-wires," "heddles," or "detectors" 8 8, (see more especially Figs. 3 and 4,) which are located herein between the position of the harness and that of the whip-roll. (Both not shown. See Fig. 1.) The said detectors are shown arranged in two ranks or series, Fig. 3, and formed with warp-eyes 81 81 and also with elongated slots 82 82, the latter enabling them to be strung upon supporting and guide bars 83 83. The said guide-bars are supported by being applied at their opposite ends to stands 84, which are bolted to brackets 85, the latter being in turn bolted to the loom-frame.

86 designates a warp-rest arranged adjacent the detectors 8 8, between the latter and the harness, and designed to sustain at predetermined heights the intact warp-threads 110 and the detectors which are applied thereto. The said warp-rest is supported at its ends in sockets 87, which are affixed to the stands 84 by bolts 88. The said bolts are passed through vertical slots 89 in the said stands, the slots permitting the warp-rest to be adjusted to the required height. 9 9 are backing-bars arranged at one side of the two series or ranks of detectors and serving as abutments which hold a dropped detector against the thrust of the feeler or vibrator. Only a single pair of backing-bars is employed at one side of the two series or ranks of detectors in the illustrated form of warp-detector devices, the said pair coacting with both of the said series or ranks. 10 designates the feeler or vibrator. It is carried by arms 101, depending from a rock-shaft 102, which is mounted in bearings on the stands 84.

The usual movements are communicated to the vibrator 10 by means of an arm 103, made fast upon rock-shaft 102, adjustable link or connection 104, a bell-crank or other lever 105, and a cam or eccentric 106 upon cam-shaft 5. (See Figs. 1 and 2.) The cam or eccentric 106 by acting against the bell-crank 105 causes movement to be transmitted to the vibrator 10 in a direction away from the detectors 8 8, while the vibrator is returned toward the detectors by a yielding force, herein the gravity of the unbalanced portion of the bell-crank tending to hold the nose 107 of the latter pressed in contact with cam or eccentric 106. As will be obvious, should the advancing edge of vibrator 10 in its return movement encounter a detector 8 which has been dropped or lowered by breakage or failure of the corresponding warp-thread 110, Fig. 3, or by the undue slackening of such warp-thread the vibrator will thereby be arrested. This arrest will result in the tripping of the signal, &c., as presently will be described. The link 104 comprises end portions which are jointed to the arm 103 and bell-crank 105, respectively, and an intermediate rod-like portion which is in screw-threaded engagement with the said end portions. Rotation of the said intermediate portion serves to increase or diminish the length of the entire link and to vary the position in space of the path described by the vibrator. Thereby the approach of the forward edge of the vibrator relatively to the backing-bars 9 9 may be adjusted.

For the purpose of apprising the weaver of the fact that a warp-thread has become broken, exhausted, or unduly slack I place under operative control of the vibrator 10 a signaling device. This last may vary more or less in character. Preferably in practice I provide signals which are both audible and visible. Thus in the present instance I have shown an arm 11, carrying a bell 12, which is of a character to be sounded by movement suddenly communicated to the said arm. The arm 11 is attached to a rock-shaft 111, which last is fitted to a bearing formed or provided on a standard 13, extending upward from the arch 2. The rock-shaft 111 is furnished with a second arm 112, normally occupying a substantially-horizontal position. Through a hole in the outer portion of the said arm 112 passes loosely a rod 113, having a nut or collar 114 thereon above the arm. The lower end of rod 113 is jointed to the horizontal arm of a bell-crank 115, which last is pivoted at 116 and has pivoted to its vertical arm a trip-pawl 117. One end of said trip-pawl has a hole therethrough receiving the lower end of a rod 118, which depends from a pivot 119, connecting it to the substantially-horizontal arm of the bell-crank 105. A nut 120, adjustable upon the threaded lower end of rod 118, bears on the trip-pawl 117. The other end of trip-pawl 117 slightly preponderates in weight and is hooked, as shown in Fig. 1. This end overhangs a tappet 121 on cam-shaft 5, having a tooth fitted to engage with the said hooked end of trip-pawl 117. From what has been set forth it will be clear,

with the aid of the drawings, that when cam or eccentric 106 moves bell-crank 105 to swing vibrator 10 away from the detectors 8 8 the pressure of nut 120 on the tail of trip-pawl 117 will be relieved, allowing the hooked rear end of the said trip-pawl to descend within the path of rotation of the tooth of tappet 121. As the nose 107 of bell-crank 105 follows the surface of cam or eccentric 106 in the returning movement of the said bell-crank and vibrator, the pressure of the nut 120 upon the tail end of trip-pawl 117 will raise the hooked end of the latter out of the range of the tooth of the said tappet. When, however, the vibrator is arrested in its return by a descended detector, the hooked end of trip-pawl 117 is permitted to remain in position to be engaged by the tooth of tappet 121, and as the said tooth engages therewith it operates to rock the bell-crank 115 upon its pivot 116, thereby moving rod 113 lengthwise and turning rock-shaft 111 so as to swing arm 11, thereby moving said arm so as to indicate for the benefit of the weaver and also so as to cause the bell 12 to sound. In the continued rotation of the tappet 121 the tooth thereof will become disengaged from the hooked end of the trip-pawl 117. The signaling devices will be actuated in each rotation of the said tappet until the weaver has responded and restored things to their proper working condition.

For the purpose of preventing a dropped detector from becoming injured by repeated strokes of the vibrator 10 against the same a vibrator-stop is employed which is arranged and operated to interrupt the action of the vibrator against the dropped detector after it has operated in connection with the latter to bring the signaling devices into play. I have shown herein a stop-lever 14, Figs. 3 4, pivoted at 141 upon bracket 85, it having an upturned inner end and a weighted outer end 142. Normally the said vibrator-stop is engaged by a stop-catch 143, which is pivoted to bracket 85 at 144, Fig. 4, the said stop-catch serving to hold the weighted end of the vibrator-stop upraised and the upturned end depressed out of the path of a portion of the vibrator 10. Upon rod 113 is made fast a finger 146. When the said rod is moved downward to operate the signaling devices, as described hereinbefore, as a result of the encounter of the feeler or vibrator 10 with a detector which has assumed its detecting position, the said finger 146 acts against the tail of the stop-catch 143, moving the latter to free the vibrator-stop 14, whereupon the latter moves so as to place its upturned inner end in the path of movement of vibrator 10, interrupting thus the action of the feeler or vibrator against the detector which has moved into detecting position.

A weaver customarily is required to attend a number of looms arranged in one or more rows. His duties require him to be on the move a considerable portion of the time and to pass from place to place in the series of looms under his charge. In order to attract his attention wherever he may be located at a given moment, I arrange so that whenever the predetermined emergency or fault occurs in any given loom signaling devices shall be operated throughout a group of looms containing such loom. This may conveniently be effected by connecting together signaling devices pertaining to all the looms in the said series, or it may be to those of a group in each row, so as to be operated in unison whenever the detector devices act in any loom which may pertain to the series or group. The connection may be established by means of a rod 15, Figs. 1, 2, and 5, extending lengthwise of the row, and a fork 16 or the like, with which arm 11 is provided, the fork of each arm engaging with projections or collars 161 161 on the said rod. Whenever the detector devices in any given loom ascertain the occurrence of the predetermined fault or emergency, they are enabled to act to bring signaling devices into operation in all of the looms throughout which the connection extends.

For the purpose of indicating to the eye of the weaver which loom in particular is in need of his attention I have combined with each loom a special or individual usual signal, herein constituted by the flag 1131, carried by rod 113. This signal will be operated in only the loom in which the emergency or fault has manifested itself. The other signaling devices of a row of looms having been brought into play to notify the weaver that the predetermined emergency or fault has been detected in some one of the looms in the said row, the up-and-down movements of flag 1131 will enable him to ascertain by quick observation the particular loom in which such emergency or fault has occurred.

The stopping or unshipping appliances of the respective looms are to be placed under the control of the weaver in order that stopping or unshipping may be effected by him at will. In order to represent these appliances, I have shown at 17, Fig. 1, the ordinary knocking-off lever of a loom in transverse section.

At 171 is shown a striker which is carried by a lay, and at 172 is shown a movably-mounted bunter. The said bunter is herein in the form of a bolt fitting a hole made through an armature-lever 173, which is mounted pivotally at 174.

At 19 is intended to be represented an electromagnet, and at 175 176 the wires which are connected with the said electromagnet. Normally the armature-lever will occupy a position in which it will hold the bunter 172 out of the path of the striker 171. When, however, the electromagnet is excited, it will swing the armature-lever 173 to place the bunter in the said path, and consequently in the ensuing advance of the striker with the lay the

bunter will be struck and borne against the knocking-off lever 17 to operate the latter to occasion the unshipping of the loom.

The wires 175 176 form a portion of an electric circuit which is intended to be utilized in effecting unshipping or stoppage of the loom at the will of the weaver after the latter has been apprised of the occurrence of the predetermined fault or emergency. The features of this electric circuit are shown most fully in Figs. 5 and 6. The said circuit is provided with a switch which normally is open, inasmuch as it is intended that under ordinary conditions such circuit shall be incapable of being used to effect unshipping or stoppage. The said switch is combined with the detector devices of the loom in order that the same may be closed automatically on such occurence in order to place the unshipping devices in proper train to be operated in case the weaver shall see fit to operate the same. Thus the wire 176 is in electrical connection with a wire 177, leading from one pole of a source of electrical energy, while the wire 175 is connected to an insulated contact-piece 178. A switch-lever is shown at 179, it being connected by a wire 180 with a wire 181.

182 designates a spring which is provided on switch-lever 179 to make contact with fixed contact-piece 178. For the purpose of closing the switch automatically on the occurrence of a fault in the warp rod 113 is furnished with a stop or collar 183, that is arranged to engage with switch-lever 179. Thereby when rod 113 is moved in the manner which has been described already stop or collar 183 acts against switch-lever 179 to cause spring 182 to press on fixed contact-piece 178. The switch thereby is closed and the unshipping devices are placed in train and made ready for being brought into play.

A push-button for use by the weaver is shown on the loom at 184. This push-button is connected by wires 185 186 with the wire 181, aforesaid, and with a wire 187, leading from the other pole of a souce of electrical energy. The switch having been closed, as described, if now the weaver presses upon the push-button 184 the circuit will be completed and electromagnet 19 will be caused to bring about the unshipping of the loom. So long as the switch remains open the weaver cannot close the circuit and bring the said electromagnet into play through the devices which have been described, and consequently cannot bring about the unshipping of the loom through the instrumentality of such devices. The switch-lever 179 will be replaced by the weaver in the normal or open position thereof which is represented in Fig. 2, or, if desired, the preponderance of its weighted end may be such as to occasion automatic return of the switch-lever to the said open position.

I contemplate combining the whole number of looms under charge of a weaver or any preferred proportionate part thereof into a series by means of the wiring thereof, the wires 177, 181, and 187 being extended throughout such series of looms, the electrical connections pertaining to the respective looms being connected therewith in multiple. This will enable the weaver, by pressure upon the push-button of the loom nearest him at any given moment, to bring about the unshipping of any particular loom of the series in which the switch may have been closed by the action of the detector devices or otherwise.

From the diagram given in Fig. 6, in which the electromagnets of a partial series of four looms are indicated at 19 19, &c., it will be clear that the unshipping devices of the respective looms are comprised in branch circuits which are connected in multiple with the main circuit 187 177, &c. In this diagram the places of the switches are indicated at *x x* in the respective branch circuits. It will be apparent that unless one of such switches is closed at the time when a push-button 184 is pressed upon none of the electromagnets can be brought into action; also, that in case the switch of any one of the branch circuits is closed pressure upon any one of the push-buttons will result in bringing into operation the electromagnet embraced in such branch circuit and in the unshipping of the particular loom to which such branch circuit pertains.

While I have been careful to describe fully the preferred manner and means of carrying my invention into effect, I wish it to be understood that I do not restrict myself to the specific mode of application or features, construction, and arrangement which have been presented herein, save where indicated otherwise in the following claims.

I claim as my invention—

1. In a loom, in combination, detector devices to ascertain the occurrence of a predetermined fault or emergency in the working of the loom, unshipping appliances normally remaining in inoperable relations and established in operable relations by the detector devices on said occurrence, without stoppage of the loom, and master connections operable at the will of the weaver to cause the stoppage of the loom to be effectuated through the said appliances after the detector devices have rendered the same operable.

2. In a loom, in combination, warp-detector devices, unshipping appliances normally remaining in inoperable relations and established in operable relations by the action of the warp-detector devices, without stoppage of the loom, and master connections operable at the will of the weaver to cause the stoppage of the loom to be effectuated through the said unshipping appliances after the warp-detector devices have rendered the same operable.

3. In combination, a series of looms, each loom provided with detector devices to ascertain the occurrence of a predetermined fault or emergency in the working thereof and with a signaling device controlled by such detector devices to apprise the weaver of such occur-

rence, unshipping appliances in each loom normally remaining in inoperable relations and controlled by the corresponding detector devices to establish operable relations on said occurrence, without effecting stoppage of the loom, and master connections for the unshipping appliances of the series of looms, operating through the said appliances to effectuate stoppage of the particular loom in which the said occurrence has been detected.

4. In a loom, in combination, detector devices to ascertain the occurrence of a predetermined fault or emergency in the working of the loom, a signaling device under control of the said detector devices to apprise the weaver of such occurrence, unshipping appliances normally remaining in inoperable relations and controlled by the detector devices to establish operable relations on said occurrence, without effecting stoppage of the loom, and master connections operable at the will of the weaver and acting to cause the stoppage of the loom to be effectuated through the said unshipping appliances after the latter have been rendered operable by the detector devices.

5. In a loom, in combination, warp-detector devices, a signaling device under control of the said warp-detector devices to apprise the weaver of the occurrence of a fault in the warp, unshipping appliances normally remaining in inoperable relations and established in operable relations by the action of the warp-detector devices, without stoppage of the loom, and master connections operable at the will of the weaver to cause the stoppage of the loom to be effectuated through the said unshipping appliances after the warp-detector devices have rendered the same operable.

6. In combination, a series of looms, each loom provided with warp-detector devices, and with a signaling device controlled thereby to apprise the weaver of a fault in the warp, unshipping appliances in each loom normally remaining in inoperable relations and controlled by the corresponding warp-detector devices to establish operable relations on such occurrence, without effecting stoppage of the loom, and master connections for the unshipping appliances of the series of looms, operating through the said appliances to effectuate stoppage of the particular loom in which the said occurrence has been detected.

7. In combination, a series of looms, detector devices in connection with each thereof to ascertain the occurrence of a predetermined fault or emergency in the working of the loom, signaling devices along the said series to apprise the weaver of such occurrence, and devices whereby the said detector devices in each of the respective looms are enabled to operate the series of signaling devices.

8. In combination, a series of looms, each provided with a signaling device to apprise the weaver, and with detector devices to operate the signaling devices throughout the series of looms, whereby on detection of a fault in any loom the signals of the series are operated.

9. In combination, a series of looms, each provided with a signaling device to apprise the weaver, and with warp-detector devices in operative control of the series of signaling devices, whereby the latter are operated throughout the series of looms on detection of a fault in the warp-threads of any one of the looms.

10. In combination, a series of looms, each having unshipping appliances and detector devices, and devices under control of said detector devices whereby on detection of a fault in a particular loom the latter may be unshipped at the will of the weaver from any one of the others.

11. In combination, a series of looms, each having unshipping appliances and warp-detector devices, and means under the control of said warp-detector devices whereby on detection of a fault in the warp-threads in a particular loom the latter may be unshipped at the will of the weaver from any one of the others.

12. In combination, a series of looms, each having unshipping appliances, a signaling device to apprise the weaver, and warp-detector devices in operative control of the said signaling device, and means under the control of said warp-detector devices whereby on detection of a fault in the warp-threads in a particular loom the latter may be unshipped at the will of the weaver from any one of the others.

13. In combination, a series of looms, each provided with a signal and with detector devices operating collectively the signals of the series of looms, and each provided also with an individual signal separately operated by the detector devices of the particular loom.

14. In combination, a series of looms, each provided with a signal and with warp-detector devices operating collectively the signals of the series of looms on the discovery of a fault in the warp-threads, and each provided also with an individual signal separately operated by the said detector devices of the particular loom.

15. In combination, a series of looms, each having detector devices and unshipping appliances, the latter including an electromagnet having in connection therewith a current-controller under operative control of the said detector devices, a normally open or broken electric circuit having the series of electromagnets arranged in multiple with reference thereto, and a manually-operable circuit-controller for said circuit.

16. In combination, a series of looms, each having detector devices and unshipping appliances, the latter including an electromagnet having in connection therewith a current-controller under operative control of the said

detector devices, a normally open or broken electric circuit having the series of electromagnets arranged in multiple with reference thereto, and a manually-operable circuit-controller at each loom for said main circuit.

17. In combination, a main electric circuit and a series of looms, each loom having detector devices and unshipping appliances including an electromagnet, the respective electromagnets of the series of looms being in branch circuits arranged in multiple with reference to the main circuit, and all united with a common connection, two circuit-controllers for each branch circuit arranged at opposite sides of the common connection, one of the said circuit-controllers being under the operative control of the detector devices of the corresponding loom whereby the particular loom in which a fault is discovered by the said detector devices may be unshipped from any one of the looms of the series of looms.

18. In combination, a series of warp-detectors, a feeler or vibrator, means to actuate the same, and a vibrator-stop operating to interrupt the action of the feeler or vibrator against a warp-detector.

19. In a loom, in combination, a signal, a series of warp-detectors, a feeler or vibrator, devices under control of said feeler or vibrator to operate the said signal, means to operate the said feeler or vibrator, and a vibrator-stop operating to interrupt the action of the feeler or vibrator against a warp-detector after the signal has been operated.

20. In a loom, in combination, a series of warp-detectors, a feeler or vibrator, means to actuate the same, a movable vibrator-stop, a latch to hold the same inoperative, and means to disengage the said latch after the feeler or vibrator has acted against a warp-detector.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY I. HARRIMAN.

Witnesses:
J. FOSTER SEARLES,
CHAS. F. RANDALL.