

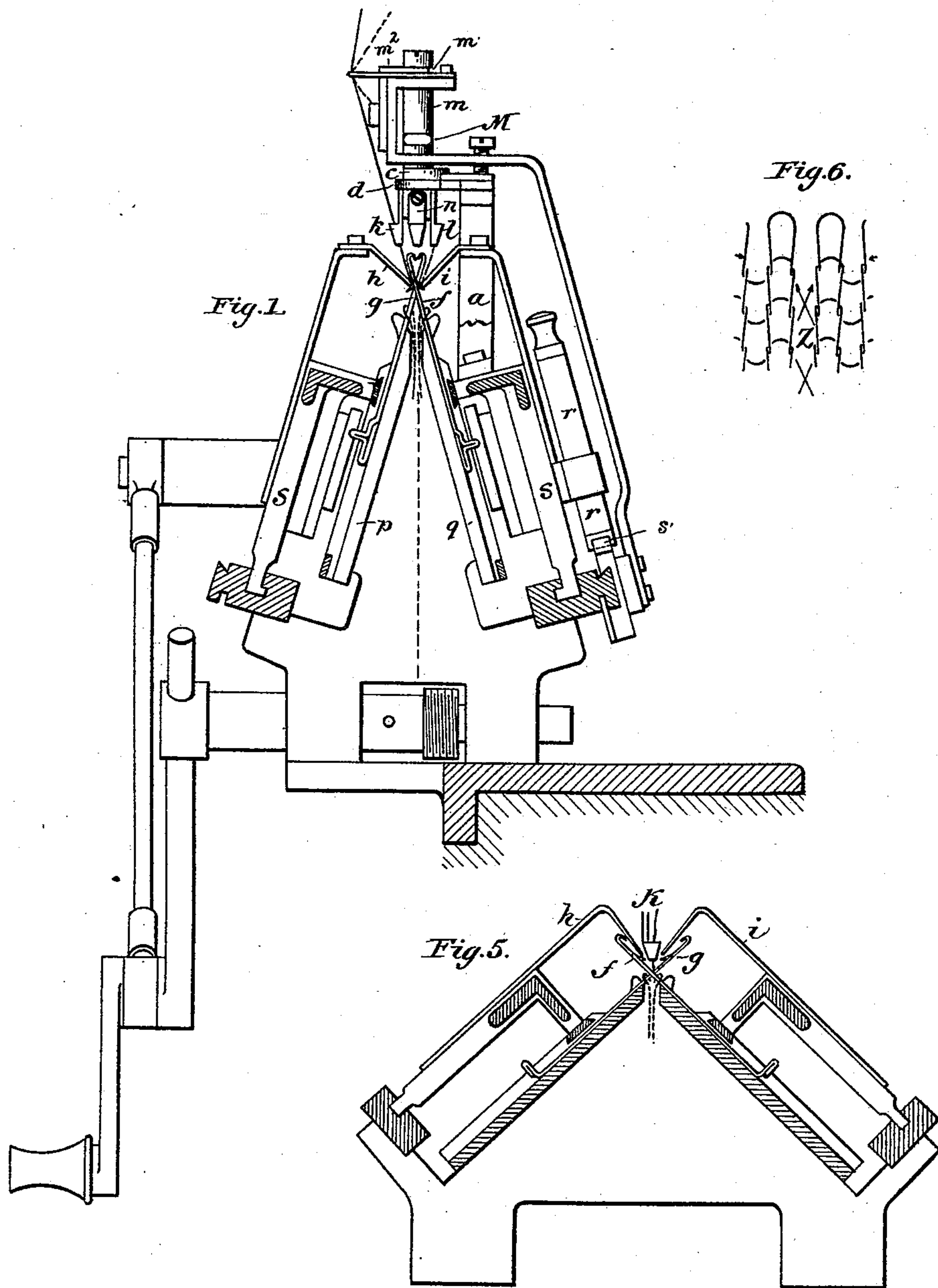
(No Model.)

3 Sheets—Sheet 1.

A. HEIDLER.  
STRAIGHT KNITTING MACHINE.

No. 471,696.

Patented Mar. 29, 1892.



Witnesses

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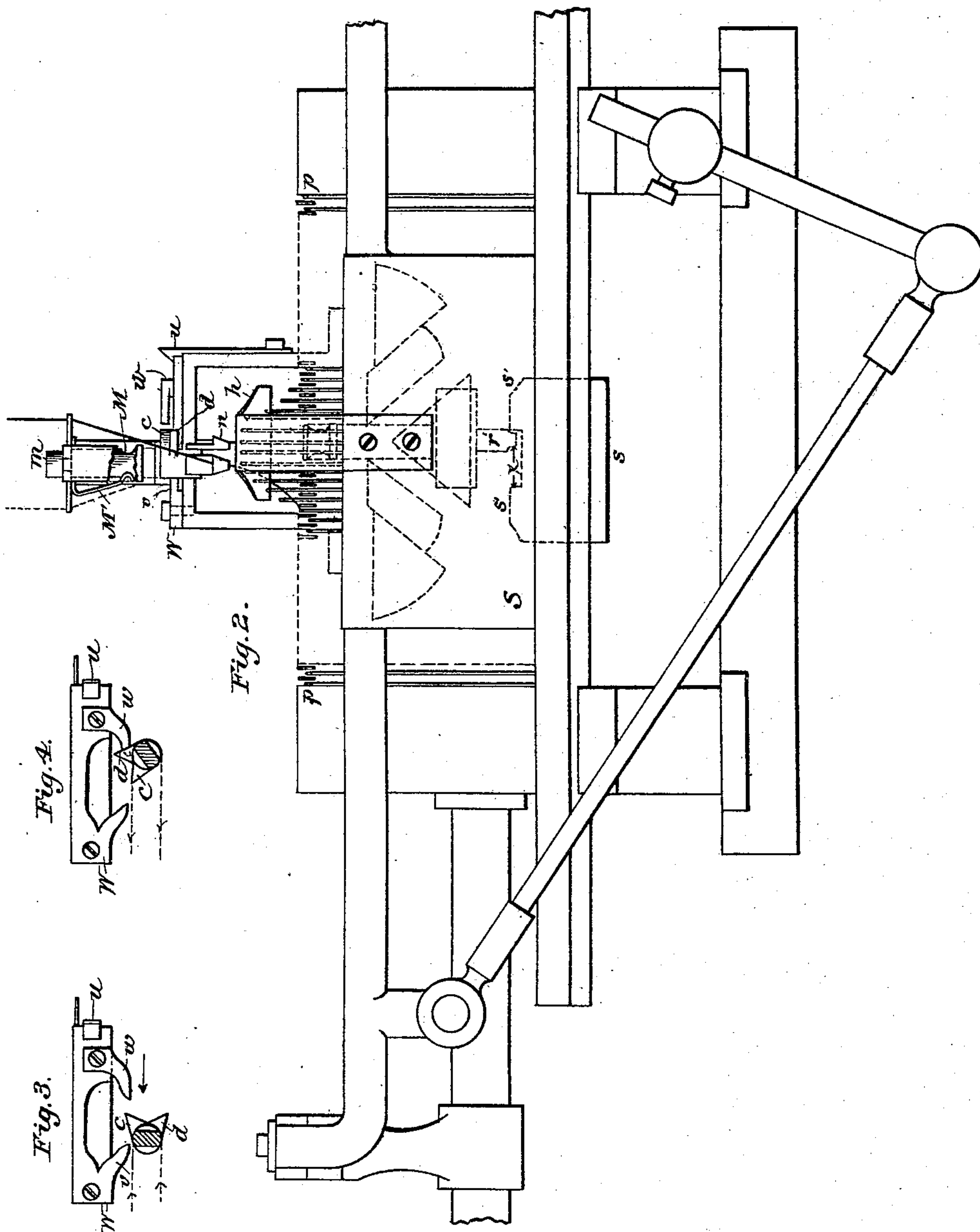
(No Model.)

3 Sheets—Sheet 2.

**A. HEIDLER.**  
**STRAIGHT KNITTING MACHINE.**

No. 471,696.

Patented Mar. 29, 1892.



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(No Model.)

3 Sheets—Sheet 3.

A. HEIDLER.  
STRAIGHT KNITTING MACHINE.

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Fig. 7.

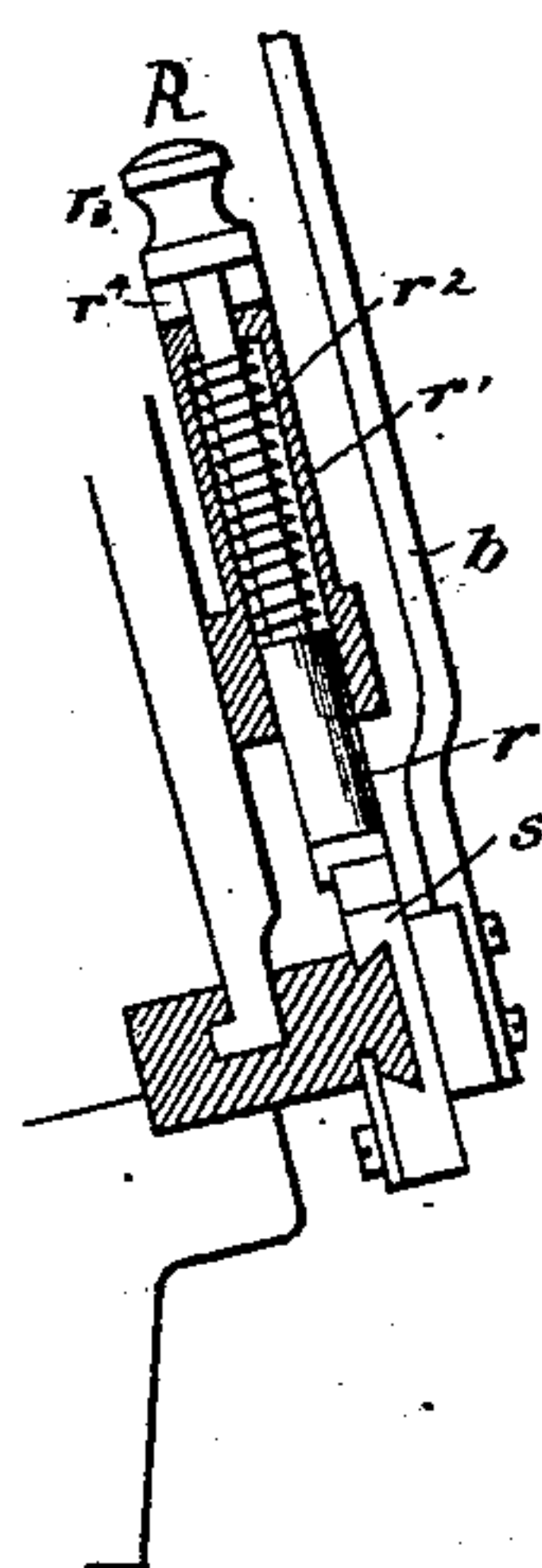


Fig. 8.

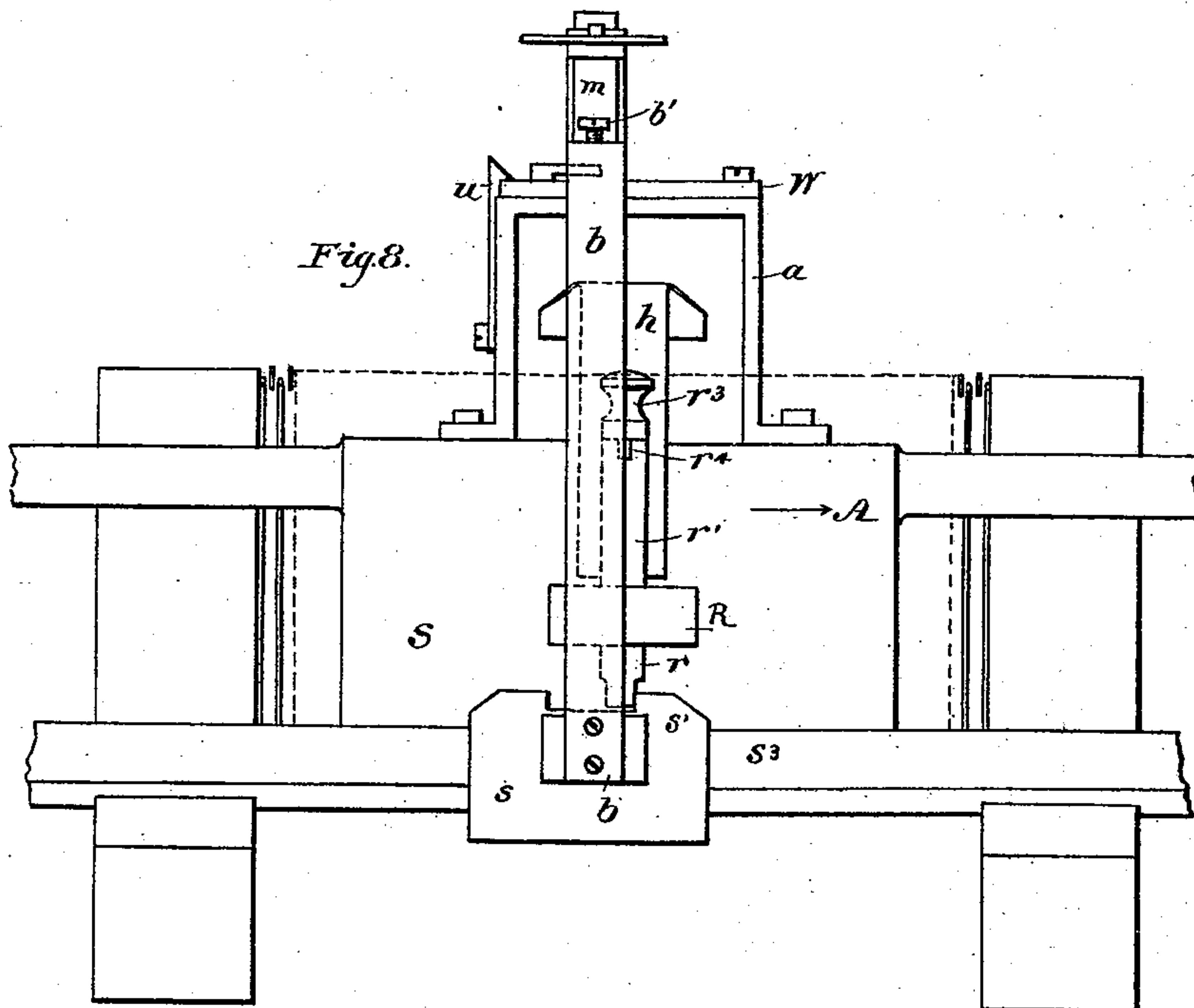


Fig. 9.

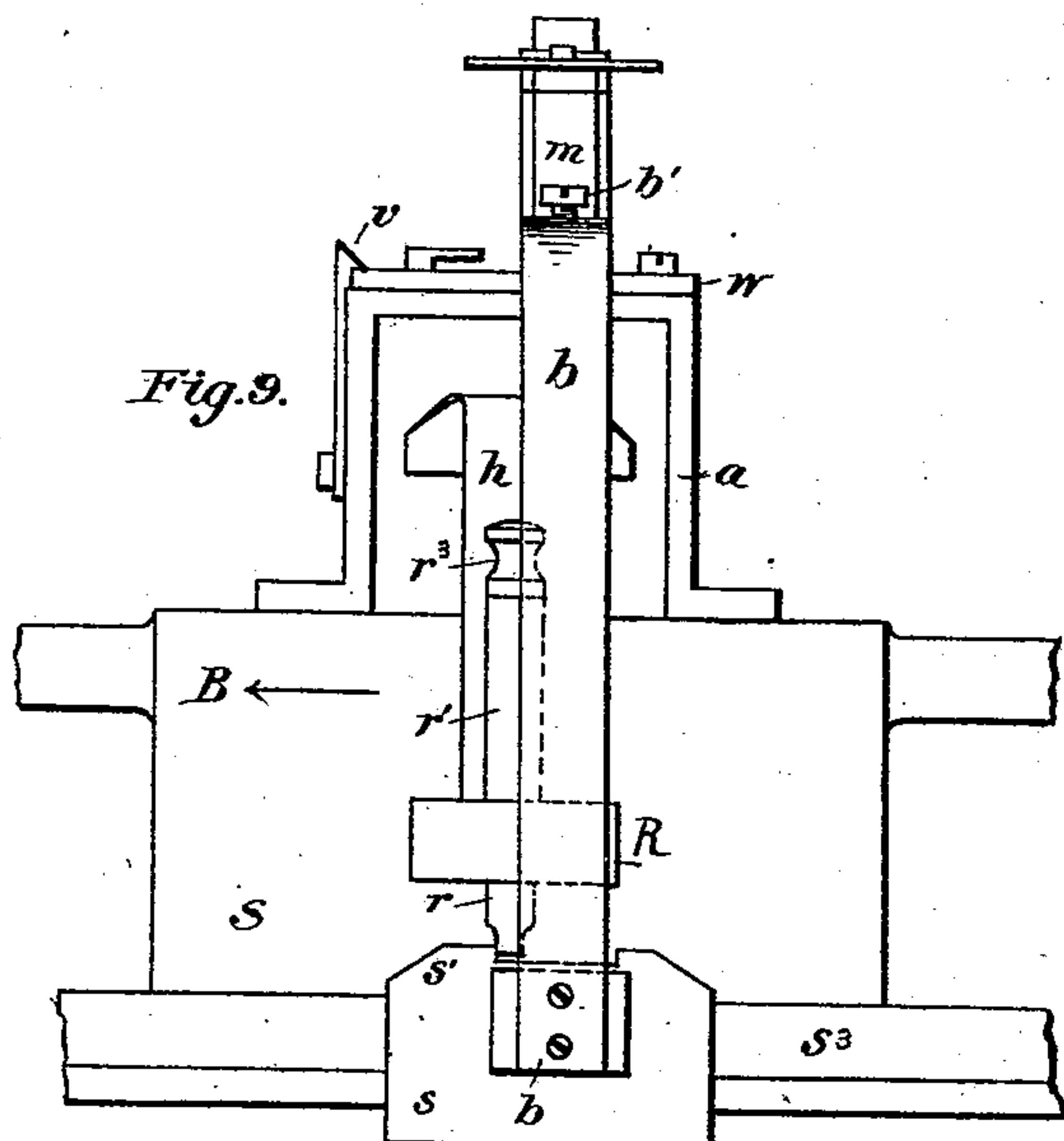
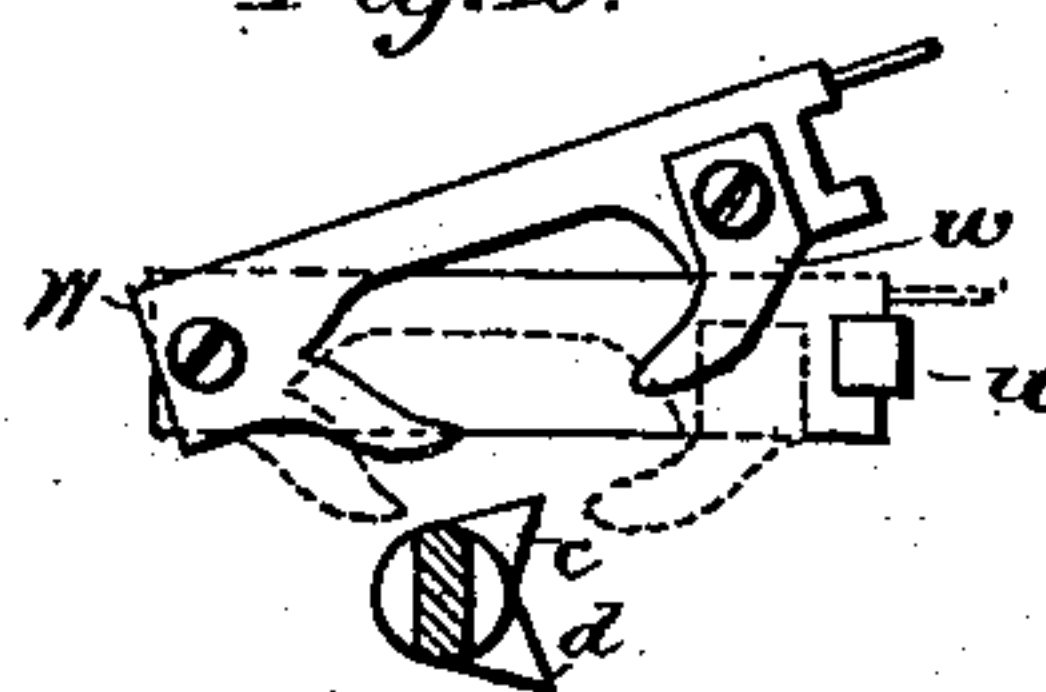


Fig. 10.



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# UNITED STATES PATENT OFFICE.

ADOLF HEIDLER, OF SIEGMAR, GERMANY.

## STRAIGHT-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 471,696, dated March 29, 1892.

Application filed April 2, 1890. Serial No. 346,360. (No model.) Patented in Germany May 23, 1889, No. 51,322; in Switzerland January 20, 1890, No. 1,812; in France January 23, 1890, No. 203,317; in England February 12, 1890, No. 2,254; in Sweden March 18, 1890, No. 2,547; in Italy March 31, 1890, No. 27,955, and in Austria-Hungary May 18, 1890, No. 8,237.

*To all whom it may concern:*

Be it known that I, ADOLF HEIDLER, a subject of the King of Saxony, residing at Siegmars, Saxony, Germany, have invented new and useful Improvements in Straight-Knitting Machines, (patented in Germany May 23, 1889, No. 51,322; in Austria-Hungary May 18, 1890, No. 8,237; in Switzerland January 20, 1890, No. 1,812; in Sweden March 18, 1890, No. 2,547; in Italy March 31, 1890, No. 27,955; in England February 12, 1890, No. 2,254, and in France January 23, 1890, No. 203,317,) of which the following is a full, clear, and exact description.

By the simultaneous operation of the two rows of needles in the Lamb knitting-machine (see Fig. 5) the yarn delivered to the yarn-guide will be divided between the needles, the loops will slide off to both sides of the fabric, and consequently one mesh will be made to the right and the next following to the left, and a straight-ribbed article will be obtained. If a smooth tubular fabric is to be made, the rows of needles must operate alternately. Then one row of needles will first form the loops of one half or side of the tube and the loops of the other half or side will be subsequently formed by the other row of needles.

The purpose of my invention is to operate the two rows of needles simultaneously while making tubular fabrics, thus saving half the time hitherto required for this purpose.

In the accompanying drawings, Figure 1 represents a transverse vertical section of a knitting-machine embodying my improvements, parts being shown in elevation and Fig. 2, a side elevation of the same. Figs. 3 and 4 represent plan views of a plate and catches and a sectional view of a bolt with cams, hereinafter more fully described. Fig. 5 represents a transverse vertical section of a Lamb knitting-machine in which the needle-beds are at a different angle to each other than in my invention. Fig. 6 represents the joining-stitches in a tubular fabric made upon a machine having my invention applied thereto. Fig. 7 shows part of the cross-section of the machine; and Figs. 8 and 9 are rear views showing the two positions of the support *b*,

which bears the thread-guides. Fig. 10 shows the plate *W* thrown back.

To achieve the purpose of my invention as above set forth, I arrange the details of the knitting-machine as follows:

The two needle-beds *p* and *q* (see Fig. 1) are inclined in such a manner that although the two needles *f* and *g* cross each other this is effected higher above the needle-bed than in the ordinary knitting-machine. (See Fig. 5.) The two yarn-guides *k* and *l* are arranged above the needles *f* and *g*. The guide *k* delivers the yarn to the needles *g*, and the guide *l* feeds the needles *f*. At every movement of the carriage in one direction or the other each of the rows will consequently form a flat web or sheet of fabric, and in order to connect these at their edges for the purpose of obtaining a tubular fabric the two yarn-guides alternate their position or change sides at the ends of the strokes of the carriage. To attain this result, the two guides *k* and *l*, Fig. 1, are screwed to a short bolt *m*, rotating in the support *b*. The bolt *m* is provided at its upper end with an annular groove *m'*, so that the bolt is kept in position by the sheet-iron strip *m<sup>2</sup>*, inserted in said groove and screwed to the support. The bolt *m* is further provided slightly above the guides *k* and *l* with two superposed cams *c* and *d*, Figs. 2, 3, and 4. Behind the guide *l*, Fig. 1, is arranged a plate *W*, which is visible in Figs. 2, 3, and 4, attached to a frame *a*, which is fastened to the rear part of the carriage *S*. This plate is provided with two projecting catches *v* and *w*, the catch *w* being disposed in position to engage with the cam *c* and the catch *v* in position to engage with the cam *d*.

During the movement of the carriage the yarn-guide runs, as usual, a little behind the center of the latch-plates, Fig. 2 showing the guides somewhat to the left. At the beginning of the back-stroke of the carriage *S* these guides will consequently stand still and the carriage travels alone a part of the stroke, carrying the center of the latch-plate to the left of the yarn-guide. For this purpose the carrier *R* has free play (indicated by *x*) between the projections *s'* of the stop-piece *s*. On the stroke to the left side as the



carriage moves and the guides stand still the catch *w* abuts against the cam *c*, Fig. 3, of the bolt *m* and rotates *c* and *d* to the left side of the bolt into the position shown in Fig. 4, the thread-guides *k* and *l* moving with them. The catch *w* does not impart any further motion to these parts, for in the meantime the space *x* is passed by the carrier *R*, so that now the yarn-guides are moved along. In order to obtain, however, a rotation of one hundred and eighty degrees of the bolt *m* and the guides *k* and *l*, I have arranged in the bolt the flat slots *M*, Figs. 1 and 2, against which a spring *M'*, Fig. 2, pushes hard enough to complete the half-revolution of the bolt *m*. At the opposite stroke of the carriage the catch *v* will act upon the cam *d*. In consequence of the rotation of the guides I obtain at each end of the machine a crossing of the threads *z*, Fig. 6, which, however, cannot be seen in close fabrics.

The carrier *R* consists of a pin *r* with head *r*<sup>3</sup>, which can be moved up and down in sleeve *r*<sup>1</sup>. Around the reduced part of the pin *r* a spring *r*<sup>2</sup> is wound, which drives the pin downward. If the carriage *S* is to be moved when in use without having the thread-guides take part in the movement, the pin *r* is lifted upward by head *r*<sup>3</sup> until it has gone above projections *s'*, Fig. 8. The sleeve of the carrier is fastened to carriage *S*, and consequently the carrier *r* gives motion to the base or stop-piece *s* of the thread-guides whenever the carriage *S* is moved, said base being fitted and adapted to slide on a suitable bar *S*<sup>3</sup> of the main frame. If the carriage *S* is moved in the direction of the arrow *A*, Fig. 8, the carrier lies against the right projection *s'*. If the carriage is, however, moved in the direction of the arrow *B*, Fig. 9, the carrier encounters the left projection. When the movement of the carriage is changed, stop-piece *s*, together with the holder *b*, stands still, and the frame *a* passes the holder *b*, and during this time the turning of the thread-guides held by the holder *b* takes place.

If the thread-guides are not to be turned, plate *W* is laid back, whereby it comes into the position in Fig. 10. The spring *u* holds the plate *W* in its working position, (dotted lines.)

The two yarn-guides, which make a half-revolution at the end of their stroke, are at such a distance from each other that the threads cannot fall directly into the needle-hooks; but in Fig. 1 the thread of guide *k* passes behind the needles *f* and the thread of guide *l* behind the needles *g*. As the thread runs always in a straight line from the guide to the last-formed loops, as shown in dotted lines in Fig. 1, the latches of the needles could not possibly catch the thread, even if I did not use for the guiding of the thread the broad latch-plates *h* and *i*, Figs. 1 and 2, which prevent the needle-catches from flying back.

The passing of the thread behind the nee-

dles, Fig. 1, and the guiding of the thread by the latch-plates would, however, be impossible if these were arranged as in the known knitting-machines. I have arranged each latch-plate so that it acts, as shown in Fig. 1, on the latches of the row of needles situated at the same side of the machine, and this arrangement makes it possible to feed the thread behind the needles.

If it is desired to make ribbed instead of flat webs, the plate *W*, Figs. 2, 3, and 4, which is kept in position by the spring *u*, is pushed back. The thread is pulled into the guide *n* and is now acted upon by both rows of needles.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a knitting-machine for making tubular fabrics, the combination of two rows of needles, a carriage and suitable operating mechanism therefor, a double thread-guide pivotally mounted in a longitudinally-movable support, a projection on the carriage for engaging and reciprocating said support, and catches on the carriage, by which said guide is engaged and rotated, substantially as set forth.

2. In a knitting-machine for making double-threaded tubular fabrics, the combination of two rows of needles, guides movable crosswise to said rows for delivering the threads, respectively, thereto, a carriage, and means, comprising a rotary support for said guides, having cams *c* *d*, and catches *w* *v* on the carriage and situated, respectively, in line with said cams, for moving the guides lengthwise of the rows of needles and interchanging them to cross the threads and to deliver the latter alternately to said rows, substantially as set forth.

3. In a knitting-machine for making double-threaded tubular fabrics, the combination of two rows of needles, the main carriage *S*, a double guide for delivering the threads, respectively, to said rows, and a carriage for said guide, separate from the main carriage and having projections *s'*, which are engaged by a portion of the main carriage, the main carriage having catches which rotate the guide to cross the threads to deliver them alternately to said rows, substantially as set forth.

4. The combination of the needles *g* *f*, beds *p* *q*, a reciprocating needle-operating carriage *S*, a holder formed of the parts *b* *s'*, a rotary bolt *m*, mounted thereon and having faces or slots *M*, a spring *M'*, guides *k* *l* on said bolt, and projections and catches for rotating the same, and pin *r*, substantially as set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ADOLF HEIDLER.

Witnesses:

H. DE SOTO,  
F. B. TUTTLE.