No. 624,155. Patented May 2, 1899.

W. H. BAKER & F. E. KIP.

WARP STOP MOTION FOR LOOMS.

(Application filed Oct. 10, 1898.)

(No Model.) 3 Sheets—Sheet 1.

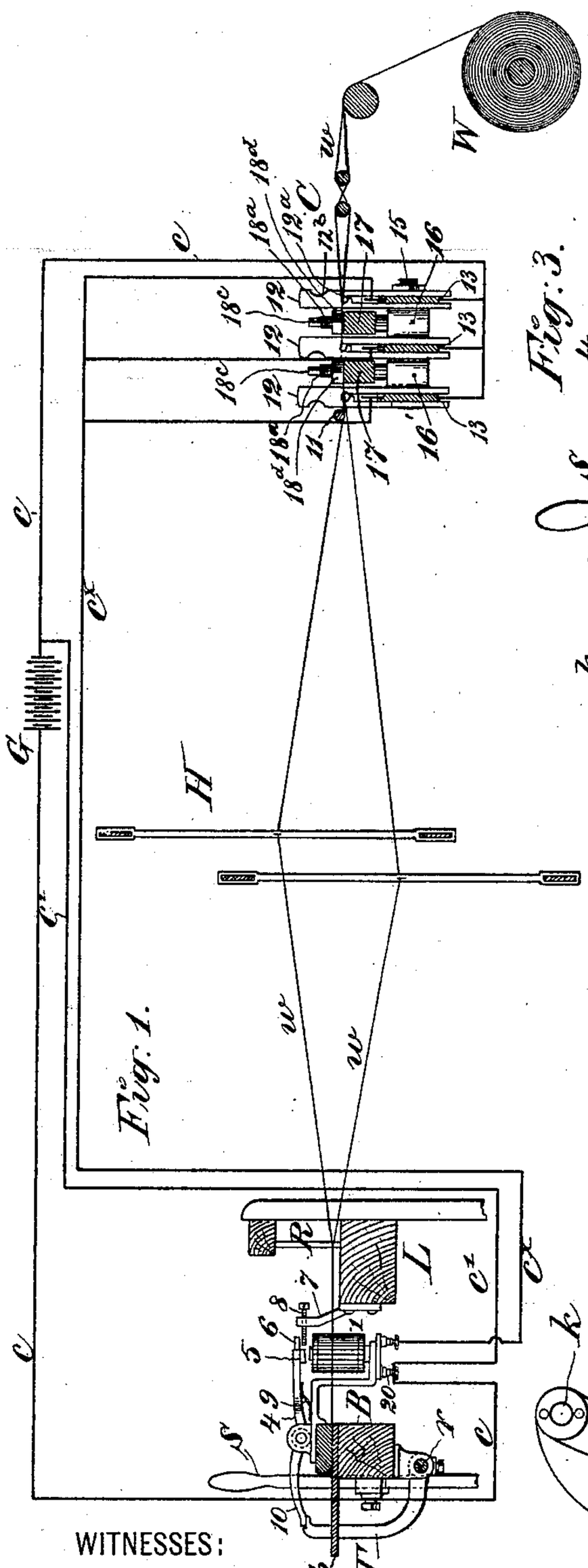

Fig. 1.

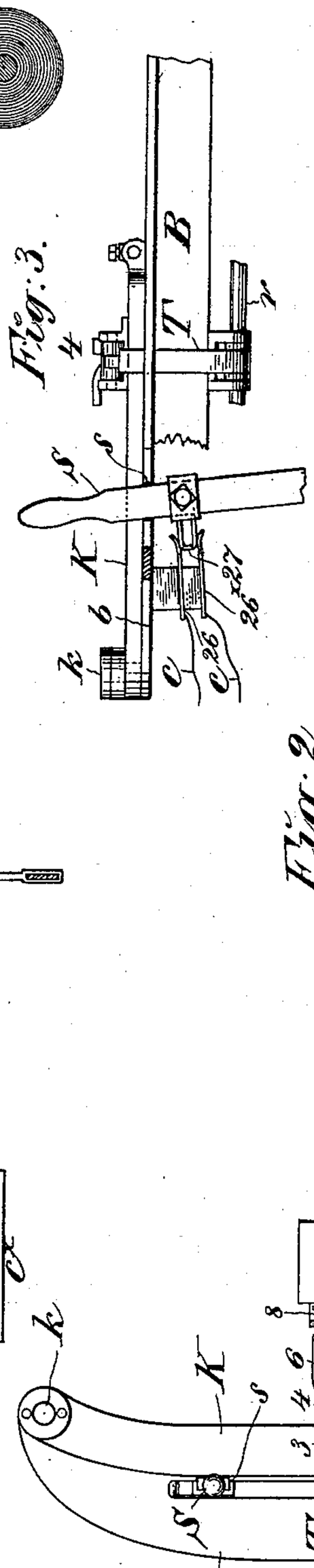

Fig. 3.

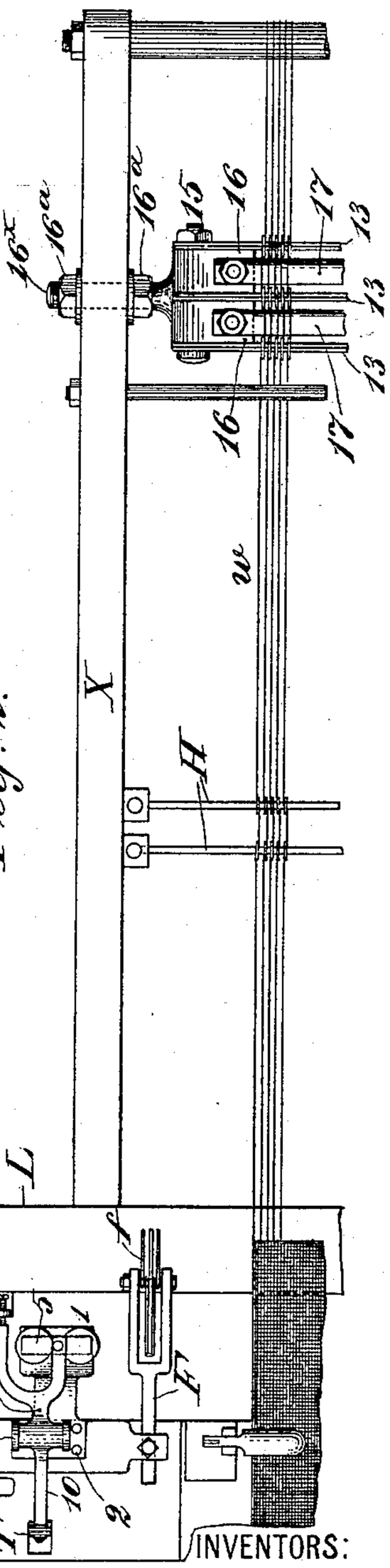

Fig. 2.

WITNESSES:

F. H. Kinnan

Peter A. Ross

INVENTORS:

William H. Baker

Frederic E. Kip

BY

Munn & Co

ATTORNEY

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Fig. 5.

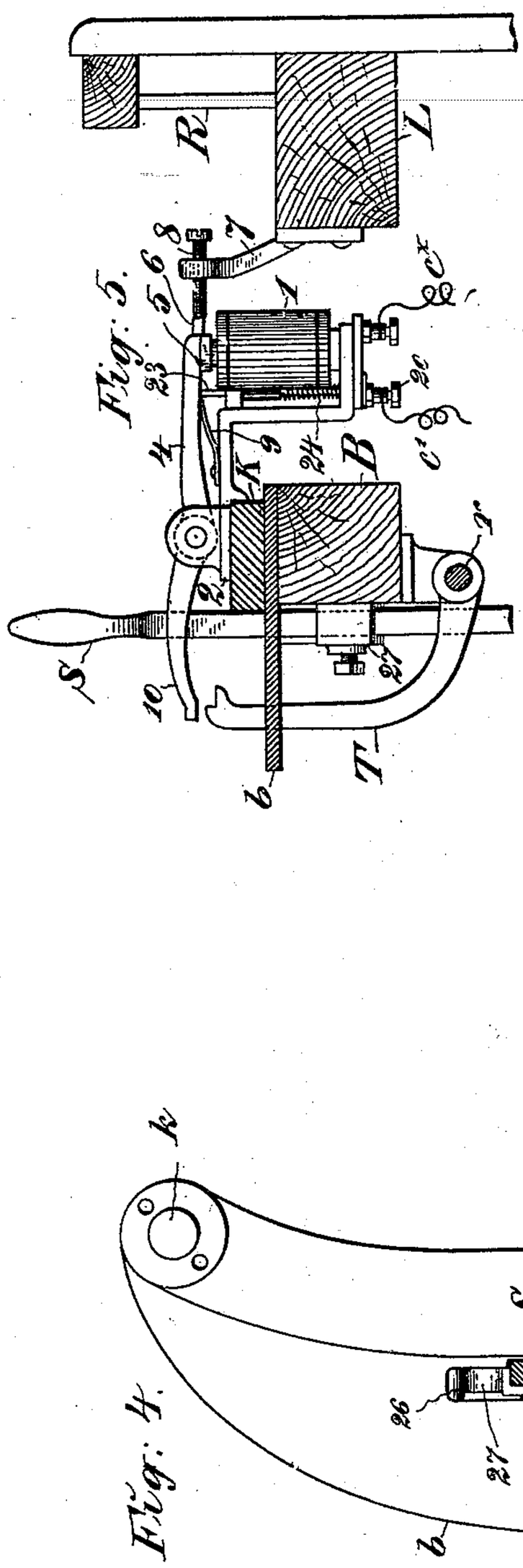


Fig. 6.

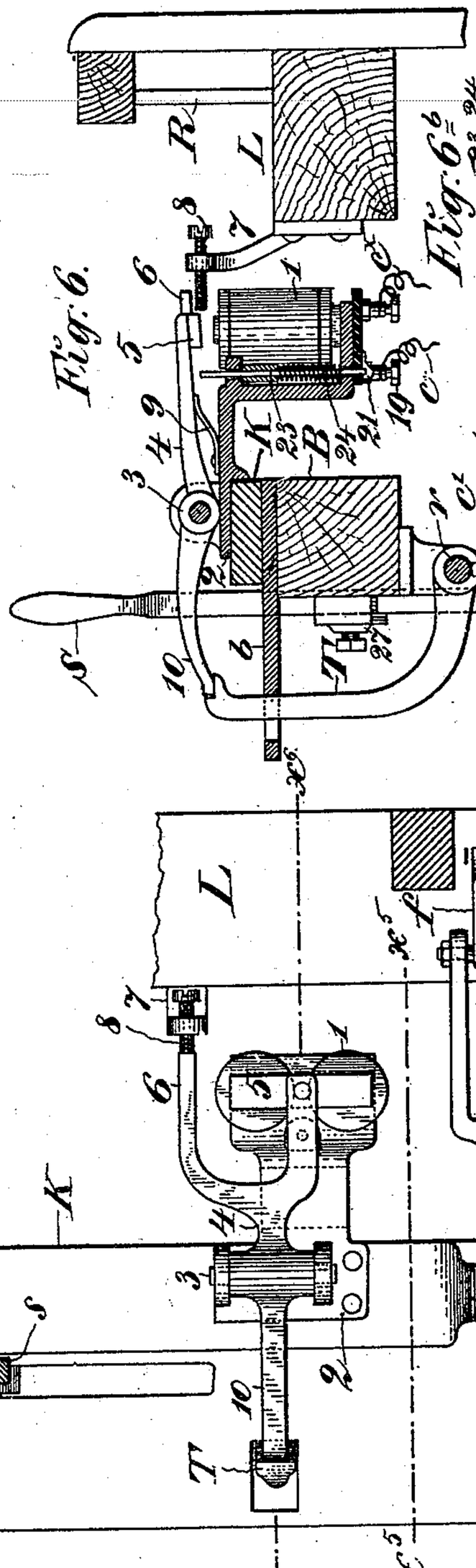


Fig. 6a.

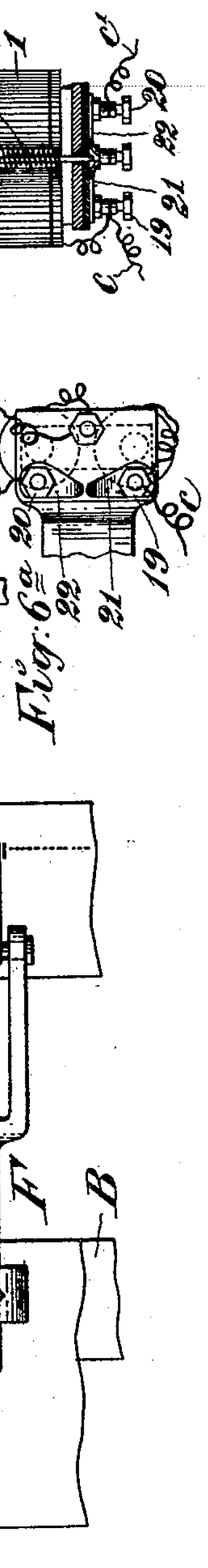
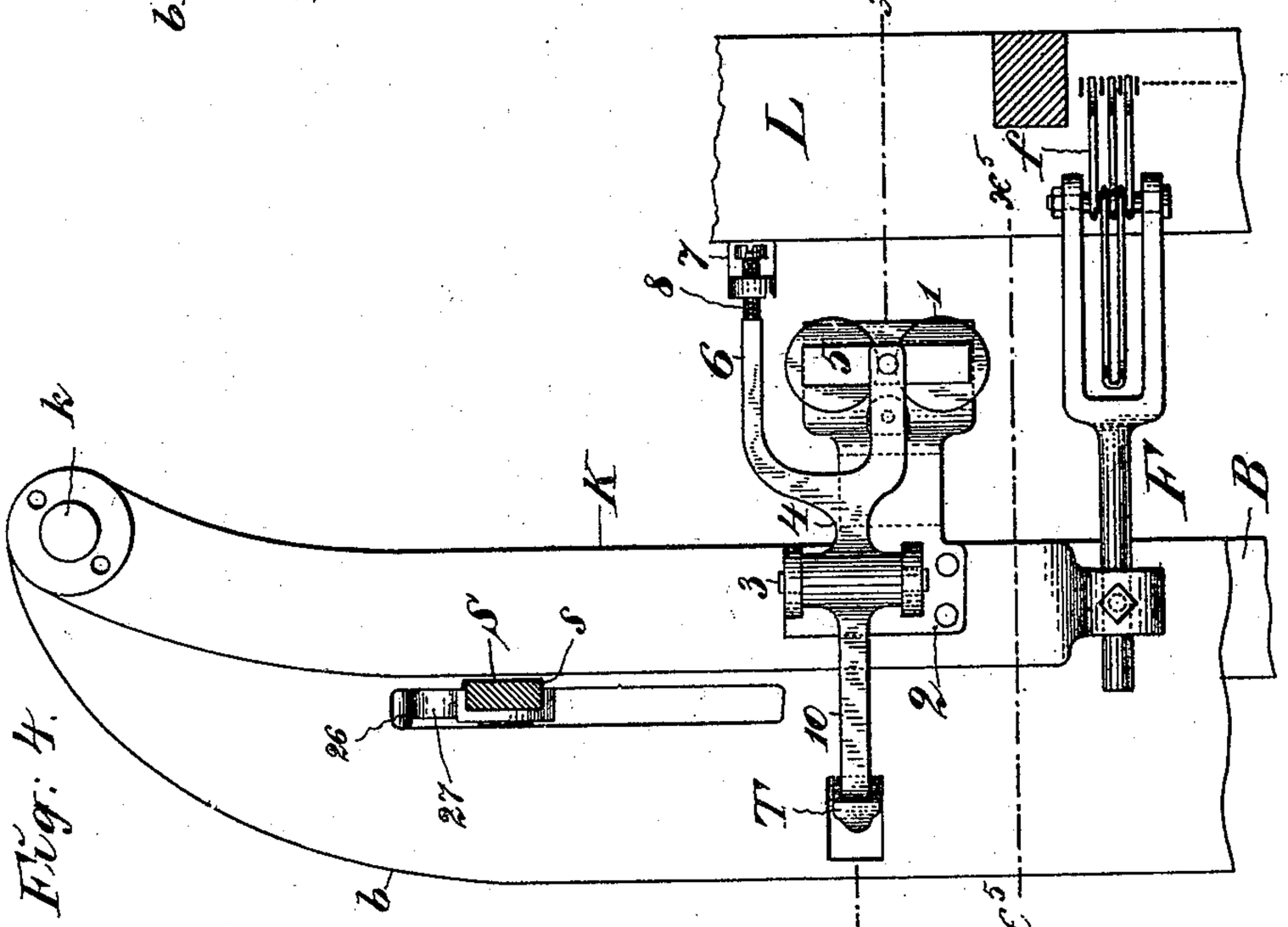


Fig. 6b.

Fig. 4.



WITNESSES:

F. W. Kliman

Peter A. Ross

INVENTORS:

William N. Baker

Frederic E. Kip

BY

Henry Connett

ATTORNEY

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W. H. BAKER & F. E. KIP.

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Fig. 8.

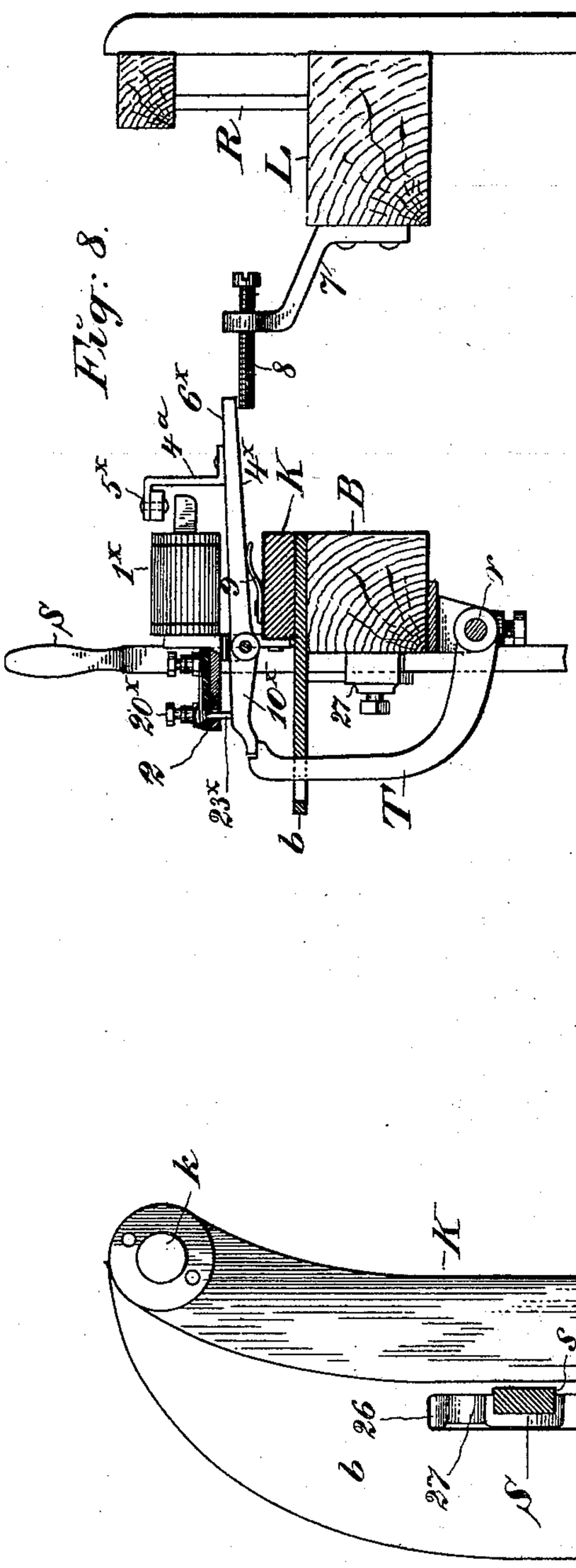

Fig. 10.

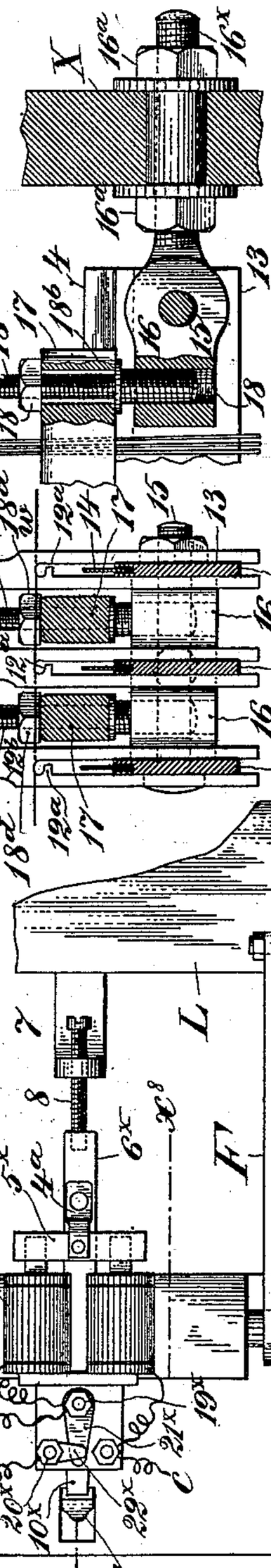

Fig. 11.

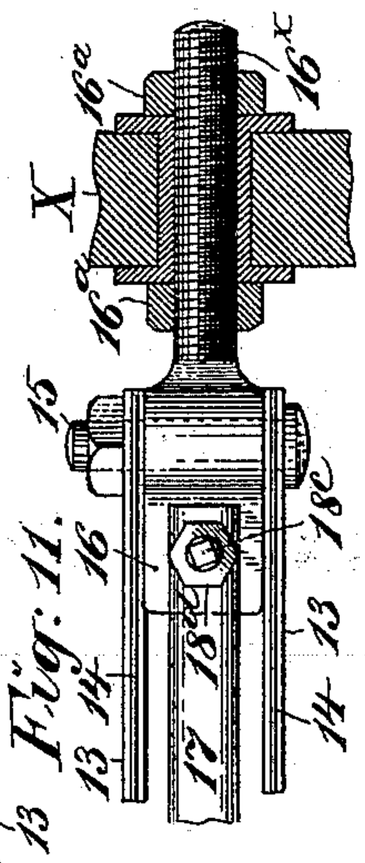

Fig. 9.

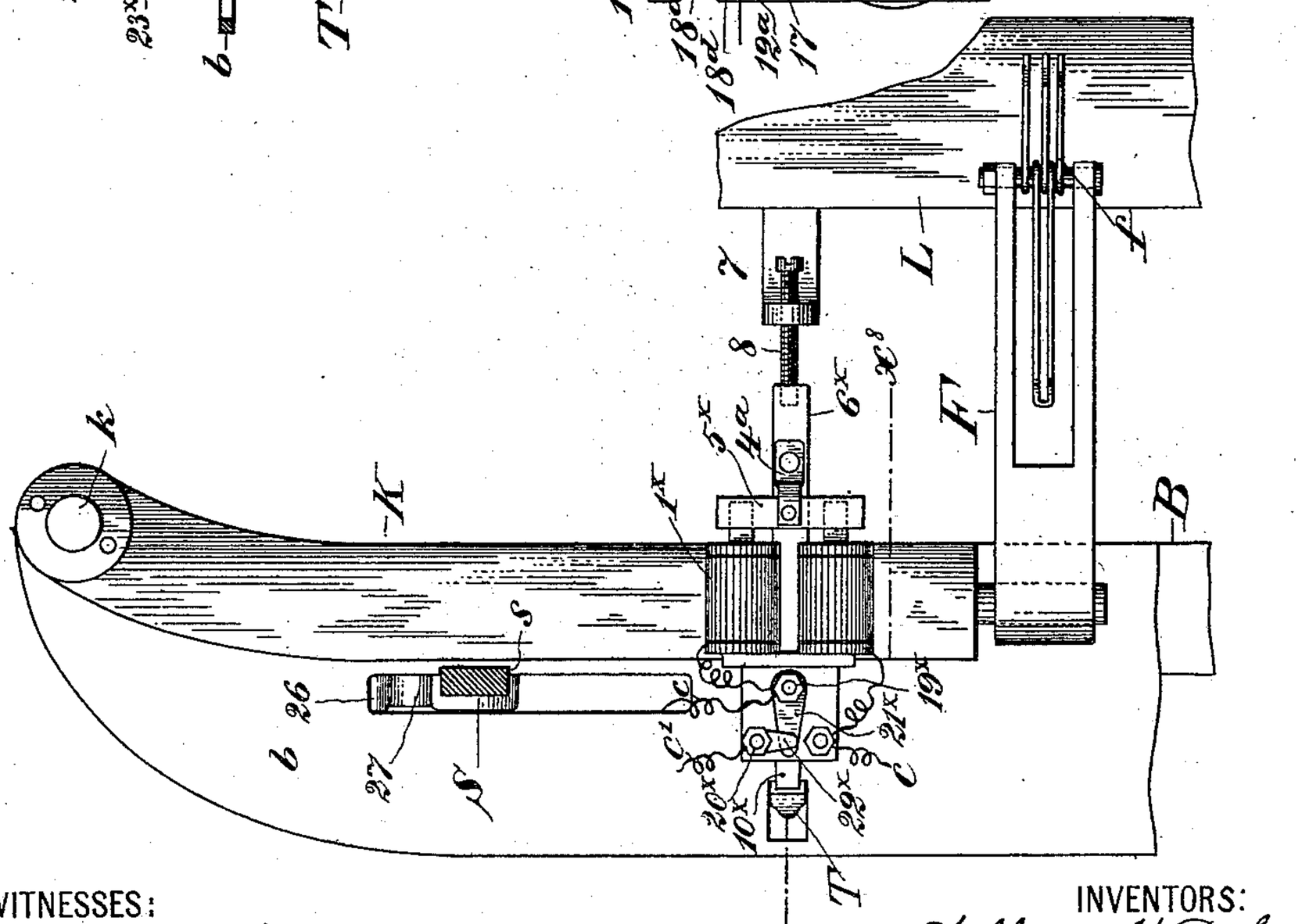

Fig. 7.

WITNESSES:

F. W. Dimock

Peter A. Ross

INVENTORS:

William H. Baker

Frederic E. Kip

BY

Henry Connett

ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM H. BAKER, OF CENTRAL FALLS, RHODE ISLAND, AND FREDERIC E. KIP, OF MONTCLAIR, NEW JERSEY, ASSIGNORS TO THE KIP-ARMSTRONG COMPANY, OF NEW YORK.

WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 624,155, dated May 2, 1899.

Application filed October 10, 1898. Serial No. 693,068. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. BAKER, residing at Central Falls, Providence county, Rhode Island, and FREDERIC E. KIP, residing at Montclair, Essex county, New Jersey, citizens of the United States, have invented certain new and useful Improvements in Stop-Motions for Looms, of which the following is a specification.

The present invention relates to the class of stop-motions for looms wherein the breaking of a warp-thread effects or permits the closure of an electric circuit which acts through suitable magneto-mechanical devices to stop the loom, and particularly to that class of such devices where a gravity-drop is suspended on each warp-thread and closes the operating electric circuit when the thread breaks and allows the drop to fall and where-in a magnet in the circuit when excited serves to interpose a part between the knock-off lever and a going or vibrating part of the loom, thus causing the said going or vibrating part to free the shipper-lever. In such looms there is ordinarily a weft stop mechanism whereby when a weft-thread breaks the knock-off lever is shifted and the shipper-lever freed, and when this takes place the knock-off lever acts through an upright take-up lever or arm on a rock-shaft to release the catches of the take-up gears, so that the web may slack or run back; but when the knock-off lever is shifted through the breaking of a warp-thread it is not desirable to actuate the take-up lever to release the web, and one of the objects of the present invention is to provide means for preventing this.

Another feature of the invention relates to a support for the flat warp near the point where the series of drops are mounted in order to prevent the sagging of the warp, all as will be hereinafter specifically described.

In the accompanying drawings, which illustrate an embodiment of the invention, Figure 1 is a diagrammatical sectional elevation of a loom embodying the invention. Fig. 2 is a fragmentary plan of the same, and Fig. 3 is an end view as seen from the point and direction indicated by the arrow 3 in Fig. 2. Fig. 4 is a plan view, on a larger scale, of the knock-off lever and the adjacent mechanism. Figs. 5 and 6 are cross-sections, respectively, at lines x^5 and x^6 in Fig. 4. Figs. 6^a and 6^b are detached views of the magnet of Fig. 6, illustrating the shunt-switch. Fig. 7 is a plan view, similar to Fig. 4, of a slightly-modified construction of the magnet on the knock-off lever; and Fig. 8 is a transverse section of the same, taken at x^8 in Fig. 7. Figs. 9, 10, and 11 are detail views illustrating the manner of mounting the warp-support and the contact-bars of the drops.

W represents the warp-beam; *w*, the warp-threads; H, the heddles; C, the lease-rods; B, the breast-beam; K, the knock-off lever; F, the weft-fork carrier, connected to and moving with the knock-off lever; *f*, the weft-fork; L, the lay; R, the reed thereon; S, the shipper-lever; T, the take-up arm or lever, and *r* the rock-shaft on which the arm T is fixed. All of these parts in some form are common in looms, and their operation will be briefly described because of their close relations to the novel features of this invention.

Normally the shipper-lever S is held with its spring under tension by engagement with a shoulder *s* on a bracket-plate *b*, which supports the knock-off lever K and to which the latter is pivotally connected at *k*. The weft-fork carriage F is connected to or coupled in some manner with the knock-off lever, so that when the hook on the weft-fork is engaged by the ordinary vibrating weft-hammer (not shown) the carriage F is driven back by the weft-hammer, carrying with it the knock-off lever, and this lever impinges on the shipper-lever S behind it, pushing it clear of the retaining-shoulder *s* and allowing its spring to act instantly on it to shift said shipper-lever, and thus stop the loom. The knock-off lever also when it moves back impinges in some manner on the take-up arm or lever T and presses it back, and this lever T acts through well-known mechanism to release the catches in the take-up gears, so that the web may slack and run back.

Referring now particularly to Figs. 4, 5, and 6, which show the magneto-mechanical devices on a larger scale than the principal views, 1 is an electromagnet mounted with

its poles upright and carried by or adapted to move with the knock-off lever. This magnet is situated on that side of the knock-off lever which is next to the lay. Preferably the magnet 1 will be carried by a plate 2, mounted on the knock-off lever, and on the plate 2 is fulcrumed at 3 an armature-lever 4, one arm of which is forked, a branch thereof carrying the armature 5 over and above the poles of the magnet 1 and the other branch 6 being adapted for depression when the magnet is excited and its armature attracted into the path of some part of the vibrating lay L or other vibrating or going part of the loom. As here shown, a bracket 7 is secured to the lay, and this bracket carries a screw 8, (for adjustment,) which latter under normal conditions moves in under the branch 6 when the lay advances in beating up; but when the magnet is excited and draws down its armature the branch 6 of the armature-lever is put in the path of the tappet-screw 8, and on the next advance of the lay the screw impinges on the branch 6 and drives back the knock-off lever, thus releasing the shipper-lever and causing the stoppage of the loom. Of course any form of tappet may be used on the going part. We utilize the lay, as it is necessarily there in position to be used, and we employ a screw 8, as it is convenient for adjustment as to length, and the bracket 7 may also be adjustable on the lay, if desired, so that the screw can be conveniently alined with the branch 6 on the armature-lever. The armature-lever has a spring 9, which normally upholds the armature, and back of the fulcrum 3 it has an arm 10, which is of course normally depressed, and when depressed it occupies a position directly in front of the upper end of the take-up lever T, Fig. 6, so that when the knock-off lever is actuated by the weft-fork and its carrier this lever T will be pressed back; but when the knock-off lever is actuated at the breaking of a warp-thread and the armature 5 is of course depressed the opposite arm 10 of the armature-lever will be elevated so as to be above the end of the take-up lever or arm T, and consequently this latter will not be acted upon in any way. The essential feature in this device is the fulcrumed armature-lever, having one arm normally in operative position with respect to the take-up arm or lever and its other arm normally in inoperative position with respect to a tappet on a going or vibrating part of the loom, and it is not essential that the armature-lever and magnet shall be arranged and mounted as has been described, for there are many ways of arranging the parts which will suggest themselves to one skilled in this art. Another arrangement, for example, is illustrated in Figs. 7 and 8. In this construction the magnet $1^{\times}$ is mounted on the knock-off lever with its axis horizontal. The armature-lever $4^{\times}$ is beneath the magnet, the armature $5^{\times}$ being carried on an upright branch 4^{a} of said lever and situated above and over the projecting cores of the magnet-bobbins. The branch $6^{\times}$ of the armature-lever projects out toward the lay, so as to be put in the path of the tappet-screw 8 thereon when the armature is depressed. The extremity of the arm $10^{\times}$ of the armature-lever occupies, as in the first-described construction, a position directly in front of the take-up arm T. The operation is the same as in the construction first described, and illustrated in Figs. 4, 5, and 6.

We will now describe the improvements in the circuit-closing devices illustrated in Figs. 1, 9, 10, and 11. 12 is a contact-drop made of thin metal and slotted to receive the warp-thread *w*, which supports it, and also the terminal strips or bars of the electric circuit. The terminal-bars herein shown and the ones we prefer to employ are the same substantially as those illustrated and claimed in our pending application, Serial No. 690,398, filed September 7, 1898, and the drops 12 are also somewhat like those described and claimed in that application. The bar comprises a flat metal strip forming one terminal 13, with which the drop is normally in contact, and set in the upper edge of this strip and carefully insulated therefrom is the other circuit-terminal 14. When the drop 12 falls from the breaking of its supporting-thread, a contact projection 12^{a}, extending across the slot in the drop, strikes and rests on the terminal 14, and thus closes the circuit at the terminals. It is found desirable to maintain the warp at a constant level at or in the near vicinity of the drops and at a constant distance above the contact-terminals 13 and 14, and it has been found desirable also to put a tension on the bar or strip forming the terminal 13, which extends transversely of the loom. To effect these objects, the construction illustrated in Figs. 1 and 2 and on a larger scale in Figs. 9, 10, and 11 has been invented. Several terminal-strips 13 are placed side by side and connected by a cross-bolt 15 to distancing-blocks 16, having a common screw-threaded shank $16^{\times}$, which passes through the frame X of the loom, being insulated therefrom by a sleeve and washers of insulating material. The nuts 16^{a} on the shank serve to strain the terminal-bars taut. The series of drops 12 are suspended on the warp-threads, so as to embrace the respective terminals 13. In Figs. 1, 2, and 9 three series of drops are shown and in Fig. 11 two series. The number of series is not essential to the present invention. Between the two series of drops and under the warp-threads is situated a transversely-extending warp-support 17, which may be of metal and be slightly rounded on its upper face. This support keeps the warp from sagging at the point where the drops are placed. The support 17 will be by preference mounted on the blocks 16 at the respective sides of the loom and will be also by preference mounted adjustably, so that it can be raised or lowered. The

means employed for effecting this adjustable mounting is best illustrated in Figs. 9, 10, and 11, the first figure being a vertical transverse section through the terminals and warp-support, the second figure a vertical longitudinal section, and the latter figure a plan. In the block 16 is set an upright screw 18, and the upper reduced end 18^a of this screw passes rather freely through a hole in the support 17, this latter resting on a shoulder 18^b on the screw. At its upper end the screw has a square 18^c to receive a wrench for turning it and a nut 18^d. By loosening this nut and rotating the screw 18 the support 17 may be set higher or lower, as required. The wires of the circuit are indicated by c and $c^\times$, and the generator in the circuit is seen at G. The electromagnet also has its coils in the circuit. In this class of devices it is desirable to provide a shunt whereby when a drop, as 12, falls and closes the circuit through the magnet the drop and the terminals thereat are instantly shunted out of the circuit. This insures the magnet remaining excited until the lay or other reciprocating part has had time to act, even though the circuit may be broken again at the drop from the shaking or vibration of the loom. In our application, Serial No. 687,943, filed August 6, 1898, we show a shunt for this purpose operated by a solenoid in the main circuit; but according to the present invention the switching of the current is effected by an arm or branch of the armature-lever of the operating-magnet. Referring to Figs. 6, 6^a, and 6^b, which show one form of the switch, 19 is a binding-post, to which one end of the coil of the electromagnet 1 is connected, and 20 is a binding-post, to which is connected the shunt-conductor c', which cuts out the terminals 13 and 14. From the respective posts 19 and 20 project spring-blade contacts 21 and 22, which do not quite meet. Mounted in bearings in the magnet-frame is a metal rod 23, upheld by a spring 24. The upper end of this rod is directly under the arm of the armature-lever which carries the armature, and its lower end is directly over the adjacent free ends of the spring-blades 21 and 22. When the armature is attracted and drawn down to the magnet, the armature-lever presses down the rod 23, and the lower end of this rod presses upon and closes the gap between the spring-blades 21 and 22, thus shunting the current, as will be readily understood. In the construction of Figs. 7 and 8 a similar shunting device is illustrated. In this case one terminal of the coils of the magnet $1^\times$ is at the binding-post $19^\times$, and the shunt-conductor c' connects with a binding-post $20^\times$. Blade-springs $21^\times$ and $22^\times$ from the respective binding-posts named overlap at their free ends, but are not normally in contact. A stud $23^\times$ in the extremity of the lower blade $21^\times$ depends over the arm $10^\times$ of the armature-lever, and when this arm rises by the excitation of the magnet it impinges on the stud $23^\times$ and presses the blade $21^\times$ up into contact with the blade $22^\times$, thus shunting the current.

When the knock-off lever K is shifted in stopping the loom, the electric circuit is instantly broken by a circuit-breaking device. (Illustrated best in Fig. 3.) Heretofore this has been effected by having a terminal contact on a stationary part—as the breast-beam, for example—in normal wiping contact or "jackknife" contact with a terminal on the knock-off lever, so that when the said lever is shifted the circuit will be broken; but this is objectionable for the reason that it does not take into account the stopping and starting of the loom by hand through the medium of the shipper-lever. In view of this we have devised the circuit-breaker which will now be described.

On the under side of the bracket b or some other fixed part adjacent to the shipper-lever S are fixed two terminals 26 and $26^\times$, which may be spring-blades of metal insulated from each other, and the spaces between their ends representing a break in the circuit. On the shipper-lever is mounted a metal contact-piece 27, adapted to enter between the terminals 26 and $26^\times$ when the loom is running, or normally, and close the circuit at this point. When the loom is stopped, whether by hand or automatically, the circuit will be broken by the movement of the shipper-lever.

In Fig. 5 the knock-off lever is represented as shifted by the impingement of the tappet-screw 8 on the arm 6 of the armature-lever. In Figs. 4 and 6 the parts are shown in their other positions.

The drops 12 being placed quite close together, side by side, it is not easy to tell which drop has fallen when a warp-thread breaks, and to facilitate this the drops will have by preference each a nick or recess 12^b in its edge above the warp. When all the drops are in horizontal alinement, these nicks will be alined; but if a drop falls the space formed by the alined nicks will be crossed by the body of the fallen drop and will be readily noted. The contact projection 12^a may extend horizontally across the slot in the drop.

11 is a rod which extends transversely over the warp just in front of the drops and serves, in connection with the nearest warp-support 17, as a means for limiting the rearward extension of the shifting shed in the warp formed by the heddles.

It may be well to explain that what is herein called the "take-up lever" T is in the main a substitute or equivalent of the tripper-lever common on looms. This tripper-lever carries the back pawl or dog, which engages the teeth of the take-up ratchet-wheel of the loom and which when moved out of engagement by the weft-fork carrier allows the take-up roll to run back one tooth. The lever or arm T takes the place of the upper arm of the ordinary tripper-lever.

In the construction of Figs. 1 to 6 the bobbins of the operating-magnet are shown as

carried by the knock-off lever K, and this is the preferred construction, as the bobbins then move with the armature and armature-lever when the lever K is shifted; but as this movement of the lever K is very slight it will be obvious that the bobbins might be secured to a fixed part. The armature-lever 4, however, must be fulcrumed on the lever K.

Having thus described our invention, we claim—

1. In a stop-motion for looms, the combination with a knock-off lever, a weft-stop-motion mechanism connected therewith, and a take-up lever or arm T, of an armature-lever movable with the knock-off lever and having one of its arms normally in operative relation with the take-up lever, whereby the shifting of the knock-off lever will actuate the take-up lever, an armature carried by the other arm of the armature-lever, an electromagnet situated so as to attract said armature, an electric circuit including said magnet and a generator, the said generator, means substantially as described for closing said circuit through said magnet when a warp-thread breaks, and a moving part of the loom adapted to impinge upon that arm of the armature-lever which carries the armature when the said lever is rocked by the excitation of said magnet and shift the knock-off lever without disturbing the take-up lever, substantially as set forth.

2. In a stop-motion for looms, the combination with a knock-off lever, a weft-stop-motion mechanism connected therewith, and a take-up lever T, of an armature-lever mounted on the knock-off lever and having one of its arms normally in operative relation to the take-up lever, so that the movement of the knock-off lever will be transmitted through it to the take-up lever, an armature on the other arm of said armature-lever, an electromagnet in operative relation to said armature, the lay of the loom provided with an adjustable tappet, adapted to impinge on the end of the armature-lever when the latter is depressed into the path of the tappet by the attractive power of the magnet, a generator, an electric circuit including said magnet and generator, and a circuit-closer adapted to be actuated to close said circuit when a warp-thread breaks, substantially as set forth.

3. In a stop-motion for looms, the combination with a knock-off lever K, a weft-fork connected therewith, a take-up lever or arm T, adjacent to the knock-off lever, an electromagnet 1, carried by the lever K, a lever 4 fulcrumed on the lever K and having an arm 10 in operative relation, normally, with the lever T, whereby the shifting of the lever K acts through the lever 4 on the lever T, an armature 5, on a branch of the lever 4 above and over the pole of the magnet 1, the lay L, provided with a tappet adapted to impinge upon a branch 6 of the armature-lever when the armature is attracted by the magnet, a generator, a normally open electric circuit including said generator and magnet, and having terminals 13 and 14, and a series of drops 12 supported on the warp-threads and adapted to close the circuit at said terminals when a drop falls from the breaking of the warp-thread, substantially as set forth.

4. In an electrical stop-motion for looms, the combination with the main operating-circuit, the generator therein, circuit-closing devices for closing said circuit when a warp-thread breaks, the main operating-magnet, the armature-lever and the armature of said magnet, of a shunt for cutting out the said circuit-closing devices, said shunt comprising a shunt-conductor c', blade-like spring-terminals adapted to direct the current through said shunt-conductor when electrically connected, and a pin interposed between the armature-lever and said blades whereby the attraction of the armature closes the shunt-circuit, substantially as set forth.

5. In an electrical warp stop-motion for looms, the combination with the main, normally open operating-circuit, the generator, the circuit-closing devices which close the main circuit when a thread breaks, the shunt-circuit, and the operating-magnet 1, of the binding-posts to which the coil-terminals are connected, the binding-post 20, for the shunt-conductor, the blade-contact 21, from one of the binding-posts 19, the blade-contact 22, from the binding-post 20, the rod or pin 23, mounted in bearings with its end adjacent to the free ends of the blades 21 and 22, its spring 24, the armature-lever situated over and adjacent to the opposite end of said pin 23, and the armature carried by said lever, substantially as set forth.

6. In an electrical warp stop-motion, the combination with the transverse terminals under the warp, and a series of drops suspended from the warp-threads at said terminals, of a warp-support extending transversely of and under the entire flat warp adjacent to said drops and terminals, and means for adjusting said support vertically and for holding it rigidly in the position set, substantially as set forth.

7. In an electrical warp stop-motion, the combination with the transverse fixed, terminals, of a warp-support, 17, carried by the terminals, and screws for adjusting said support vertically with respect to the terminals and for holding it fixedly when set, substantially as set forth.

8. In an electrical warp stop-motion for looms, the combination with transversely-extending terminals 13, distancing-blocks 16 between them at their ends, said blocks having means for securing them to the sides of the loom-frame, and cross-bolts for securing the terminals to said blocks, of the upright screws 18, in said blocks, the warp-support 17, mounted on said screws, and the nuts 18^d, substantially as set forth.

9. In an electrical warp stop-motion for looms, the combination with a transversely-extending, non-moving, compound terminal

forming a part of the operating-circuit, and a series of gravity-drops suspended vertically on the respective warp-threads at points in the same vertical plane with said terminal, of a rigid warp-support, fixed against movement and extending transversely of and under the entire, flat warp, whereby the warp-threads are maintained at a fixed distance above said terminal, substantially as set forth.

10. In an electrical warp stop-motion for looms, the combination with a compound terminal, in and forming a part of the operating-circuit, said terminal comprising two metal strips connected together and insulated from each other, of means carried by said terminal for fixing it and straining it taut in the loom-frame, substantially as set forth.

11. As an improved article of manufacture, a circuit-closing device for an electrical warp stop-motion, consisting of a terminal to extend across the warp and provided with means for straining and fixing it in position, and a warp-support, connected with said terminal and substantially parallel therewith, said support being vertically adjustable with respect to the terminal, substantially as set forth.

12. As an improved article of manufacture, a circuit-closing device for an electrical warp stop-motion, consisting of two parallel terminals connected together at their ends and provided with means for fixing them in the loom-frame and straining them longitudinally, and a warp-support 17, carried by said terminals, above and over the space between them, said support being mounted adjustably with respect to said terminals, substantially as set forth.

13. In a warp stop-motion for looms, the following instrumentalities, namely: a series of metallic drops each having a thread-aperture, an elongated guide-slot, and a contact projection between said thread-aperture and slot, an electric circuit having two terminals which extend through said guide-slots in the series of drops, the upper terminal being normally insulated from the drop, an electromagnet mounted on the knock-off lever and in said circuit, the said lever, the shipper-lever, adapted to be set free to stop the loom by the shifting of said knock-off lever, the lay, and means whereby the knock-off lever is shifted by said lay when the circuit is closed by the falling of one of said drops onto the upper circuit-terminal, substantially as set forth.

In witness whereof we have hereunto signed our names, this 30th day of September, 1898, in the presence of two subscribing witnesses.

WILLIAM H. BAKER.
FREDERIC E. KIP.

Witnesses:
JOHN N. BUTMAN,
FRED. M. ARMSTRONG.