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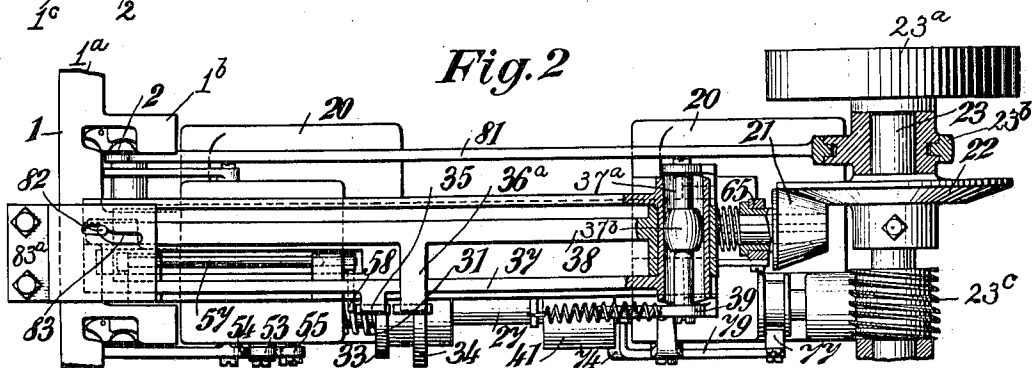
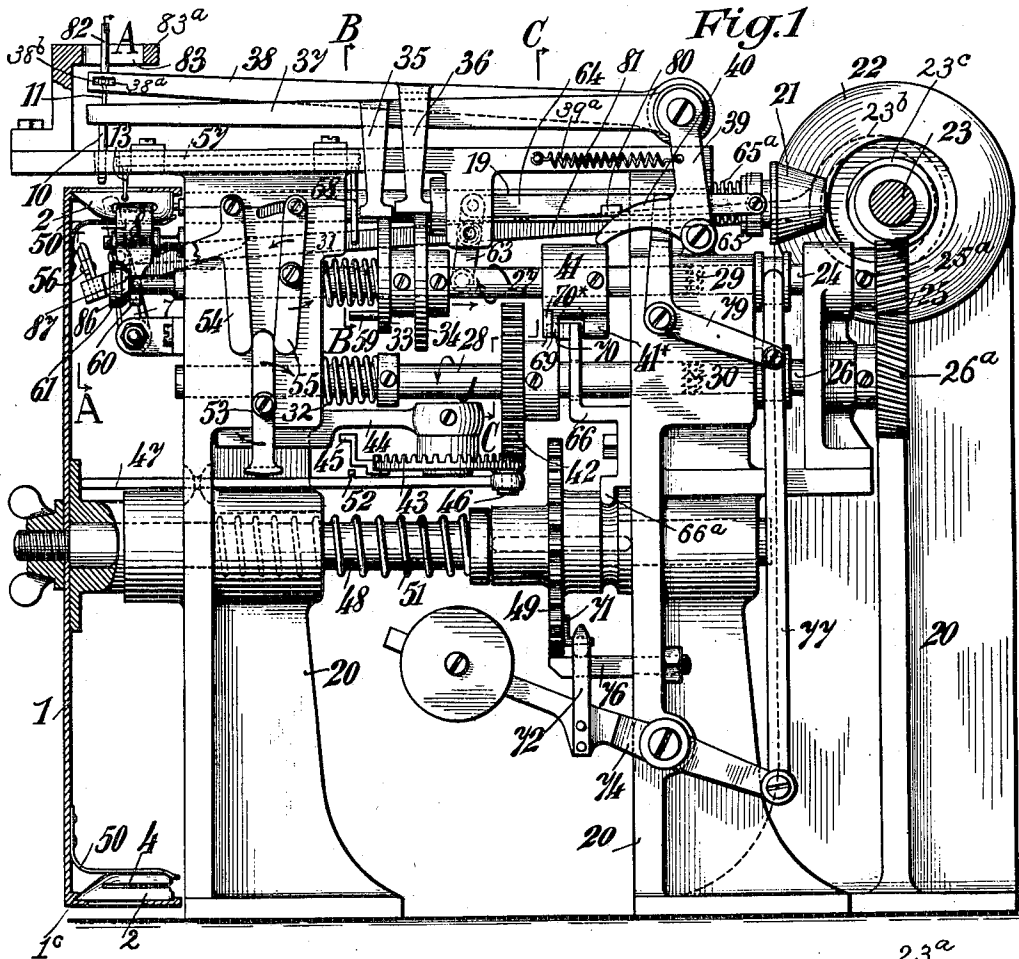
PATENTED DEC. 25, 1906.

E. BERGER.

APPARATUS FOR FILLING THE SHUTTLES OF EMBROIDERING MACHINES.

APPLICATION FILED JUNE 26, 1905.

4 SHEETS—SHEET 1.



Witnesses:

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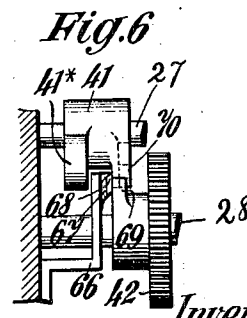
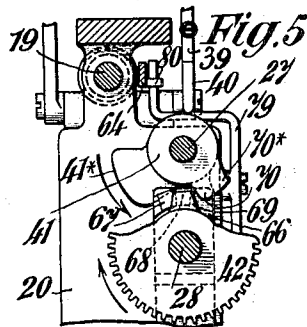
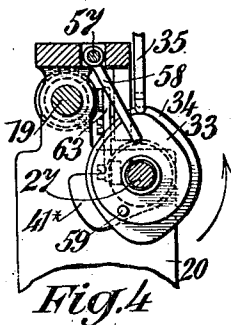
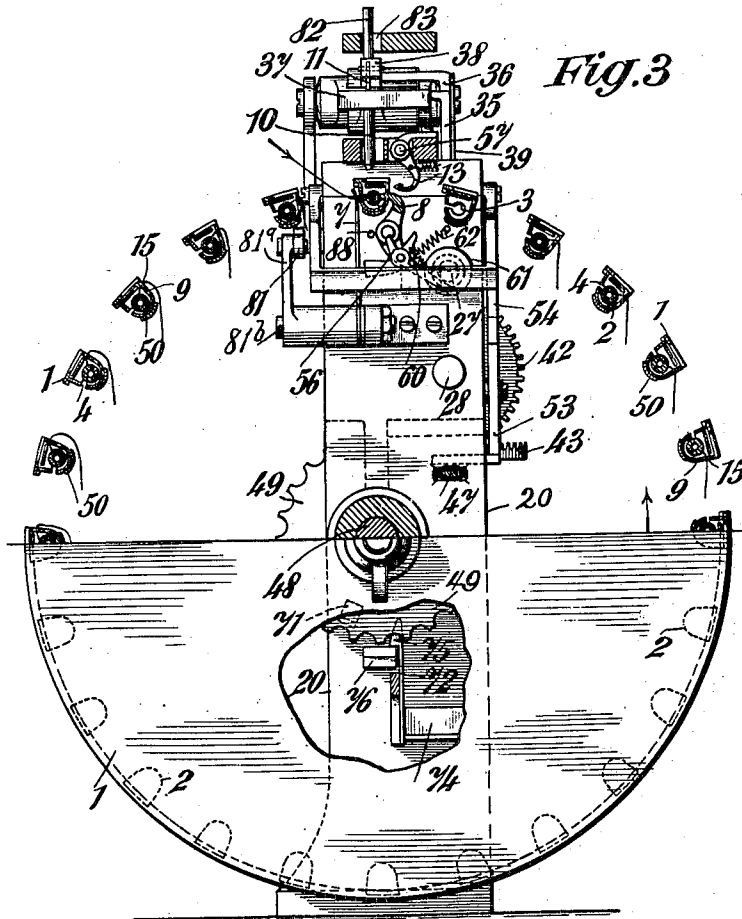
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4 SHEETS—SHEET 2.



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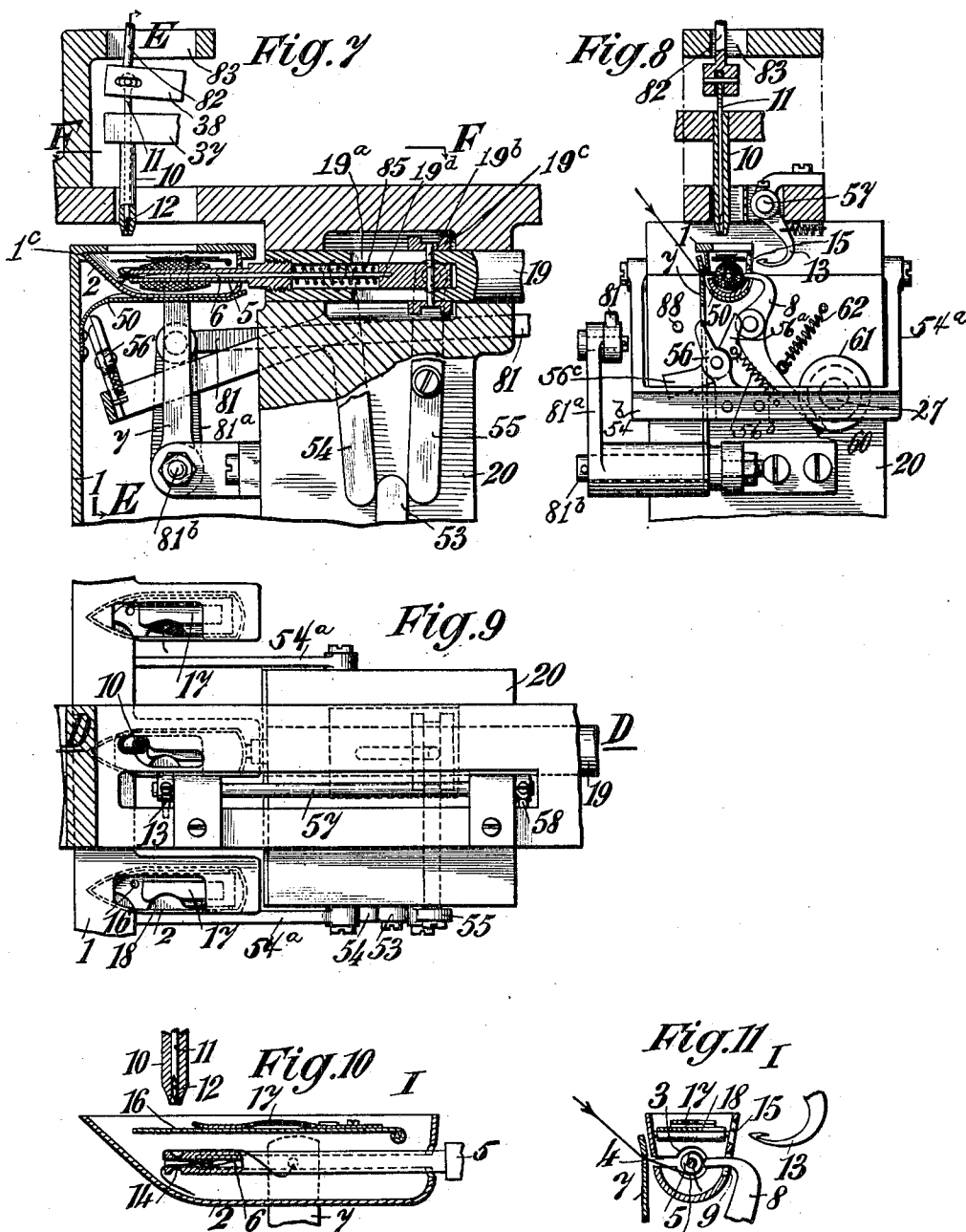
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4 SHEETS—SHEET 3.



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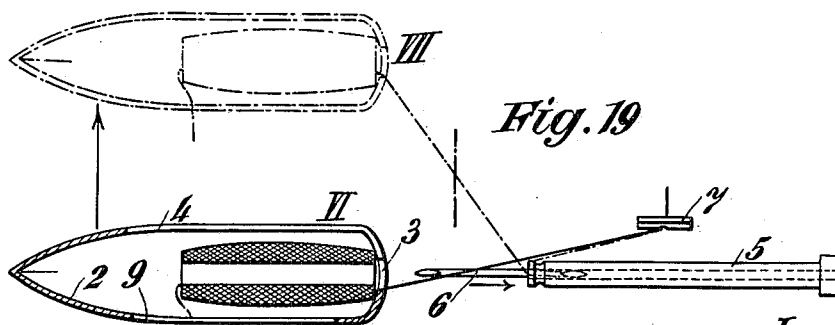
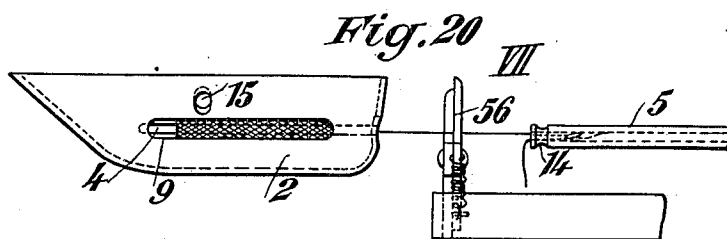
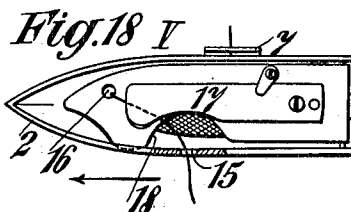
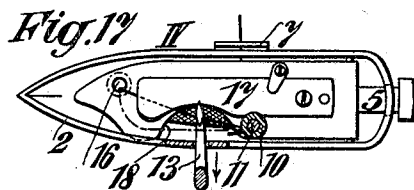
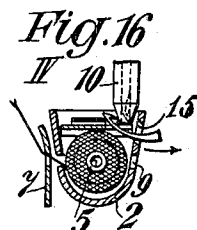
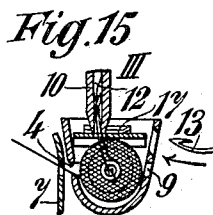
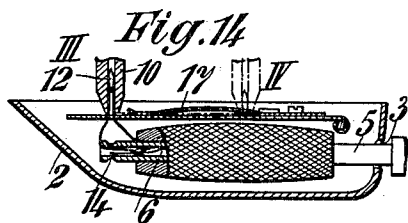
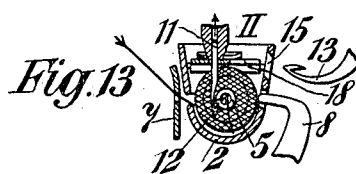
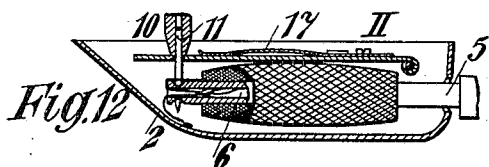
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APPARATUS FOR FILLING THE SHUTTLES OF EMBROIDERING MACHINES.

APPLICATION FILED JUNE 26, 1905.

4 SHEETS—SHEET 4.



Witnesses:

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UNITED STATES PATENT OFFICE.

ERNST BERGER, OF RORSCHACH, SWITZERLAND, ASSIGNOR TO THE FIRM
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APPARATUS FOR FILLING THE SHUTTLES OF EMBROIDERING-MACHINES.

No. 839,449.

Specification of Letters Patent.

Patented Dec. 25, 1906.

Application filed June 26, 1905. Serial No. 267,053.

To all whom it may concern:

Be it known that I, ERNST BERGER, a subject of the King of Württemberg, Germany, residing at Rorschach, Switzerland, have invented new and useful Improvements in Apparatus for Filling the Shuttles of Embroidering-Machines, of which the following is a specification.

This invention has relation to means for filling shuttles and more particularly the shuttles used in embroidering-machines.

As is well known, the number of needles used in embroidering-machines is or may be very large, in some cases as many as six hundred (600) needles are required, and the filling of the shuttles by the means heretofore available is very laborious and requires much time.

My invention has for its object to avoid the disadvantages referred to, and comprises mechanism for forming a cop within a shuttle, a shuttle-carrier, mechanism for moving the carrier periodically, and thereby moving the empty shuttles successively in position to be filled, mechanism for threading each shuttle after being filled, and mechanism for cutting the thread fed to the shuttle after it has been threaded.

In the accompanying drawings, Figure 1 is a front elevation, partly in section, of a machine embodying my invention. Fig. 2 is a fragmentary plan view, also partly in section; and Fig. 3 is a left end elevation, partly in section, on line A A of Fig. 1. Figs. 4 to 9 are detail views drawn to an enlarged scale, Figs. 4 and 5 being sections taken, respectively, on lines B B and C C of Fig. 1. Fig. 6 is a rear elevation of part of the mechanism shown in Fig. 5. Fig. 7 is a section on line D D of Fig. 9. Fig. 8 is a section on line E E of Fig. 7, and Fig. 9 a section on line F F of Fig. 7. Figs. 10 to 20 are also enlarged details illustrative of the successive steps in the operation of filling a shuttle, threading the same, and cutting the thread, Figs. 10, 12, and 14 being longitudinal vertical sections, Figs. 11, 13, 15, and 16 cross-sections, Figs. 17, 18, and 19 plan views, and Fig. 20 a side elevation, each of Figs. 11 to 20, showing a shuttle and a part or parts of the mechanism for filling and threading the same or for cutting the thread.

In order that the mechanism referred to may perform its functions automatically, as

hereinafter described, the shuttles 2 have besides the usual cover having thread-aperture 16 and tension-spring 17 the inspection-slot 9 and the thread-exit aperture 15 in one of its side walls, a longitudinal slot 4 in its opposite side wall for traversing the thread along the cop-winding spindle, an aperture 3 in its rear wall for the introduction and withdrawal of said spindle and the stripping off of the formed cop by such withdrawal, while the shuttle-cover is partly cut away at 18 to form a gap, the tension-spring 17 being suitably recessed. Such a shuttle is shown in Figs. 10 to 20 and fully described in Letters Patent of the United States granted to me April 17, 1906, No. 817,744.

Referring now to Figs. 1, 2, and 3, the operative devices are mounted on or carried by a suitable frame 20, which has bearings for the main driving-shaft 23, to which are secured a belt-pulley 23^a, an eccentric 23^b, a beveled friction drive-wheel 22, and a worm 23^c. The strap-rod 81 of the eccentric 23^b is connected to a radial arm 81^a on a rock-shaft 81^b, having its bearings in a bracket secured to the main frame 20, and to said shaft is secured the thread-guide 7, whereby the latter is vibrated in front of the shuttle-slot 4 to traverse the shuttle-thread along the cop-winding spindle 5, hereinafter referred to as the "cop-spindle." (See also Figs. 7 and 8.) The frame 20 also has bearings for four parallel shafts arranged one above the other, all of which have endwise motion in their said bearings. The lower shaft 48 has secured to its left end the shuttle-carrier 1 in the form of a disk having a peripheral flange, Fig. 2, from which project tongues 1^b at equal distances apart, and the under side of said flange 1^a at the rear end of each tongue has an angular seat 1^c for the beak of a shuttle 2, while on the under side of the forward end of the tongue is a shoulder for the rear wall of said shuttle, which is further supported by a spring 50, which holds the shuttle against the under side of the tongue 1^b, Figs. 1 and 7. The tongues 1^b are suitably cut away to expose the thread-aperture 16 in the shuttle-cover and to admit the thread being carried under the tension-spring 17 and across the gap or recess in said spring and across the gap 18 in the shuttle-cover in the threading of the shuttle, as hereinafter described.

On shaft 48 is mounted a coiled spring

51, between a collar and the left end wall of a socket in the shaft-bearing, said spring tending to hold the shaft and shuttle-carrier in its normal or operative position, shown in Fig. 1, with a shuttle in position to be filled, means hereinafter referred to being provided to move the shaft 48 and shuttle-carrier to the left sufficiently to cause the shuttle to move off the cop-winding spindle, and thereby strip the cop off of said spindle, means being also provided to then rotate the shaft and shuttle-carrier sufficiently to bring an empty shuttle into position for filling. The two shafts above shaft 48 are sectional or two-part shafts, the sections 28 and 27 of which carry coiled springs 32 31, respectively, the tendency of which is to move the shafts to the right to couple them to their respective right end sections 26 and 24, both sections of each shaft being provided with clutch-coupling faces 30 and 29, respectively, of usual construction. Sections 26 and 24 of the two shafts carry each a worm-wheel 26^a and 25^a, respectively, meshing with each other, wheel 25^a gearing with worm 23^c on main driving-shaft 23, from which the shafts 24 27 and 26 28 can be driven. Each of the shaft-sections 26 and 24 also has a shifting collar engaged by a shifting-rod 77, connected to one arm of a weighted lever 74. To this lever is secured a spring-latch 72, engaging a fixed keeper 76, the free end of said latch lying in the path of a tripper-arm 71 on ratchet-wheel 49, connected to shaft 48 by groove and feather and held against longitudinal motion with the shaft by a lug 66^a at the foot of an arm 66, secured to the main frame and having a segmental cam at its upper end, hereinafter referred to. The tripping of lever 74 raises the shifting-rod 77 and shifts the shaft-sections 26 24 toward the right, and thereby moves the worm-wheel 25^a out of gear with the worm 23^c on main shaft 23. Simultaneously therewith the rod 77 actuates a bell-crank lever 79 to throw the cop-winding shaft 19 out of gear, as will be presently described.

The part 28 of shaft 26 28 carries a gear-wheel 42 in gear with a crown-wheel 43, having bearing in an arm 44, secured to the main frame 20. To the periphery of said wheel 43 is secured a pawl 45, adapted to engage the teeth of the ratchet-wheel 49 on shaft 48 at each revolution of the wheel 43 to rotate shaft 48 and impart to the shuttle-carrier 1 an angular movement equal to the distance between two shuttles. To the under side of the crown-wheel 43 diametrically opposite pawl 45, at 46, is pivoted a push-rod 47, extending to the left and in contact with the shuttle-carrier 1, said rod being guided in the machine-frame, so that at each revolution of the crown-wheel the shuttle-carrier is moved to its left extreme position and then rotated a step to bring an

empty shuttle in position for filling. The push-rod 42 has a lug 52 in the path of the lower arm of a two-armed actuating-lever 53 for purposes presently explained. The hub of the gear-wheel 42 on section 28 of shaft 26 28 has a projection 69, acted on by a stepped segmental cam-face at the upper end of the fixed arm 66, above referred to. This cam-face has two steps 68 and 67, which not only act on the projection 69 on hub of gear-wheel 42, but also on a nose 70 of a cam 41 on section 27 of shaft 24 27, which cam 41 has two other cam-noses 70^x and 41^x. (See also Figs. 4 to 6.) On said section 27 of shaft 24 27 are secured two lifting-cams 33 and 34, the latter having a pin 59, adapted to engage a radial arm 58 on the right-hand end of a spindle 57, to the left-hand end of which is secured the shuttle-threading hook 13, held in a retracted position by a spring 13^a, Fig. 8; but when the pin 59 engages the arm 58 the spindle is turned to move the threading-hook 13 to the left, Fig. 8, through the thread-exit aperture 15 in the shuttle 2 to seize the shuttle-thread, Fig. 16, and draw it through said aperture. When pin 59 on cam 33 releases radial arm 58 on the threading-hook spindle, the latter is turned in an opposite direction by spring 13^a, connected with said hook, Fig. 8, to draw the shuttle-thread out through shuttle-aperture 15.

At its left end the section 27 of shaft 24 27 has a collar 61, which is partly cylindrical and partly conical or tapering inwardly, and 8 is a feeler-lever fulcrumed on a stud on the main frame, its upper bent arm adapted to project through the inspection-slot 9 of the shuttle 2 in contact with the cop-winding spindle, Fig. 11. The lower arm 60 of said lever 8 during the formation of a cop lies in contact with the inner face of the aforesaid collar 61, and its function will be presently described.

At its right end the cop-winding shaft 19 carries a conical friction drive-wheel having sliding motion on said shaft but rotating therewith, said cone-wheel being driven by the friction bevel-wheel 22 on main shaft 23. A coiled spring 65^a on shaft 19, acting on the hub of cone-wheel 65, tends to maintain the same in frictional contact with drive-wheel 22, and on said hub of cone-wheel 21 is mounted a sliding collar connected by a rod 64 to a lever 63, fulcrumed to the main frame, the free end of which lever carries a roller in contact with the face of the hub of cam 34 on section 27 of shaft 24 27. The connecting-rod 64 has a lug 80 in the path of the upper arm of the bell-crank lever 79, so that when the latter is rocked by the shifting-rod 77 on the release of weighted lever 74, above described, the bell-crank lever will act on the lug 80 and push the rod 64 toward the left, thereby moving driven cone-wheel 21 out of contact with driving-wheel 22. On the

other hand when bell-crank lever 79 is moved back to normal position by the downward movement of the shifting-lever 77 the coiled spring 65^a on shaft 19 moves the wheel 21 to the right in contact or in gear with wheel 22 on main shaft 23.

The left end of the cop-winding shaft is tubular, and in its left end is screwed the cop-winding spindle 5, which is also tubular and has an annular peripheral groove 14, Figs. 10, 12, and 14. The shaft 19 in rear of the cop-spindle 5 is slotted longitudinally, as shown at 19^a, Fig. 7, to form a guide for a pin 19^b, secured to a sliding collar 19^c, connected to the upper arm of a lever 55, actuated by the lever 53, above referred to. The pin 19^b passes through a slide-block 19^d, to which is secured a rod or wire 6, having a hook at its left end. A spring 85, coiled about said rod and abutting against the winding-spindle 5 and slide-block 19^d, tends to move the rod 6 toward the right. When the push-bar 47 moves toward the left, its lug 52 turns lever 55 toward the right to project the hook-rod 6 from the spindle 5, for purposes presently explained.

I will now describe the shuttle-threading devices: Above the main frame is located a pin or spindle 37^a, secured to and carried by the vertical arm of an angle-lever 39, fulcrumed on the machine-frame, and said spindle has an enlargement 37^b, Fig. 2, to form a rocking bearing for the hub of a lever 37, constructed in the form of an oblong rectangular frame, in the cross-bar, at the free end of which is secured a tubular rod 10, tapered at its lower end. The front longitudinal bar of the lever 37 has a lateral extension to which is secured a depending foot 35, which rests on the lifting-cam 33, Fig. 1. On the hub of lever 37 is mounted a second lever 38, having a longitudinal slot 38^a at its outer end for a transverse pin 38^b, to which is pivoted a rod 11, which has vertical motion in the tubular rod 10 and has a hook 12 at its lower end. (See also Figs. 7, 8, and 10 and Figs. 12 to 16.) To the free end of lever 38 is also secured a vertical guide-pin 82, projecting through a longitudinal slot 83 in an overhanging bracket 83^a on top of the machine-frame 20, said slot being formed of two parallel portions out of line with each other, Fig. 2, and said lever has a lateral extension 26^a extending over the front longitudinal bar of frame-lever 37, to which extension is secured a depending foot 36, which rests on cam 34 on shaft 19. By means of the described arrangement sufficient lateral movement is afforded to the levers 36 and 37 to permit the guide-pin 81 to move from the left end of the slot 83 into and along its right-hand end. The lever 39 is connected to the machine-frame by a spring 39^a, and the horizontal arm 40 of said lever bears on cam 41 on section 27 of shaft 24 27 and is periodic-

ally tilted by the cam-nose 41^x of said cam to move the levers 37 and 38 from left to right, the reverse movement being effected by the spring 39^a when cam-nose 41^x ceases to act on lever-arm 40, as will be readily understood.

The devices for cutting the feed-thread comprise a yoke 54^a, pivoted to the machine-frame and having a downwardly-projecting arm 54, between which and the lower arm of the lever 55 lies the upper arm of the vertical lever 53, actuated by the lug 52 on the push-bar 47, above referred to. It will be seen that when the push-bar 47 moves the shuttle-carrier to the left and actuates lever 53, and thereby lever 55 to project the hooked rod 6 in the cop-winding spindle 5 out of the latter, the lever 54 will not be affected; but after said lug moves out of contact with the lever 53 and makes its return movement said lever 52 will actuate lever 54, and thereby raise the yoke 54^a. The cross-bar 54^b of the yoke carries two shear-blades. One, 56^a, is pivotally connected to the fixed blade, Fig. 8. The movable blade 56^a is held open by a spring 56^b and has an extension 56^c in the path of a pin 88, so that when yoke 54^a is lifted the pin 88, acting on arm 56^c, closes the movable blade 56^a against the tension of its spring 56^b, and when said yoke again drops said spring opens the movable blade, as will be readily seen.

It being assumed that thread is fed to a shuttle from any conveniently located thread-feed and that the end of said thread has been threaded through the eye of the thread-guide 7 and by the projection of the hooked rod in the cop-winding spindle seized, drawn into said spindle, and held therein, the operation of the machine will be as follows, the parts being shown in Figs. 1 to 6 and 10 and 11 in their respective positions for beginning the winding of a cop—that is to say, a shuttle 2 has been moved onto the cop-winding spindle 5 by the movement of the carrier 1 from left to right, the driven friction-cone 21 on the winding-shaft 19 is in contact with the driving-cone 22 on the main shaft 23, threading-hook 13 withdrawn, the upper feeler-arm of the feeler 8 in contact with the winding-spindle 5, position I, Fig. 11, the lower arm 60 of said feeler on the right of the collar or head 61 at the left end of section 27 of shaft 24 27, whereby said shaft-section 27 has been moved sufficiently toward the left to uncouple it from its section 24 and compress the spring 31 on said section 27, while shaft-section 28 is also uncoupled from its section 26 and the spring on said section 28 compressed. The main shaft 23 being now rotated a cop is wound on the spindle, and as said cop increases in diameter the upper arm of the feeler 8 is forced outwardly against the stress of its spring 62, connected to its arm 60, Fig. 8, while said arm 60 is moved away

from head 61 on shaft-section 27 until the cop is completed, when arm 60 of the feeler-lever 8 will have moved along the inclined face of head 61 to the cylindrical portion of said head, thereby moving the feeler 8 out of the shuttle 2 and releasing shaft 27, which is now coupled to its section 24 by the action of the spring 31, and said shaft is rotated by the gearing 23° 25^a in the direction indicated by arrow, Fig. 1. By this movement of the shaft-section 27 the hub of cam 34 acts on lever 63 and through its connecting-rod 64 moves the driven cone 21 toward the left against the stress of spring 65^a and out of contact with drive-wheel 22, thereby stopping the rotation of winding-shaft 19. As shaft 24 27 now rotates the noses of the two cams 33 34 move from under the feet 35 36 of the levers 37 and 38, causing them to drop, thereby bringing the tapering end of the tube 10 over and in register with the thread-aperture 16 in the shuttle-cover, with the rod 11 projecting into the shuttle and with its hook 12 in the annular groove 14 at the left end of the cop-winding spindle 5, position II, Figs. 12 and 13.

From Fig. 4 it will be seen that cam 33, which acts on foot 35 of lever 37, has but one cam-nose, while cam 34, which acts on foot of lever 38, that carries the hook-rod 11, has two such noses diametrically opposite each other, so that at the next half-revolution of shaft 24 27 said lever 38 is lifted again to withdraw the rod 11 into the tubular rod 10 after having hooked the cop-thread stretched across the annular spindle-groove 14, position III, Figs. 14 and 15. At about the same time the pin 59, projecting from cam 33, engages the radial arm 58 on the threading-hook spindle and turns said shaft to move the hook through the thread-aperture 15 into the shuttle 2, Fig. 16, and about this time the cam-nose 41^x on cam 41 on shaft-section 27 tilts lever 39 toward the right, thereby moving levers 37 38 in the same direction, and under the guidance of the pin 82 in slot 83 in frame-bracket 83^a the tubular rod 10 will be moved from the position III above the thread-aperture 16 in the shuttle-cover to the position IV, Fig. 17. By this movement the thread end held in the winding-spindle, and now also held in the tubular rod 10, is drawn out of said spindle, then under the tension-spring 17 and across the gap 18 in the shuttle-cover and across the hook of the threading-hook 13, at which time the pin 59 on cam 34 releases arm 58 on the threading-hook spindle 57, and under the action of the spring 13^a of hook 13, the latter and with it the end of the cop-thread is drawn or threaded through the eye or aperture 15 in the side wall of the shuttle 2, position V, Fig. 18. After the threading of the shuttle the cam-nose 41^x on cam 41 moves out of contact with arm 40 of lever 39, caus-

ing levers 37 38 to be tilted back toward the left, at which time cams 33 and 34 lift said levers to their position of rest.

Shortly before the completion of the operations last described the cam-nose 70 on cam 41 moves onto the first step 67 of the fixed cam 66, and cam-nose 70^x of cam 41 at the same time acts on projection 69 on the hub of gear-wheel 42 on section 28 of shaft 26-28, which is then on the second step 68 of said fixed cam, to hold the uncoupled shaft-section 28 against the stress of its spring 32. The action of cam-nose 70^x on projection 69 is such as to move the latter off step 68 on fixed cam 66, and thereby release shaft-section 28 and cause its spring 32 to couple it to its section 26, whereby said shaft is rotated by gearing 23° 25^a 26^a. At the same time the cam-nose 70 of cam 41 moves onto the step 67 of fixed cam 66, thereby camming shaft-section 27 toward the left and uncoupling the same from its section 24 and thereby bringing arm 60 of feeler 8 again in front of collar 61, Fig. 1. The rotation of shaft 26-28 also rotates crown-wheel 43 through gear 42, the former moving the push-rod 47, and through the latter the shuttle-carrier 1, toward the left, whereby the threaded cop is stripped off the winding-spindle 5. During this movement of the push-rod 47 lug 52 thereon acts on lever 55, thereby projecting the hook-rod 6 from the winding-spindle 5 in position to hook the thread leading from the thread-guide 7 to the cop, which thread is drawn out of the shuttle by the hook-rod 6 as the shuttle-carrier 1 moves to the limit of its position toward the left. (Position VI of shuttle and winding-spindle, Fig. 19.) At this time the pawl 45 on the crown-wheel 43 engages a tooth of ratchet-wheel 49 and rotates the same, thereby imparting to the shuttle-carrier 1 an angular movement sufficient to bring an empty shuttle in line with the winding-spindle 5. The previously-filled shuttle will now occupy position VII, Fig. 19, relatively to the winding-spindle, with the feed-thread held by the hook-rod 6 in said spindle. During the movement of the push-rod 47 toward the left its lug 52 will move out of contact with lever 53, causing the spring 85 to retract the hook-rod 6 into the spindle to hold the feed-thread ready for the winding of the next cop. On the return movement of the push-rod 47 the lug 52 thereon acts on lever-arm 54, lifts the shear-frame 54^a with the open blades of the shears straddling the thread from the cop in the filled shuttle to the hook-rod 6 in spindle 5, when the movable shear-blade is closed by the means before described and said thread is cut, leaving the feed-thread from the thread-guide 7 to the hook-rod jammed in spindle 5 ready for the winding of a cop, and as lug 52 moves out of contact with lever 53 the shear-frame drops to its normal posi-

tion. This movement of the shuttle-carrier from left to right under the stress of the spring 51 on the carrier-shaft 48 moves the empty shuttle, previously positioned, onto the winding-spindle 5. At the same time the projection 69 on hub of toothed wheel 42 moves onto the first step 68 of fixed cam 66 and moves the nose 70 of cam 41 onto the second step 69 of said fixed cam, thereby camming shaft-section 28 toward the left and uncoupling the same from its section 26. Shaft-section 27 is uncoupled from its section, as above described, at the same time shaft-section 28 is uncoupled from 26, and as cam 34 moves to the left with shaft-section 27, which movement is followed by the lever 63 under the stress of spring 65^a on cop-winding shaft 19, the latter is moved in an opposite direction by said spring, moving driven friction-cone 21 thereon in contact with driving-cone 22, all the mechanism being again in the position Fig. 1, and the described operations will be repeated until all the shuttles on the carrier have been filled.

In the drawings I have shown as an example a shuttle-carrier adapted to carry twenty-four shuttles. When the last shuttle has been filled, the tripping-arm on ratchet-wheel 49 engages the spring-catch 72 and releases lever 74, whereby shafts 19 and shaft-sections 24 and 26 are shifted to throw the driven gearing out of gear with the driving-gearing by the mechanism hereinbefore described.

I claim—

1. In a shuttle-filling machine, the combination with a cop-winding spindle, of a shuttle-carrier carrying a suitable shuttle, means to move the carrier toward the spindle and thereby move the shuttle onto said spindle, and means to form a cop on the spindle within the shuttle.

2. In a shuttle-filling machine, the combination with a cop-winding spindle, of a shuttle-carrier carrying a suitable shuttle, mechanism for automatically moving the carrier toward the spindle and thereby moving said shuttle onto the spindle and means to form a cop on the spindle within the shuttle.

3. In a shuttle-filling machine, the combination with a cop-winding spindle; of a shuttle-carrier carrying a suitable shuttle, means to move the carrier toward the spindle and thereby move the shuttle onto said spindle, means to form a cop on the spindle within the shuttle and means to move the carrier away from the spindle and thereby strip the formed cop off said spindle.

4. In a shuttle-filling machine, the combination with a cop-winding spindle; of a shuttle-carrier carrying a suitable shuttle, means to automatically move the carrier toward the spindle and thereby move the shuttle onto said spindle, means to form a cop on the spindle within the shuttle and means to au-

tomatically move the carrier away from the spindle and thereby strip the formed cop off said spindle.

5. In a shuttle-filling machine, the combination with a cop-winding spindle; of a shuttle-carrier carrying a suitable shuttle, mechanism to automatically move the carrier toward the spindle and thereby move the shuttle onto said spindle, mechanism to form a cop on the spindle within the shuttle and mechanism controlled by the diameter of the cop to move the carrier away from the spindle and thereby strip the cop off said spindle.

6. In a shuttle-filling machine, the combination with a cop-winding spindle; of a rotatable and to-and-fro movable shuttle-carrier adapted to carry a plurality of suitable shuttles, mechanism to automatically move the carrier toward the spindle and thereby move one of the shuttles onto said spindle, means to form a cop on the spindle within the shuttle; and mechanism controlled by the diameter of the cop in the shuttle to move the carrier away from the spindle and thereby strip the cop off said spindle.

7. In a shuttle-filling machine, the combination with a cop-winding spindle; of a rotatable and to-and-fro movable shuttle-carrier adapted to carry a plurality of suitable shuttles, mechanism to move the carrier toward the spindle and thereby move a shuttle onto said spindle, means to form a cop on the spindle within the shuttle, means controlled by the diameter of the cop to move the carrier away from the spindle and thereby strip the formed cop off said spindle, and mechanism set in operation to rotate the carrier to present an empty shuttle to the spindle.

8. A machine for filling shuttles, comprising mechanism to automatically form a cop within a suitable shuttle and mechanism to automatically thread the free end of the cop-thread through the shuttle.

9. A machine for filling shuttles, comprising a cop-winding spindle, mechanism to automatically form a cop within a suitable shuttle, mechanism to thread the free end of the cop-thread through the shuttle, means to automatically withdraw the shuttle from the spindle and thereby strip the formed cop off said spindle, and mechanism to cut the thread fed to the spindle.

10. A machine for filling shuttles, comprising mechanism to automatically form a cop within a suitable shuttle, mechanism to automatically draw the free end of the cop-thread through an eye in the shuttle-cover, draw it under the tension-spring on said cover and then through an eye in one of the side walls of the shuttle.

11. A machine for filling shuttles, comprising mechanism to automatically form a cop within a suitable shuttle, mechanism to automatically draw the free end of the cop-

thread through an eye in the shuttle-cover, draw it under the tension-spring on said cover and then through an eye in one of the side walls of the shuttle; in combination with means for automatically withdrawing the shuttle from the spindle and thereby stripping the formed cop off said spindle, means to simultaneously draw the feed-thread out of the shuttle, and means for cutting said feed-thread.

12. A machine for filling shuttles, comprising a cop-winding spindle, mechanism to automatically form a cop within a suitable shuttle, mechanism to automatically thread the shuttle ready for use, mechanism to automatically withdraw the shuttle from the spindle and thereby strip the formed cop off said spindle, means to simultaneously draw the thread fed to the spindle out of the shuttle, and mechanism to cut the last-named thread; in combination with a controller operated by the diameter of the cop, mechanism controlled by said controller to automatically throw the cop-forming devices out of operation, to automatically actuate the means for withdrawing the shuttle from the winding-spindle and to automatically actuate the feed-thread-cutting device.

13. A machine for filling shuttles, comprising a cop-winding spindle, a revoluble shuttle-carrier having seats for a multiplicity of suitable shuttles, mechanism to move the shuttle-carrier toward and from the winding-spindle and thereby move a shuttle onto and off said spindle, mechanism to automatically form a cop within a shuttle when on the spindle, and mechanism to automatically thread the shuttle ready for use; in combination with a controller controlled by the diameter of the cop formed in the shuttle and controlling intermediate mechanisms to first throw the cop-winding spindle out of operation, then to operate the threading mechanism and throw the same out of operation, then to operate the mechanism to move the shuttle-carrier away from the spindle and thereby strip the cop off said spindle, next to operate the mechanism for imparting angular motion to the shuttle-carrier to bring an empty shuttle into alinement with the winding-spindle, and finally to operate the mechanism to move the shuttle-carrier back toward the spindle and thereby move the empty shuttle onto the same.

14. A machine for filling shuttles, comprising a cop-winding spindle provided with means to hold the free end of the thread fed to said spindle, a revoluble shuttle-carrier having seats for a multiplicity of suitable shuttles, mechanism to move the shuttle-carrier toward and from the winding-spindle and thereby move a shuttle onto and off said spindle, mechanism to automatically form a cop within a shuttle when on the spindle, mechanism to automatically seize the free

end of the cop-thread and thread it through the shuttle ready for use and mechanism to cut the feed-thread; in combination with a controller controlled by the diameter of the cop, and intermediate mechanism controlled by the controller and operating to first throw the cop-winding spindle out of operation, then to operate the threading mechanism and throw the same out of operation, then to operate the mechanism to move the shuttle-carrier away from the winding-spindle and thereby strip the cop off said spindle and operate means to draw the thread fed to the spindle out of the shuttle, to operate the mechanism for imparting angular movement to the shuttle-carrier to bring an empty shuttle in alinement with the winding-spindle and at the same time set the cutting device in operation to cut the feed-thread drawn out of the shuttle and then throw said mechanism out of operation, then to set in operation the mechanism for moving the shuttle-carrier back toward the spindle and the empty shuttle in alinement therewith onto the same and to finally restart the cop-winding spindle.

15. A machine for filling shuttles, comprising a cop-winding spindle provided with means to hold the free end of the thread fed to said spindle, a revoluble shuttle-carrier having seats for a multiplicity of suitable shuttles, mechanism to move the shuttle-carrier toward and from the winding-spindle and thereby move a shuttle onto and off said spindle, mechanism to automatically form a cop within a shuttle when on the spindle, mechanism to automatically seize the free end of the cop-thread and thread it through the shuttle ready for use and mechanism to cut the feed-thread; in combination with a controller controlled by the diameter of the cop, and intermediate mechanism controlled by the controller and operating to first throw the cop-winding spindle out of operation, then to operate the threading mechanism and throw the same out of operation, then to operate the mechanism to move the shuttle-carrier away from the winding-spindle and thereby strip the cop off said spindle and operate means to draw the thread fed to the spindle out of the shuttle, to operate the mechanism for imparting angular movement to the shuttle-carrier to bring an empty shuttle in alinement with the winding-spindle and at the same time set the cutting device in operation to cut the feed-thread drawn out of the shuttle and then throw said mechanism out of operation, then to set in operation the mechanism for moving the shuttle-carrier back toward the spindle and the empty shuttle in alinement therewith onto the same and to finally restart the cop-winding spindle, and mechanism controlled by the devices which impart angular movements to the shuttle-carrier, to throw all the operative

mechanisms simultaneously out of operation when the last shuttle on the carrier has been filled, threaded and the feed-thread cut.

16. In a machine for filling shuttles, the combination with a vibratory thread-guide, a revoluble tubular cop-winding spindle and a hook-rod movable in said spindle; of a shuttle-carrier carrying a suitable shuttle, means to move the carrier toward the spindle and thereby move the shuttle onto said spindle, means to move the carrier away from the shuttle and mechanism to project the hook-rod from and retract it into the spindle at proper periods, for the purpose set forth.

17. In a machine for filling shuttles, the combination with a cop-winding spindle, a driven wheel having axial motion thereon, a revoluble drive-wheel to drive said driven wheel, a spring on said spindle to maintain the driven wheel in gear with the drive-wheel, a thread-guide, means to vibrate the same and a shuttle-carrier having seats for suitable shuttles and movable toward the winding-spindle to move a shuttle onto said spindle; of an endwise-movable shifting-shaft, a spring thereon adapted to move said shaft in one direction, a spring-controlled feeler-lever held in contact with the winding-spindle during the formation of a cop therein and moved against the stress of its spring by the increasing diameter of the cop, a suitable abutment on the shifting-shaft in contact with the feeler-lever to hold said shaft against motion under the stress of its spring and release the same when the cop has attained a given diameter, and means controlled by the shifting-shaft to shift the driven wheel on the winding-spindle out of gear with its drive-wheel, for the purpose set forth.

18. In a shuttle-filling machine, the combination with a vibrating thread-guide, a revoluble cop-winding spindle having an annular groove at its free end, a thread-hook contained in said spindle, mechanism to project said hook out of and withdraw it into the spindle, to seize the free end of the thread fed to the spindle, draw the same across said annular groove and hold it, a shuttle-carrier carrying a suitable shuttle, and means to automatically move the carrier toward the spindle and thereby move the shuttle onto said spindle; of means for threading the shuttle, comprising a tubular pin, a hook-rod movable in said pin, mechanism to move the pin in register with an aperture in the shuttle-cover and project the hook-rod into the shuttle in line with the aforesaid groove in the spindle to seize the thread stretched across said groove, means to withdraw the hook into its pin and thereby jam the thread therein, means to raise said pin to withdraw the thread from the spindle, means to move said pin along the shuttle to draw the thread under the tension-spring on the shuttle-cover, a

threading-hook, and means to first move said hook into the shuttle through the thread-aperture in one of its side walls to seize the thread held in the aforesaid tube and then move said hook out of said aperture with the thread end, thereby drawing said thread end off the hook-rod in the tube and out of the same.

19. The combination with the lever, 39 40, its pin 37^a having enlargement 37^b, the lever 37 mounted on said pin, the lever 38 mounted on the hub of lever 37, the tubular rod 10 at the free end of lever 37, the hook-rod 11 movable in said rod 10 and pivoted to the free end of lever 38, the pin 82 on the latter lever, and the fixed bracket 83^a having guide-slot 83 for pin 82; of the sectional shaft 24-27 having coupling-faces 29, means to drive said shaft, a spring thereon tending to couple the shaft-sections, cams 33, 34 and 41 on shaft-section 27 acting respectively on levers 37, 38 and 39 40, the collar 61 at the end of shaft-section 27 and the spring-controlled two-armed feeler-lever 8 the arm 60 of which normally engages the aforesaid collar 61, substantially as and for the purpose set forth.

20. The combination with the sectional shaft 24-27, the collar 61 and cam 41 thereon, the fixed cam 66, the sectional shaft 26-28 having coupling-faces 30, the spring 32 and gear-wheel 42 on shaft-section 28, the crown-wheel 43 in gear with wheel 42 and having pawl 45 and the push-rod 47; of shaft 48 movable axially in its bearings, a spring 51 on said shaft to move it in one direction, the ratchet-wheel 49 on the shaft 48 held against axial motion therewith and the shuttle-carrier 1 secured to the shaft and moved by push-rod 47 against the stress of spring 51.

21. The combination with the cop-winding shaft 19, its tubular winding-spindle 5, the slidable hook-rod 6 in said spindle, the retracting-spring 85, the slide-block 19^d, the shifting-collar 19^e and the lever 53 engaging said collar, and the lever 53 to actuate lever 55; of the push-rod 47, the lug 52 thereon and the mechanism for imparting to-and-fro motion to said push-rod, substantially as and for the purpose set forth.

22. The combination with the shear-yoke 54^a, the fixed and movable shear-blades 56, 56^a thereon, the retracting-spring 56^b for the movable blade and the movable-blade-closing pin 88 and the lever-arm 54 of said yoke; of the lever 53 to actuate lever-arm 54, the push-rod 47, the lug 52 acting on lever 53 and mechanism for imparting to-and-fro motion to the push-rod, substantially as and for the purpose set forth.

23. The combination with the cop-winding shaft 19, the friction-cone 21 slidable thereon, the shifting-rod 64, the abutment 80 thereon, the shaft-sections 24 and 26, the gears 25^a 26^a, the main shaft 23 and gears 22 and 23^c

thereon, the shuttle-carrier shaft 48, the ratchet-wheel 49 thereon having tripping-arm 71 and mechanism to impart angular movements to said wheel; of the lever 74, its
5 spring-latch 72 and keeper 76, said spring-latch in the path of arm 71, the shifting-rod 77 connected to shaft-sections 24, 26, and the bell-crank lever 79 connected to rod 77 and adapted to act on abutment 80 on the shift-

ing-rod for the cop-winding spindle, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERNST BERGER.

Witnesses:

ERNST FISCHER,
A. LIEBERKNECHT.