

(No Model.)

3 Sheets—Sheet 1.

J. H. HINCHLIFFE.
CIRCULAR KNITTING MACHINE.

No. 450,291.

Patented Apr. 14, 1891.

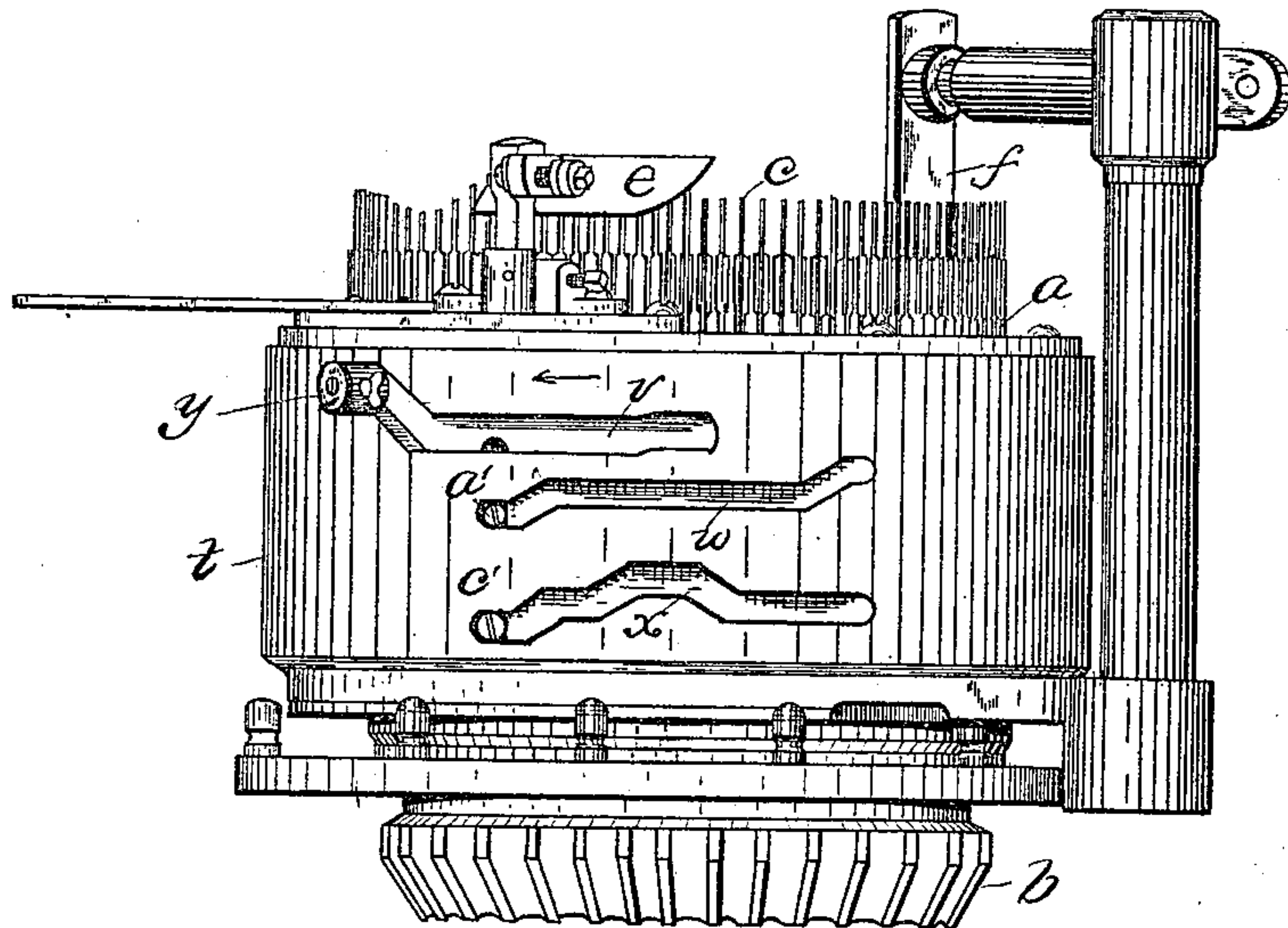


Fig. 1.

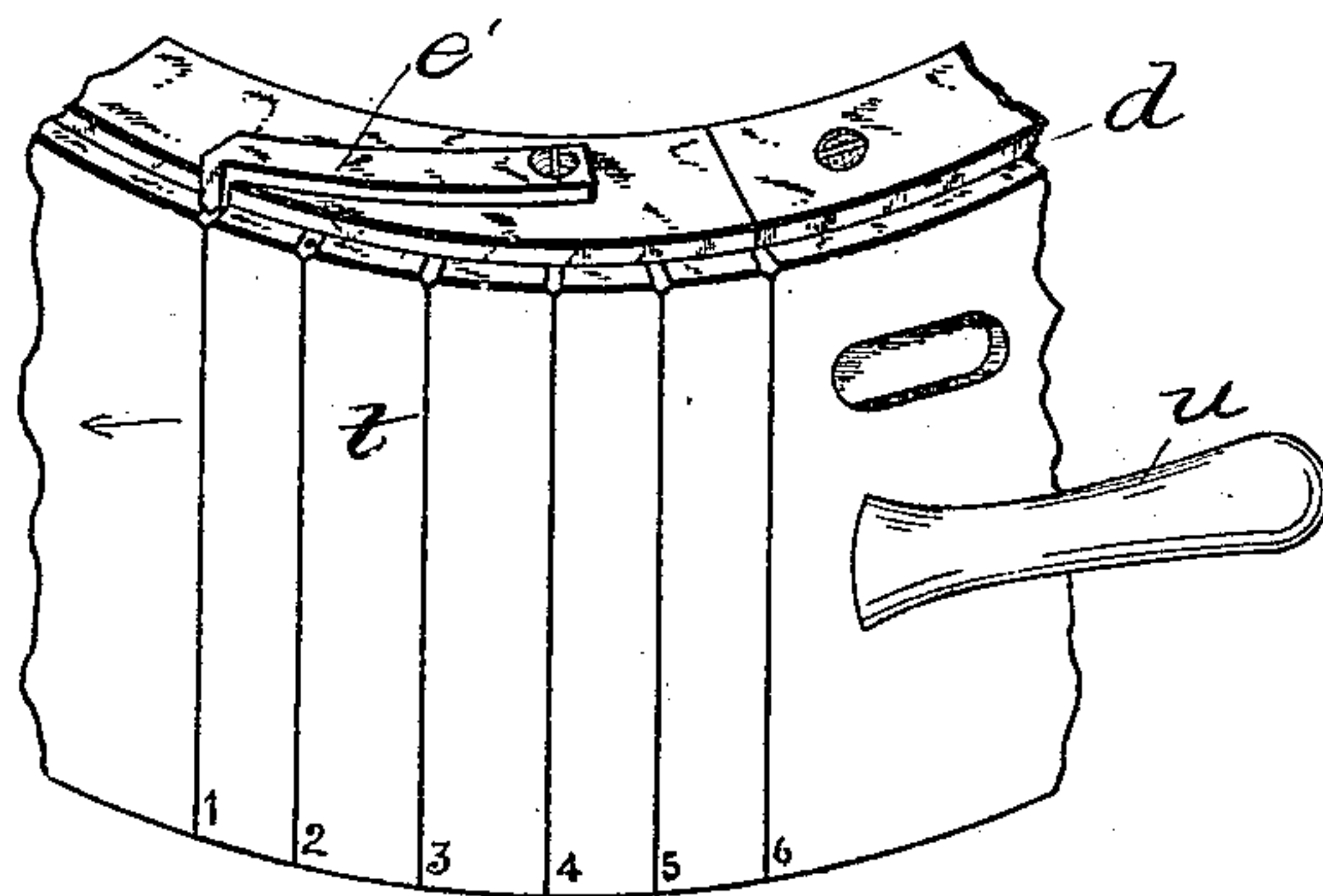


Fig. 2.

Witnesses
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(No Model.)

3 Sheets—Sheet 2.

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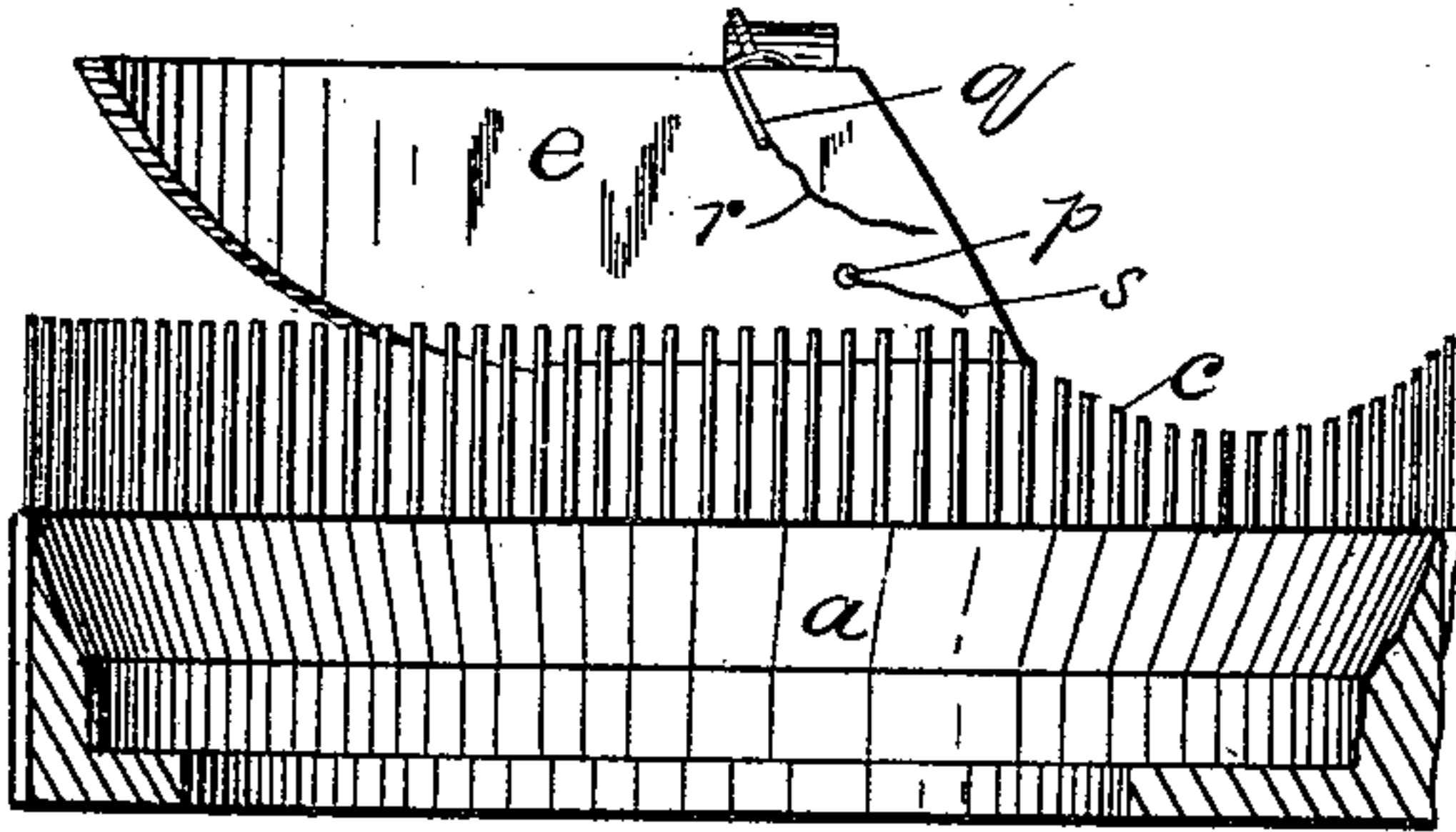


Fig. 3.

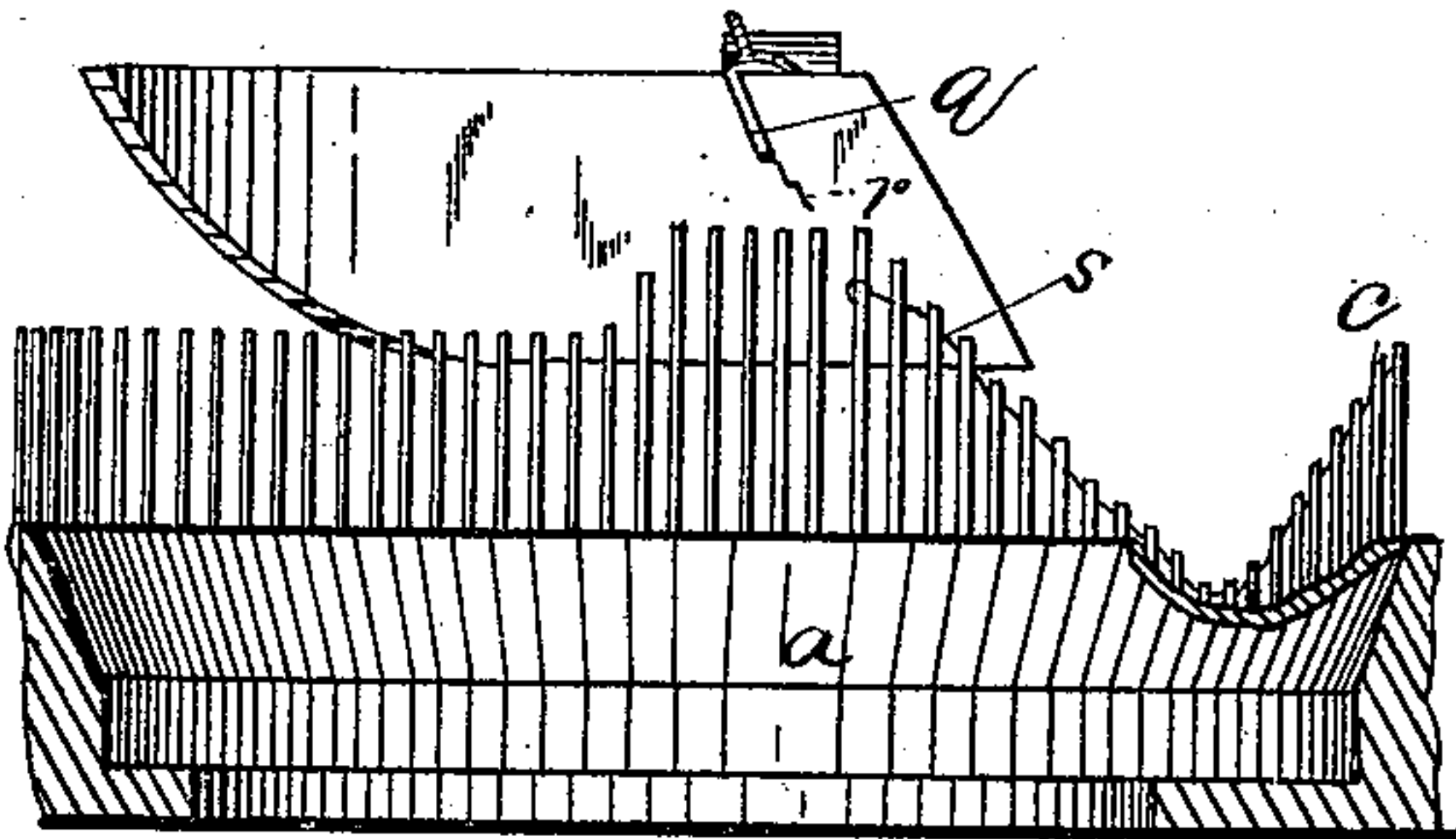


Fig. 4.

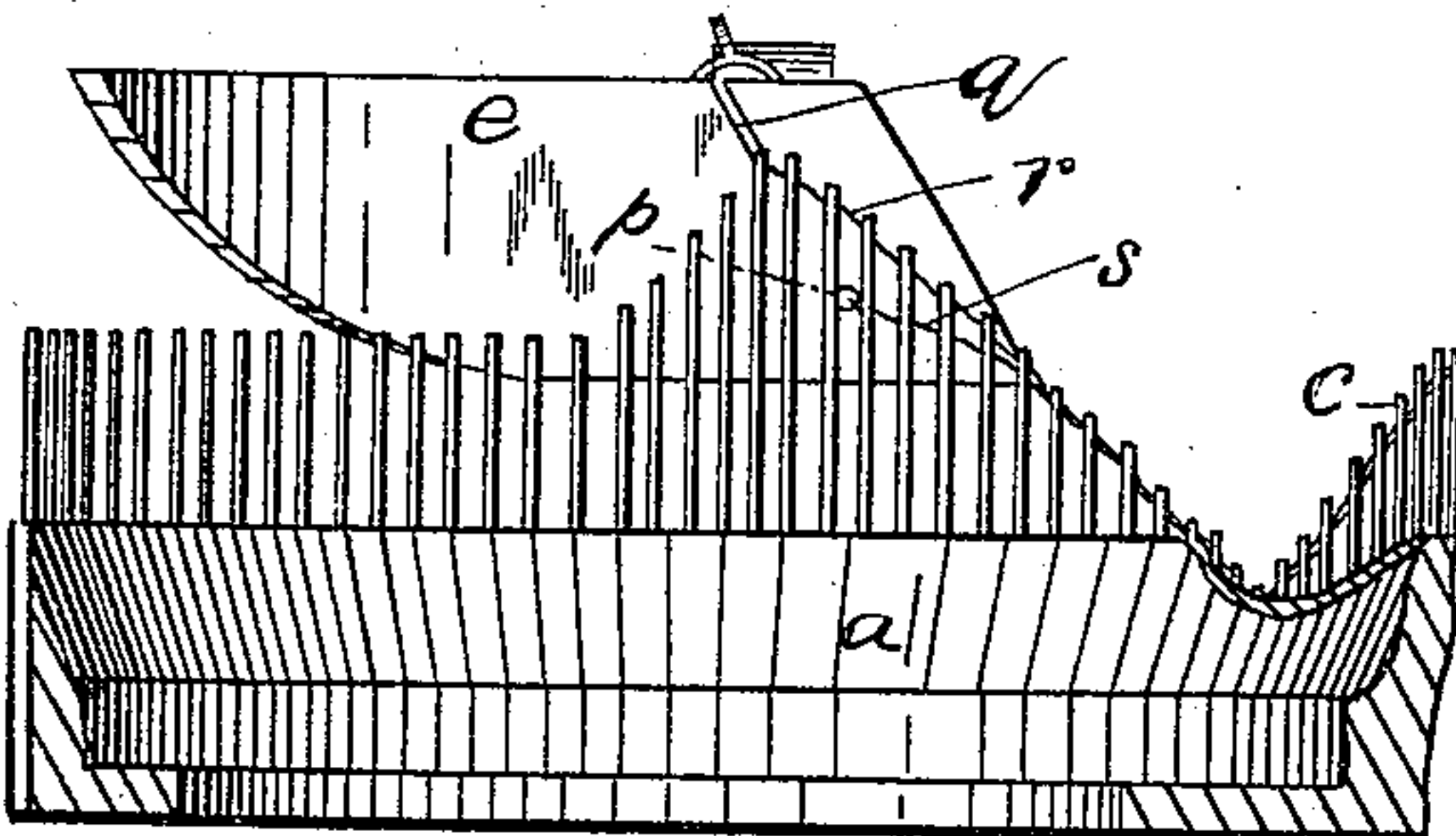


Fig. 5.

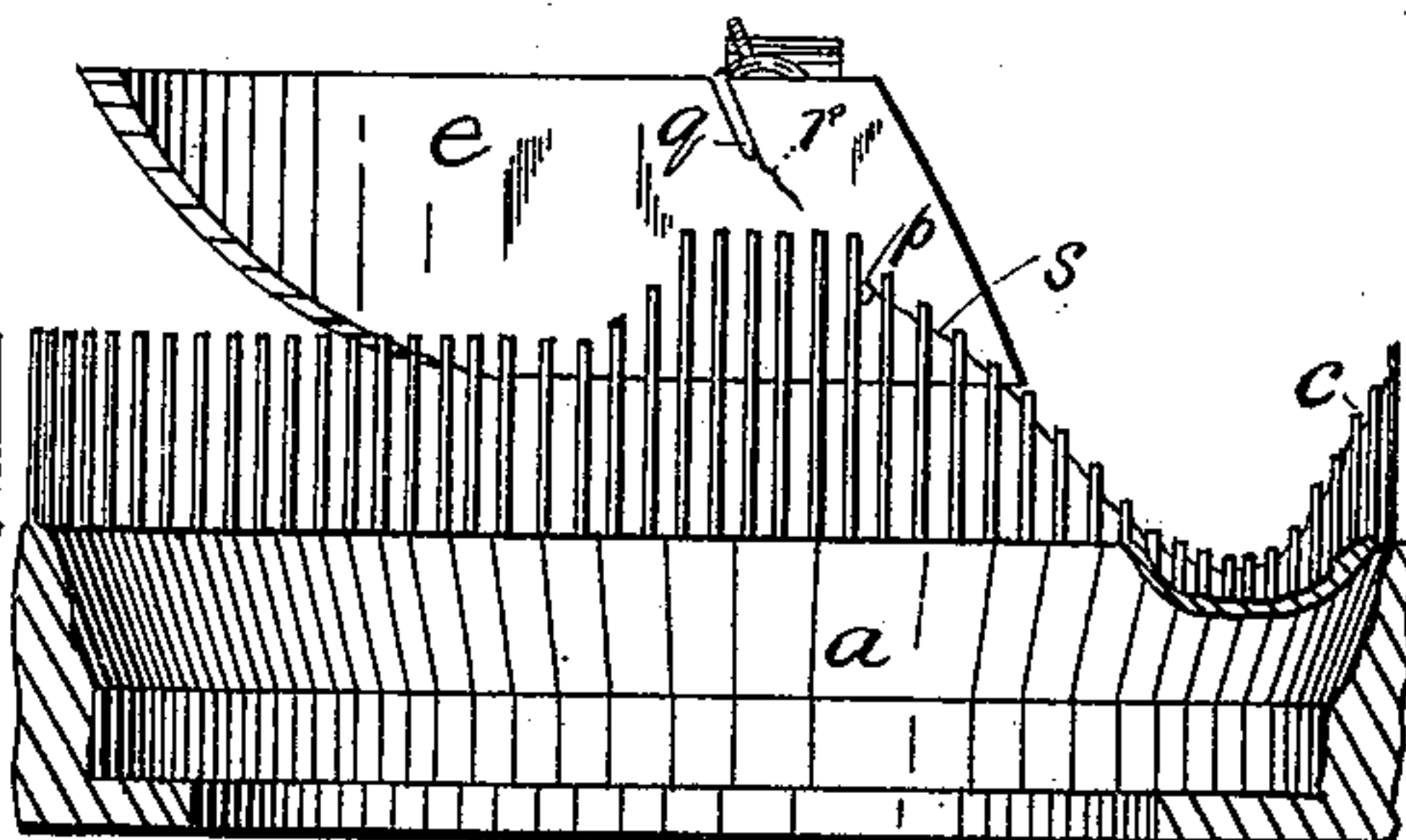


Fig. 6.

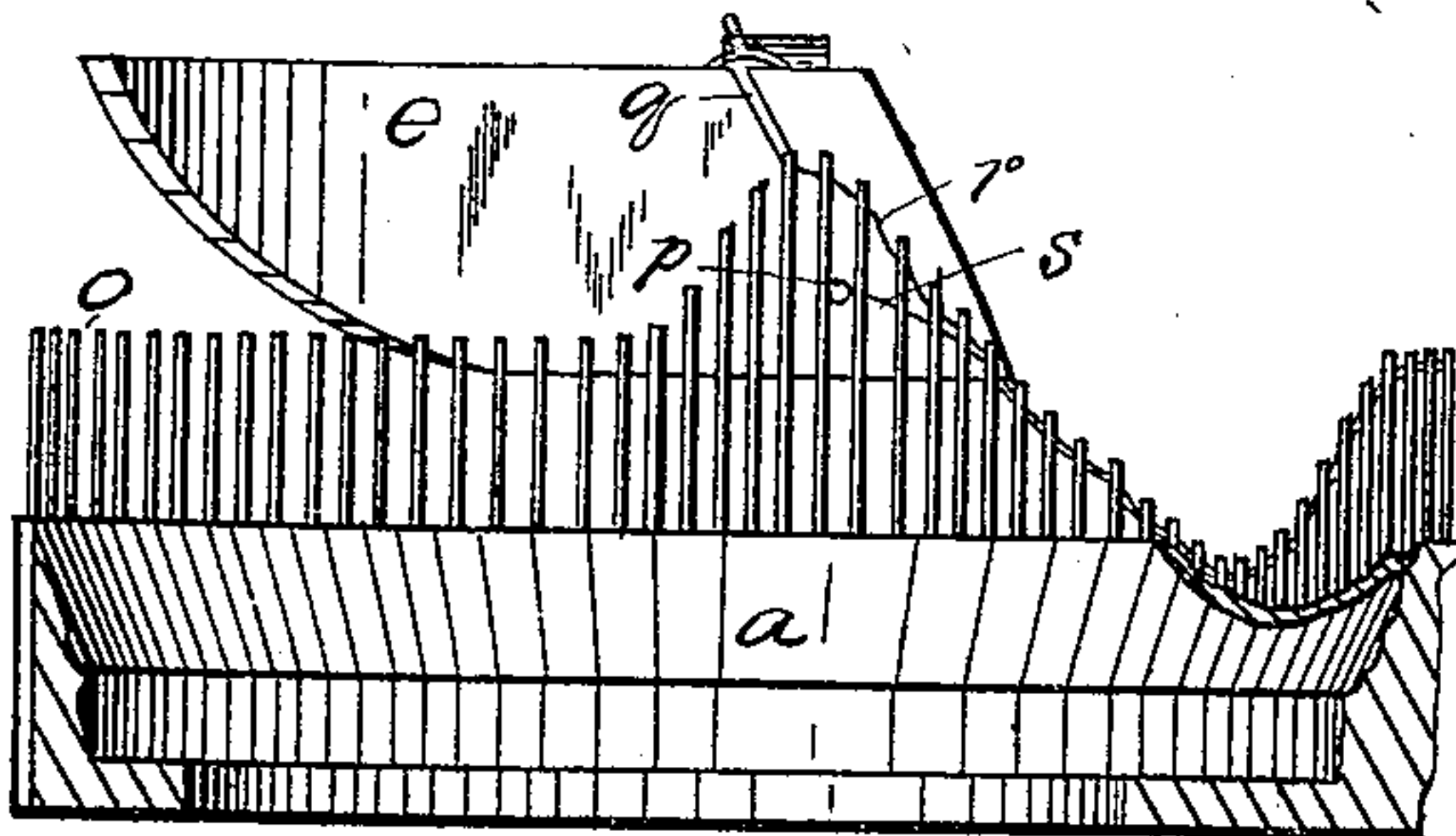


Fig. 7.

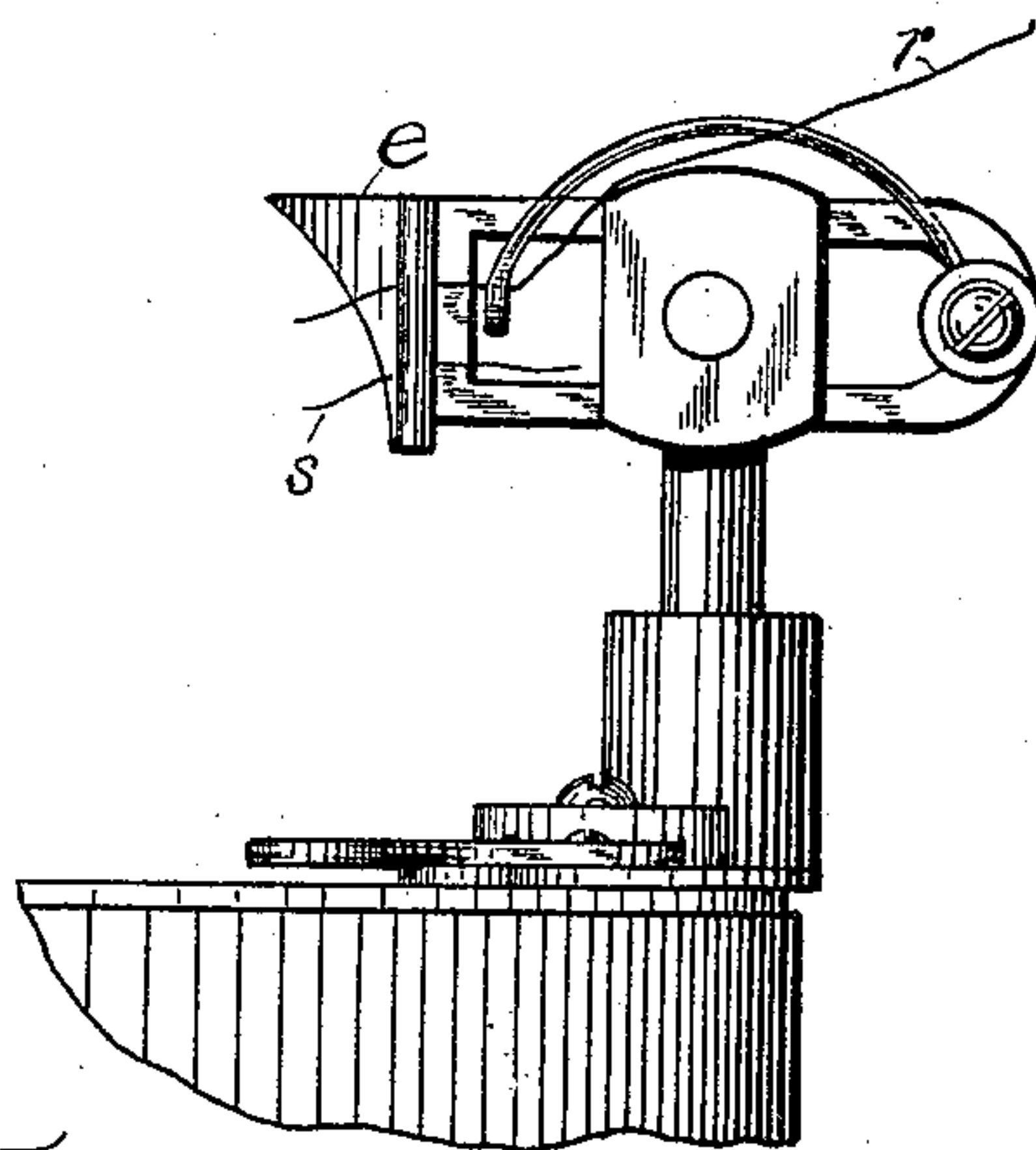


Fig. 15.

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(No Model.)

3 Sheets—Sheet 3.

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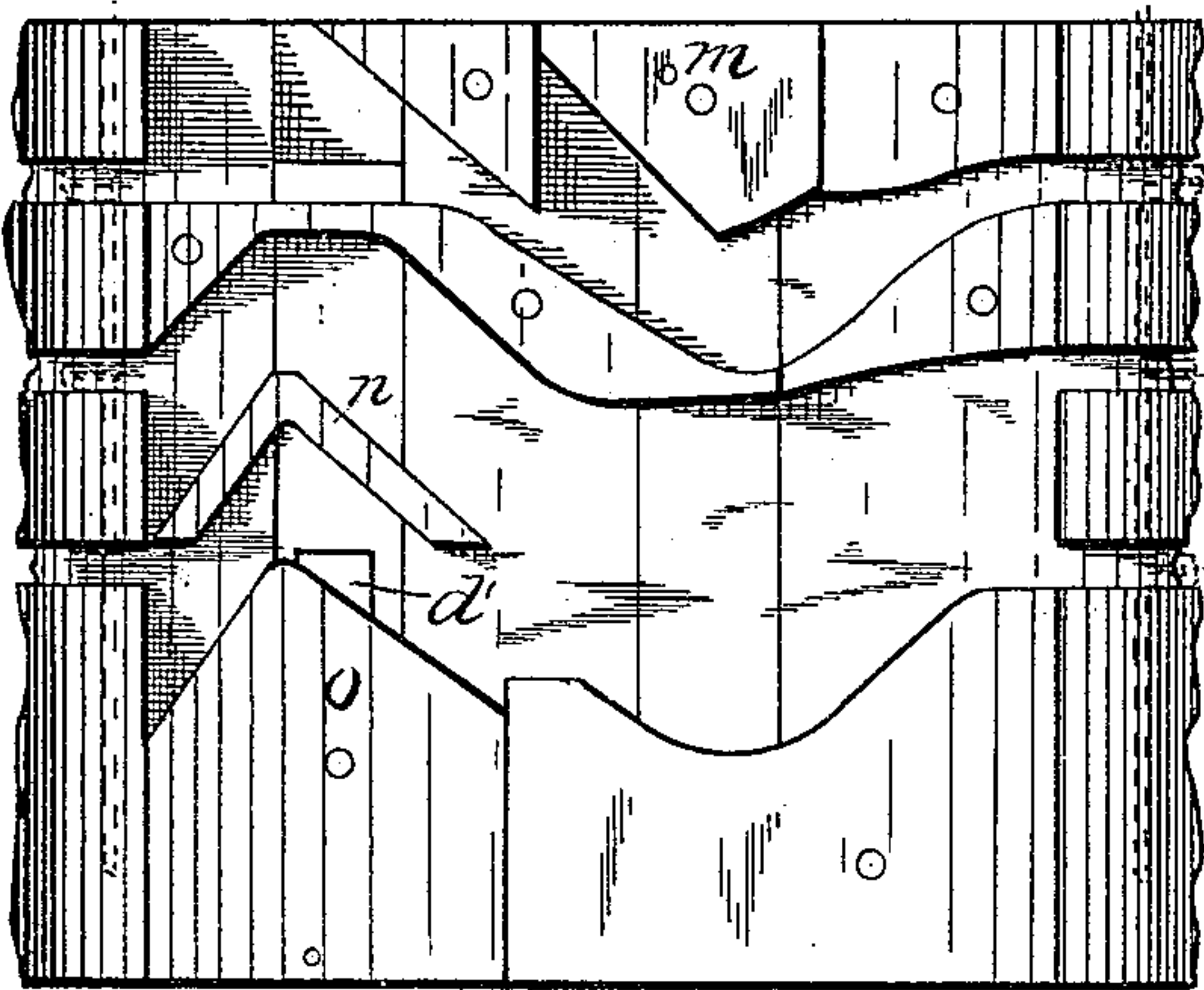


Fig. 8.

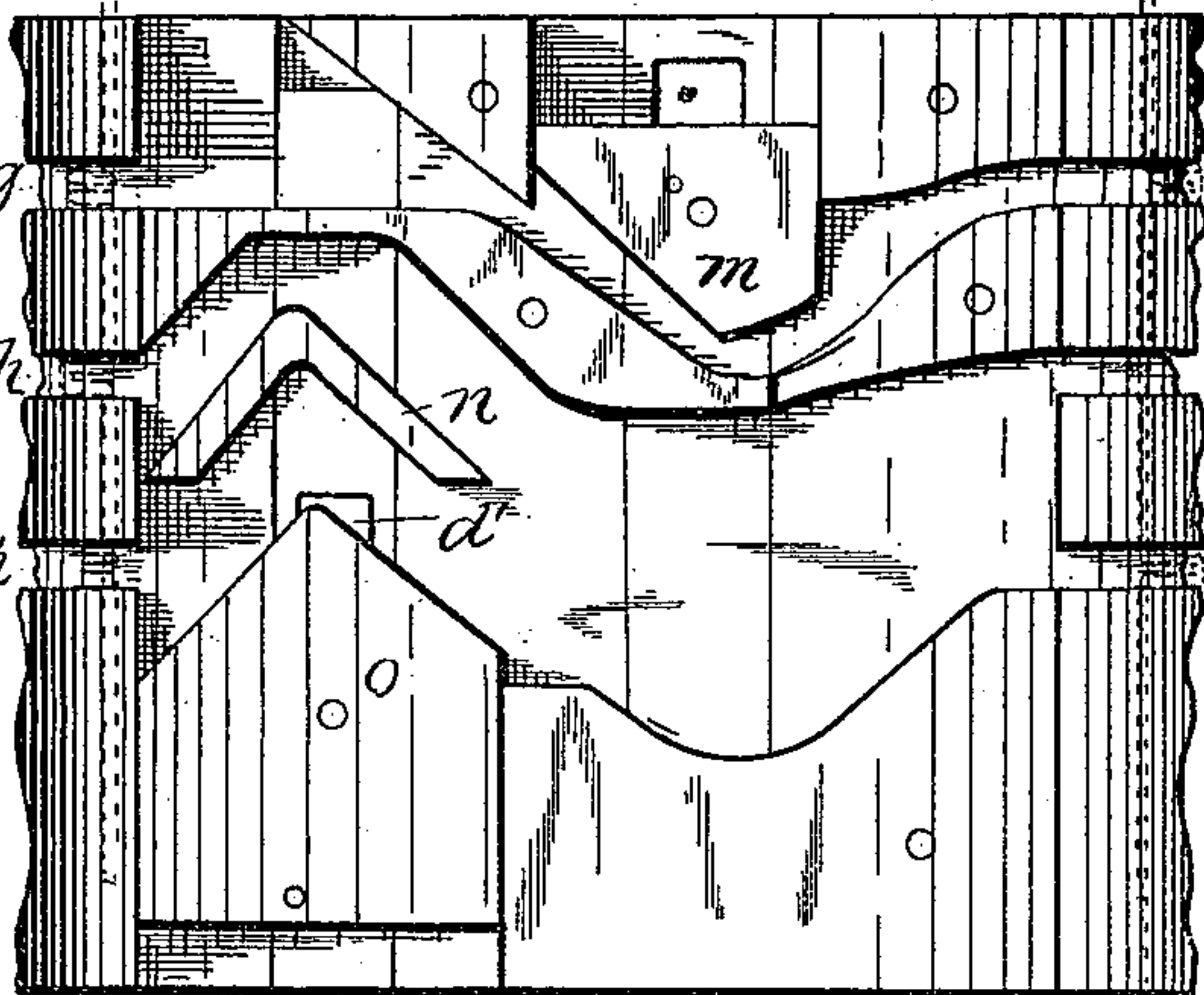


Fig. 9.

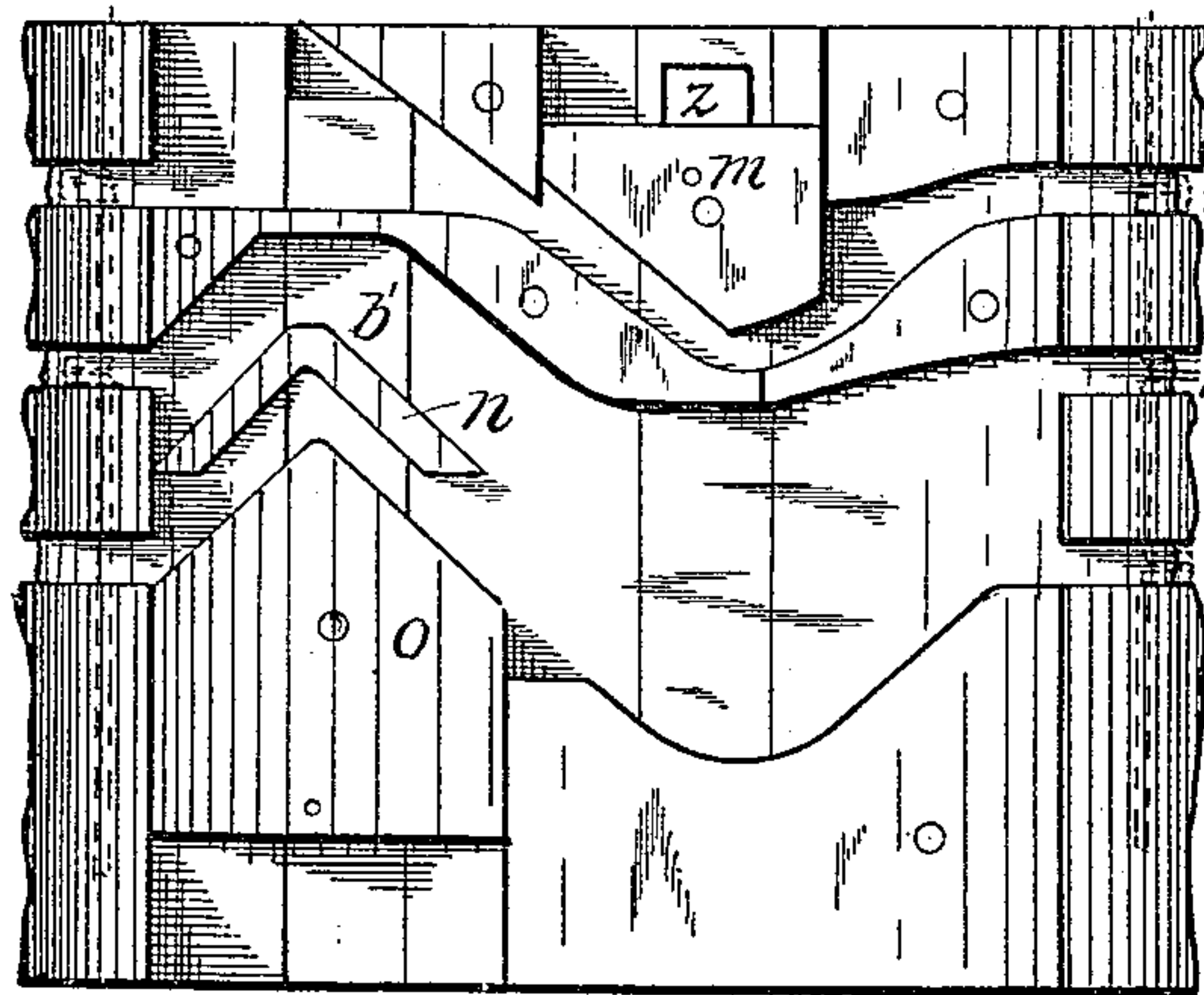


Fig. 10.

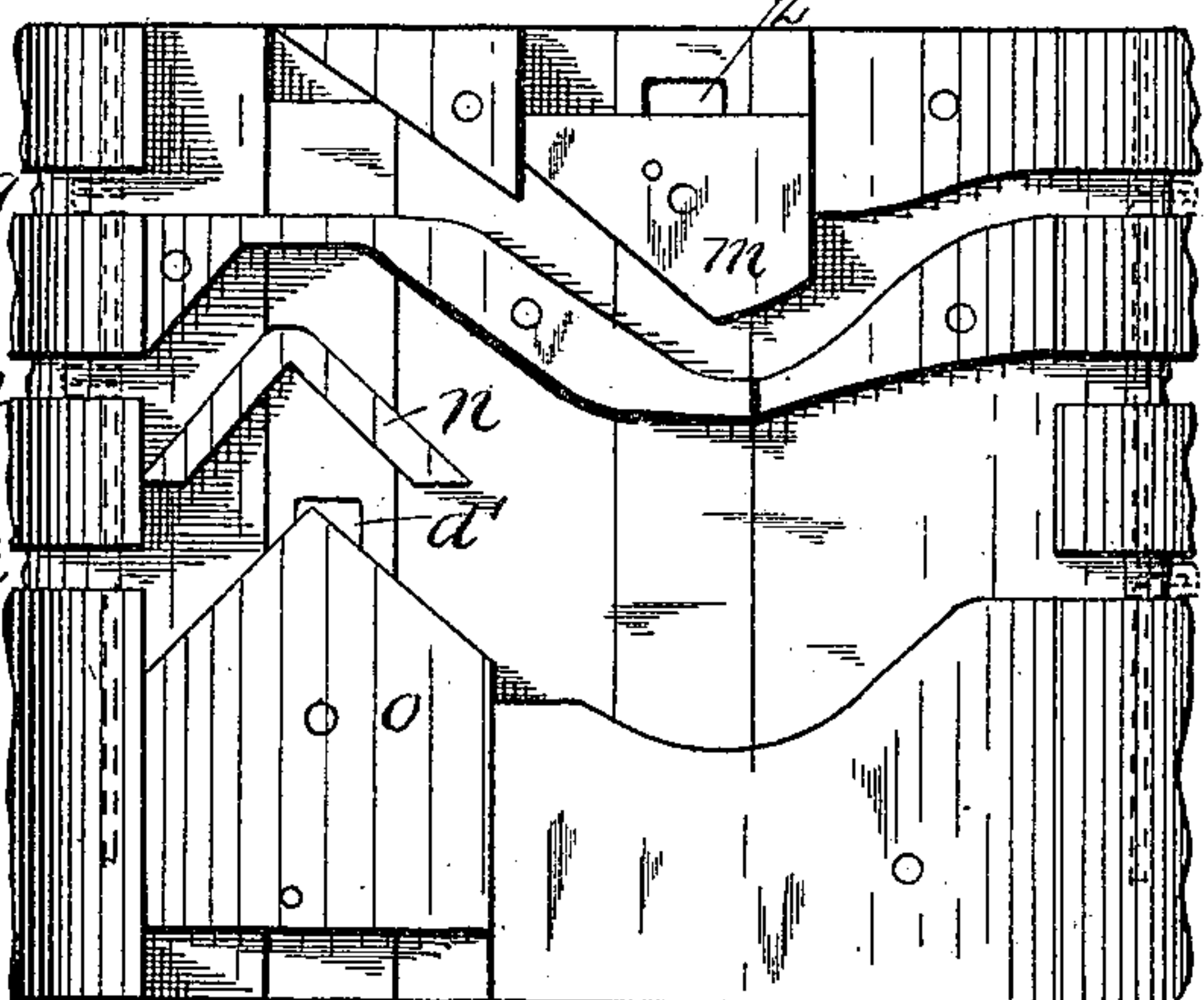


Fig. 11.

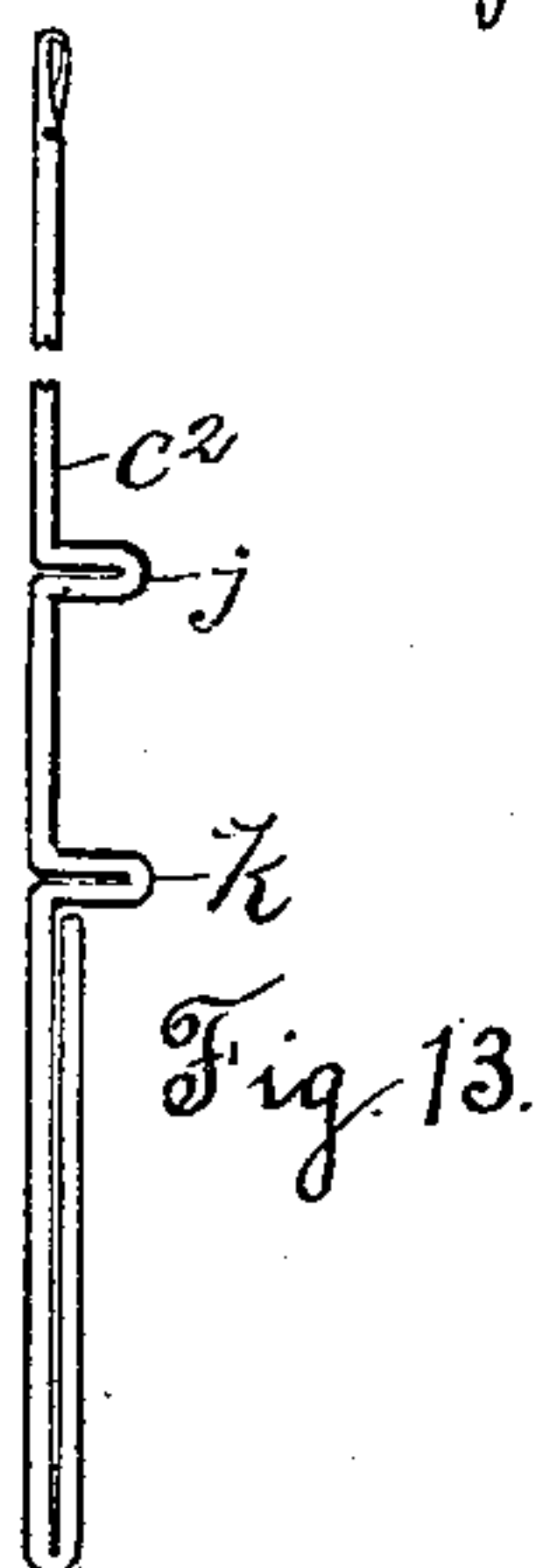


Fig. 13.

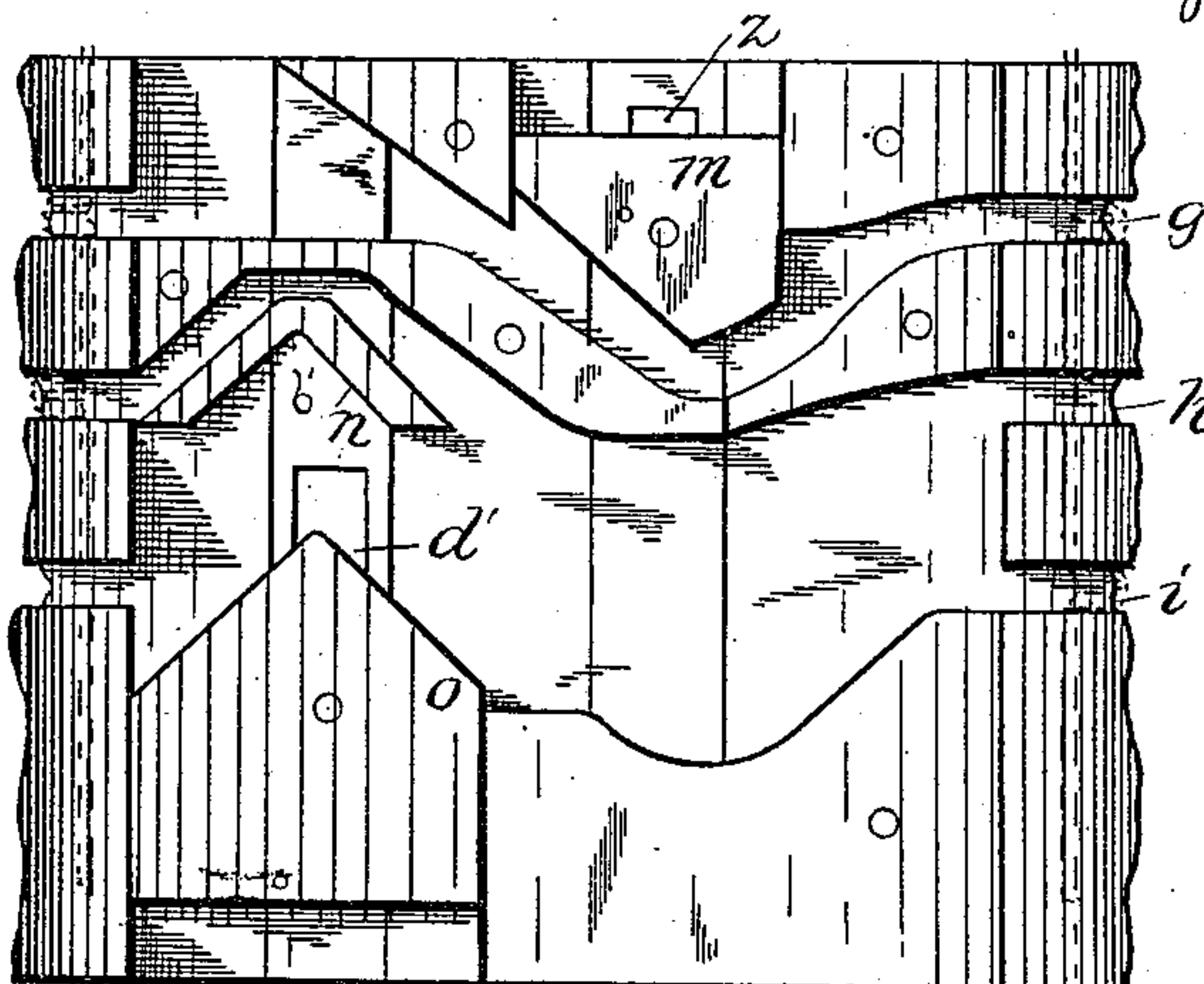


Fig. 12.
Per



Fig. 14.

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UNITED STATES PATENT OFFICE.

JAMES H. HINCHLIFFE, OF LACONIA, ASSIGNOR TO SAMUEL HODGSON, OF MEREDITH, NEW HAMPSHIRE.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 450,291, dated April 14, 1891.

Application filed March 27, 1890. Serial No. 345,573. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. HINCHLIFFE, of Laconia, in the county of Belknap and State of New Hampshire, have invented certain new and useful Improvements in Circular-Knitting Machines, of which the following is a specification.

My improvements are particularly applicable to circular-knitting machines employing reciprocating needles.

The invention consists of improvements in circular-knitting machines, whereby a "thickening - thread," so called, is readily introduced into the fabric at desired points and for the desired distance around the web; also of improved means for controlling the position of the needles, so that a ribbed top or cuff can readily be run thereon.

Reference is to be had to the annexed drawings and to the letters and figures of reference marked thereon, forming a part of this specification, the same letters, figures, and signs designating the same parts or features, as the case may be, wherever they occur.

Of the said drawings, Figure 1 is a side elevation of a knitting-machine head embodying my invention. Fig. 2 is a detail in perspective hereinafter more fully referred to. Figs. 3, 4, 5, 6, and 7 are diagrams of the yarn-guide and portions of the needles and needle-cylinders, showing the various positions to which the needles may be moved with respect to the yarn-guide and needle-cylinder in carrying out the objects of my invention. Figs. 8, 9, 10, 11, and 12 are diagrams of a portion of the interior of the cam-cylinder, showing the cams positioned to accord with the position of the needles shown, respectively, in Figs. 3, 4, 5, 6, and 7. Figs. 13 and 14 show broken side elevations of the different structures of the needles employed in the invention. Fig. 15 is a side view of the yarn-guide, its support, and a portion of the cam-cylinder.

In the drawings, *a* designates the needle-cylinder provided on its lower end with bevel gear-teeth *b*, which may be engaged by the teeth of a bevel-gear in order to rotate the cylinder.

c designates the needles, which may be of the kind known as "latch-needles," and which

are adapted to be reciprocated in grooves formed in the cylinder *a*.

d designates the cam-cylinder provided with means, as hereinafter described, for operating the needles and maintaining the same in desired position.

e designates the yarn-guide, and *f* the push-back, which may be employed when the knitted product is drawn upward, no such device being required when the work is drawn down through an opening in the center of the cylinder *a*.

In the present example the needle-cylinder is supposed to be revoluble, while the cam-cylinder is maintained in stationary position, though it will appear obvious to knitting artisans that the cam-cylinder may be made revoluble and the needle-cylinder held stationary. The views of the needle-cylinder on Sheet 2 and of the cam-cylinder on Sheet 3 are supposed to be taken from the interior of the same.

In carrying out my invention I employ two sets of needles, each needle having two heels on its shank, the upper heels in both sets being in the same horizontal plane, while the lower heel of one set is formed at a higher point than the same heel in the other set. For the sake of convenience I will refer to the set of needles constructed as shown in Fig. 13 as "needles *c*²" and the set constructed as represented in Fig. 14, as "needles *c*³." Needles *c*² may be supposed to occupy the grooves of the needle-cylinder one half way around the same, and the set *c*³ the remaining half of the grooves in the said cylinder. Three paths or grooves *g h i* are formed in the cam-cylinder, in which the heels of the needles travel when beyond the reach of the reciprocating cams. The path *g* receives the upper heels *j* of both sets of needles, the path *h* the lower heels *k* of set *c*², and the path *i* the lower heels *l* of set *c*³. The needle-actuating cams of the cam-cylinder operate upon the lower heels of the needles to raise the same and upon the upper heels to depress them. A single cam *m* is employed to draw down or depress the needles, while cam *n* is employed to act upon the heels *k* of needles *c*² to raise the said needles, and cam *o* is constructed to act upon heels *l* of needles *c*³ to raise the

latter. All of the said cams are adjustable vertically, so that the needles may be drawn down and raised to a greater or less extent, the construction and arrangement of the cams being such that both sets of needles, when depressed at all, will be depressed to the same extent, while the needle-raising cams *n* *o* may be so adjusted as to raise both sets of needles to the same extent, or so as to raise either set to a greater height than the other.

The yarn-guide *e* is provided with two yarn-guiding eyes *p* *q*, one above the other. Through the upper guide-eye *q* is passed the thickening-yarn *r*, while the regular knitting-yarn *s* is passed through the lower guide-eye *p*. When the needles or any portion of them are raised high enough to catch the yarn *r* from the upper yarn-guide *q*, such needles will catch both yarns and knit them into the web; but when the needles are raised high enough only to catch the yarn *s* they will fail to take the yarn *r* and but a single yarn (the yarn *s*) will be knit into the fabric. A ring *t* is arranged on the outside of the cam-cylinder *d* in such manner as to be revolved thereon by means of the handle *u* or other suitable device. The said ring *t* is provided with cam-slots *v* *w* *x*, as is best seen in Fig. 1. A pin *y* extends through cam-slot *v* and through a vertical slot *z* in the cam-cylinder *d*, and is connected with needle-depressing cam *m*. A pin *a'* extends through cam-slot *w* and through a vertical slot (not shown) in the cam-cylinder, and is connected with the vertically-movable slide *b'*, to which is attached the needle-raising cam *n*. A pin *c'* extends through cam-slot *x* and through vertical slots *d'* in the cam-cylinder and slide *b'* and is secured to the needle-raising cam *o*.

e' is a spring-latch attached at one end to the upper edge of the cam-cylinder and adapted at its other end to engage notches formed in the upper edge of the ring *t*, as is shown in Fig. 2, vertical lines numbered from 1 to 6, inclusive, being represented in the figure last mentioned as intersecting the said notches.

To explain the operation of my invention, let it be supposed that it is desired to knit a web suited to the production of a shaped long-leg stocking with a thickening-yarn knit in the front of the web at the knee-point and a like yarn knit into the rear of the web at the heel-point and that it is desired to have a ribbed top on such web. With this purpose the ring *t* will be moved in a direction contrary to that indicated by the arrow in Fig. 1 as far as the lengths of the slots in which the pins *y* *a'* *c'* operate will permit, which will bring said pins to the ends of the said slots, as is represented in Fig. 1, cause the latch *e'* to engage the notch in the ring *t*, intersected by line 1, and raise cam *m* and depress cams *n* *o*, as indicated in Fig. 8, the effect of which will be upon the revolution of the needle-cylinder to raise all of the needles, as shown in Fig. 3, so that a ribbed top may

be cast thereon. By moving the cam-ring *t* so that the latch will engage the notch intersected by the line 2 the cam-slots *v* *w* *x* will act upon the pins *y* *a'* *c'* in a way that will be understood by an inspection of the form of the said slots, so as to raise cams *n* *o* and depress cam *m*, bringing the said cams to the position represented in Fig. 9, the effect of which will be upon the revolution of the needle-cylinder to raise all of the needles to uniform height and high enough only to catch the regular yarn *s* and depress the same, so as to form a long stitch, as is shown in Fig. 4, thus knitting the portion of the web which is to extend above the knee. By moving the ring *t* in the same direction as before, so that the latch *e'* will engage the notch intersected by the line 3, the cam *o* will be raised to the position in which it is represented in Fig. 10, the other cams remaining in position, as before, so that upon the revolution of the needle-cylinder the needles *c*³, which are supposed to occupy the grooves in the needle-cylinder one-half way around the same, will be raised high enough to catch the yarn *r*, as well as the yarn *s*, and so knit both of the said yarns into the web as far as the said needles extend, the needles *c*² occupying the other half of the number of grooves in the needle-cylinder being raised by the cam *n* high enough only to catch the yarn *s*. In this operation the yarn *r* will float on the back of the fabric formed by the needles *c*², while it will be knit into the web formed by the needles *c*³, Fig. 5. By now moving the ring *t* so that the latch will engage the notch intersected by the line 4, the cam *o* will be depressed to the position shown in Fig. 9, and knitting may be performed as when the latch engaged the notch intersected by the line 2. By again moving the ring *t* so that the latch *e'* will engage the notch intersected by the line 5 cam *m* will be slightly raised, (see Fig. 11,) so as not to depress the needles to the extent that they were before drawn down, (see Fig. 6,) the effect of which will be to produce a web with a shorter or closer stitch than before. By again moving the ring *t* so that the latch will engage the notch intersected by the line 6 the needle-operating cams will remain in the position last described, excepting cam *n*, which will be raised to the position represented in Fig. 12, with the effect upon the revolution of the needle-cylinder of raising needles *c*² high enough to catch both yarns *r* and *s*, (see Fig. 5,) while needles *c*³ will be raised high enough only to catch the latter yarn, thus knitting the thickening-yarn into the tubular web on the side opposite to that in which it was knit when the latch was in the notch intersected by the line 3. The ring *t* may now be moved back, so that the latch *e'* will engage the notch intersected by the line 5, which will bring the needle-operating cams to the position shown in Fig. 11, and further knitting may be performed under this condition of the parts.

From the description thus given it will be seen that a tubular web suited to the manufacture of a stocking, as before explained, may be produced, the shorter stitches forming a web of less diameter than the longer, the web of greater diameter being designed for the upper-leg portion of the stocking and that of less diameter being suited to the ankle and foot portions and the thickening-yarn being knit in at the knee and heel points.

Changes may be made in the form and arrangement of parts of the contrivance without departing from the nature and spirit of the invention.

I claim—

1. In combination, the needle-cylinder and its needles, the latter comprising two opposing sets c^2 c^3 , means for guiding two yarns to the needles at different points, the cam-cylinder d , having an adjustable cam n for actuating the needles of the set c^2 to take one or both yarns at one operation, adjustable cam o for actuating the needles of the set c^3 to take one or both yarns at one operation, a cam for depressing the needles, and means for adjusting cams n and o , substantially as described.

2. In combination, the needle-cylinder and its needles, the latter comprising two opposing sets c^2 c^3 , means for guiding two yarns to the needles at different points, the cam-cylinder d , having an adjustable cam n for actuating the needles of the set c^2 to take one or both yarns at the same operation, adjustable cam o for actuating the needles of the set c^3

to take one or both of said yarns at the same operation, an adjustable cam m for depressing the needles, and means for adjusting said cams, substantially as described.

3. In combination, the needle-cylinder and needles, the latter comprising two sets, the shank of each needle being provided with two heels, the upper of which are all in the same plane, while the lower heels of the two sets are in two different planes, and a cam-cylinder provided with three cam-paths, a needle-depressing cam in the upper cam-path and a needle-raising cam in each of the other of said paths, substantially as described.

4. The combination, with the needle-cylinder and needles, the latter comprising two sets, the shank of each needle in each set being provided with two heels, the upper heels in each set being in the same plane and the lower heels of one set being at a lower plane than the lower heels of the other set, of a cam-cylinder provided with three cam-paths, an adjustable needle-depressing cam in the upper cam-path, and a needle-raising cam in each of the other cam-paths, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 5th day of March, A. D. 1890.

JAMES H. HINCHLIFFE.

Witnesses:

EDGAR F. REEVES,
JOHN W. ASHMAN.