(No Model.)

3 Sheets—Sheet 1.

J. P. HASLAM.

ELECTRIC STOP MOTION FOR WARPING MACHINES.

No. 432,040.

Patented July 15, 1890.

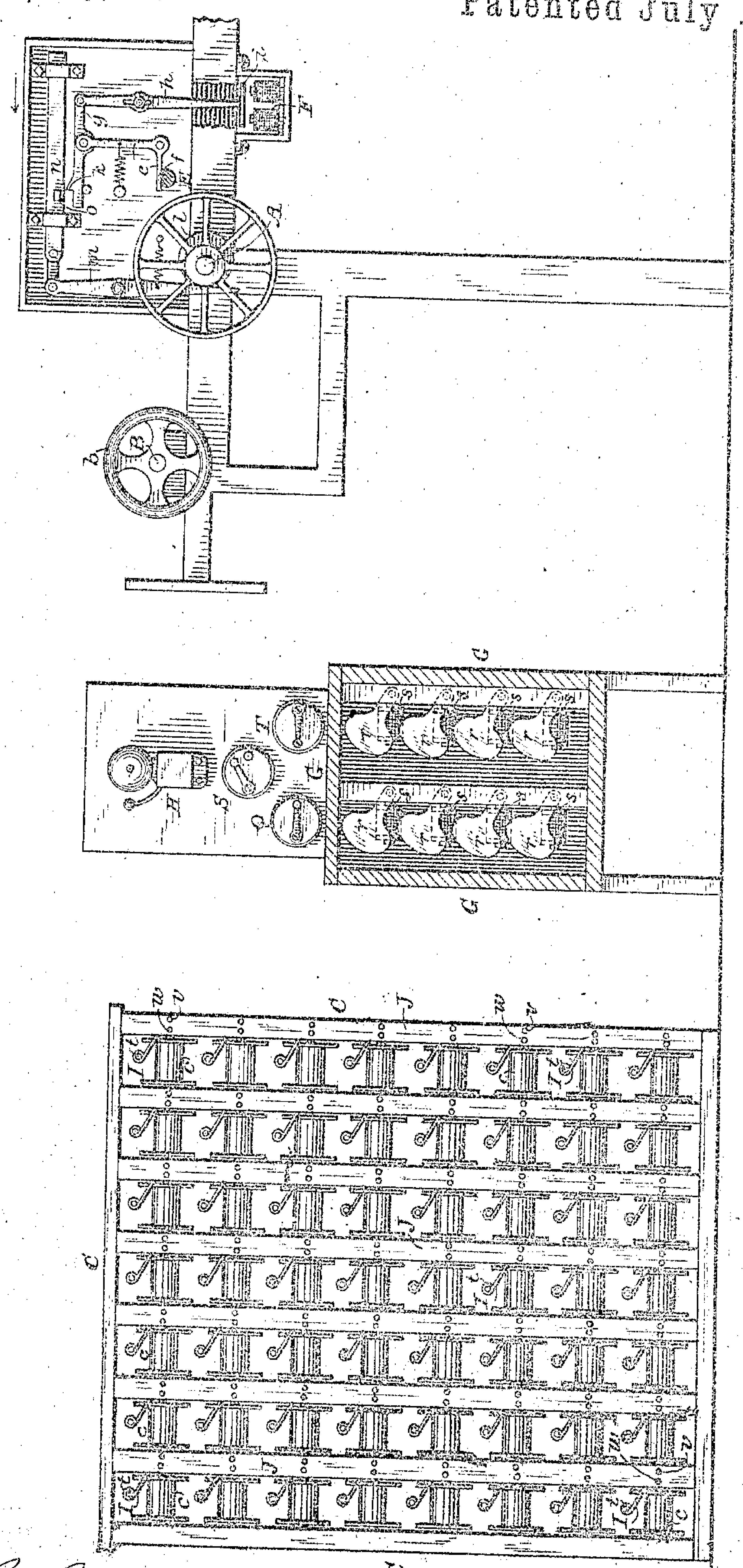

Fig. 1.

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Carleton E. Snell

Inventor
John Plumley Haslam
By his Attorney
Arthur P. Browne

(No Model.)

3 Sheets—Sheet 2.

J. P. HASLAM.

ELECTRIC STOP MOTION FOR WARPING MACHINES.

No. 432,040. Patented July 15, 1890.

Fig. 2.

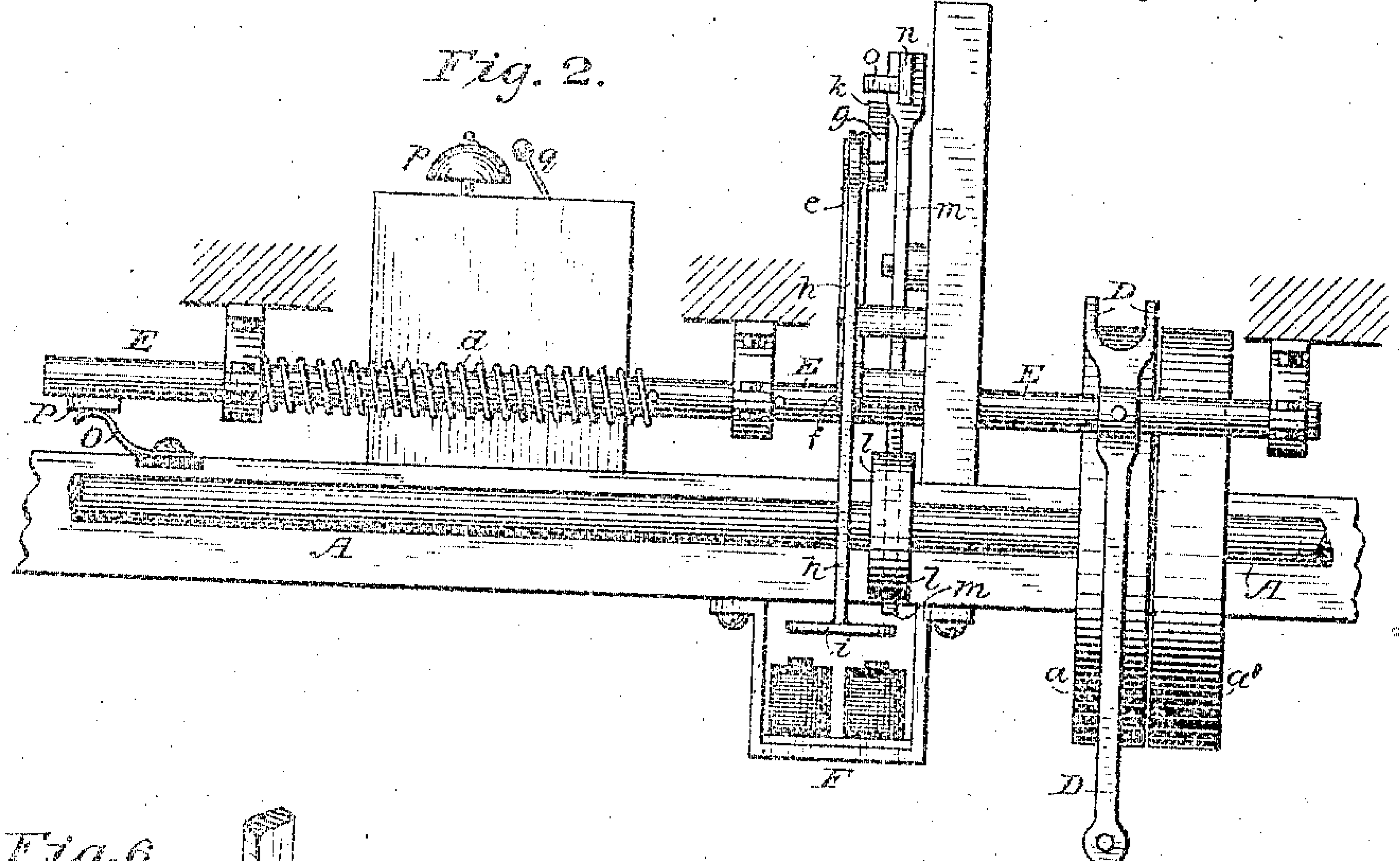


Fig. 6.

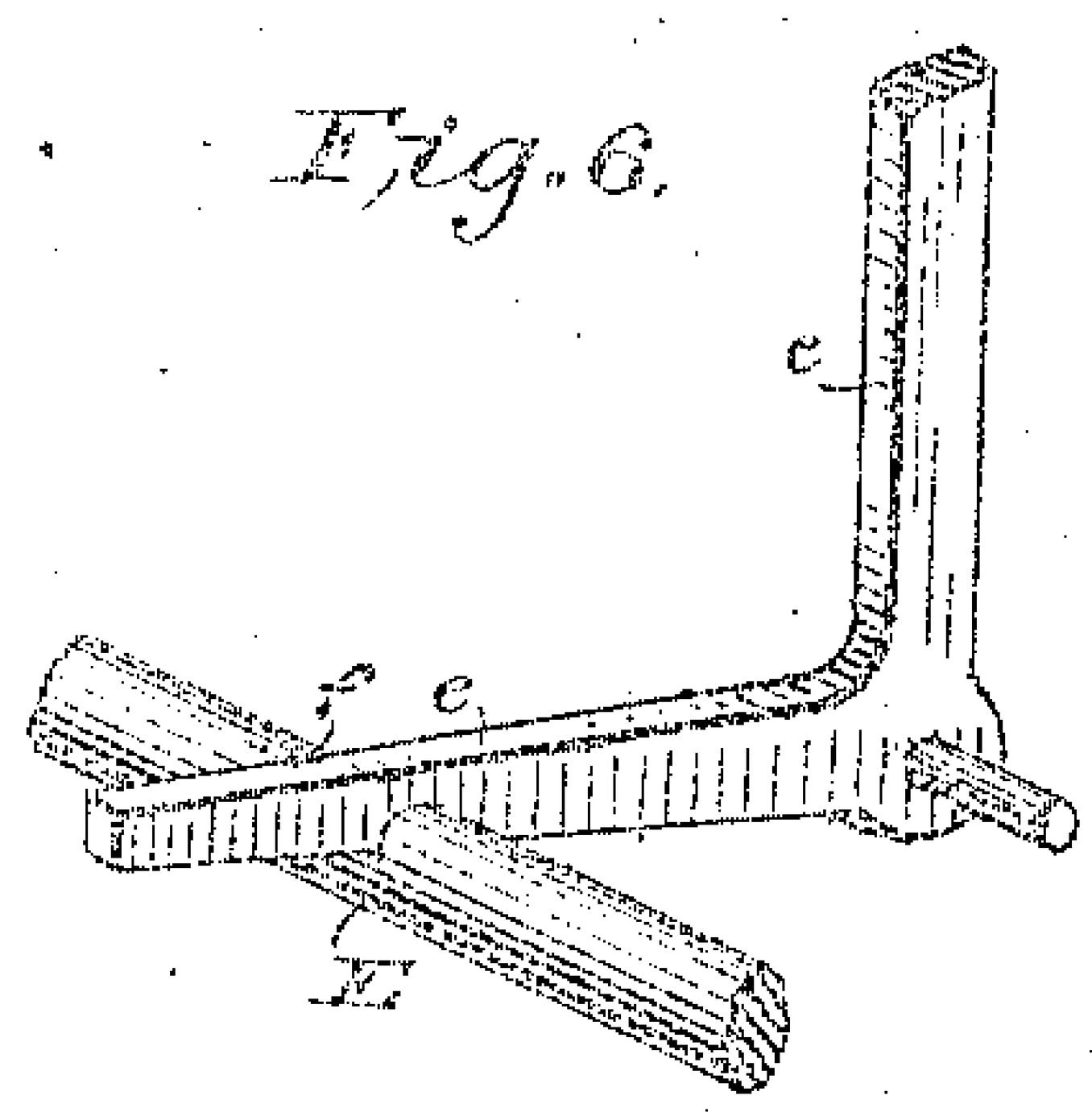


Fig. 3.

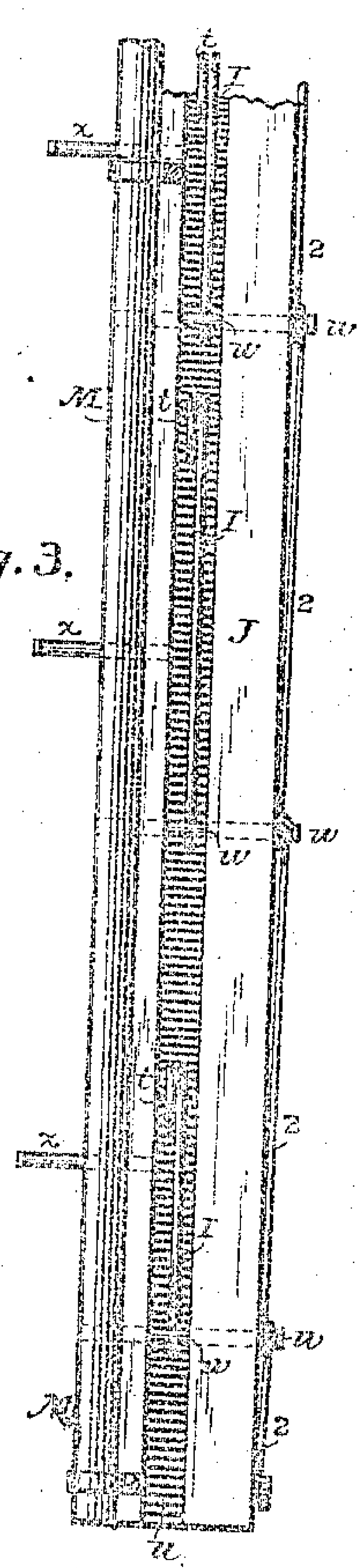


Fig. 4.

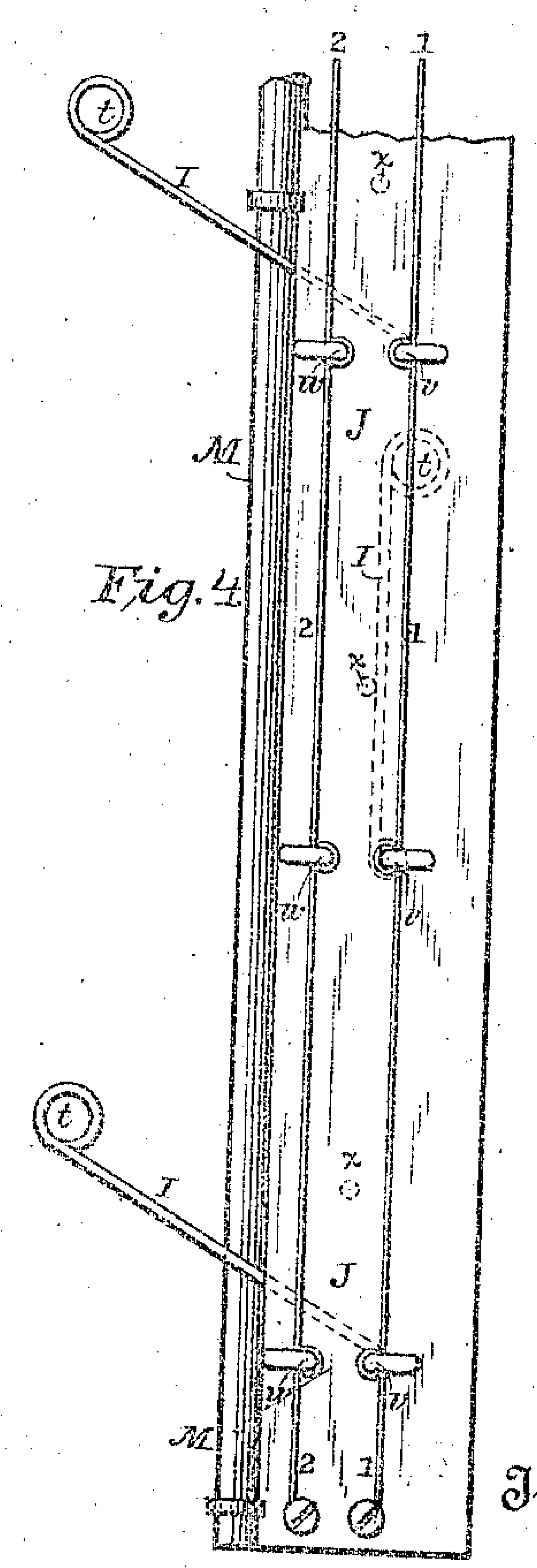
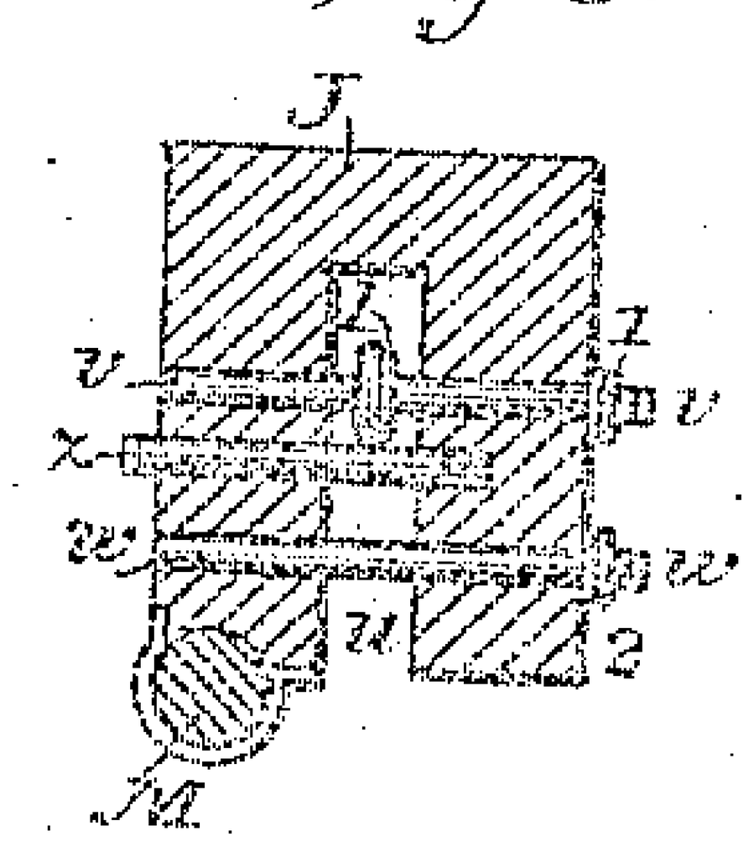


Fig. 5.



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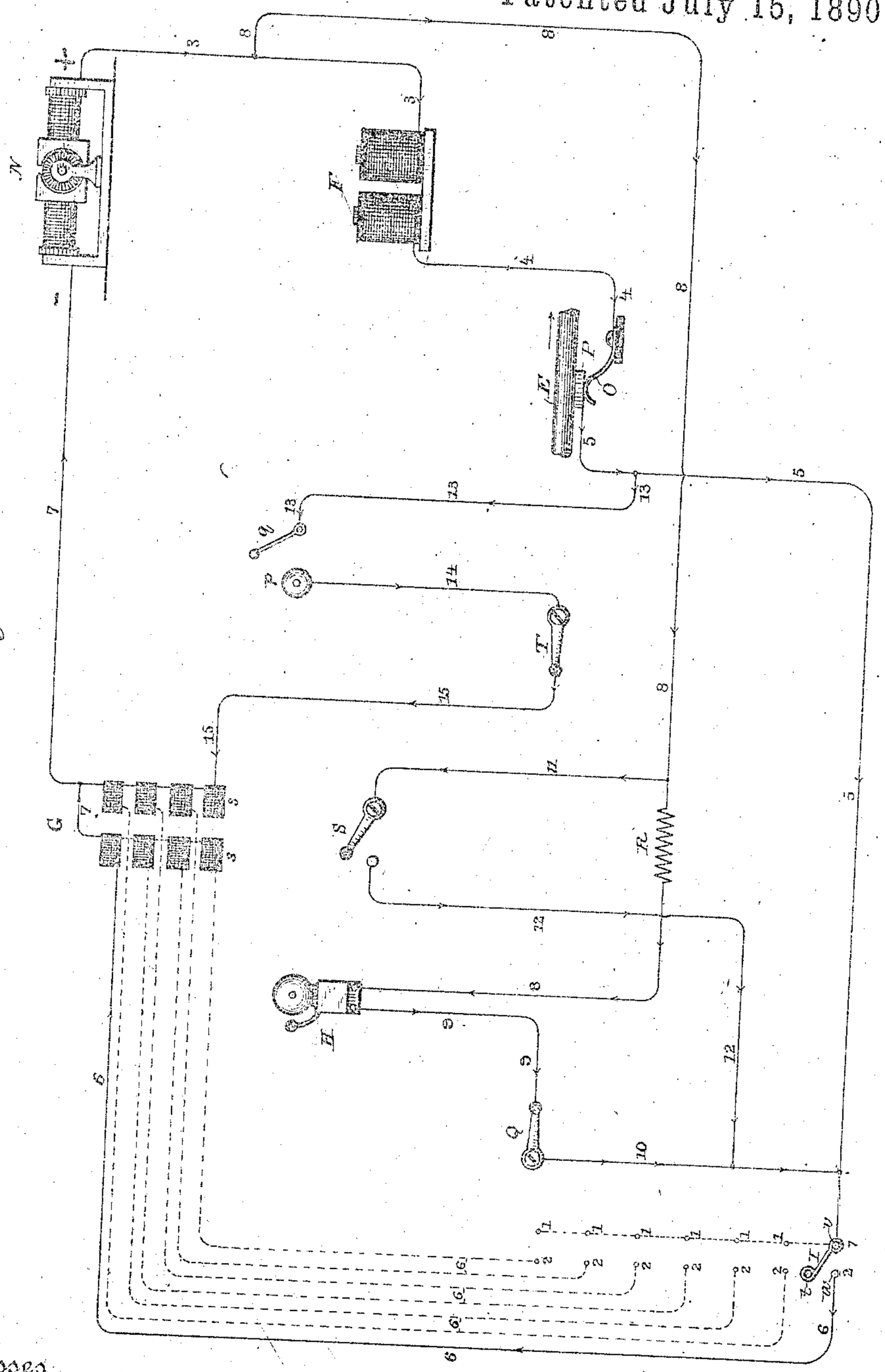
3 Sheets—Sheet 3.

J. P. HASLAM.

ELECTRIC STOP MOTION FOR WARPING MACHINES.

No. 432,040. Patented July 15, 1890.



Witnesses
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UNITED STATES PATENT OFFICE.

JOHN PLUMLEY HASLAM, OF WILMINGTON, DELAWARE, ASSIGNOR OF SEVEN-TENTHS TO FRANCIS E. GALLAGHER, SAMUEL L. FOSTER, AND JOHN T. AHRENS, ALL OF SAME PLACE.

ELECTRIC STOP-MOTION FOR WARPING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 432,040, dated July 15, 1890.

Application filed September 28, 1889. Serial No. 325,347. (No model.)

To all whom it may concern:

Be it known that I, JOHN PLUMLEY HASLAM, of Wilmington, in the county of New Castle and State of Delaware, have invented certain new and useful Improvements in Electric Stop-Motions for Warping-Machines, of which the following is a specification.

This invention relates to electric stop-motions for warping-machines having the general characteristics of that described in Letters Patent to Lewis H. A. Schwartz, No. 395,851, dated January 8, 1889. This patented stop-motion is characterized by the employment of a visual annunciator electrically actuated, so that when a break occurs in a yarn or "end" not only will the machine be stopped, but also the location of the particular broken thread or end will be indicated. This is a very important and desirable feature, since there are prepared in a warping-machine frequently as many as two thousand three hundred threads or ends, and on the occurrence of breaks much time has hitherto been consumed in hunting for the broken threads—a difficulty which is avoided by the employment of the electric visual annunciator. There are several contingencies, however, of frequent occurrence that are not provided for by the Schwartz patented appliances. It frequently happens that the attendant is out of sight of the machine when it stops, and hence some minutes may elapse before he is aware that it has stopped. To overcome this difficulty an electric alarm-bell is introduced into the electric circuit, so that an alarm will be sounded when the machine stops, and thus the attention of the attendant will be attracted. It also frequently happens that the machine is stopped by a slack occurring in one or more threads or ends instead of by breaks occurring. Hitherto it has been necessary to examine each thread of the group of threads indicated by the visual annunciator to see whether it is broken or whether it is only slackened. In accordance with the present invention the alarm-bell circuit and the character of the devices therein are such that by turning the usual balance-beam to tighten the threads the bell will cease ringing in case the machine has been stopped by a slack thread or threads; but it will continue ringing in case a thread is broken. Warping-machines have also commonly been constructed so that when the proper number of yards of warp have been prepared a gong would be struck mechanically. In case the attendant should be out of hearing of the gong, the machine would continue to prepare warp, and the additional amount would thus be wasted; or even in case of the attendant hearing the gong a number of extra yards will usually be prepared before he can stop the machine. In accordance with the present invention the machine is automatically stopped on the completion of the proper amount of warp, and the fact that the machine is thus stopped and not by the breaking or slackening of a thread is indicated by the visual electric annunciator.

A warping-machine provided with electric stop devices in accordance with the present invention will thus be automatically stopped on the breaking of a thread or end or on the completion of the warp. The particular threads or ends broken or the fact of the completion of the warp will be indicated on the visual annunciator, and the stopping of the machine will be announced by an electric bell, which will contine ringing until the attendant has done what is required.

The invention also includes improvements in the construction of the yarn-guide circuit-closing drop-hooks described in the Schwartz patent. It frequently happens with the drop-hooks or the circuit-plates, with which they are adapted to make electric contact, that they become covered with lint to such an extent that electric contact is prevented; so the machine fails to stop when the threads break. The present invention includes an improved construction in this respect for overcoming this difficulty.

The warping-machine is usually operated with a less number than its maximum number of threads or ends. Consequently when so used the unused circuits must be prevented

from closing. The present invention includes means for rendering inactive the unused circuits.

The present improvements are illustrated in the accompanying drawings, in which—

Figure 1 is a side view of so much of a warping-machine as is necessary for an understanding of the present invention, showing the location of the visual electric annunciator and the electric bell. Figs. 2, 3, 4, 5, and 6 are detail views of the mechanical stopping devices and other mechanical features. Fig. 7 is a diagram showing the electrical connections.

A is the main drive-shaft of the warping-machine, carrying fast and loose pulleys *a a'*, and B is the balance-beam, around which the threads pass, said balance-beam having the usual hand balance-wheel *b*.

C is one of the creels of the machine, having a number of sections filled with spools *c c*, on which the yarn or thread is wound. There are as many creels and as many sections and spools in each creel as the character of the work demands; but only one creel is illustrated. Usually there are six creels and seven sections in each creel.

The motion of the machine is stopped by means of a shipper-fork D, which carries the drive-belt from the fast to the loose pulley on the drive-shaft A. This shipper-fork may be moved by any convenient mechanism, the action of which is initiated by the movement of the armature of an electro-magnet, such mechanisms being well known. I prefer the mechanism illustrated, which, however, is not new with me, and constitutes in itself no part of my invention. Coacting with the shipper-fork is a sliding spring-actuated shifting-rod E, which is mounted in the framework of the machine, so as to slide longitudinally. The shifting-rod is moved to shift the belt from the fast pulley *a* to the loose pulley *a'* (thus stopping the machine) by a coiled spring *d*. When the machine is running, the rod E is held retracted, and the spring *d* is held under tension by means of a catch-lever *e*, one end of which engages a notch *f* on the sliding shifting-rod. To the other end of this lever is pivoted a balanced lever *g*, which lies in a substantially horizontal plane. From one end of this lever *g* is suspended by a rod *h* the armature *i* of an electro-magnet F. The lever *g* is balanced so that normally the armature *i* is held uplifted above the magnet. When, however, the electro-magnet is energized by the passage through or around it of an electric current, the armature is easily drawn down, there being but little weight to be overcome. On the other arm from that to which is pivoted the armature-rod connection the lever *g* carries an upwardly-projecting catch *k*.

On the main drive-shaft A is a cam or eccentric *l*, against which rests one end of a spring-held lever *m*. The upper end of this lever is connected by a link with a reciprocating bar *n*, held in suitable guides. The motion communicated by the cam to the lever *m* is in turn communicated by the lever to the bar *n*, which is thus constantly reciprocated while the machine is running. The reciprocating bar *n* has a projecting stud *o*, which reciprocates just above the position normally occupied by the catch *k* on lever *g*. When the magnet F is energized, its armature is depressed and the catch *k* is lifted into the path of the stud *o*, so that the lever *g* is swung on its pivot by the movement of the bar *n*. By this movement the lower end of the lever *e* is released from the notch *f* in the sliding shifting-rod E, which is then free to be actuated by its spring *d*, and so stop the machine. Hence it is evident that the passage of an electric current through the magnet F will stop the machine.

The usual mechanism for sounding a gong to give notice that the warp is completed is only partially shown. This mechanism includes a gong *p*, which is adapted to be struck by a lever *q* at the proper time. This lever is actuated by a train of gearing of well-known construction, which is not shown, because it is well known and because it constitutes no part of the present invention. A mechanism of the character referred to is, for example, shown and described in Letters Patent to J. J. and G. Ashworth, No. 183,619, dated October 24, 1876. The only portions of this mechanism for indicating the completion of the warp that are essential to the present invention are the gong and the striking-lever, and it is only necessary to know that the lever is adapted to be moved at the completion of the warp.

G is the electric visual annunciator, which is (or may be) of well-known construction. I prefer to employ an annunciator made in accordance with Letters Patent to Aaron D. Blodgett, No. 359,051, dated March 8, 1887. This annunciator has a series of sight-targets *r r*, which are exposed to view on the excitation of their respective magnets *s s*. The number of the targets depends upon the number of creels and sections. Preferably there is a target for each creel-section, so that a machine having forty-two sections would have forty-two targets in its annunciator. There may be a separate target for indicating the completion of the warp, or one of the other targets may be selected for this purpose. Since only one creel is illustrated, having seven sections, the annunciator shown has eight targets, including a separate target for indicating that the warp is completed.

H is the electric bell, which may be of any of the well-known kinds which ring constantly until attended to.

In order that the breaking of a thread may stop the machine, it is necessary that an electric circuit in which the stop-magnet F is located should thereby be closed. Each thread therefore passes through an eye *t* in the end of a metallic circuit-closing gravity drop-hook

I, which is held normally uplifted by the tension of the thread, as in the Schwartz patent, heretofore referred to. These circuit-closing hooks are mounted as follows: Each section of each creel has attached to it a vertically-extending grooved bar or box J, of wood or other suitable insulating material, having a deep groove or recess *u* extending throughout its length. For each spool or thread there are two horizontal metallic wires or rods *v w*, which extend crosswise of the groove *u*. To each inner wire *v* one of the drop-hooks I is pivotally connected, so that it is in permanent metallic contact therewith, and each drop-hook is normally upheld by the tension of the thread passing through its eye out of contact with the outer wire *w*. When, however, the thread breaks, the drop-hook falls and comes in contact with wire *w*, and, since wires *v* and *w* are respectively connected with opposite poles of an electric generator, the circuit in which the stop-magnet F is located is thereby closed. Owing to the location of the wires *w* in the groove *u* they are much less liable to become covered by lint, and so be prevented from electric contact with the drop-hooks than if they were located outside of the grooves. Any one of the drop-hooks can be permanently kept out of contact with its wire *w* when its thread is not in use by the insertion of a stop-pin *x* in apertures *y* in the box L beneath the drop-hook and above its wire *w*. The drop-hook is then held uplifted by the stop-pin out of contact with the wire *w*, and is thus rendered inactive.

In order to prevent the thread being cut by coming in contact with the edge of the groove-box, the edge over which the threads pass is provided with a rounded bar M, which is preferably made of metal, glass, or other material which will afford a smooth surface and will not be worn by the threads.

It is not necessary in practice that each drop-hook should have a separate indicating-target on the visual annunciator. It is sufficient that there should be one target for each section, for, since all the drop-hooks for each section are in a single vertical line, when the section is known where the break has occurred it can be instantly seen which drop-hooks are out of line. Hence all the wires *v* to which the drop-hooks of one section are pivoted are connected by a single wire 1, and all of the wires *w* with which the drop-hooks come in contact are connected by a single wire 2.

The electric circuits are illustrated diagrammatically in Fig. 7, and are as follows: The electric energy is furnished by any suitable electric generator, such as a small dynamo N. From the positive pole of the dynamo extends a wire 3 to the stop-magnet F. From this magnet a wire 4 extends to a spring-contact O, which is normally in contact with a projecting plate P, on the spring-actuated shifting rod E. The rod E itself, if of metal, or else its plate P, is connected by a wire 5 to all of the wires 1 on all of the sections of all of the creels, so that all of the drop-hooks are primarily connected with the positive pole of the dynamo. Each separate wire 2 is connected by a wire 6, with one of the magnets *s* of the visual annunciator, and all of the magnets of the visual annunciator are connected with a return-wire 7, leading to the negative pole of the dynamo. This circuit formed by the wires 1, 2, 3, 4, 5, 6, and 7, constituting the main-line connections, does not pass through the electric bell. It has been found that if the stop-magnet F, the bell-magnet, and the annunciator-magnets are all located in the same circuit the amount of energy furnished by a small dynamo, such as can conveniently be run by attachment to the motor of the machine without an increase of power, will be insufficient to actuate them all simultaneously, especially so in case a number of the threads in different sections should break simultaneously, as frequently happens. Hence the bell-magnet is located in a shunt-line connecting with the main-line connections, so as to exclude the stop-magnet. Between the dynamo and the stop-magnet F a branch wire 8 leads from wire 3 to the bell H. From the bell H a wire 9 leads to a normally-closed bell-switch Q, by means of which the bell-circuit can be cut out, if desired, to stop the bell's ringing, and from the switch a wire 10 leads to the wire 5, and thence by wires 1 *v*, drop-hooks I, wires *w* 2 6, annunciator, and return-wire 7 to the dynamo. The wires 8, 9, and 10 thus constitute a shunt-line, which connects with the main line and excludes the stop-magnet F. In order that when a hook I drops the current will not be shunted through the bell-circuit, and so fail to actuate the stop-magnet, a resistance-coil R is interposed in the wire 8, so that the combined resistance of the bell-magnet and coil R shall be greater than that of the stop-magnet. Assume, now, that the machine is running and one of the threads breaks. Its hook I immediately drops, closing the stop-magnet circuit and so stopping the machine by the release of the spring-actuated sliding shifting-rod E. The movement of this rod E in stopping the machine, however, breaks the contact between the spring O and the plate P on the shifting-rod, thus breaking the main or stop-magnet circuit. The resistance of the stop-magnet no longer being encountered, the electric current then traverses the shunt or bell line and sounds the bell. The bell continues to sound until the attendant does what is necessary. Practice has, however, shown that even with the stop-magnet out of the circuit the annunciator will not indicate all defective threads when several happen to be broken or run out simultaneously. Hence to insure the indication of all defective threads means are provided for cutting out the bell-magnet and so turning the full force of the dynamo into the annunciator-magnet. To

this end a wire 11 branches from the wire 8, being connected therewith between the resistance-coil and the dynamo. Wire 11 leads to a normally-open annunciator-switch S. From the switch S a wire 12 connects with the wire 10, and thence through 5, 1, *r*, I, *w*, 2, 6, annunciator 7 to the dynamo. When therefore the machine stops and the bell rings, the attendant steps to the switch S and closes the same, thus cutting out the bell, causing it to stop ringing, and concentrating the current upon the annunciator. Thus all the annunciator-magnets in circuit are excited and their targets exposed. In practice it has been found that ordinarily none of the annunciator-magnets will act until the switch S is closed, the electric energy being too far exhausted by the stop and bell magnets to excite any of the annunciator-magnets simultaneously. The attendant then repairs the indicated threads and starts the machine. It frequently happens, however, that the machine is stopped by slack threads and not by the occurrence of breaks, so that the attention of the attendant to the creels is unnecessary. The introduction of the bell-circuit secures the important advantage of enabling the attendant to ascertain whether the machine has been stopped by slack threads or otherwise, and if stopped by several threads, partly slack and partly broken, it enables only the broken threads to be indicated on the annunciator. Thus much time is saved. When the attendant hears the bell ringing, his first act is to turn the balance-beam B in the proper direction to tighten the threads. If then the machine has been stopped by slack threads alone, their respective hooks I will be lifted, thus breaking the circuits closed by them, and the bell will instantly cease ringing, thus showing that there are no broken threads. If, however, the bell still continues to ring, there are one or more broken threads. Accordingly the annunciator-switch S is then closed and only the targets are exposed which indicate the location of the broken threads.

In order to stop the machine when the warp is completed, advantage is taken of the usual mechanism for this purpose, having the metal lever *q*, which strikes the metal gong *p*. This is substantially the same movement as that effected by the drop-hooks I, and consequently the lever *q* may be electrically connected as though it were one of the hooks I and as though its gong *p* were one of the wires or rods *w*. A branch wire 13 leads from wire 5 to the lever *q*, and a wire 14 leads from the gong *p* to a normally-closed switch T. From the switch T a wire 15 leads either directly to a separate annunciator-magnets, as shown, or to any selected one of the wires 6. Hence when the warp is completed the same effects are produced as when one of the drop-hooks I acts.

The object of the stop-switch T is to break the warp-completion circuit while the machine is being made ready for the preparation of a new warp. The addition of these stopping devices enables an attendant of average intelligence to do as much work in a given time with one warping-machine as two attendants will do with two ordinary warping-machines. The described arrangement of the circuits enables an electric generator of a minimum capacity to be employed, in addition to securing the results already described.

The several electrical connections have been described in each case as being supplied by wires. It is obvious that portions of the circuit-wires may be replaced by metallic parts of the warping-machine, which may be conveniently used in some instances.

I claim as my invention—

1. The driving mechanism of a warping-machine, a stop electro-magnet, devices intermediate between said magnet and said driving mechanism whereby on the passage of an electric current around said magnet said driving mechanism will be stopped, and circuit-closing hooks through which the threads are adapted to pass and which are adapted to close electric circuits on the breaking of a thread, in combination with a visual annunciator having a plurality of sight-signals and a plurality of annunciator electro-magnets for actuating said respective sight-signals, an electric generator, wire connections between said electric generator, circuit-closing hooks, stop-magnet, and visual annunciator, a shunt-line which connects with the main-line connections, so as to exclude said stop-magnet, an electric bell in said shunt-line, and means for shunting the electric current into said shunt-line on the stoppage of the machine, substantially as set forth.

2. The driving mechanism of a warping-machine, a stop electro-magnet, devices intermediate between said magnet and said driving mechanism whereby on the passage of an electric current around said magnet said driving mechanism will be stopped, and circuit-closing hooks through which the threads are adapted to pass and which are adapted to close electric circuits on the breaking of a thread, in combination with a visual annunciator having a plurality of sight-signals and a plurality of annunciator-magnets for actuating said sight-signals, an electric bell, an electric generator, wire connections between said electric generator, circuit-closing hooks, stop-magnet, bell, and visual annunciator, and an annunciator-switch for shunting the entire electric current into those annunciator-magnets which have been brought into electrical connection with the electric generator by the action of the circuit-closing hooks, substantially as set forth.

3. The driving-shaft of a warping-machine, a sliding shifting-rod which effects the stopping of the machine, a stop electro-magnet, mechanism intermediate between said sliding shifting-rod and said magnet whereby on the passage of an electric current around said magnet said shifting-rod will be released,

and circuit-closing hooks through which the threads are adapted to pass and which are adapted to close electric circuits on the breaking of a thread, in combination with an electric generator, a circuit-wire leading from one pole of said generator to said stop-magnet, a wire leading from said stop-magnet to all of said circuit-closing hooks, a break in said wire which is closed when the machine is running and which is opened by the movement of said sliding shifting-rod, a visual annunciator having a plurality of sight-signals and a plurality of annunciator-magnets for actuating the same, circuit-wires connecting said circuit-closing hooks when dropped with said annunciator-magnets, a return-wire connecting all of said annunciator-magnets with the opposite pole of said electric generator, an electric bell, a circuit-wire leading from the generator to said bell, the resistance through said bell-circuit being greater than through said stop-magnet circuit, and a circuit-wire leading from said bell to the wire which leads to all of said drop-hooks, substantially as set forth.

4. The driving mechanism of a warping-machine, a stop electro-magnet, and devices intermediate between said magnet and said driving mechanism whereby on the passage of an electric current around said magnet said driving mechanism will be stopped, in combination with an electric generator, a normally-broken electric circuit in which said generator and stop-magnet are located, and mechanism indicating when the warp is completed, said mechanism on the completion of the warp closing said electric circuit, substantially as set forth.

5. The creel of a warping-machine, provided with vertically-extending grooved bars or boxes having longitudinally-extending grooves, in combination with two sets of metallic rods or wires located in said grooves and adapted to be connected with opposite poles of an electric generator, and circuit-closing hooks pivoted to the rods or wires of one of said sets and normally held out of contact with the wires or rods of the other of said sets by means of the threads or ends, substantially as set forth.

6. The creel of a warping-machine, provided with vertically-extending grooved bars or boxes having longitudinally-extending grooves, in combination with two sets of metallic rods or wires located in said grooves and adapted to be connected with opposite poles of an electric generator, circuit-closing hooks pivoted to the rods or wires of one of said sets and normally held out of contact with the rods or wires of the other of said sets, and movable pins adapted to permanently hold said hooks in an inactive position, substantially as set forth.

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

JOHN PLUMLEY HASLAM.

Witnesses:

HENRY C. CONRAD,

JOSEPH L. CAVENDER.