

(No Model.)

T. C. ENTWISTLE.

COMB FOR WARPING AND BEAMING MACHINES.

No. 333,399.

Patented Dec. 29, 1885.

Fig. 4.

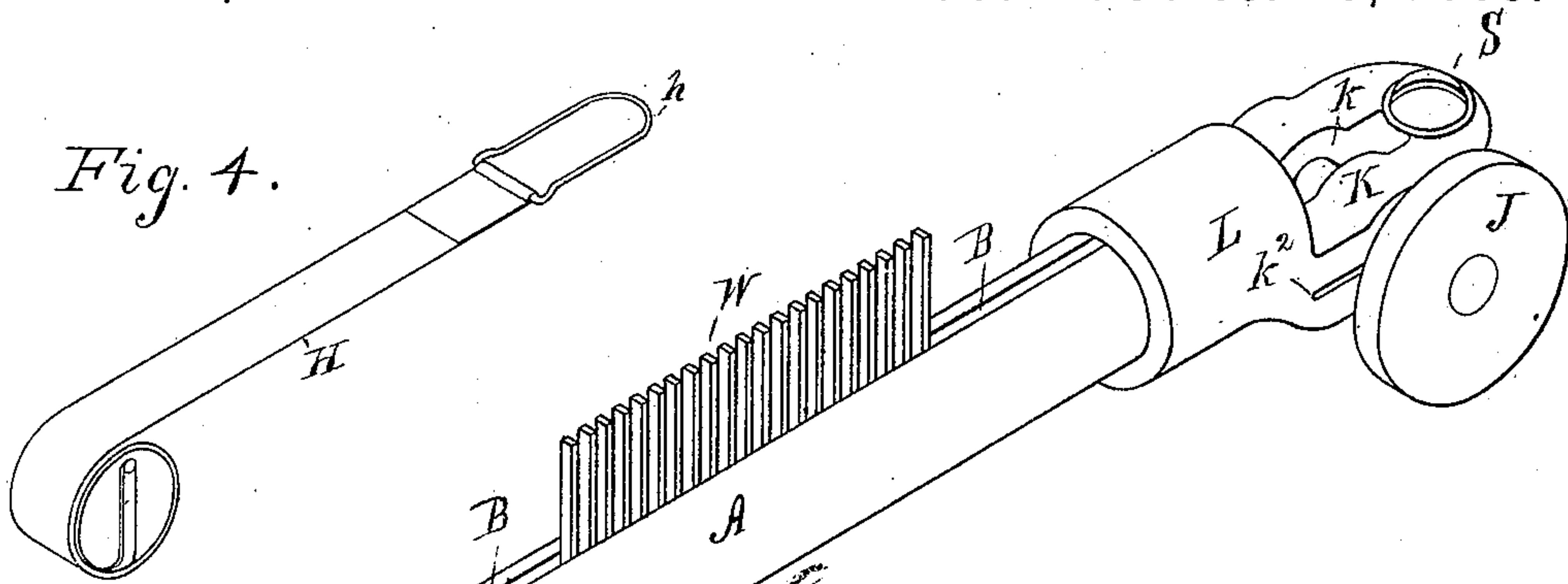


Fig. 1.

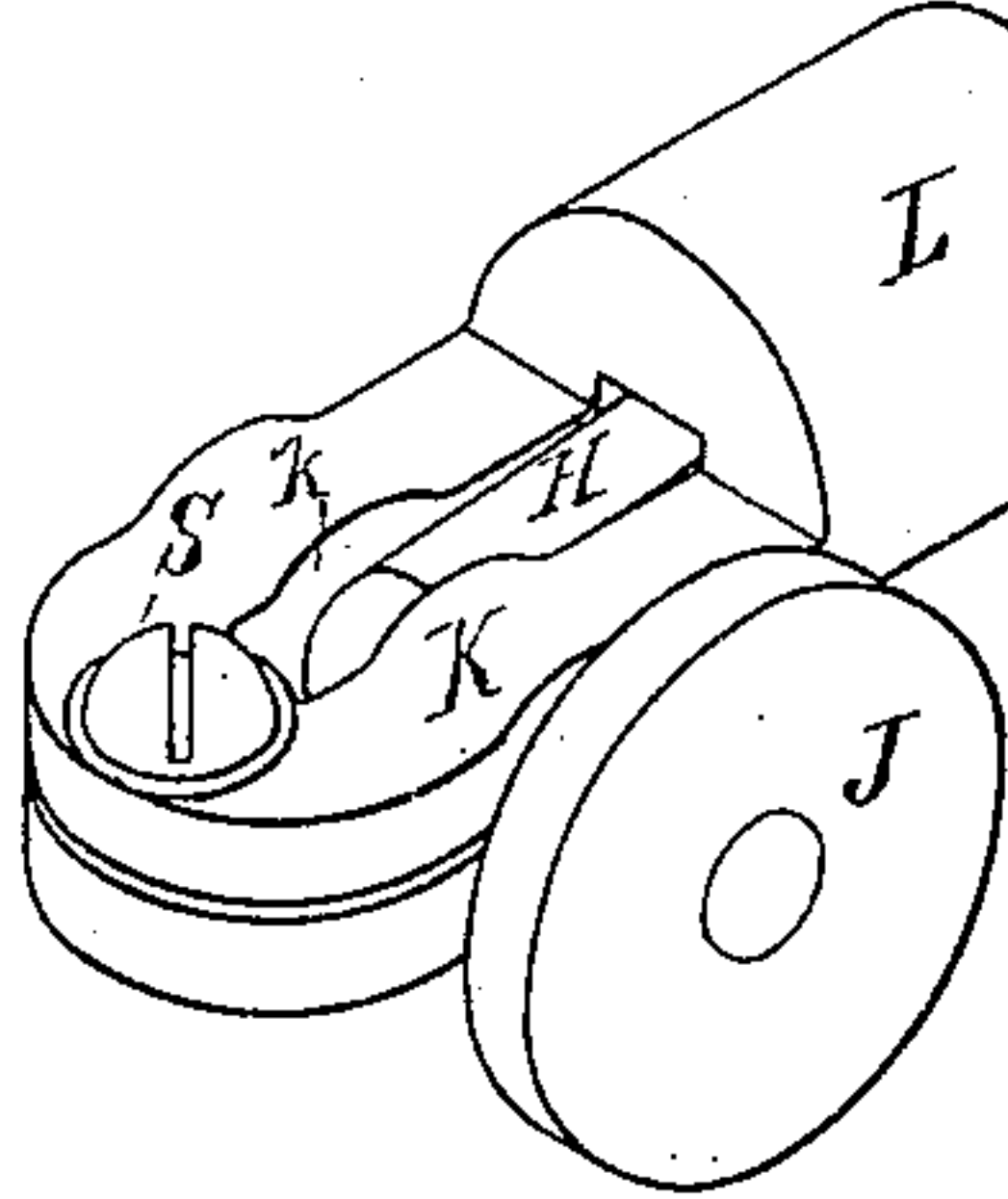


Fig. 3.

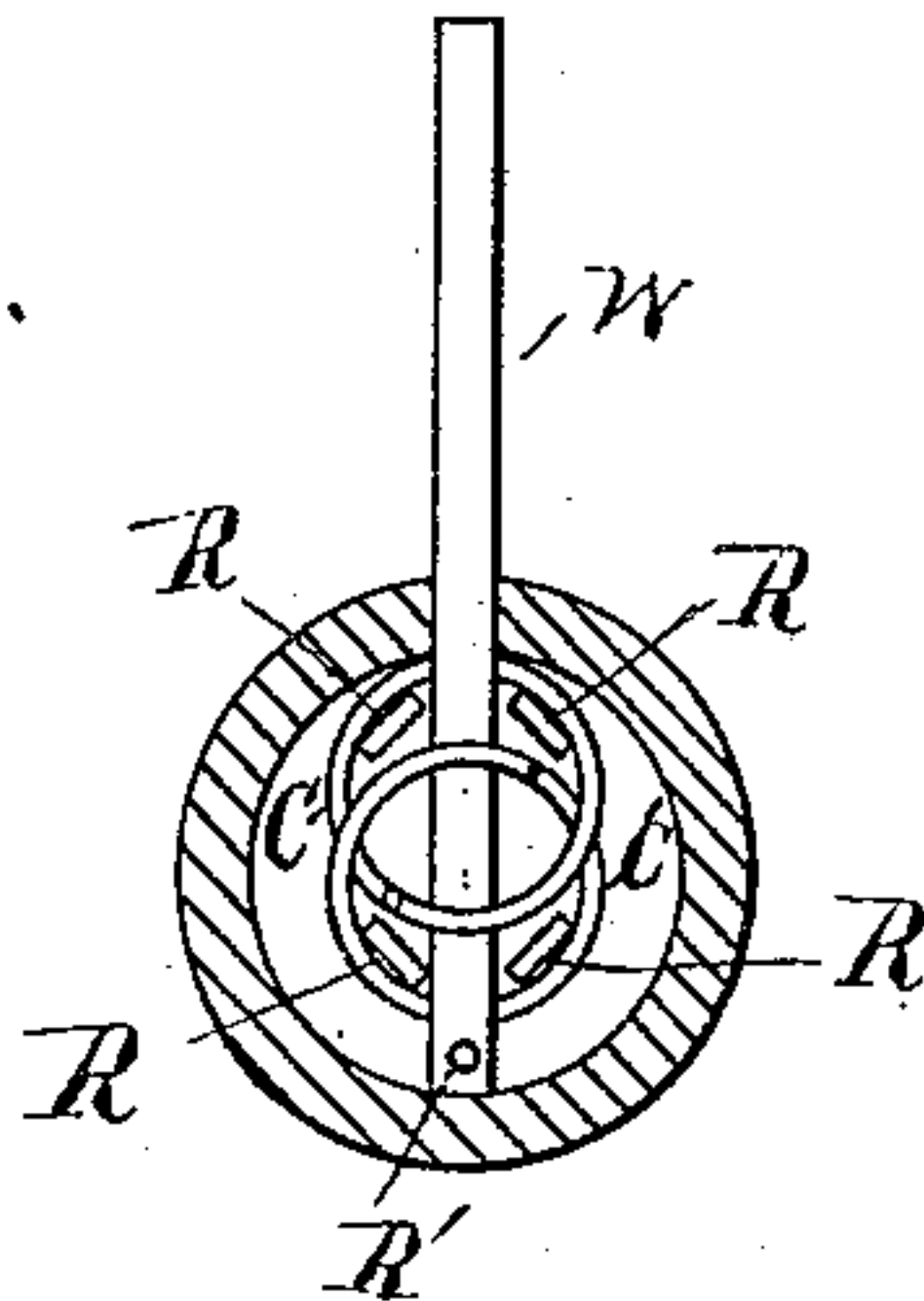


Fig. 2.

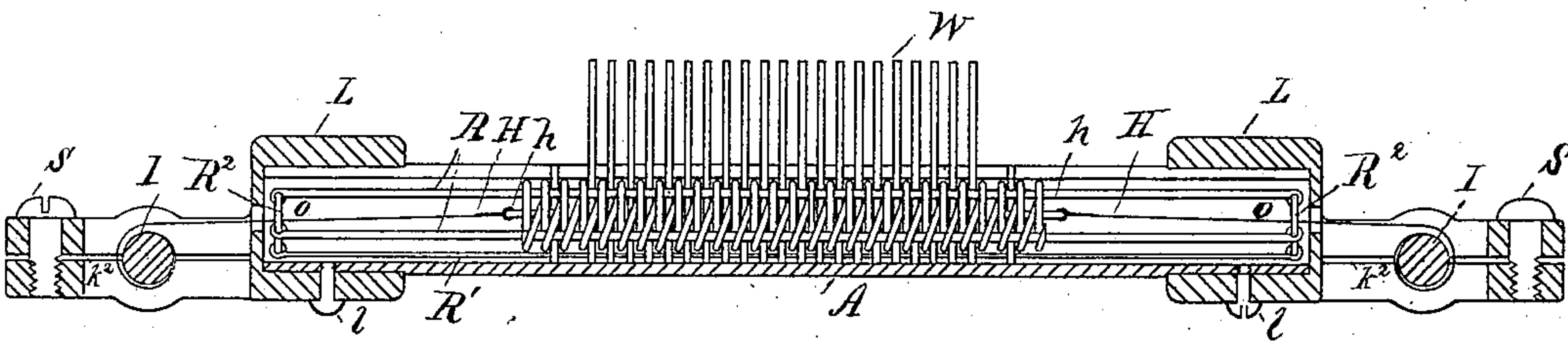


Fig. 5.

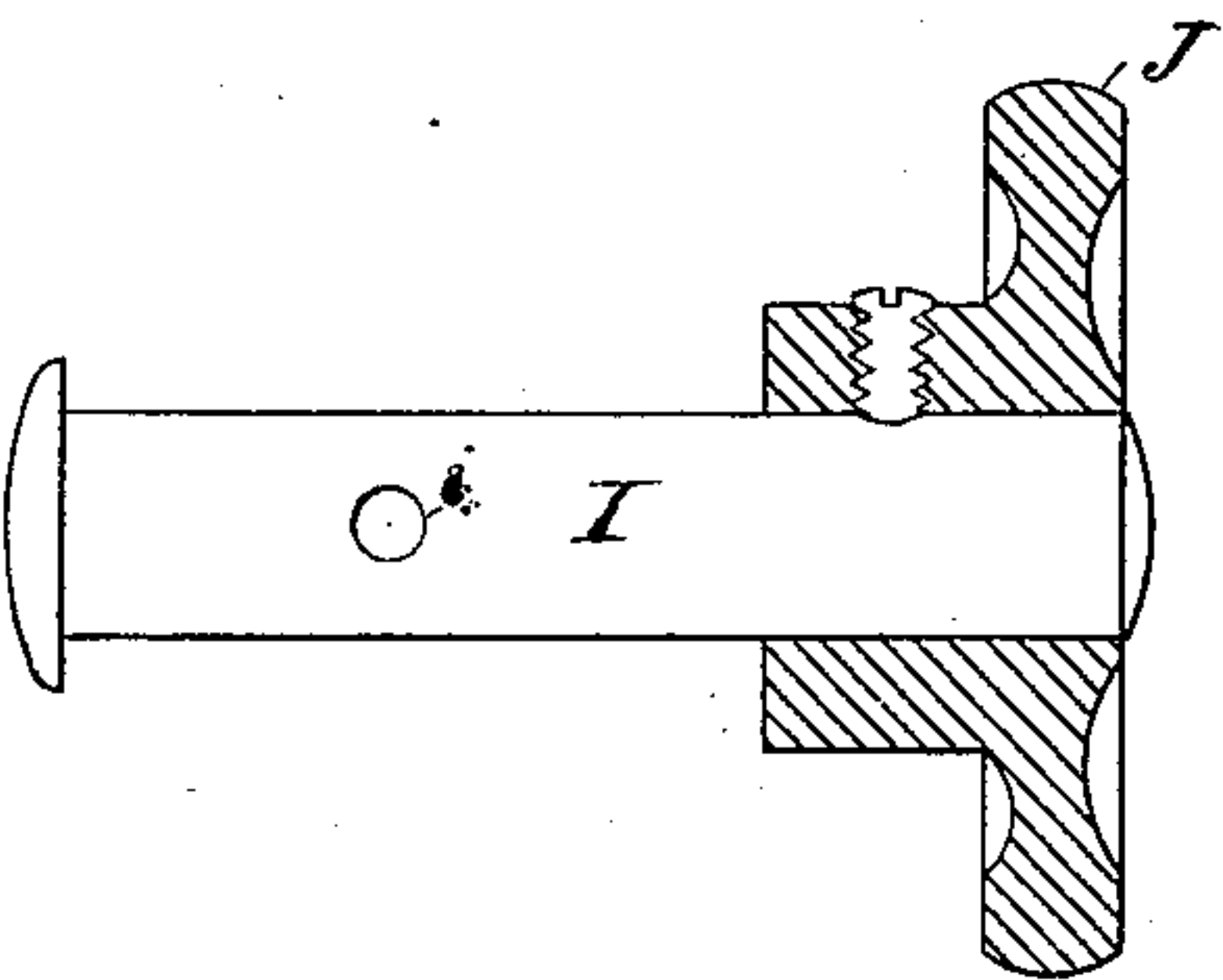
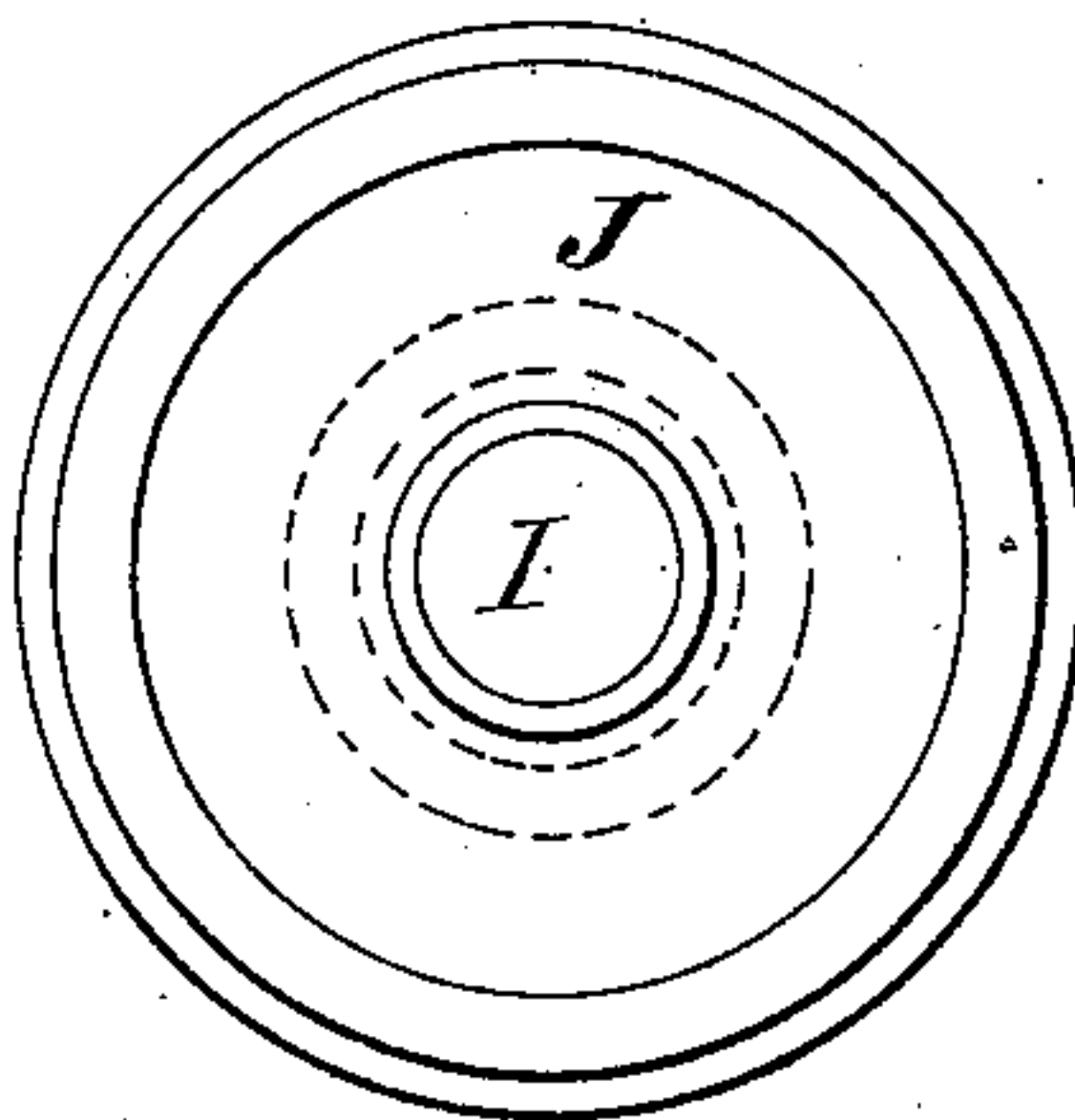


Fig. 6.



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# UNITED STATES PATENT OFFICE.

THOMAS C. ENTWISTLE, OF MELROSE, MASSACHUSETTS.

## COMB FOR WARPING AND BEAMING MACHINES.

SPECIFICATION forming part of Letters Patent No. 333,399, dated December 29, 1885.

Application filed September 15, 1884. Serial No. 143,046. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS C. ENTWISTLE, a citizen of the United States, residing at Melrose, in the county of Middlesex and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Combs for Warping and Beaming Machines, of which the following is a specification.

My invention relates to expansion-combs for warping, beaming, and other machines; and it consists in the devices and combinations hereinafter described and claimed.

In the accompanying drawings, Figure 1 is an isometric view of my improved comb; Fig. 2, a longitudinal central section of the same; Fig. 3, a cross-section of the same through the box or tube between the heads; Fig. 4, an isometric view of the strap, showing the loop by which it is attached to the spring, and the means by which the other end is attached to the drum; Fig. 5, a side elevation of the drum and a central vertical section of the hand-wheel; Fig. 6, an end view of the drum and hand-wheel.

The comb-box generally used is made of two strips of wood or iron bolted or screwed together at the bottom, and hollowed on their inner faces to receive the springs, nuts, dents, and adjusting-screw, named below, such box being open at the top to allow the dents to project out. It has also been customary to use two pairs of spiral wire springs, one pair being placed above the other in the comb-box. The dents are placed vertically between the coils of each pair of springs, and are prevented from being drawn out from the springs and box by a guide and stop rod which runs through holes punched in all the dents, near the lower end of the same, and are kept in line with the axes of the springs by guide-rods, two of which are placed in each spring on opposite sides of the dents. The ends of the stop-rod and guide-rods are prevented from getting out of place by being looped around a pin at each end of the comb-box, inside of the same. The spaces between the dents are ordinarily varied by a right-and-left-hand screw which turns in nuts, one of which is connected by a pin with each end of the spring, so that turning the screw in one direc-

tion expands the springs and spreads apart the dents, and turning it in the other direction brings the nuts nearer together and allows the springs to contract, thereby drawing the dents nearer together.

Instead of the usual comb-box I use a tube, A, (preferably metallic,) slotted at B from end to end on the upper side, through which the upper ends of the dents project, and within the tube I place one pair of springs, C C', the dents W being arranged vertically between the coils of the spring in the usual manner. The guide-rods R and the guide and stop rod R' serve the usual purpose, and their ends are looped around rings R<sup>2</sup>, one at each end of the box A within the same.

I expand the comb by winding up on drums I I straps H H, preferably metallic, the inner ends of the straps being provided with loops h, which surround the end dents, and the outer ends of said straps being attached to said drums by being inserted in round holes i, the ends of the strap being rolled up to fit said holes. (See Figs. 4 and 5.) The end dents are then cut off at the top of the box A, because they would be liable to be bent by the strain of the strap on them in expanding the springs, and thereby rendered useless for spacing the threads. The drums are revolved by means of the hand-wheels J J, and are supported in brackets K K, cast or formed in one piece with the heads L L, which form the ends of the box. The heads are hollow cylinders, which surround the ends of the tube A and fit the same, and are held in place by set-screws l, which turn in threaded holes formed radially in said heads and thrust against said tube A. The brackets are drilled through transversely to receive the drums, and are slotted longitudinally at k to admit the straps H H, which pass through holes in the centers of the ends of the heads, the said ends with this exception being closed. The brackets are provided with transverse slits k<sup>2</sup>, which lie in the same plane as the axes of the drums. In each bracket there is a clamp-screw, S, at right angles to the slit k<sup>2</sup>, which screw passes freely through one part of the bracket into a threaded hole in the other part of the bracket, so that turning up the clamp-screw causes the parts of the



bracket to pinch the drum sufficiently to prevent its being turned by the contraction of the springs.

The springs above named (those heretofore used and mine) are closely wound in pairs out of two wires upon a single arbor at one operation, and are then usually laid aside until required to be used in making combs.

In making up the combs two pairs of springs made from different wire, or wound with a different pitch or tension, are likely to be put into the same comb, and the result is that one pair will expand more readily than the other and the dents will not be parallel with each other. Again, if there be in either pair a place which expands unequally with the other parts of the same pair, not only will the dents be unequally spaced, but the dents will not be vertical, unless the other pair of springs have an equal defect immediately above or below the defect in the first-named pair. Hence the use of two pairs of springs will generally result in exaggerating the defects of each pair. There is therefore a great mechanical advantage in using only a single pair of springs. Using a single pair of springs also allows of a tube being used for a box, and this tube may be an ordinary wrought-iron pipe, such as is used for conveying gas or steam. Such tubes or boxes are less expensive and more easily handled, and have less space to be filled with dirt. Besides this, I save the cost of a pair of springs and of four guide-rods, and have fewer parts liable to be broken. I also dispense with the screw and nuts.

The middle dent is usually held rigidly, so that the comb is expanded from the middle dent by the right-and-left-hand screw above named, so that an unequal expansion of the springs on opposite sides of the middle dent, owing to defects and inequalities in the springs, will bring the threads on one side of the middle dent nearer together than on the other side of the same, the result being a greater number and length of threads at one end of the warper-beam from its center than at the other. When the yarn from a beam so wound is run subsequently through slashers or dressers, the yarns will be unwound sooner from the small parts of the filled beam, the yarns being shorter at the small parts of the beam, and the yarn from the larger part of the beam (a greater length thereof being unwound at each revolution from the large parts of the beam) becomes slack and tangled, and therefore broken, requiring the machine to be stopped to piece up.

To avoid the disastrous results above named, a warping machine of the ordinary construction, having an expanding comb, is provided with an adjusting-screw, which turns without advancing in the frame of the warper, and also turns in a nut secured to the comb-box, so that the entire box may be moved endwise across

the machine to equalize, as nearly as possible, the distribution of the yarns along the warper-beam; but this moving over of the box does not prevent entirely the inequalities of the beams, because the expansion of the comb is entirely from the fixed middle dent, and the only benefit therefrom is gained just at the ends of the beams. Where a right-and-left-hand screw is used to expand the comb simultaneously at each end of the comb, it is evident that the springs are expanded from the middle toward the ends.

I do not fasten the middle dent, but allow it to move as freely as the others, and when I turn one of the hand-wheels I expand the comb from the end of the same farthest from the hand-wheel so turned, and each end may be independently expanded, so that in adjusting the width of my comb I set one side, by means of one hand-wheel, at the proper place, and then set the other side, by means of the other hand-wheel, so as to expand the part of the comb in use to the width of the beam between the heads thereof. If the beam begins to wind unequally, its shape may be corrected by unwinding the strap at the large end of the beam, which has the effect to draw the dents nearer together throughout the length of the comb.

It is evident that the drum may be prevented from unwinding in various ways, as by a ratchet and pawl, or by a worm and gear.

I claim as my invention—

1. The combination of a box or tube, slotted, as described, the springs placed within said box, the dents placed vertically between the coils of said springs, the straps connected, substantially as described, to said springs, the heads secured to said box or tube and provided with brackets, the drums turning in said brackets, said brackets being slit in the planes of the axes of said drums, and means, substantially as described, of closing the sides of said slit upon said drums, as and for the purpose specified.

2. The combination of a box or tube, slotted, as described, the springs placed within said box, the dents placed vertically between the coils of said springs, the straps connected, substantially as described, to said springs, the heads secured to said box or tube and provided with brackets, the drums turning in said brackets, said brackets being slit in the planes of the axes of said drums, and a clamp-screw turning freely in the part of the bracket on one side of the slit and screwing into the part of the bracket on the other side of said slit, as and for the purpose specified.

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