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E. C. COVELL & E. S. CRAM.

KNITTING MACHINE.

No. 365,244. Patented June 21, 1887.

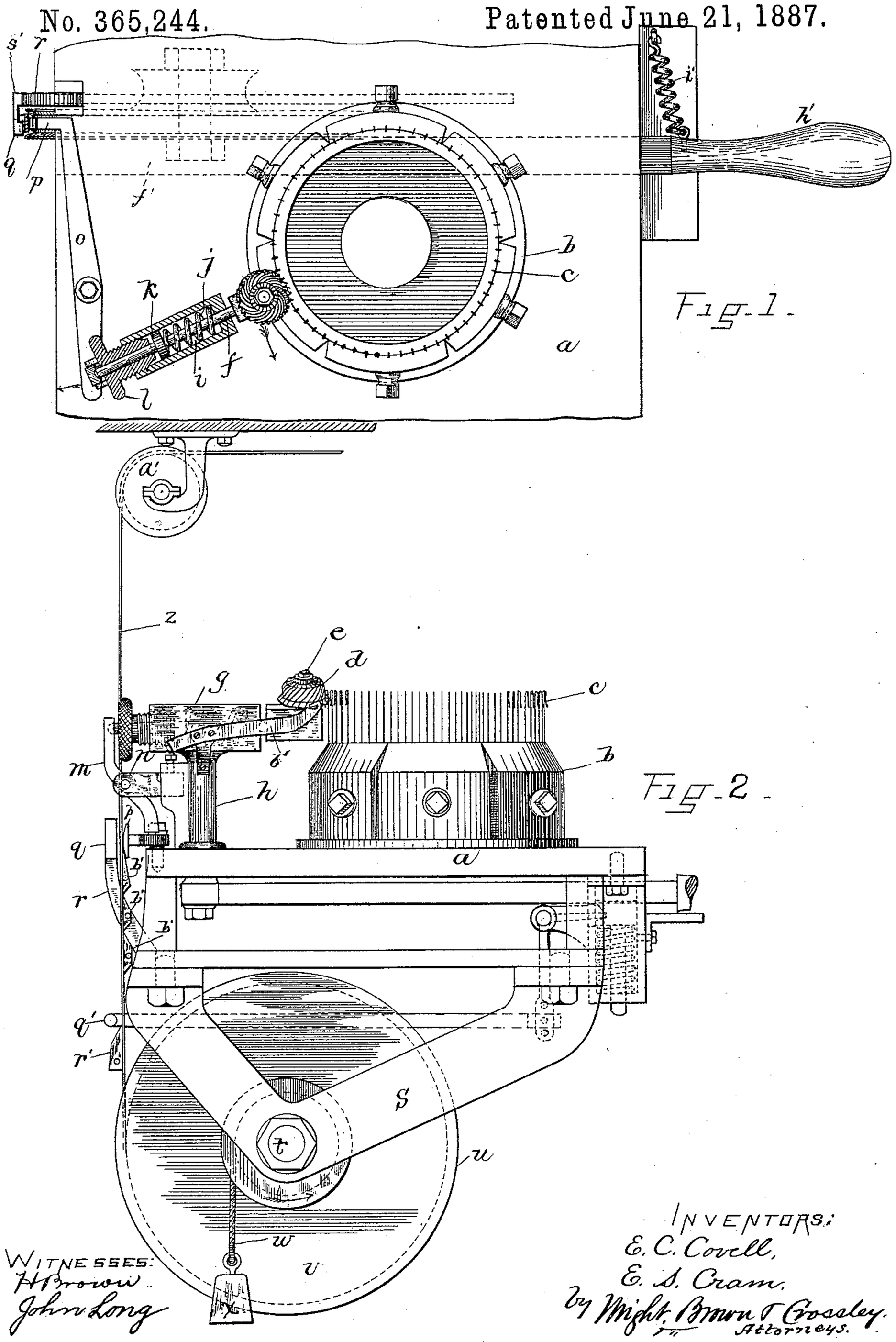

Fig. 1.

Fig. 2.

WITNESSES:
H. Brown
John Long

INVENTORS:
E. C. Covell,
E. S. Cram,
by Wright, Brown & Crosley,
Attorneys.

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Fig. 4.

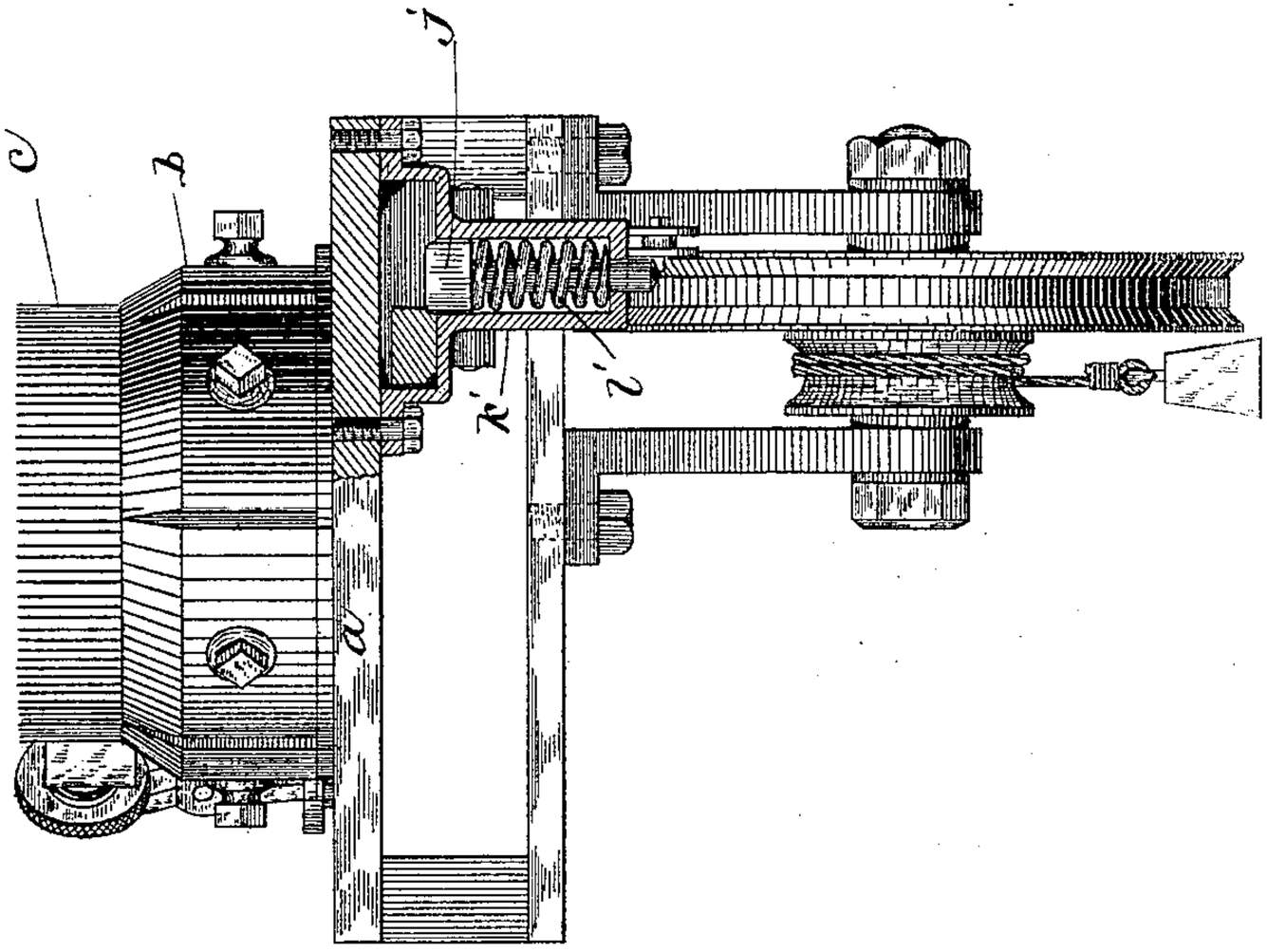
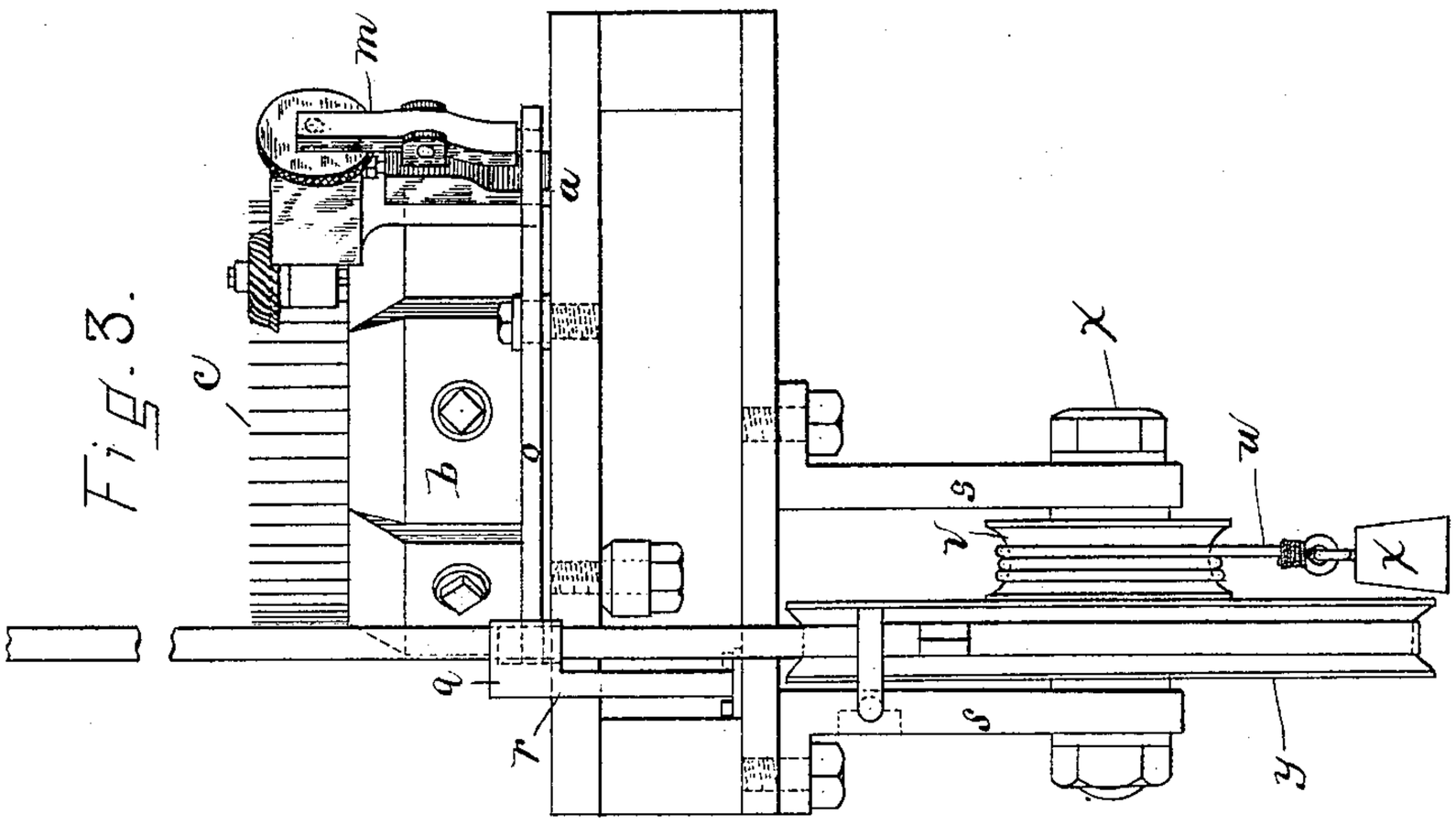


Fig. 3.



WITNESSES:
H. Brown.
John Long.

INVENTORS:
E. C. Covell.
E. S. Cram.
by Wright Brown & Crossley.
Attorneys.

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E. C. COVELL & E. S. CRAM.

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Fig. 6.

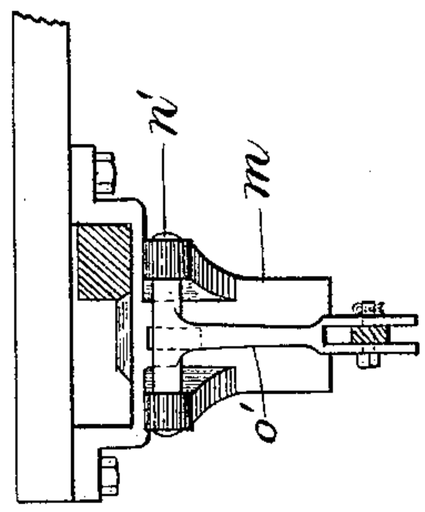


Fig. 8.

Fig. 7.

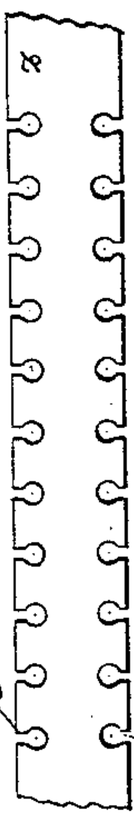
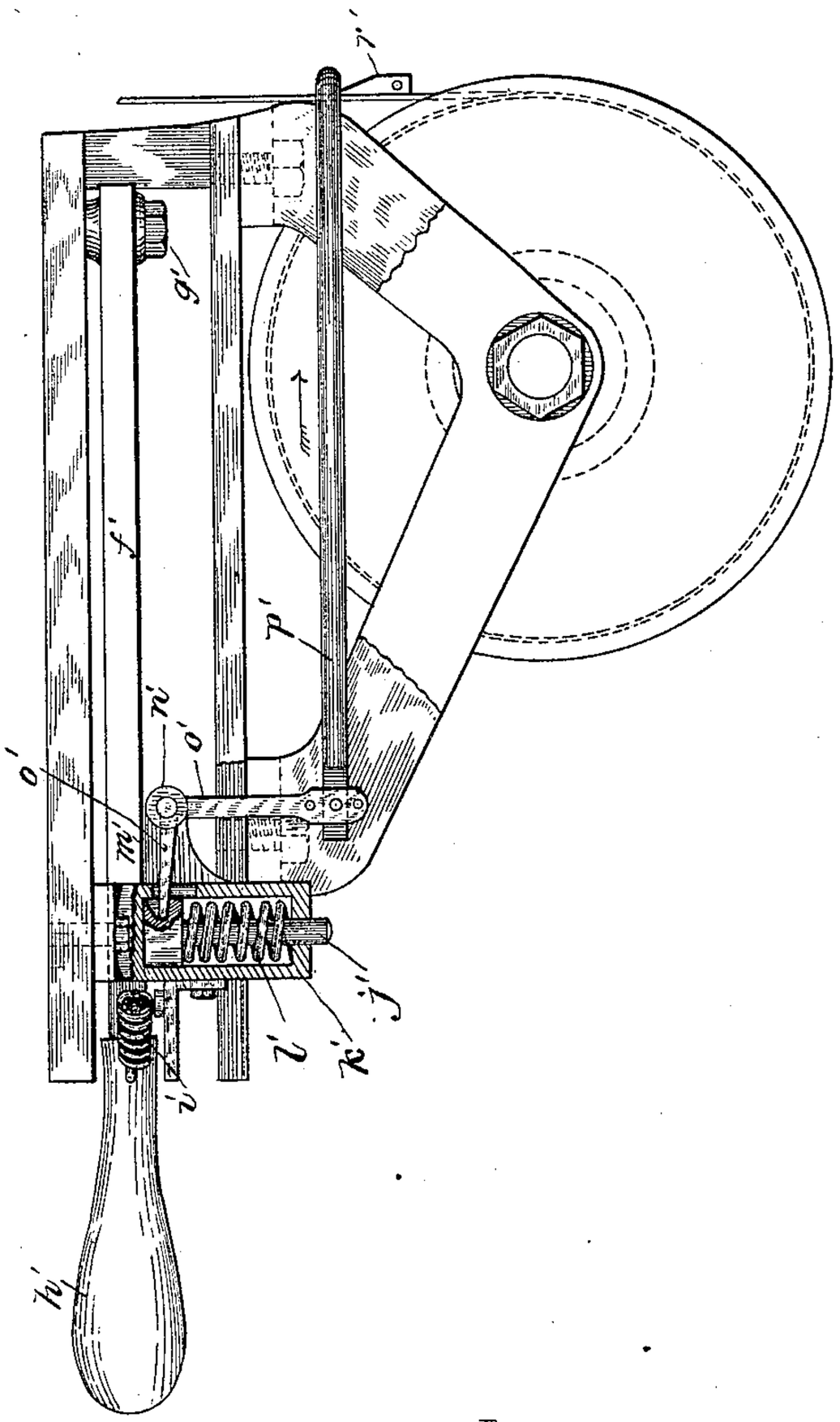


Fig. 5.



WITNESSES:
Horace Brown.
John Long.

INVENTOR:
E. C. Covell.
E. S. Cram.
by Wight, Brown & Crossley.
Attorneys.

UNITED STATES PATENT OFFICE.

EDGAR C. COVELL AND ELISHA S. CRAM, OF LACONIA, NEW HAMPSHIRE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 365,244, dated June 21, 1887.

Application filed August 16, 1886. Serial No. 211,001. (No model.)

To all whom it may concern:

Be it known that we, EDGAR C. COVELL and ELISHA S. CRAM, of Laconia, in the county of Belknap and State of New Hampshire, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a specification.

Our invention relates to knitting-machines, and more particularly to machines of the circular type employing barbed or spring-beard needles fixed in a rotary cylinder and designed to produce, by the aid of stitch or loop, landing, and knocking-over wheels and their necessary co-operating parts or devices, a tubular web calculated to be made up into stockings and kindred articles of apparel.

It is the object of our invention to produce devices whereby the position of the stitch or loop wheel which operates to take the yarn from the yarn-guide and deliver a sufficient quantity thereof to and under the heads of the needles to form loops for the fabric may be automatically controlled to regulate the length or size of the loops stitch by stitch and course by course, and consequently the size or diameter of the tube.

It is also the object of the invention to provide devices connected with those above mentioned whereby the knitting operations of the machine may be stopped at any predetermined period.

It is also the object of our invention to incidentally improve the machine in other respects than those mentioned.

To the foregoing ends our invention consists in the improvements which we will now proceed to describe, so that others skilled in the art may be able to make and use the same, reference being made to the accompanying drawings, forming a part of this specification, and the invention being pointed out and distinctly claimed at the end of the description of the manner of constructing and using it.

Of the drawings, Figure 1 represents a top plan view, parts being shown in section, of a machine embodying our invention. Fig. 2 represents a side view of the same, parts being shown as broken away. Fig. 3 represents in outline a rear view of the invention. Fig. 4 represents a view similar to the last mentioned, partially in section. Fig. 5 represents a side view opposite to that shown in Fig. 2, partly in section, of the shipping-lever, the parts for operating the same, and its immediately-associated devices. Fig. 6 represents a rear detail view, partially in section, of certain devices shown in Fig. 5. Figs. 7 and 8 represent detail views of portions of the pattern belt, straps, or similar contrivance, hereinafter referred to.

Like letters of reference indicate like parts in all of the figures.

In the drawings, *a* represents the bed of the machine; *b*, the needle-cylinder; *b'*, the yarn-guide, and *c* the barb or spring-beard needles of a circular-knitting machine adapted to be equipped with all of the appliances necessary to produce a tubular web in a manner well understood by all knitting artisans. A machine of this character is shown and described in the patent to John Bradley, No. 244,736, July 26, 1881, and reference may be had thereto. The parts having no connection with or relationship to our invention are, for the sake of clearness, neither represented in the drawings nor described in the specification proper.

d indicates the stitch or loop wheel, of common form and construction and designed to perform the usual functions of such devices, as described in the patent referred to. Said stitch or loop wheel is mounted and adapted to turn on a stud, *e*, secured to the inner end of a rod, *f*, supported in the usual star-box, *g*, which latter is supported by a stud or pillar, *h*, secured to the bed of the machine, as most clearly represented in Fig. 2.

The star-box *g* is chambered out, as shown at *i*, Fig. 2, and a spiral spring, *j*, surrounding the rod *f*, is placed therein, with one end bearing against the inner end of chamber *i* and the other against a collar, *k*, rigidly secured to rod *f* within the said chamber, said spring operating with a tendency to push rod *f* and stitch-wheel *d* outward, or in a direction away from the needles. A plug, *l*, formed as a thumb-screw, is adapted to be screwed into the outer end of the chamber *i*, formed in the star-box, so as to make its inner end bear against collar *k*, the outer end of rod *f* extending longitudinally through plug *l* and a short distance beyond its outer end, as best represented in Fig. 1.

m represents a short lever pivoted to a

bracket, *n*, secured to any convenient point of the bed or frame. The upper end of said lever *m* bears against the outer end of rod *f*, while its lower end is loosely connected with one end of a lever, *o*, pivoted on the bed or on a bracket secured to the bed of the machine, the opposite end of which lever has a part, *p*, constructed substantially at right angles to its main portion or body and extending rearwardly toward the outer end of the angular part *q* of bracket *r*, secured to the frame or bed, as shown in Figs. 1, 2, and 3 of the drawings.

s s represent hangers or brackets secured to the bed or frame on a stud or short shaft, *t*, journaled in which is a double pulley, *u*, on one rim portion, *v*, of which a cord or similar device, *w*, is adapted to be wound, having a weight, *x*, secured to the free end thereof in such manner that the weight will have a tendency to unwind the cord and turn the pulley in the direction of the arrow marked on Fig. 2.

y indicates the other part of the double pulley, around the periphery of which a band, strap, chain, or similar contrivance is wound, the free end of which extends upward between the end of the angular part of lever *o* and the angular part *q* of bracket *r*, over a pulley, *a'*, arranged to turn in brackets applied to the ceiling, to the cord or similar contrivance connected with the work-pulling-up devices common in this class of machines, and such, for example, as is shown in the patent to R. M. Appleton, No. 256,533, April 18, 1884.

The band *z* is provided at suitable intervals on that side or face toward the needle-cylinder with lugs *b'*, adapted to come in contact with the end of angular part of lever *o* and rock the same on its pivot or fulcrum, as will be understood by reference to Figs. 1, 2, and 3. Said lugs or swells *b'* may be constructed as shown in Fig. 8, which represents one of said lugs or swells in cross-section, and as provided with a screw, *c'*, the shank of which is adapted to be slipped into one of the holes *d'* of strap *z* through slot *e'*, opening to the edge or to the center of the strap, (see Fig. 7,) by which screw said lugs or swells may be secured to the strap in a way that will be at once understood. Said lugs or swells are so formed and arranged on the strap or belt *z* as that when the latter is drawn upward and between the end *p* of lever *o* and the upper end, *q*, of bracket *r* the highest face of the swell will not have left the part *p* before the highest face of the next succeeding swell will have passed therebetween, so that the position of the stitch or loop wheel may be retained undisturbed in a single position while said swells are passing between the parts *p* and *q*. It is also to be explained that the swells *b'* are arranged along the belt or straps *z* near the edge thereof, for a purpose to be presently explained.

In the operation of the machine as thus far described, the parts being so adjusted that when the loop or stitch wheel is set to form loops of ordinarily long length, the collar *k* will not rest quite against the inner end of screw-plug *l*, Fig. 1, and the swells on pattern-strap *z* passing between the parts *p* and *q* as the descending weight of the work-pulling-up devices (not shown) draws strap *z* upward the knitting will proceed with stitches of uniform length—as for the calf portion of the leg of a stocking—until the point is reached where it is desired to form a tube of smaller dimensions—as for the ankle and foot portions of the stocking, or the narrower parts of shirt-sleeves, the legs of drawers, &c.—when the swells or lugs *b'* on pattern-strap *z* will pass from between the angular part *p* of lever *o* and the upper end, *q*, of bracket *r*, permitting spring *j* to push rod *f* and its attached stitch or loop wheel in a direction away from the needles, shortening the stitches or length of the loops stitch by stitch and course by course in a way that will be readily understood by knitting artisans. It is essential to our mode that this narrowing or shortening of the loops should be gradually effected—that is, stitch by stitch and course by course, as described.

Plug *l* is so set in star-box *g* as not to permit stitch-wheel *d* to be drawn so far back as to make the loops or stitches so short that they will be broken by the other fabric-forming devices. But three lugs or swells *b'* are shown in Fig. 2, the upper one of which is represented as just about to enter between the parts *p* and *q*, though to hold the stitch-wheel in the position in which it is represented in Fig. 1 it is necessary that a lug or swell should be between said parts *p* and *q*, and though the face of the last or lowest swell is shown to be as high as those preceding it, it is preferred to construct the lowest lugs on the straps of gradually diminishing thickness or height, so as to have the narrowing performed in a like gradual manner.

When a tube of any predetermined length has been knit, the pattern-belt *z* is rewound upon the part *y* of the pulley *n* by the operation of weight *x* and cord *w*, the construction of swells *b'* as separate parts permitting this to be done.

As hereinbefore stated, another feature of our invention has relation to means connected with the pattern-belt *z*, whereby the operation of the machine may be stopped at any predetermined point in the knitting process. This part of the invention we will now proceed to explain.

f' represents an ordinary shipping-lever, pivoted at *g'* to the bed and extending underneath the same to the front thereof, where it is provided with a handle, *h'*, for operating the same, as usual. Said shipper-lever may be presumed to be connected with the hub of the bevel-wheel splined on the driving-shaft, which meshes with the bevel-gear formed on or connected with the needle-cylinder for rotating the same, so that as said lever is moved in one direction said bevel-gear may be moved into operative connection with the gear on

the needle-cylinder, and when moved in the opposite direction said gears will be disconnected and the needle-cylinder rendered inoperative, all as is common in knitting-machines of this class.

i' represents a spring, one end of which is secured to the bed or stationary part of the frame and the other to the shipping-lever, said spring operating with a tendency to move the lever so as to stop the operation of the machine.

j' represents a pin arranged in a bracket, *k'*, secured to the bed of the machine, said pin being pressed and held up, as represented in Fig. 4, by a spring, *l'*, one end of which bears upon the bracket *k'* and the other upon the head of the pin, as shown. Said pin is constructed and arranged to hold the shipper-lever in operative position when moved to that position, as shown, but is adapted to be moved down against the pressure of spring *l'* and permit the spring *i'* to move the shipper-lever to its inoperative position.

m' represents a yoke or bracket connected with the bracket *k'*, or secured to the bed of the machine, in which is journaled a rock-shaft, *n'*, to which are secured the arms *o'*, said shaft and arms forming a bell-crank lever, one end of which elbow-lever is loosely connected with pin *j'*, and the other is pivoted to a rod, *p'*, extending rearwardly and slightly beyond the rear edge of the bed of the machine, where it is bent at right angles, so as to embrace with its right-angular part *q'* the pattern-band *z*, as shown in Figs. 2, 3, and 5. Pattern-belt *z* is provided on its face opposite that to which the lugs or swells *b'* are secured thereto with swells or lugs *r'*, secured near the edge of said belt opposite that at which said swells *b'* are attached to it.

It is to be noticed that the inner end and side of the angular part *q* of bracket *r* is cut away, as at *s'*, Fig. 1, so as to permit swell *r'* to pass the part *q* without obstruction.

The operation of this feature of our invention will now be understood. The machine having been set in motion and the shipper-lever locked in operative position, knitting is proceeded with until a desired length of fabric is produced, at which point a swell or lug, *r'*, is arranged on the pattern-belt *z* to come in contact with the right-angular part *q'* of the rod *p'*, moving said rod rearwardly, as indicated by the arrow in Fig. 5, operating elbow-lever *o'*, so as to depress pin *j'* and permit spring *i'* to move the shipper-lever to its inoperative position and stop the machine.

It is obvious that instead of constructing and arranging the parts so as to move the loop or stitch wheel in the manner described, star-box *g* might be pivoted on post *h* and the lugs or swells made to operate on the screw-plug *l*, or the outer end of rod *f'*, so as to move the stitch or loop wheel in the direction of the arrow in Fig. 1, which would be in a direction away from the needles, whereby the same result of shortening the length of the stitches would be accomplished. It is also obvious that other changes in the form and arrangement of the devices comprising our invention might be made without departing from its nature or spirit.

We are aware that provision is made in machines of the class referred to for adjusting the position of the stitch or loop wheel with reference to the needles by hand, and hence do not broadly claim a mode of effecting such adjustment irrespective of its nature or effect. Our method differs from that referred to in that the position of the stitch-wheel with reference to the needles is regularly varied stitch by stitch and course by course to effect the widening and narrowing of the web. This is an essential and inseparable feature of our invention, and has, so far as our knowledge extends, not been accomplished or attempted previous to our invention, and, besides this, would be practically impossible with the means referred to.

We are also aware that a web has been narrowed by varying the length of the loops in each course by varying the tension on the yarn, as described in United States Patent No. 200,225, February 12, 1878; but our method differs from this in that we do not vary the tension on the yarn, but with a uniform tension vary the length of the loops stitch by stitch and course by course by a regular and gradual variation of the position of the loop-wheel relatively to the needles.

We are further aware that a stocking has been produced in which the stitches are shortened for the ankle and lengthened for the heel and instep, and in which one or more threads are added to the yarn at the parts where the stitches are lengthened to maintain the thickness of the stocking, as shown and described in the patent to Woodward, No. 106,017, August 2, 1870. In this case, however, there is no variation of the loops stitch by stitch and course by course, and there are other differences not necessary to recount herein.

Having thus described our invention, what we claim is—

1. The needle-cylinder and needles, the yarn-guide, the stitch or loop wheel constructed to take the yarn from the yarn-guide and feed it under the beards of the needles, a support for said loop or stitch wheel, a pattern device, and a system of levers intermediate of said stitch-wheel support and pattern device, the latter being adapted to operate on the levers to gradually and regularly control the position of the stitch-wheel with respect to the needles, stitch by stitch and course by course, to lengthen or shorten the stitches, the whole combined, arranged, and operating substantially as and for the purposes hereinbefore set forth.

2. The needle-cylinder, needles, and yarn-guide, the star-box, a rod longitudinally movable in said star-box, the stitch-wheel constructed to take the yarn from the yarn-guide

and feed it under the beards of the needles, said stitch-wheel being supported by said rod, a pattern device, and a system of levers intermediate of said longitudinally-movable rod and pattern device, the latter being adapted to operate on the levers to move said rod to gradually and regularly control the position of the stitch-wheel with respect to the needles, stitch by stitch and course by course, to lengthen or shorten the stitches, the whole combined and operating substantially as and for the purposes hereinbefore set forth.

3. The shipping-lever and spring-pressed pin for locking it in operative position, and a spring for moving it into inoperative position, in combination with the pattern belt or band, a rod, p', rock-shaft n', and arms o' intermediate of said spring-pressed pin and pattern-belt, the latter being adapted to operate on the rod, and through it on arms o', to depress said spring-pressed pin to permit the shipping-lever to be moved into inoperative position, as set forth.

4. The art of knitting a tubular fabric of varying diameter on a circular spring-needle knitting-machine, which consists in gradually and regularly varying the position of the stitch or loop wheel with respect to the needles, stitch by stitch and course by course, as the knitting progresses, to vary the length of the stitches, and consequently the diameter of the tube, as set forth.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 30th day of July, A. D. 1886.

EDGAR C. COVELL.
ELISHA S. CRAM.

Witnesses:
JAMES JUDKINS,
F. GEO. H. OSGOOD.