(No Model.) 6 Sheets—Sheet 1.

F. M. FRANKE.

RING SPINNING AND TWISTING MACHINE.

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Fig. 6.

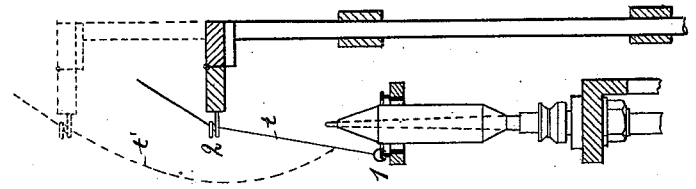


Fig. 5.

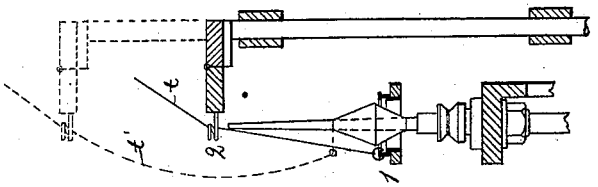


Fig. 4.

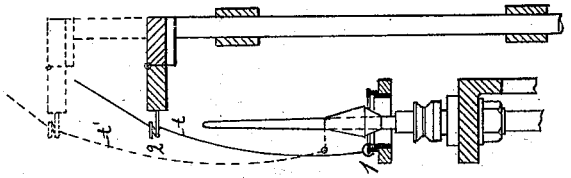


Fig. 3.

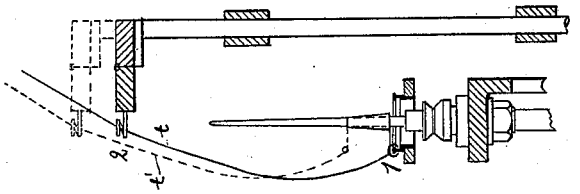


Fig. 2.

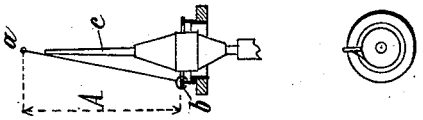
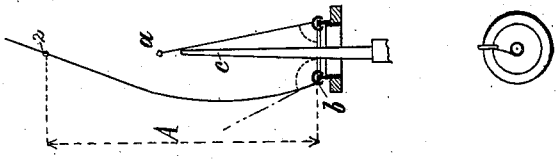


Fig. 1.



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RING SPINNING AND TWISTING MACHINE.

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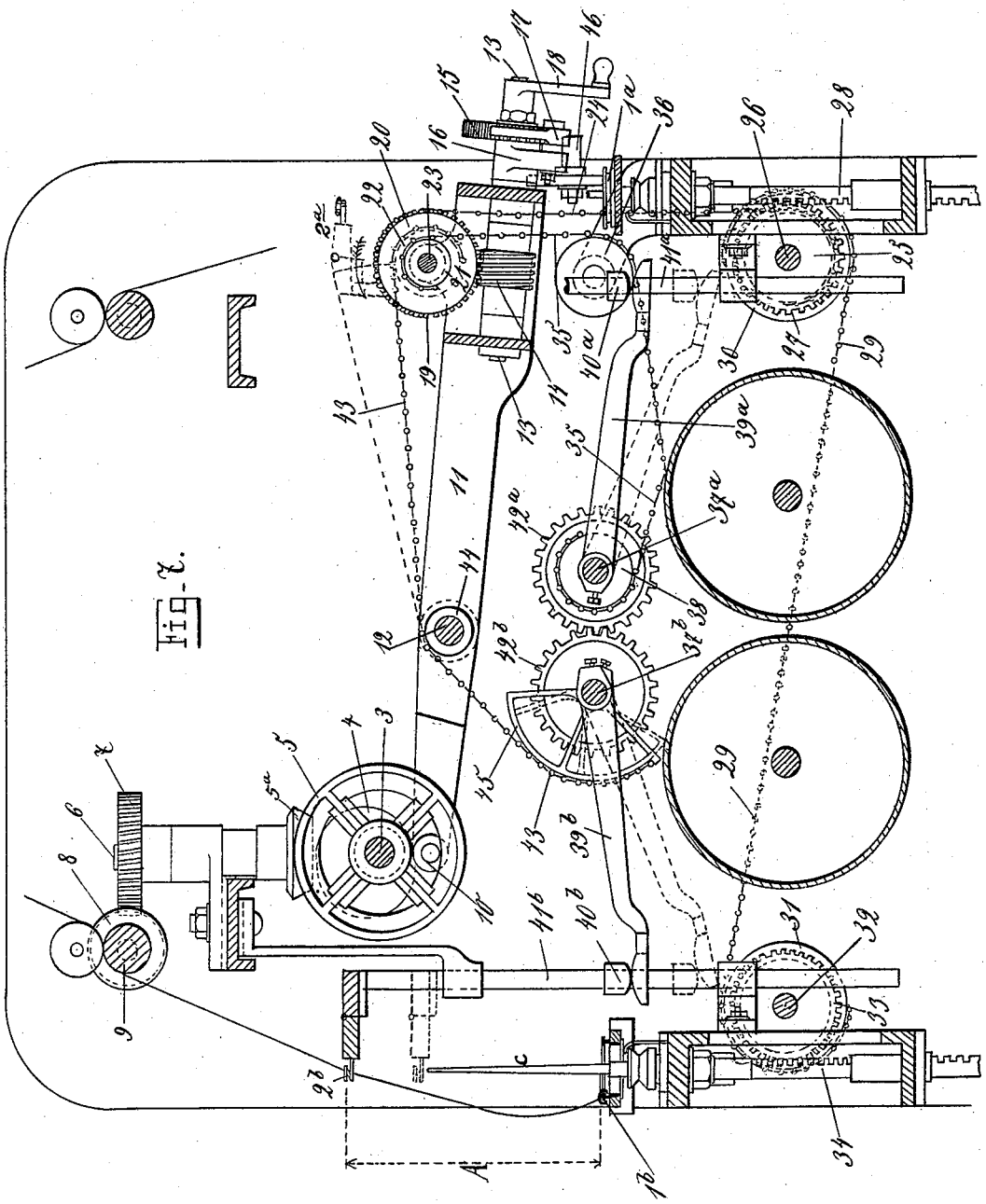

Fig. 2.

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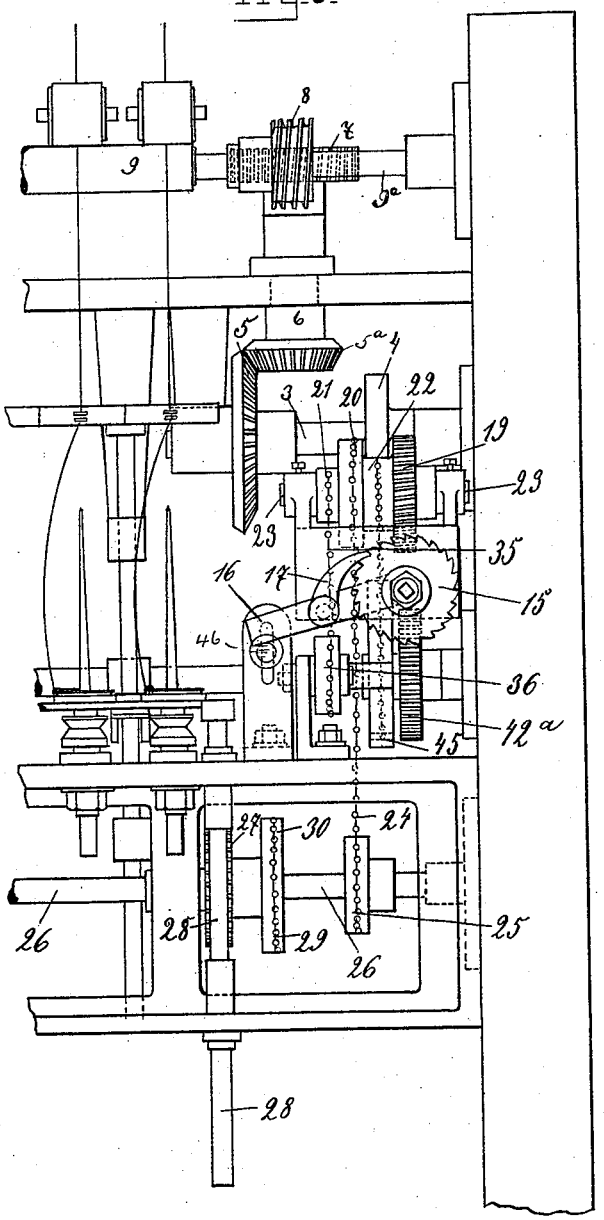
RING SPINNING AND TWISTING MACHINE.

No. 456,249. Patented July 21, 1891.

Fig. 8.



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RING SPINNING AND TWISTING MACHINE.

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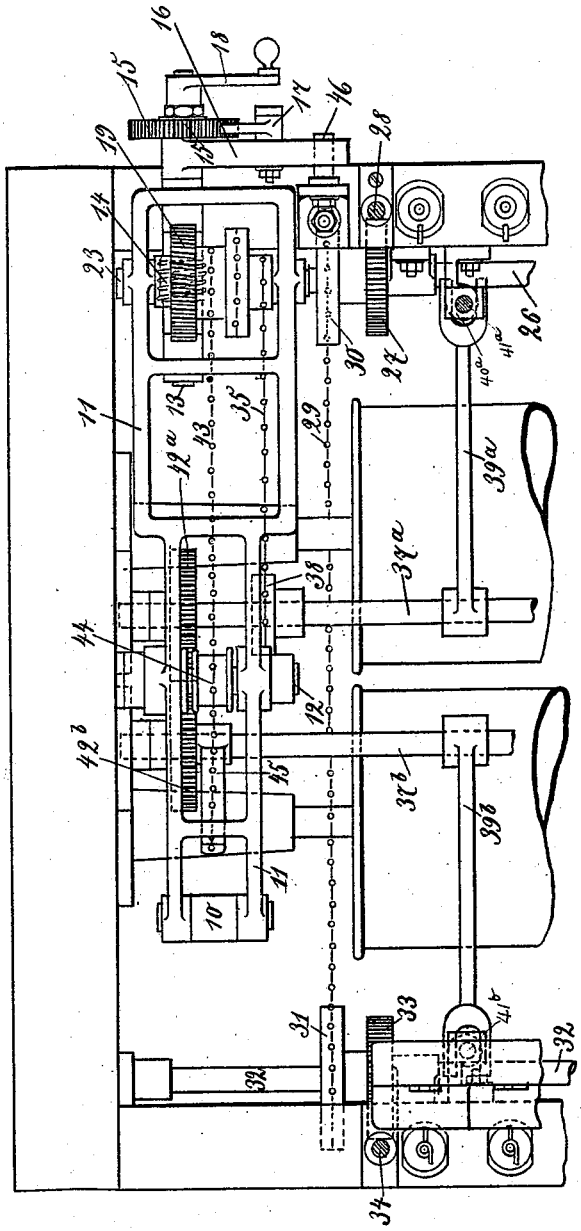

Fig. 9.

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RING SPINNING AND TWISTING MACHINE.

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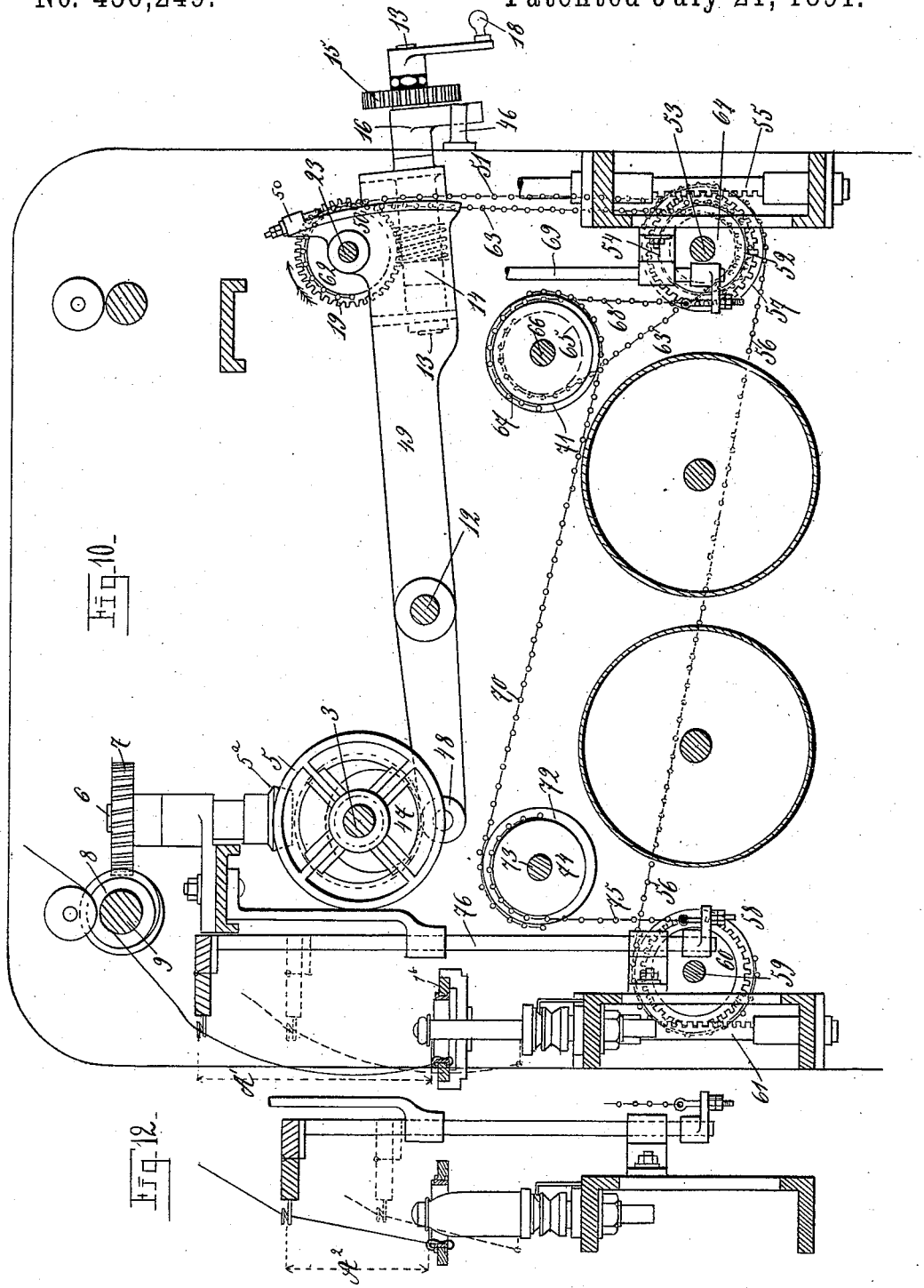

Fig. 10.

Fig. 12.

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RING SPINNING AND TWISTING MACHINE.

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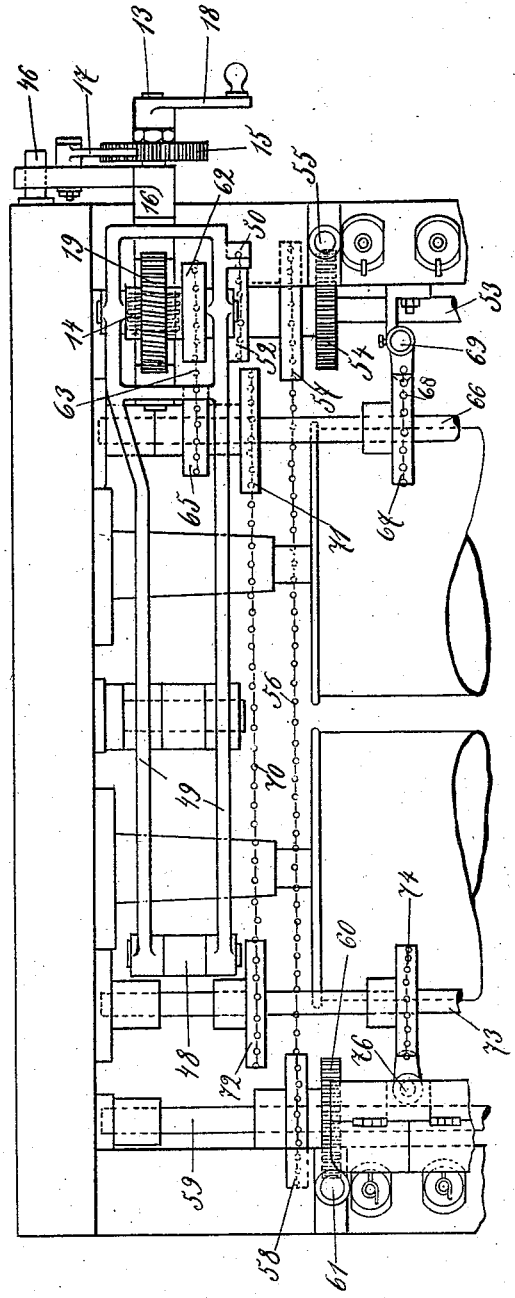

Fig. 11.

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UNITED STATES PATENT OFFICE.

FRIEDRICH MORITZ FRANKE, OF CHEMNITZ, GERMANY.

RING SPINNING AND TWISTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 456,249, dated July 21, 1891.

Application filed September 17, 1888. Serial No. 285,645. (No model.) Patented in Germany April 27, 1888, No. 45,009, and in England August 7, 1888, No. 11,384.

To all whom it may concern:

Be it known that I, FRIEDRICH MORITZ FRANKE, of Chemnitz, in the Kingdom of Saxony and German Empire, have invented new and useful Improvements in Ring Spinning and Twisting Machines, (for which I have obtained patents in Germany, No. 45,009, dated April 27, 1888, and in Great Britain, No. 11,384, dated August 7, 1888,) of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in ring spinning and twisting machines. In machines of the ring-spinning type in one arrangement or device for guiding the thread between the rollers and the ring and traveler as hitherto constructed the thread-guide was fixed and stationary, and on each lift of the ring-rail the distance between the thread-guide and the ring was diminished as the ring moved toward the smallest part of the cop, and a further diminution took place in consequence of the constant elevation of the ring-rail with the increase of the length of the cop. In another arrangement of this type of machine the thread-guide followed the motion of the ring-rail, in which case the distance between them always remained the same. The great distance existing between the thread-guide and ring-rail produced then with a thicker spindle such a large thread-balloon that the well-known anti-ballooning arrangements became necessary.

My improvements are founded on the facts that, first, the thread-tension becomes less as the angle formed by the thread-guide, the ring-traveler, and the winding-point on the spindle becomes more obtuse, but this angle increases as the distance from the yarn-guide to the traveler increases; second, the thread-tension is less as the diameter of the cop or yarn load at its winding-point becomes larger, or, in other words, the nearer the winding-point of the cop is to the ring-traveler, but increases largely with the diminution of the cop's diameter at the point where the yarn or thread is being wound.

In accordance with the above, the herein-described thread-guide operating device is so arranged that with the smallest cop diameter the distance from the yarn-guide to the traveler is the greatest, and the angle above referred to, with the assistance of the thread-balloon which is forming, is the most obtuse; but as the cop increases in diameter this distance becomes smaller and the angle more acute. I thus obtain greater uniformity of tension and of quality of thread, and regulate the ballooning tendency.

In the annexed drawings, Figures 1 to 9 show this thread-guide contrivance applied to ring-spinning machines in cases where the thread-winding is to be done in cop form. Figs. 1 and 2 show the correct distance between the thread-guide 2 and the ring and traveler, with the smallest and largest cop diameters. Figs. 3 to 6 show eight different positions the thread-guide 2 assumes in relation to the ring and traveler, according to the different radii of the cop at its winding-point from the commencement to the completion. In Fig. 7 a portion of a spinning-frame provided with my improved mechanism is shown in sectional side elevation. In Fig. 8 the same portion is shown in front elevation, and in Fig. 9 in plan, parts being removed. Figs. 10 to 12 show the mechanism constructed and arranged as it will be when the thread-winding takes place on ordinary bobbins. Fig. 10 shows a portion of a spinning-frame provided with my improvements in sectional side elevation. Fig. 11 shows the same in plan, parts being removed, while Fig. 12 is a detail showing the position of the thread-guide in relation to the ring and traveler when the bobbin is full.

It will be evident from Figs. 7, 8, and 9 that the lifting motions of the ring-rail 1^a and ring 1^b and of the thread-guides 2^a 2^b are effected by the cam 4, fixed to the shaft 3, which, by means of the bevel-wheels 5 5^a, shaft 6, worm-wheel 7, and worm 8, receives its rotation from the shaft 9^a of the lower roller 9. The cam 4 imparts through the roller 10 to the double rocking lever or bar 11, whose bearing is on the pin 12, an up-and-down movement. On the heavier or right-hand end of the rocking lever 11, as shown in Fig. 7, there is provided a movable shaft 13, on which the worm 14 and the ratchet-wheel 15 are fixed, while the pawl-holder 16, with its pawl 17, is mounted loosely on

this shaft 13. On the end of the shaft 13 a crank 18 is mounted in such a manner that it can be removed at pleasure. The worm 14 gears with the worm-wheel 19, which is fixed to the three chain-wheels 20, 21, and 22, all of which are mounted and work together loosely on the axle 23. By means of the chain-wheel 20 the lifting motions of both ring-rails are effected—namely, through the chain 24, chain-wheel 25, shaft 26, pinion 27, and rack 28 of the ring-rail 1^a, and again through the chain 29, chain-wheels 30 and 31, shaft 32, pinion 33, and rack 34 of the ring-rail 1^b.

The chain-wheel 21 effects, besides the up-and-down movement of the thread-guides 2^a 2^b, another—namely, the continuous raising of the upper limit of the stroke of the said thread-guides 2^a and 2^b—while the chain-wheel 22 has to regulate the lower limit of the stroke of the thread-guides at the commencement of the winding of the cop. Motion is transmitted to both thread-guides 2^a and 2^b from the chain-wheel 21, being transmitted through the chain 35, passing around the guide-pulley 36 to the chain-wheel 38, fixed on the shaft 37^a, and thence to the raising-lever 39^a, fixed on the shaft 37^a, which engages and works the thread-guide rod 41^a, which has fixed to it a ring or collar 40^a. To the other side of the machine the movement is transferred through gear-wheels 42^a and 42^b, provided with an equal number of teeth, (said wheels being mounted on the shafts 37^a and 37^b,) to the raising-lever 39^b, collar 40^b, and the thread-guide rod 41^b. The chain-wheel 22 controls the extent of the descent of the thread-guides 2^a and 2^b through the chain 43, which is carried over a guide-pulley 44, mounted on the pivot-pin 12 of the lever 11, and connected to the circular segment 45, which is fixed to the shaft 37^b. It may be here remarked that the stroke transmitted from the lever 11 to the thread-guides 2^a and 2^b, as is apparent from Fig. 7, is a much larger one than that of the ring-rails.

The mode of action of the thread-guide-actuating mechanism from the commencement to the completion of the cop is as follows: At the commencement of the winding of the thread the positions of all the parts are as shown in Fig. 7. The ring-rails are brought to their lowest position by bringing the heavy end of the lever 11 to its lowest position and by winding back the chain-wheel 20 by means of the crank or hand lever 18; also, the thread-guides 2^a and 2^b, through the simultaneous turning back of the chain-wheel 21, attain their position, as shown in full lines in Fig. 7, which may be termed the "bottom limit of their first vertical reciprocation," the dotted lines in Fig. 7 representing the bottom limit of their subsequent reciprocation, as also indicated in Fig. 5. They must be limited in their downward movement or supported at such height that the required distance A between the thread-guide and the ring-traveler for the empty spindle is reached. This will be done by the taking up of the chain 43, which has been wound in the reverse direction on chain-wheel 22 from that of the chain 35 on chain-wheel 21. The chain 35 will in consequence become so slack that on raising the lever 11 it will be only slightly tightened in the latter part of the stroke thereof, which results in raising the thread-guide but a little. (See Fig. 3.) The bottom limit of the stroke of the thread-guide being dependent upon the chain 43, which passes over the pivot or turning point of the lever 11, the up-and-down movement of the latter can consequently have no influence on the height of the parts 39^a 39^b, except through the gradual letting off of chain 43 from wheel 22, as below described, to change the bottom limit of the movement of the thread-guide. At each downward stroke of the heavy end of the lever 11 the pawl-holder 16 strikes against the adjustable stop-bolt 46, and receives in consequence a partial revolution, which is communicated by the pawl 17 to the ratchet-wheel 15. Through the latter there is communicated, by means of the shaft 13 and the worm 14, to the worm-wheel 19 and chain-wheels 20, 21, and 22 a small movement toward the left, as indicated by the arrow in Fig. 7, by means of which the chains 24 and 35 are wound up, and, on the other hand, the chain 43 is slacked. From this it follows that the chain 24 raises gradually the bottom limit of the vertical reciprocation of the ring-rail, keeping the traveler opposite the part of the bobbin which is being wound, while the chain 43 gradually unwinds, so that the bottom limit of the reciprocation of the thread-guide is for a time lowered until the cop has attained its greatest diameter, Fig. 5. From this point the chain 43 becomes by further unwinding continually slacker and ceases to have any influence on the movement of the thread guide or conductor up to the completion of the cop. Furthermore, from this moment the full periodical and slowly progressive strokes of the thread guide or conductors are occasioned solely by the chain 35 and are continued until the end of the cop with constant regularity. After the removal of the cop, by turning the shaft 13 in a reverse direction by means of the crank 18 all the moving parts of the ring-rails and the thread-guides are brought back into their original positions, so that the winding may begin afresh.

The above-described mechanism may be made much simpler when the winding of the thread takes place on bobbins, such as shown in Figs. 10 and 11. With an empty bobbin, in this case the distance A between the thread-guide 2 and the ring-traveler is largest, but it becomes reduced at every fresh layer of thread which is wound on, until with a full bobbin the determined minimum has been reached. The movement of the cam 47, Figs. 10 and 11, is derived from the lower

roller 9 in the same manner as described with reference to Fig. 7. The cam 47 imparts in this case also, by means of the roller 48, the periodical oscillatory stroke to the lever 49. On the lever 49 there is provided a circular segment 50, on which the chain 51 lies, and to which it is fastened. This segment produces the stroke of the ring-rail on the right through the chain-wheel 52, shaft 53, pinion 54, and rack 55, and on the left through the chain-wheels 57 and 58, chain 56, shaft 59, pinion 60, and rack 61. The stroke of the thread-guide is also effected through the lever 49; but this proceeds from the chain-wheel 62, which, though connected with a similar actuating mechanism as the chain-wheels 20, 21, and 22 in Figs. 7 to 9—that is to say, a pawl and ratchet-wheel, worm, and worm-wheel—has this difference, that the chain 63 is wound off the chain-wheel 62 a little by the action of the worm and worm-wheel at each stroke of the pawl. In consequence of this the thread guides or conductors after each fresh layer of thread approach a little toward the ring-rails until with a full bobbin the smallest distance A^2, Fig. 12, is reached. The motion of the thread-guide on the right-hand side is effected through the chain 63, loose guide-wheel 64, chain-wheel 65, shaft 66, chain-wheel 67, chain 68, and thread-guide rod 69, and that of the left-hand side through the chain 70, chain-wheels 71 and 72, shaft 73, chain-wheel 74, chain 75, and thread-guide rod 76. After the removal of the full bobbins the thread-guides are similarly placed back in their former positions by reversing the motion of the chain-wheel 62 by means of the crank 18.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination, with the spindle, the ring and traveler, and means for traversing the ring and traveler, of a thread-guide moving with the ring and traveler in directions parallel with the spindle-axis and actuating mechanism for said guide, whereby it is traversed in unison with the ring and traveler, and whereby it is caused also to approach the ring and traveler as the diameter of the yarn load increases, substantially as set forth.

2. The combination, with the spindle and the ring and traveler and their traversing devices, of a thread-guide and actuating mechanism whereby it is caused to move in unison with the ring and traveler in directions parallel with the spindle-axis, said actuating mechanism for said guide being connected with the traversing devices of the ring and traveler, and also operating to cause the guide to approach the ring and traveler as the diameter of the yarn load increases, substantially as set forth.

3. In a ring-frame spinning-machine, the combination of a thread-guide, a spindle, a ring-rail, ring and traveler, a gradually-operating take-up mechanism connected with said guide and rail and adapted to change their limits of movement, and means for moving said take-up mechanism boldily to reciprocate the guide and rail, substantially as set forth.

4. In a ring-frame spinning-machine, the combination of a thread-guide, a spindle, a ring and traveler, a ring-rail, a rocking lever, chain-wheels mounted thereon, chains having operative connection with said guide and ring-rail, and means for gradually rotating the wheels and for rocking the lever, substantially as set forth.

5. In a ring-frame spinning-machine, the combination of a thread-guide, a spindle, a ring and traveler, a ring-rail, a rocking lever, chain-wheels mounted thereon, chains wound on said wheels and having operative connection with said guide and ring-rail, a ratchet-wheel having a mechanical connection with the chain-wheels, and a pawl and actuating means therefor for gradually rotating the ratchet-wheels, substantially as set forth.

6. The combination of the thread-guides, the spindles, the rings and travelers, the ring-rails, a movable bar 11, means, such as a cam 4, for actuating the same, a shaft 23, carried by said bar, chain-wheels 20, 21, and 22 thereon, chains 24, 35, and 43 wound on said wheels, gears 42^a 42^b, with which the chains 35 and 43 are operatively connected, levers 39^a and 39^b in operative connection with the thread-guides, mechanical connections between the chain 24 and the ring-rail, and means for gradually rotating the chain-wheels, substantially as set forth.

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

FRIEDRICH MORITZ FRANKE.

Witnesses:

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WILLIAM R. MATTHES.