3 Sheets--Sheet 1.

J. S. RICHARD.

Warping-Machine.

No. 161,638. Patented April 6, 1875.

Fig: 12

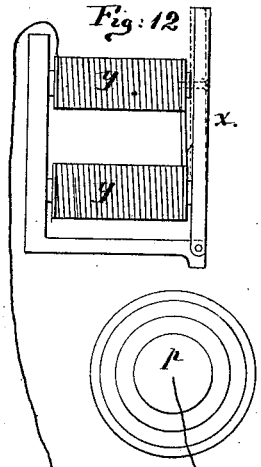


Fig: 1

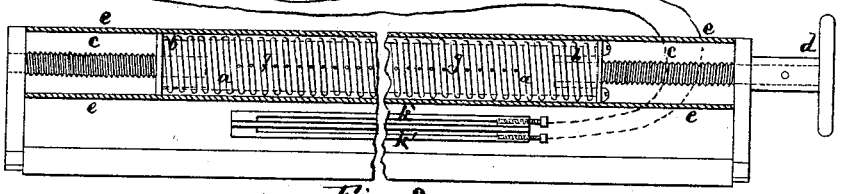


Fig: 2

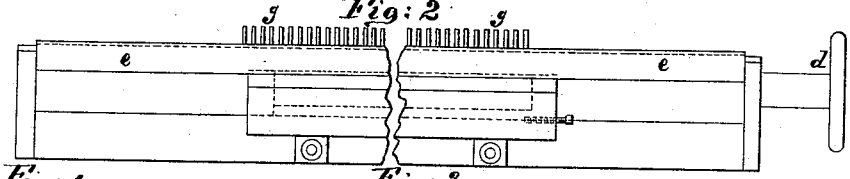
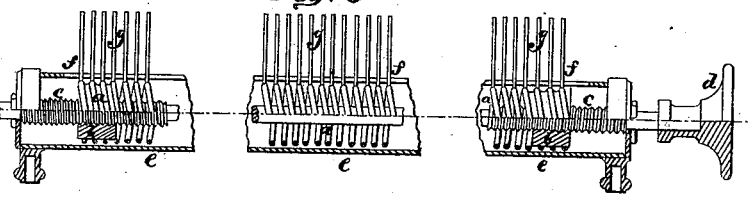


Fig: 4

Fig: 3



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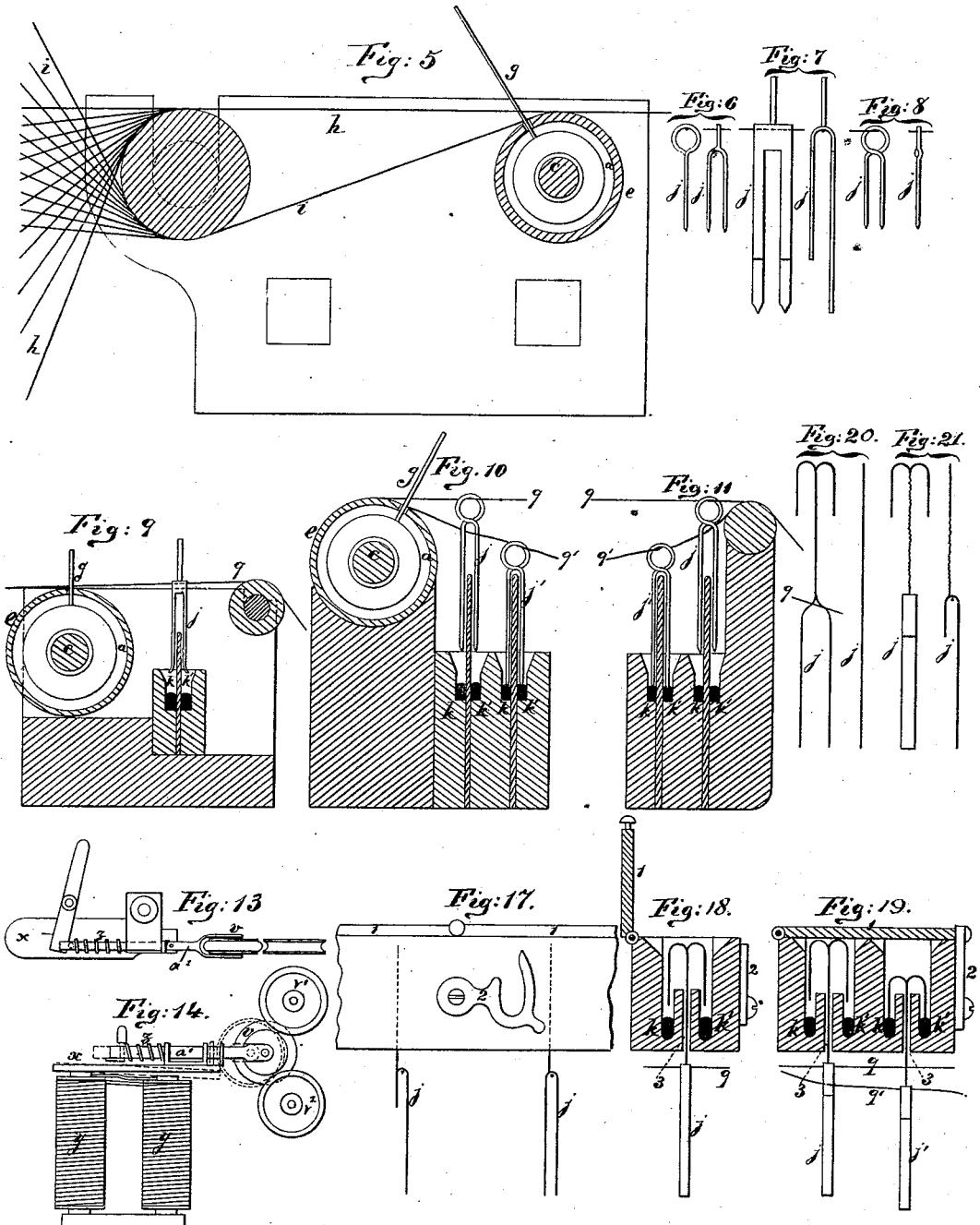
J. S. RICHARD.

Warping-Machine.

No. 161,638. Patented April 6, 1875.



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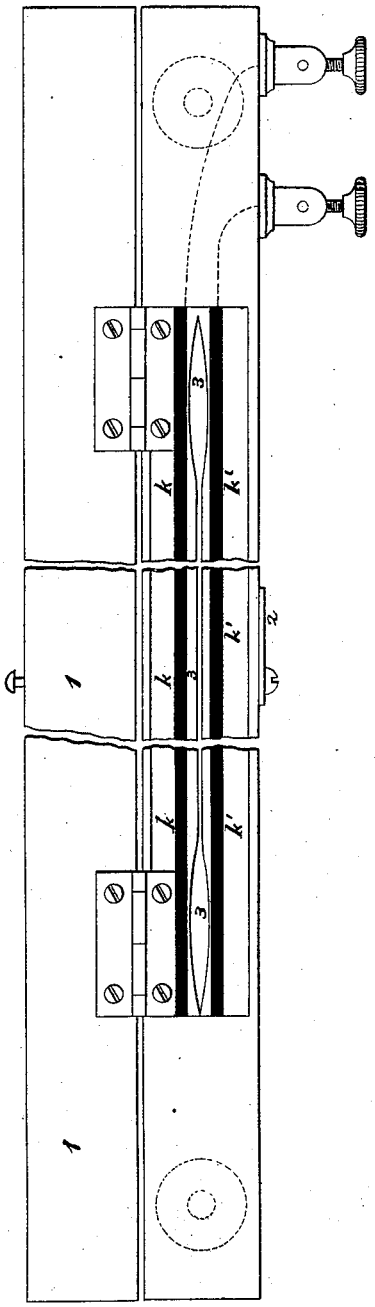

Fig. 16.

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UNITED STATES PATENT OFFICE.

JOSEPH S. RICHARD, OF PARIS, FRANCE.

IMPROVEMENT IN WARPING-MACHINES.

Specification forming part of Letters Patent No. **161,638**, dated April 6, 1875; application filed December 2, 1874.

To all whom it may concern:

Be it known that I, JOSEPH SIGISBERT RICHARD, of Paris, France, engineer, have invented improvements in machines in which one or more series of threads are employed, such as Looms, Warping, and other Machinery; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed sheets of drawing, making a part of the same.

This invention relates to improvements in machines in which one or more series of threads are employed, such as looms, warping, and other machines; and consists, first, in improvements in the expanding and contracting comb or reed known under the name of universal reed; second, in improvements in the application of electricity for effecting instantaneously and automatically the stoppage of the machine on the failure, breakage, slackening or fraying of one or more of the threads. The above improvements may be employed either separately or in combination.

The improvements in the universal reed consist, first, in applying projecting dents to the perforated coils of a spiral spring, which is mounted upon a shaft, and may be extended and contracted, so that thereby the distance between the dents which act as fingers of the reed may be varied, and may, if desired, be reduced to a minimum, which it was not possible to do by placing the dents between the coils of a spring, as was heretofore done. Secondly, in inclosing the spiral spring in a sheath or case to prevent its becoming clogged by dust and shags, which would otherwise soon prevent its contracting.

The invention is illustrated in the accompanying drawing, in which Figure 1 represents in plan the improved comb or reed with the sheath in section; Fig. 2, a vertical elevation; Fig. 3, a longitudinal section, and Fig. 4 a transverse section of the same.

a, spiral spring attached at each end to a nut, *b*, through which works the right and left handed screw-rod, *c*, provided with a knob, *d*, by which the rod is turned in one or other direction to expand or contract spring *a*.

To facilitate the introduction of the screw *c* in nuts *b*, one of them—the one on the right, for instance—is made in two tubular portions, sliding the one in the other, the inner one or nut proper being fixed by set-screws in the outer part, (which is permanently attached to spring *a*,) but not until the other end of the rod has been screwed through its nut to the proper position. The spring *a* is inclosed in a case or cylinder, *e*, having a longitudinal slot, *f*, and in the convolutions of the spring holes are drilled, in which are inserted, by screwing, soldering, or otherwise, dents *g* to form the comb.

When the comb or reed is placed toward the back of the warping or winding machine, as in Fig. 5, a round bar is provided, under and over which the yarns *h i* pass from, the bobbins before passing to the machine.

By giving the spring an oval form, and so reducing its diameter, two or three springs may be placed side by side, so as to form a comb or reed which will accommodate itself to any gauge.

The method of applying electricity for instantly stopping the machine, upon the breakage, absence, or slacking of one or more threads, consists in suspending from each thread a forked wire, hereinafter termed a "rider," whose extremities hang one on either side of a partition, extended above two troughs containing mercury, and insulated one from the other, a metallic wire from a battery, *p*, or other source of electricity being connected with each trough. Every time a thread breaks or becomes too slack the rider falls until its limbs both dip into the mercury contained in the two troughs, thus completing the electric circuit, whereupon an electro-magnet, *y y*, is charged and influences its armature in such manner as to actuate mechanism whereby the motion of the machine or loom is at once arrested. The riders, in falling, are guided and then supported in their respective positions above the troughs by means of a rail partition, as seen in Figs. 10 and 11.

Figs. 6, 7, and 8 of the drawings show several forms of these riders, *j j*, made of twisted wire, which are preferred on account of their small cost and suitability for threads of all sizes.

Fig. 9 shows in transverse section the combination of the improved universal comb or reed, with a double trough, *k k'*, and riders *j j*.

Fig. 10 shows a transverse section of a sim-

ilar combination with quadruple trough, which latter should be employed for coarse threads or when using a reed of extra fineness.

Fig. 11 shows in transverse section a quadruple trough, *k k'* and riders *j j*, in combination with a roller or beam instead of a reed. It will be understood the number of the troughs may be increased five or six fold or more, according to the size of the threads and fineness of the reed, while the position of the apparatus will also vary according to the kind and form of machine to which they are applied. A simple inspection of the drawing will suffice to show the method of arranging the different parts of the apparatus.

The riders *j* are equal in number to the threads employed in the machine.

An electric circuit is established between the troughs *k k'*, a battery, *p*, and an electromagnet, *y y*, which circuit is, however, interrupted as long as the riders *j* are held up by the threads *q* in tension; but immediately a thread breaks or fails from any cause, as seen at *q'*, Figs. 10 and 11, the limbs of its rider at once dip into the mercury contained in troughs *k k'*, and establish a metallic communication between the two, which completes the electric circuit, whereupon the armature *x* of electromagnet *y y* is attracted, (see Figs. 13 and 14,) which inward movement of the armature releases the sliding bar *a* and allows the spring *z* to carry back the bar *a'*, thereby withdrawing the friction-roller *v* (attached to the arm *a'*) from the rollers v^1 v^2 of the driving mechanism, and stopping the machine.

In those machines in which an instantaneous stoppage is not necessary the electric stop-motion may be replaced by an electric-bell apparatus to give warning of the breakage, slackening, or absence of thread, in order that the attendant may stop the machine.

Fig. 15 shows an instrument or rake by which the dust or flue may be cleaned out of the troughs when necessary.

In order to entirely exclude such matters from the mercury-troughs, and also to prevent the riders from being jerked out of their places by the vibration of the threads, I provide the troughs with a hinged cover, 1, as shown in plan and elevation, Figs. 17, 18, and 19, secured by a hook, 2, or otherwise, and separate the troughs *k k'* by a double partition having longitudinal slot 3, Figs. 16, 18, and 19, the riders being made of the form shown in Figs. 20 and 21. The riders have an upward extension moving in the slot 3, terminating at the upper part in prongs bent to the right and left, as shown, so as to dip in the troughs. Thus the cover 1 will both prevent them rising by the vibration of the threads and exclude dust and flue from the troughs. The threads which support the riders pass in this case beneath the troughs, as in Figs. 18 and 19, which show transverse sections of double and quadruple trough arrangements, respectively.

In employing the aid of electricity in warping-machines and looms there arises the difficulty of preventing the deposit of flue and dust at the points of contact on the devices used for completing the electric current. Many ingenious plans, some even involving the use of the precious metals, have been attempted. By the use of mercury-troughs, as hereinbefore described, this difficulty is overcome, as nothing can obstruct the passage of the current when the rider, released by the thread, actually dips into the fluid metal. These forks or riders may be made exceedingly light without diminishing their efficiency, and may be carried by the finest yarns.

This invention may be adapted to any machine of the kind herein mentioned, and it will be possible in many cases, owing to the certainty with which the machine is stopped, on the breakage, absence, or slackening of a thread, to take the bobbins direct from the spinning-frame without rewinding, which is both expensive and weakens the yarn.

I claim—

1. The spiral spring *a*, made with perforated coils and combined with the projecting dents *g*, said dents being inserted in the holes drilled into the coils and arranged to form a reed or comb, substantially as set forth.

2. In combination with the right and left screw *c* and nuts *b b*, the spiral spring *a*, dents *g*, and slotted box *e*, all arranged substantially as described, and for the purpose specified.

3. In combination with the electric stopping mechanism of a warping-machine, the riders *j*, constructed substantially as shown, and the mercury-troughs adapted to receive and support the riders, all operating together to stop the machine when a thread breaks, as hereinbefore described and set forth.

4. In combination with the electric stopping mechanism of a warping-machine, the double mercury-trough *k k'*, provided with a partition adapted to guide and support the riders *j*, substantially as hereinbefore described and set forth.

5. In combination with the electric stopping mechanism of a warping-machine and the riders *j*, the double mercury-troughs *k k'*, constructed substantially as described, and provided with a hinged cover, as set forth.

6. In combination with the electric stopping mechanism of a warping-machine and the double mercury-trough, slotted as shown, a two-pronged rider provided with an eye arranged to receive the thread below the trough, substantially as hereinbefore described and set forth.

7. In combination with the armature *x* of the electric stopping mechanism of a warping-machine, the sliding bar *a'*, provided with a friction-roller, *v*, the spring *z*, and rollers v^1 v^2, all operating together substantially as hereinbefore described and set forth.

JOSEPH SIGISBERT RICHARD.

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