

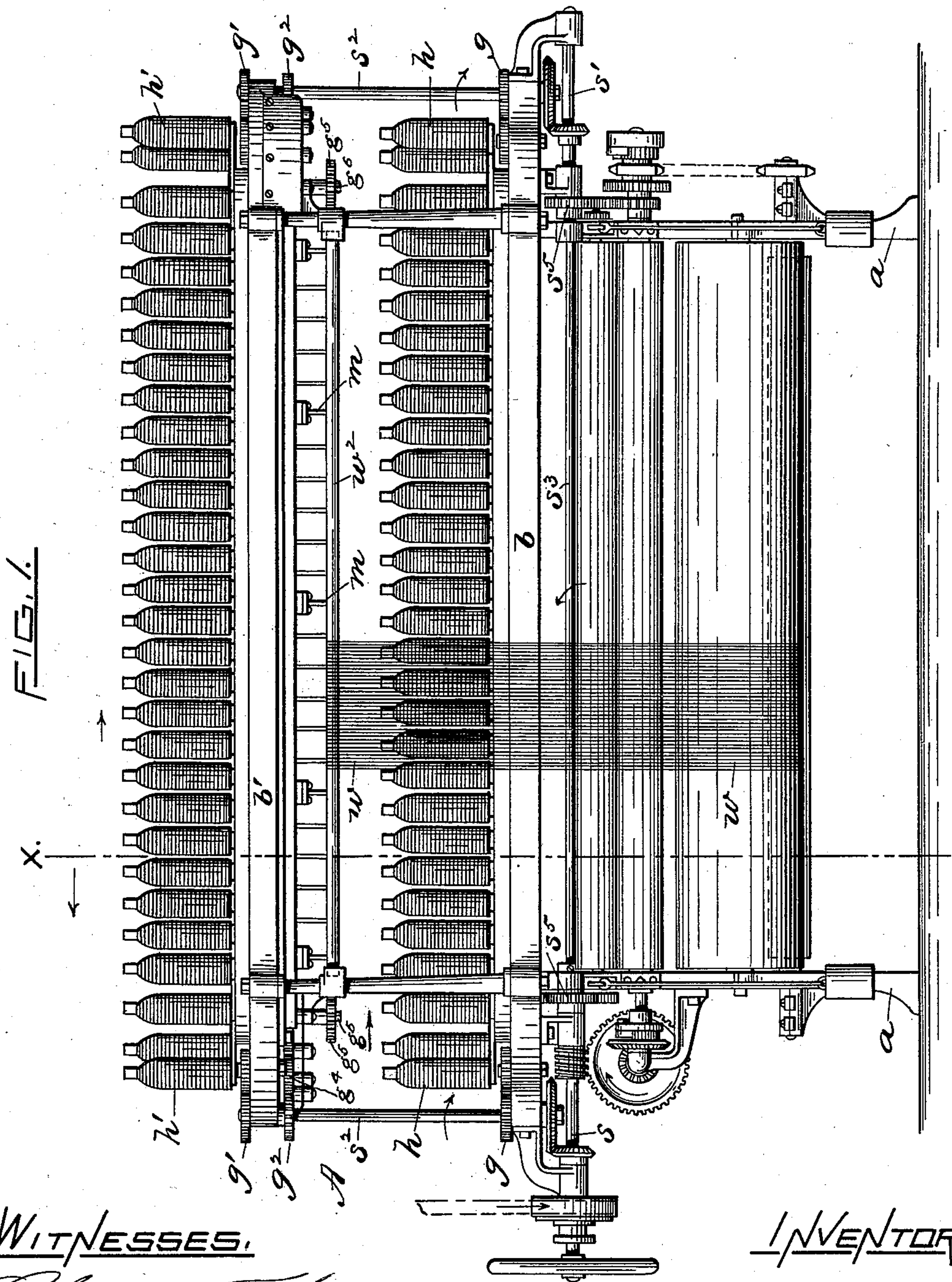
(No Model.)

4 Sheets—Sheet 1

L. E. SALISBURY.
STRAIGHT KNITTING MACHINE.

No. 601,307.

Patented Mar. 29, 1898.



Charles T. Hannigan
Hemington Sherman

Levi E. Salisbury
By Geo. H. Remington & Co.
Attys

(No Model.)

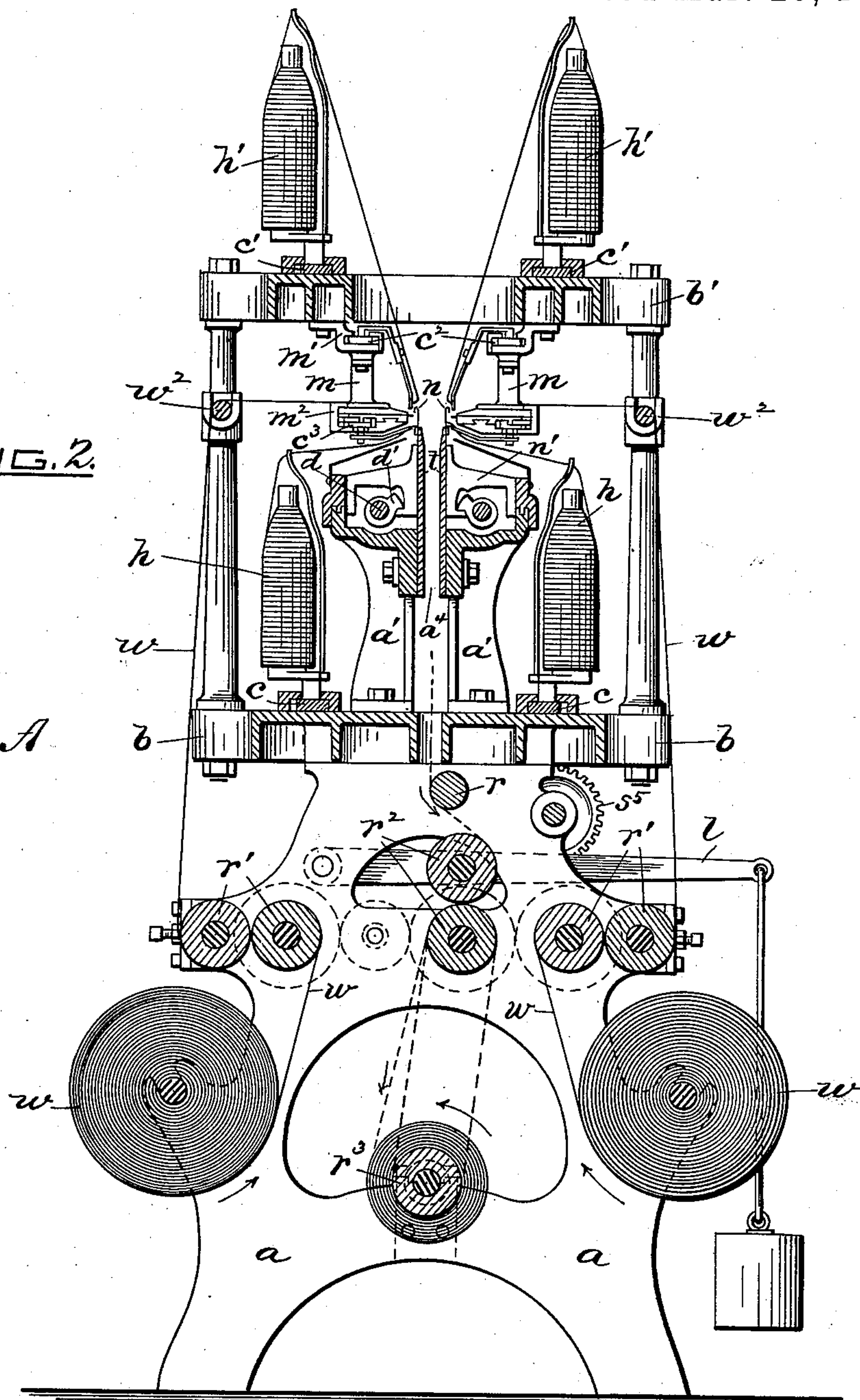
4 Sheets—Sheet 2.

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FIG. 2.



WITNESSES.

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4 Sheets—Sheet 3.

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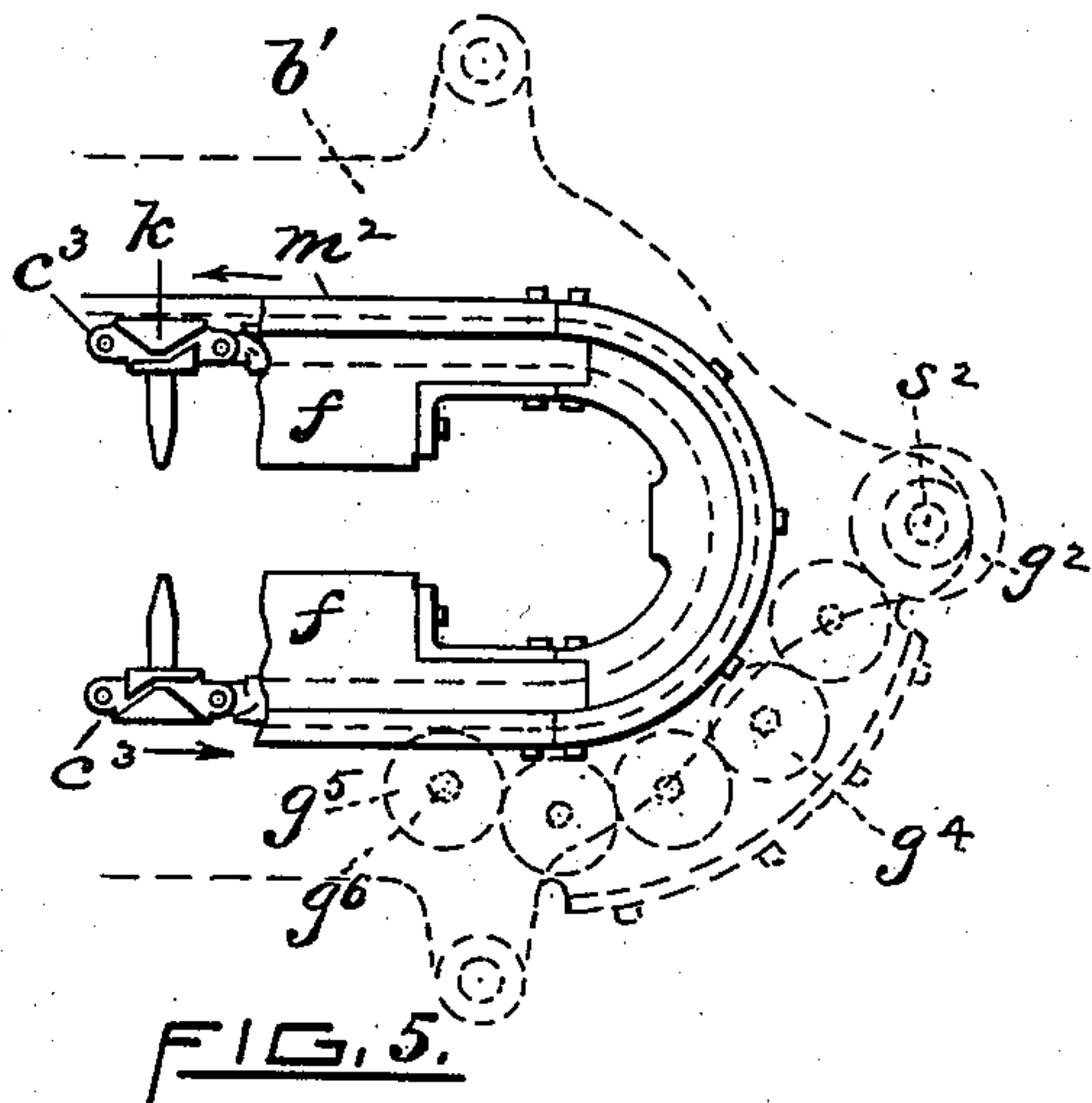


FIG. 5.

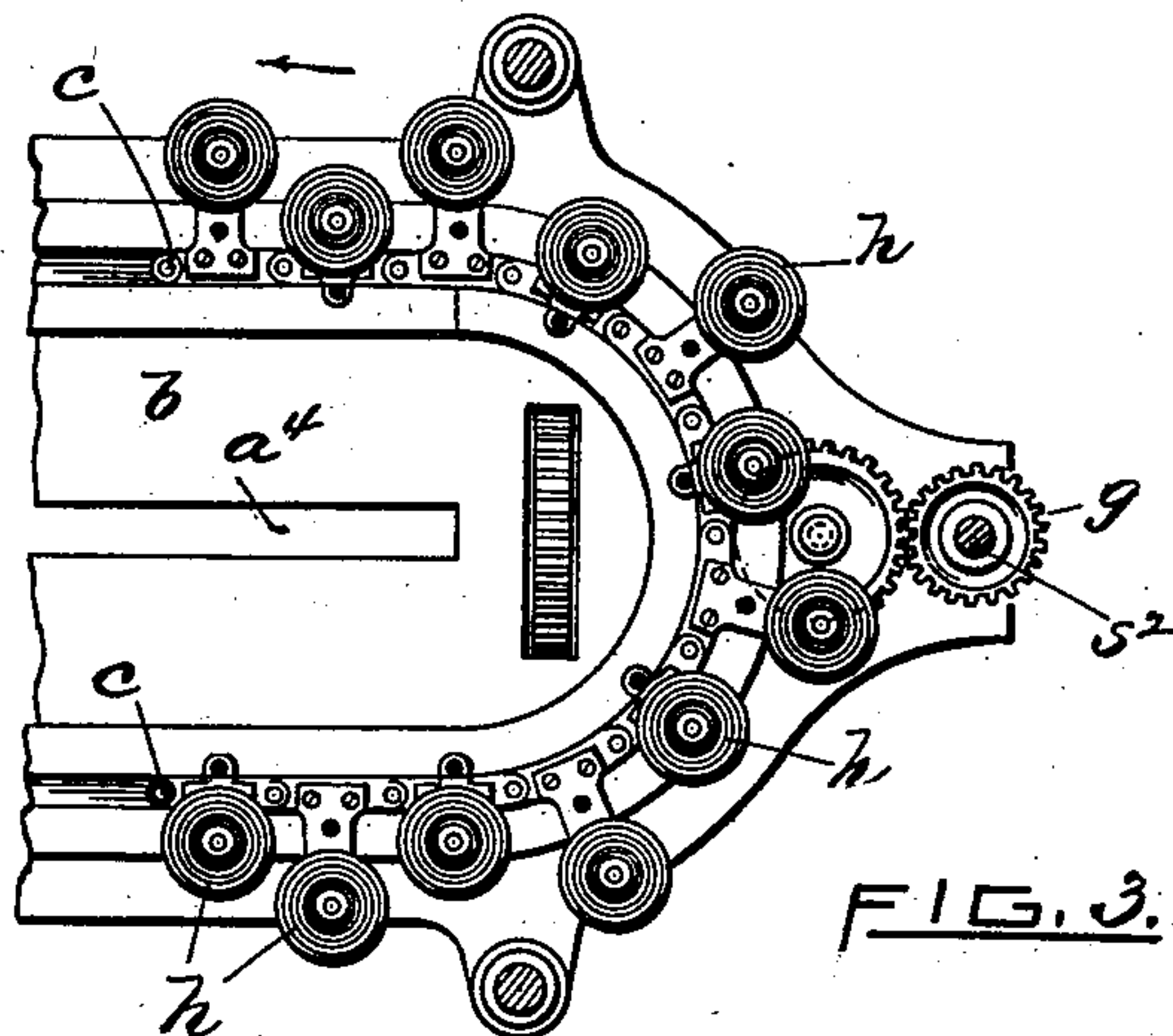


FIG. 3.

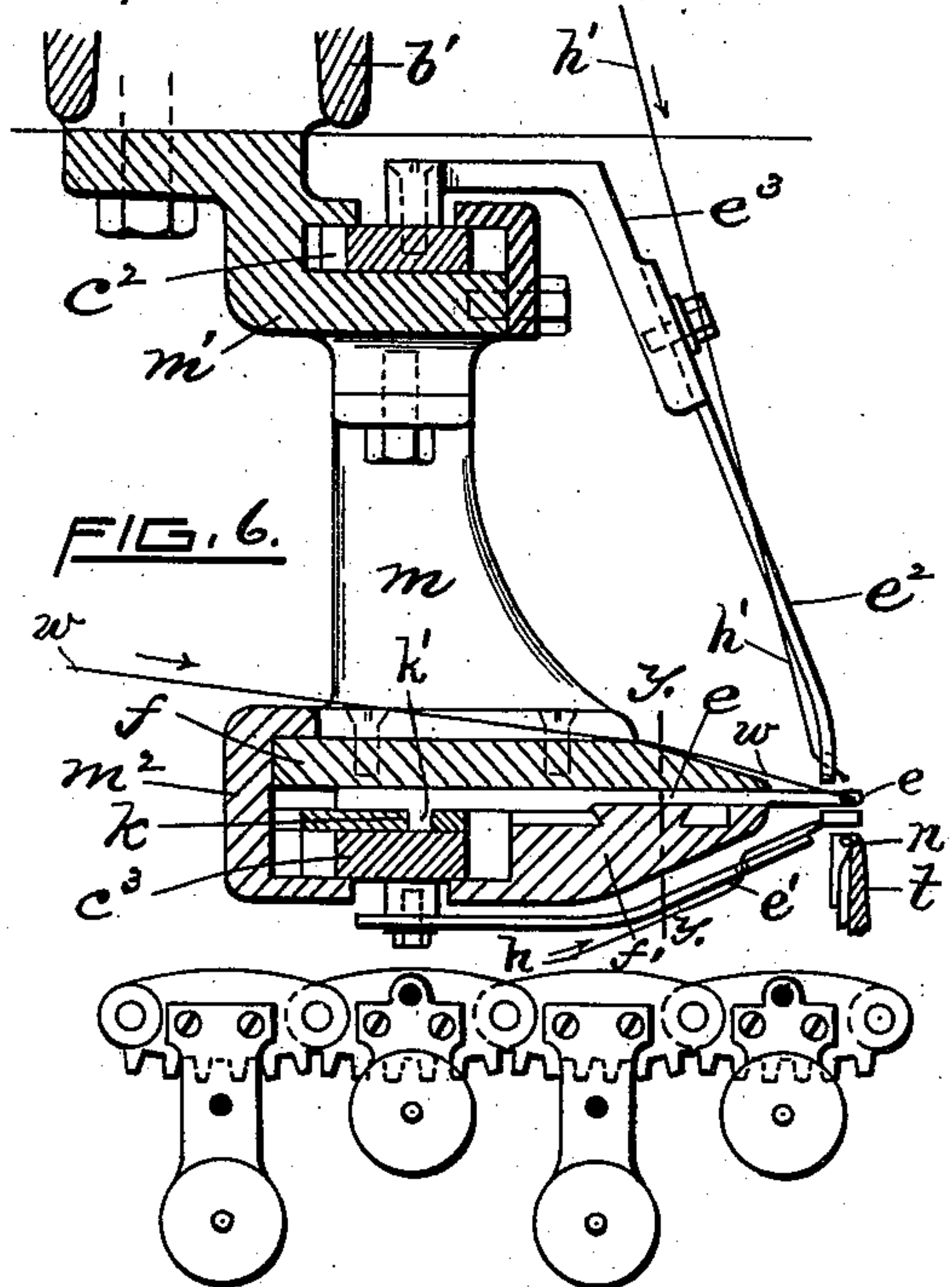


FIG. 6.

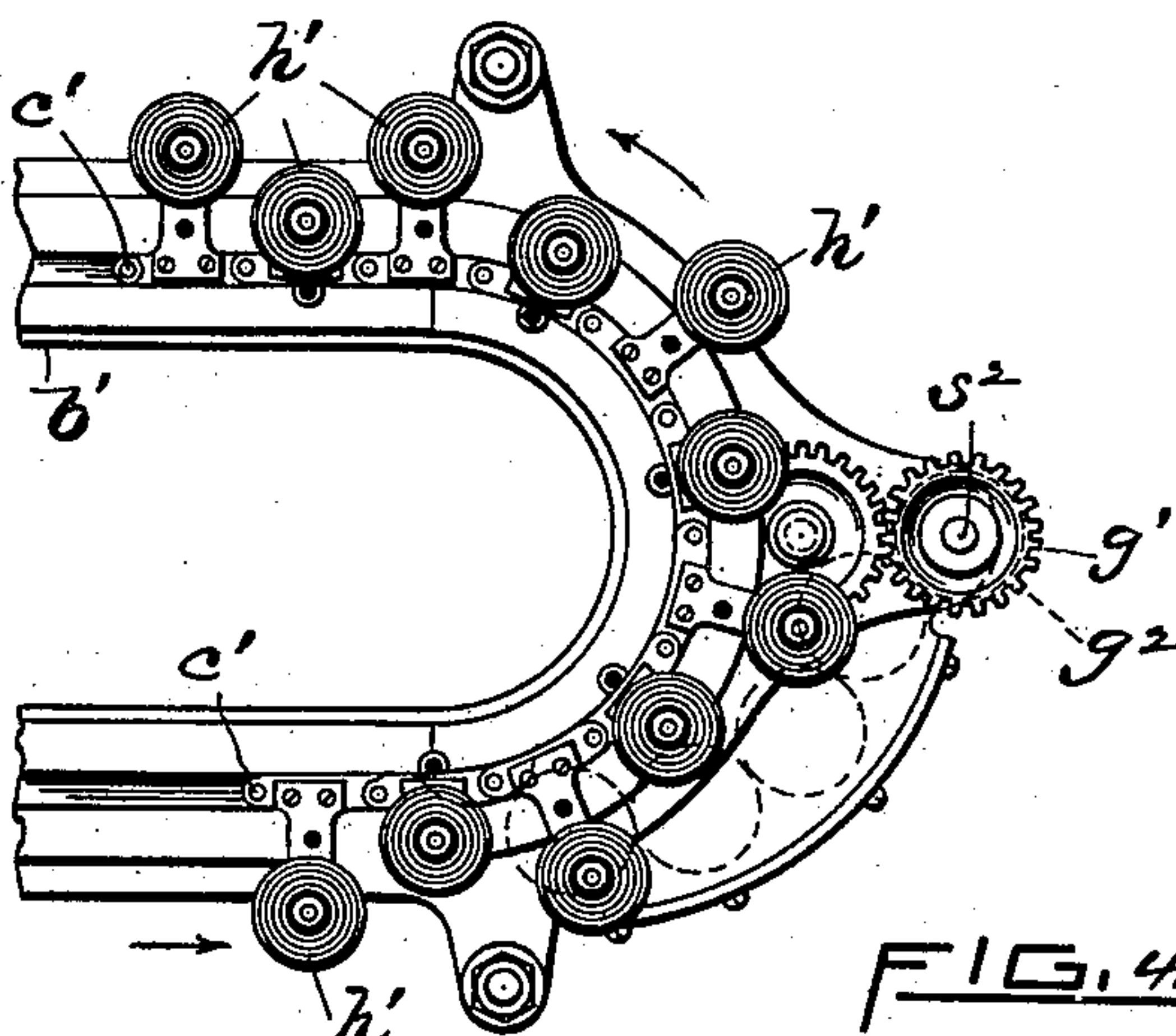


FIG. 4.

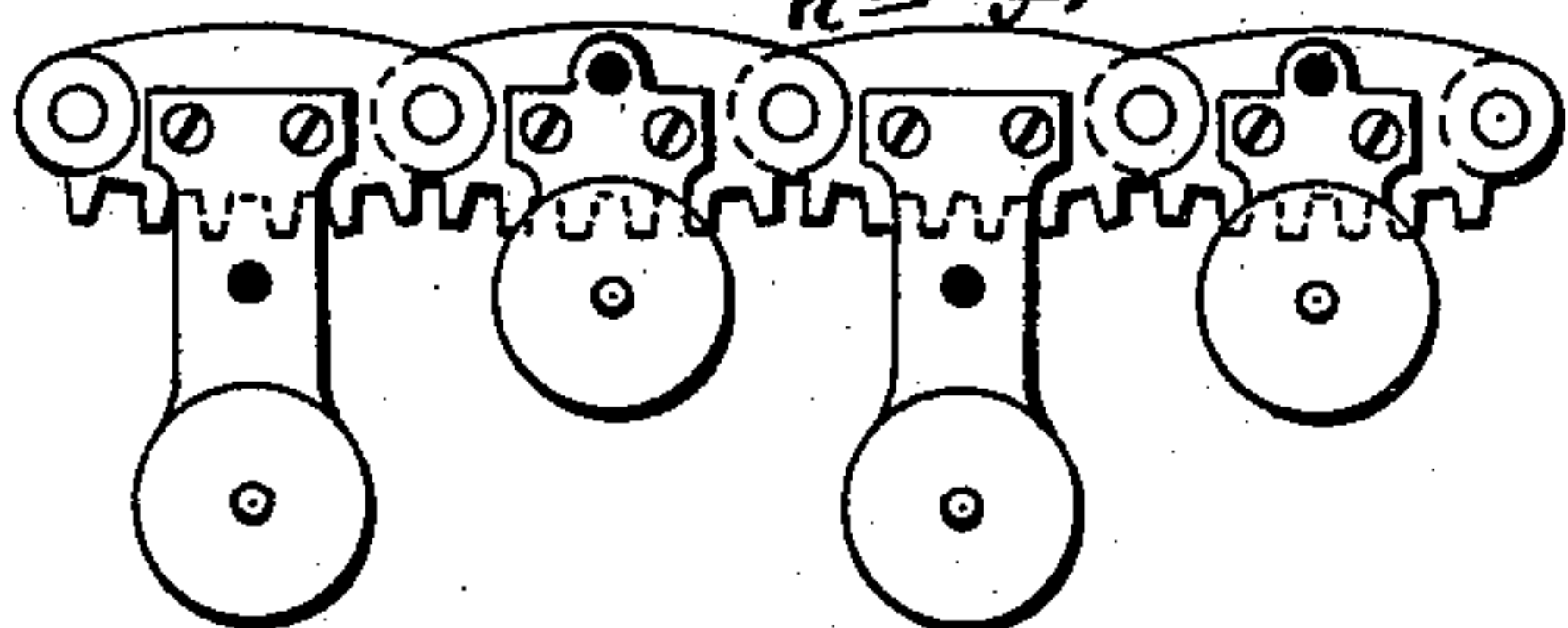


FIG. 7.

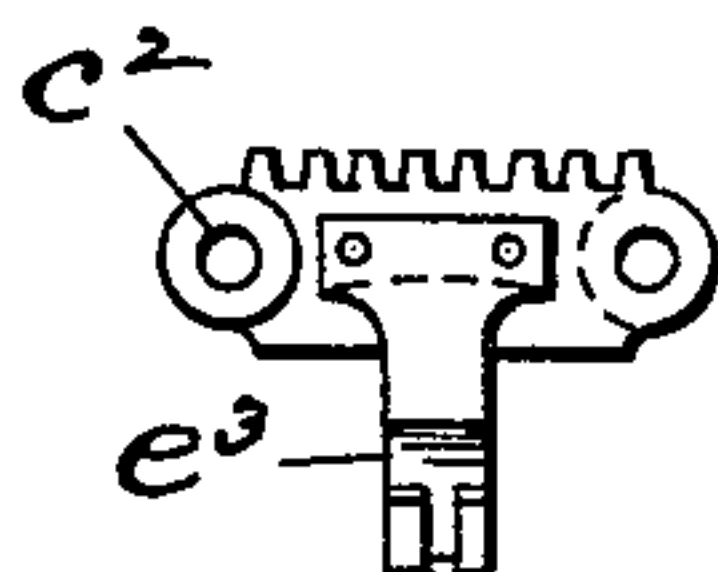


FIG. 8.

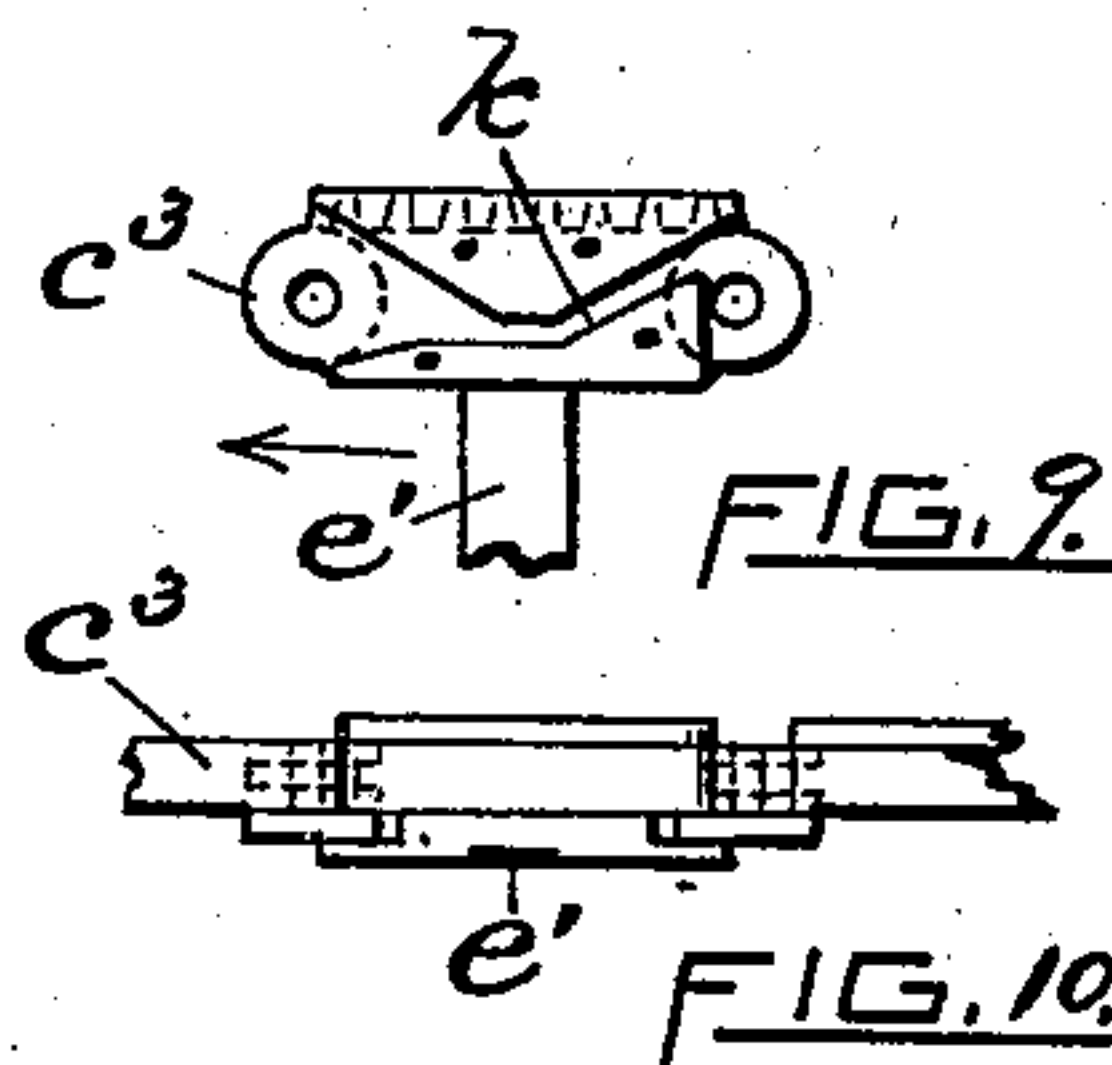


FIG. 9.

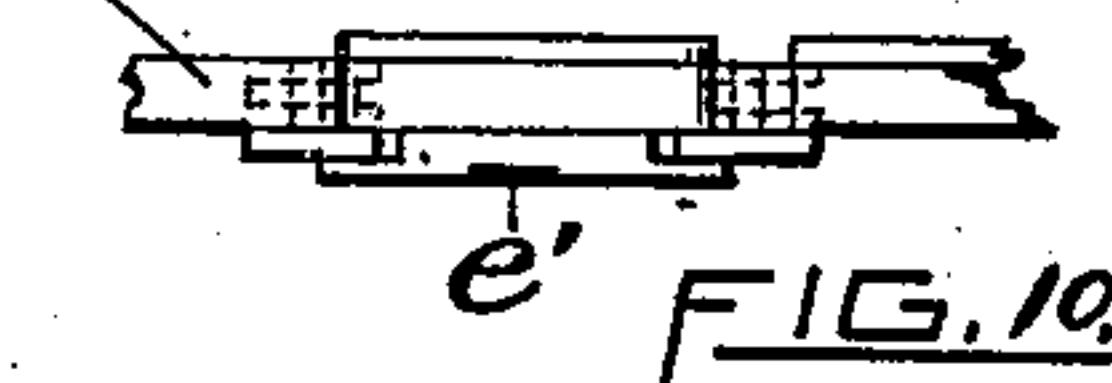


FIG. 10.

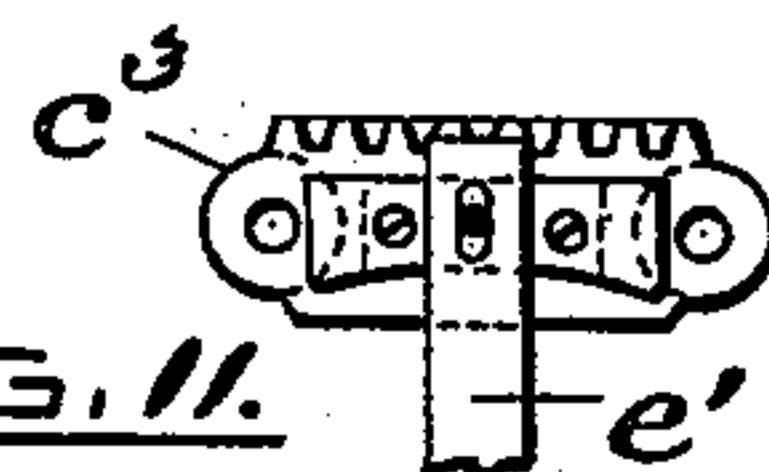


FIG. 11.

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(No Model.)

4 Sheets—Sheet 4.

L. E. SALISBURY.
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FIG. 12.

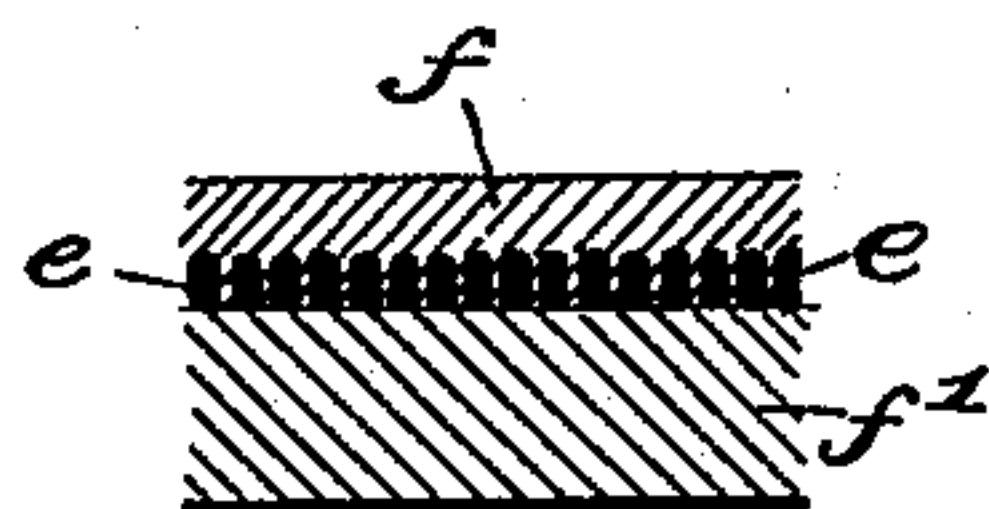
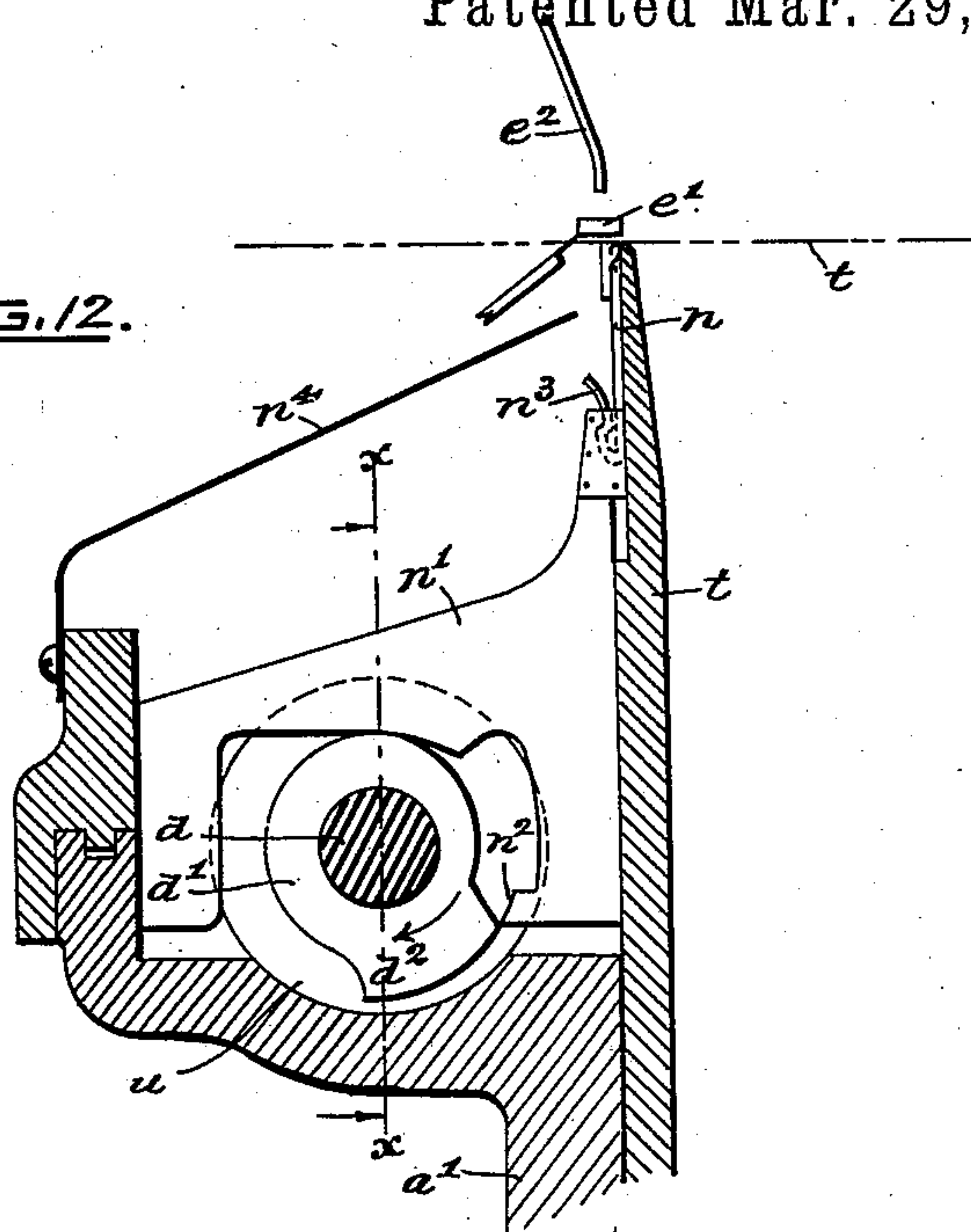


FIG. 13.

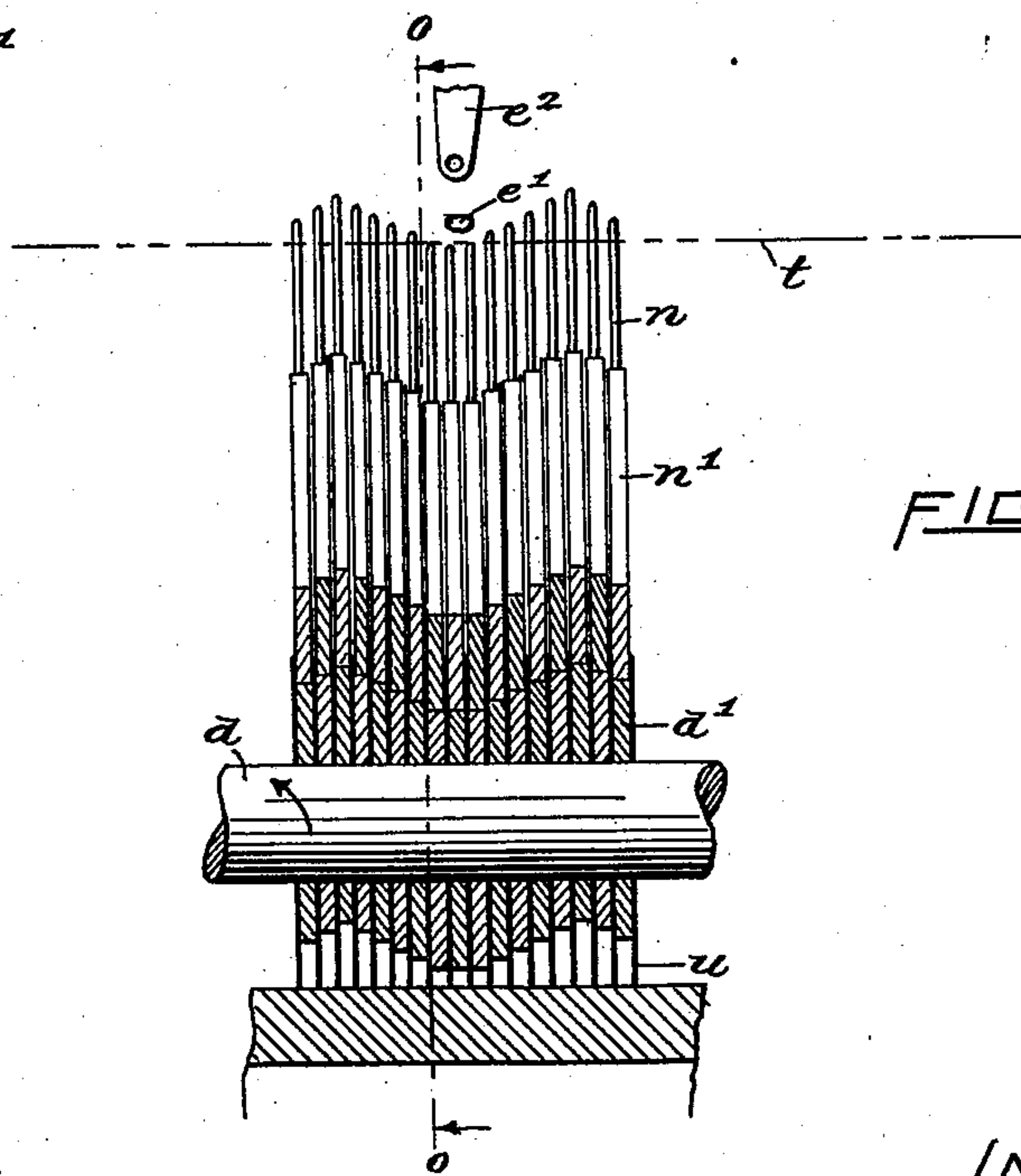


FIG. 14.

WITNESSES.

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UNITED STATES PATENT OFFICE.

LEVI E. SALISBURY, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO JOHN MILLAR, OF SAME PLACE.

STRAIGHT-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 601,307, dated March 29, 1898.

Application filed April 22, 1897. Serial No. 633,390. (No model.)

To all whom it may concern:

Be it known that I, LEVI E. SALISBURY, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Straight-Knitting Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My invention relates to straight-knitting machines or to "knitting-loom," as they are sometimes called; and it consists in the novel construction and arrangement of parts, as hereinafter set forth and claimed.

The present invention is an improvement in the knitting-machine patented to me July 7, 1891, No. 455,464, and November 6, 1894, No. 528,810. In the said patented machines the fabric produced thereon is composed of a series of warp-threads, a series of upper knitting-threads interlocking with each other and with the said warp-threads, and a series of lower filling-threads alternating with the upper threads and laid continuously in a straight manner along one side of the warp-threads. In the said patented machines the several knitting-threads and their guides were carried by a continuously-traveling upper chain, while the lower filling-threads and their guides were carried by a similarly-traveling lower chain, the latter also carrying cams adapted to successively engage and actuate the warp-guides in an endwise manner. While such former construction was capable of being operated smoothly at a comparatively quick rate of speed, it has been found desirable to even further increase it, thereby correspondingly increasing the percentage of output or product.

The object I have in view in the present invention is to so construct the machine that it can be successfully driven at a faster rate than as formerly devised, the result being that not only a greater amount of fabric is produced, but the degree of working friction is reduced, the parts are rendered more ac-

cessible for inspection, adjustment, &c., and the guides for the several series of threads are adapted to travel more uniformly.

In my present invention, too, the cams and needle-carrying frames or jacks are arranged so as to actuate the connected series or groups of needles in a practically positive manner, thereby avoiding the liability of a possible temporary non-action of the needles in case the friction upon the needle-holders exceeds the normal degree.

In the accompanying four sheets of drawings, Figure 1 is a general side elevation of my improved straight-knitting machine, some of the minor details being omitted. Fig. 2 is a corresponding transverse section enlarged. Fig. 3 is a partial plan view of the lower bed or table, showing the manner of actuating the chain which carries the series of bobbins on which are wound the lower filling-threads. Fig. 4 is a similar plan view of the corresponding part of the upper bed, showing the chain which carries the upper knitting-threads. Fig. 5 is a partial plan view of the lower intermediate track, &c., for the chain carrying the warp-guides and the filling-thread guides, the relation of the upper bed thereto being indicated by dotted lines. Fig. 6 is a transverse section, enlarged, taken through the upper and lower intermediate chains and the corresponding tracks or holders. Fig. 7 is a plan view of a section of the upper and lower chains which carry the two series of said yarn or thread holding bobbins. Fig. 8 is a plan view of one of the links of the upper intermediate chain. Fig. 9 is a plan view of one of the links of the lower intermediate chain, and also showing the cam for actuating the warp-guides. Fig. 10 is a side view of the same. Fig. 11 is an inverted plan view of it. Fig. 12 is a partial transverse section, enlarged, of the needle-driving shaft, cam-box, &c., on line *o o* of Fig. 14. Fig. 13 is a partial section taken on line *y y* of Fig. 6; and Fig. 14 is a section on line *x x* of Fig. 12 through the needle-cams, jacks, &c., showing the relative arrangement of one group of needles.

In my present improved knitting-machine or knitting-loom each series of guides for the several threads is carried by an independent

chain, the chains themselves being arranged in different horizontal planes and driven at each end of the machine by suitable mechanism, thus insuring smoothness of operation.

5 In Fig. 1 of the drawings is shown the general arrangement of the driving mechanism and the means for operating the several thread and guide carrying chains. It will be seen, referring to said Fig. 1, that the filling
10 or weft threads h are wound on the lower series of spools or bobbins, which in turn are mounted on stands or holders secured to the links of the lower chain c . (See also Figs. 2, 3, &c.) The upper knitting-threads h' are
15 similarly mounted and are carried by the links of the upper chain c' . (See Figs. 2 and 4.) Located immediately below and supported by the stationary upper bed b' are arranged the two intermediate chain holders or tracks
20 m' m^2 , vertically separated from each other by the interposed brackets m . The chain c^2 , mounted in the upper immediate holder m' , carries the top thread-guides e^2 , and the lower chain-holder m^2 supports the corresponding
25 chain c^3 , which in turn carries the cams which actuate the warp-guides e and also carries the filling-thread guides e' . (See also Figs. 6, &c.) The several chains and guides are properly set or adjusted with respect to each other and
30 all travel in unison continuously at the same rate of speed.

In knitting the fabric it will be seen that there are two sets of needles n and also two complete sets of threads or yarn, the arrange-
35 ment being such that two connected webs or widths of fabric are produced simultaneously. Each set of needles, guides, &c., operate to introduce the threads at the upper edge of the corresponding needle bar or plate t , the
40 fabric produced passing downwardly through the narrow central opening a^4 , thence around the guide-roll r to and between the pair of driven friction-rolls r^2 to the web beam or roll r^3 , on which the fabric is mechanically
45 wound.

The following is a description of the manner of feeding or introducing the several threads to the action of the needles n . The warp-threads w pass from the warp-beam,
50 thence to and between the corresponding pair of friction or tension rolls r' , and upwardly over the stationary guide-rods w^2 , and from the latter to and through end holes formed in the longitudinally-reciprocating warp-guides
55 e , actuated by cams carried by the traveling chain c^3 . (See Figs. 2, 6, and 12.) The filling or weft threads h are mounted on bobbins carried by the lower chain c . The free ends of the threads h unwind from the bobbins and
60 extend through eyes formed in the outer ends of the corresponding guides e' , secured to the under side of the said lower intermediate chain c^3 . The bobbins carrying the upper knitting-threads h' are mounted on and ac-
65 tuated by a chain c' in substantially the same manner as the lower bobbins. In this case, however, the ends of the threads h' in un-

winding extend downwardly through eyes formed in the guides e^2 , the latter being carried along in unison with the bobbins by
70 means of the upper intermediate chain c^2 and the corresponding guide brackets or holders e^3 .

The several chains above referred to travel at a rate of speed common to all, thus insur-
75 ing that the corresponding traveling threads will be properly introduced successively to the several groups of needles. The following description relates to means for effecting such concurrent action of the guides, &c.

Referring to Fig. 1, it will be seen that
80 power is transmitted from the front horizontal driving-shaft s to the rear shaft s' by the connecting-shaft s^3 and its end gearing s^5 . The two vertical shafts s^2 , located at the ends of the machine, revolve simultaneously in
85 one direction by means of bevel-gears, as shown. The lower bobbin-carrying chain c is driven by the said shafts s^2 through the two corresponding gear-trains g , similar trains g'
90 at the upper ends of the shafts being employed to propel the upper bobbin-carrying chains c' . (See also Fig. 2.) At a point just below the upper bed b' the shafts s^2 are each provided with a spur-gear g^2 and correspond-
95 ing train for simultaneously propelling the two intermediate chains c^2 and c^3 , these latter being shown in Figs. 2 and 6.

I prefer to make the length of the links of the several sets of chains alike—for example,
100 three inches from center to center of the joint-pins—the length of the chains themselves being alike. Fig. 3 shows a partial plan view of the lower bed b and its chain c , and Fig. 4 a similar view of the upper chain c' . The links of these two chains are alike. Fig. 7
105 shows a plan view of a section of the said chains c c' in enlarged scale. While, as just stated, the length of the links and chains c^2 c^3 are the same as in chains c c' , the former are lighter and thinner, since they have less work
110 to do. The upper one, c^2 , of these two chains is mounted to slide in the track or holder m' , each link carrying a downwardly-bent bracket e^3 , to which the guide e^2 of the corresponding thread h' is adjustably secured. (See Figs. 115 6 and 8.) The other or lower intermediate chain c^3 travels in a track m^2 , suspended from the upper track by a series of short hangers m . To the base of the latter is secured the stationary guide-plate f , which is grooved or
120 tricked transversely throughout its length to freely receive the several warp-guides e . (See also Fig. 13.) In order to prevent these last-named guides from falling out, a plate f' is dovetailed to the under side of the plate f .
125 (See Fig. 6.) The plate f' also serves as a member of the track or chain-guide m^2 . I may add that in all the chains the round heads of the joint-pins travel in the longitudinal grooves of the tracks, thus keeping the chain-
130 links in position laterally. The chains c^2 c^3 are propelled by means of the said gears g^2 , the intermediate or idler gears g^4 , and the gears g^5 , the latter being secured to each end

of a short vertical shaft g^6 and intergearing with the teeth formed on the outer edge of the links. Fig. 5 shows the relative arrangement of the said driving mechanism. (See also Fig. 1.)

The chain c^3 is provided on its upper side with a suitable cam-shaped groove k , Fig. 9, adapted to receive the tongue or projection k' , Fig. 6, formed on the under side of the warp-guides e . By means of this arrangement the traveling chain causes the guides to be successively reciprocated back and forth, thus introducing the warp-threads w at the proper time to the front of the needles, the latter at the same time being dropped to their limit by the action of the needle-cams d' , Fig. 12.

It will be seen, Fig. 6, that the outer or trumpet-shaped end of the thread-guides e' is so arranged with respect to the cam k that the latter in traveling operates to successively maintain two or three guides e in the outermost position, said trumpet portion being located directly below the guides e and above the needle-plate t . The arrangement of the cam-grooves k of the chains c^3 is such that the warp-guides are projected outward at the same instant that the revolving cams d' retract the corresponding needles. (See Fig. 14.) In the last-named figure is represented one of the groups or series of needles and the actuating mechanism, the distance occupied on the shaft d being, say, equal to the length of a link. The cams d' are spirally arranged on and secured to the shaft, a round disk u being interposed between each pair of cams and supported in the bottom of the cam-box a' , to which latter the needle-plate t is secured. The needle frames or jacks n' are thinner than the cams, thus adapting them to move freely in a vertical direction. The needle-frames are cut away on the lower side to permit the passage of the cam arm or projection d^2 of the cam, the frame at the same time being supported by the upper edge of the cam d' . It will be seen, referring to Fig. 12, that the cam portion d^2 is so constructed that it is in continuous engagement with the projection n^2 , formed on the lower side of the frame, during an angular movement of some sixty degrees, thus insuring that the needles cannot accidentally rise while the warp-guides are projected.

In order to provide the needles with means whereby they may be easily and quickly removably secured to the frames n' , the needle-shanks may be bent to form a spring-arm adapted to interlock with the corresponding part of the frame. (See dotted lines, Fig. 12.) As thus made the lower portion of the needle is sprung into a socket, the extreme end n^3 of the spring-arm projecting above the frame. n^4 indicates a sheet-metal cover at the top of the cam-box.

I claim as my invention—

1. In a straight-knitting machine, provided with a dual set of warp, filling and knitting threads adapted to be interlocked to produce a double web of fabric, the combination of four independent endless chains traveling in unison and arranged substantially as hereinbefore described, wherein one of said chains carries the filling-thread bobbins, another carries the knitting-thread bobbins, another carries a series of guides, as e^2 , adapted to present the said knitting-threads to the needles, and the fourth chain carries a series of filling-thread guides as e' , and a corresponding series of cams, and guides e containing said warp-threads actuated by said cams.

2. In a straight-knitting machine, employing warp, filling and knitting threads, the combination of the endwise-movable guides e carrying the warp-threads, and the suitably-mounted vertically-separated endless independent chains, c^2, c^3 ; the upper one c^2 of said chains having guides carrying the knitting-threads, the other chain having guides carrying the filling-threads and also provided with cams for actuating the said warp-guides, the said chains c^2, c^3 being employed for the purpose of carrying the series of knitting and filling thread guides, respectively, and being wholly independent of the chains or mechanism which carries the bobbins from which the said knitting and filling threads unwind, substantially as described.

3. In a straight-knitting machine, the combination with the duplex series of needles arranged in groups and mechanism for actuating the same, of the two endless independent traveling chains, as c^2, c^3 , provided with guides for the knitting and filling threads, respectively, non-traveling guides e for the warp-threads, adapted to be reciprocated back and forth with respect to the needles, and by cams carried by said chain, c^3 , the said chains c^2, c^3 being employed for the purpose of carrying the series of knitting and filling thread guides, respectively, and being wholly independent of the chains or mechanism which carries the bobbins from which the said knitting and filling threads unwind, substantially as described.

4. In a straight-knitting machine, the combination with the positively-revolving needle-actuating cam d' having an arc-shaped peripheral extension d^2 , of the needle-carrying frame or jack n' cut away on its under side and provided at the bottom with the extension n^2 arranged in the path of and adapted to be engaged by the cam member d^2 , substantially as described and for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

LEVI E. SALISBURY.

Witnesses:

GEO. H. REMINGTON,
REMINGTON SHERMAN.