J. JOSEPHS & D. T. BERLIZHEIMER.

QUILL WRAPPING MACHINE.

APPLICATION FILED MAY 13, 1918.

1,298,221.

Patented Mar. 25, 1919.

4 SHEETS—SHEET 1.

Fig. 1.

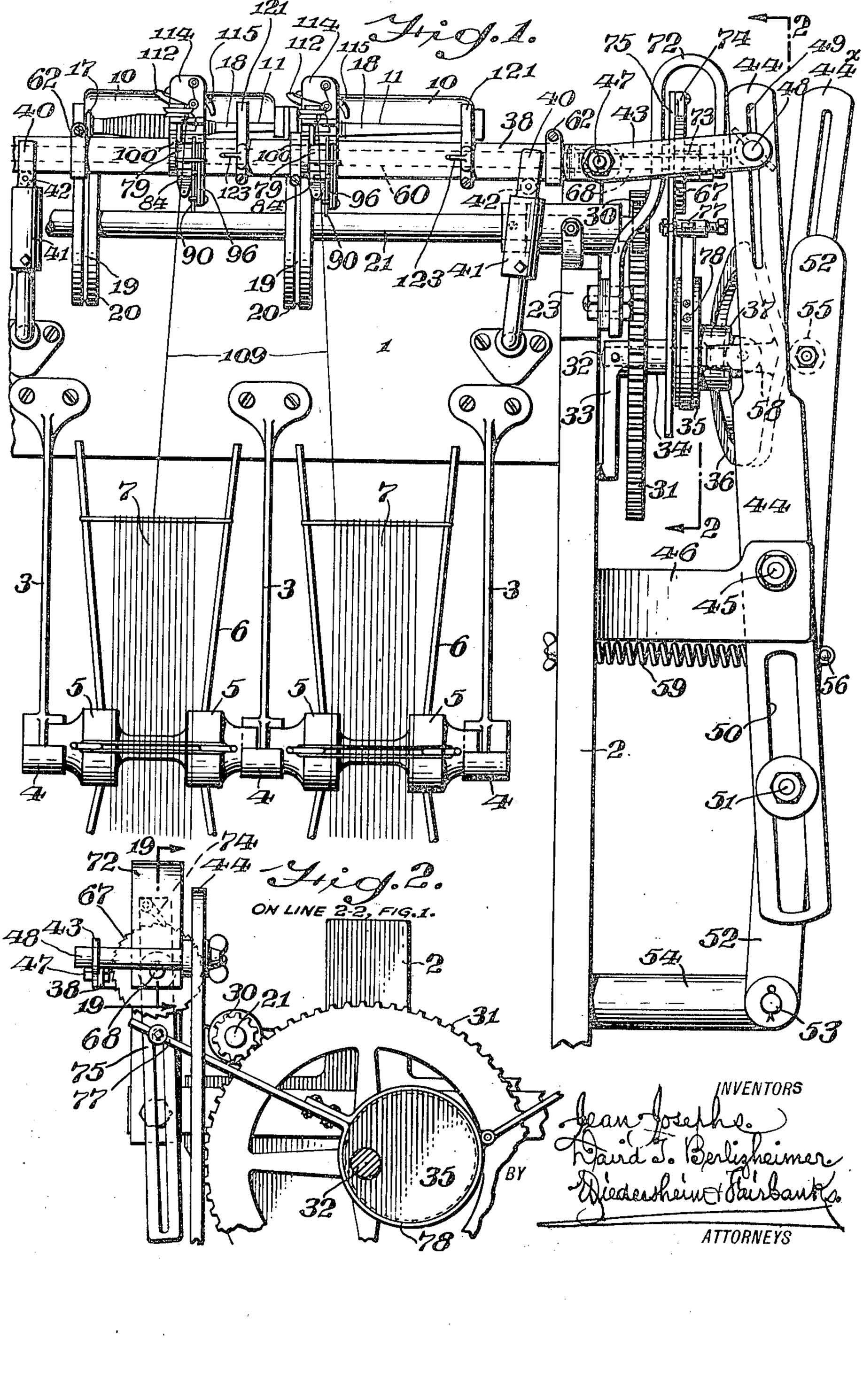


Fig. 2.

ON LINE 2-2, FIG. 1.




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4 SHEETS—SHEET 2.

Fig. 4.

ON LINE 4-4, FIG. 3.

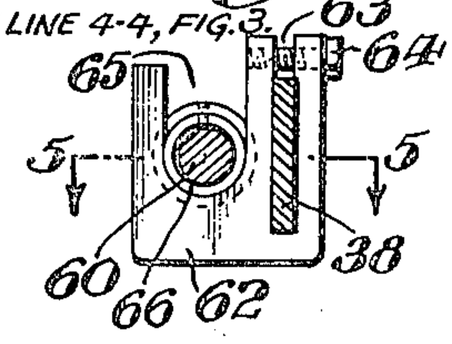



Fig. 5.

ON LINE 5-5, FIG. 4.

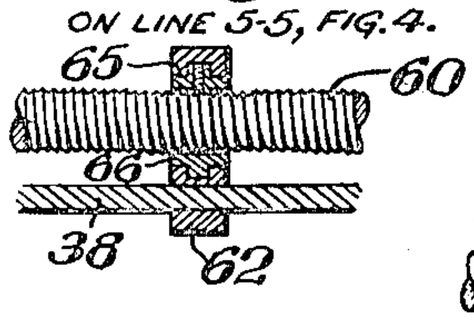
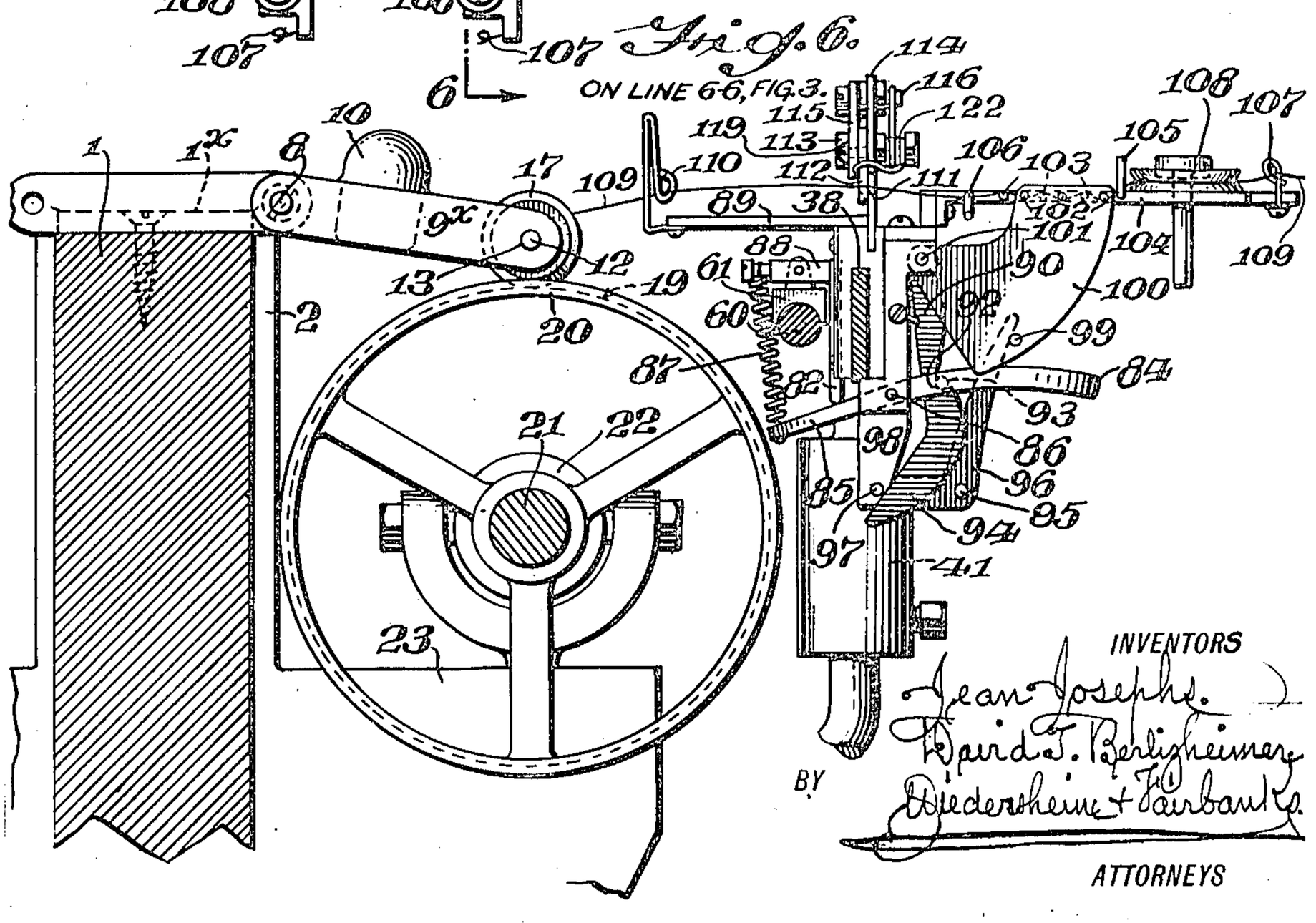



Fig. 3.




Fig. 6.

ON LINE 6-6, FIG. 3.

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4 SHEETS—SHEET 3.

Fig. 7.

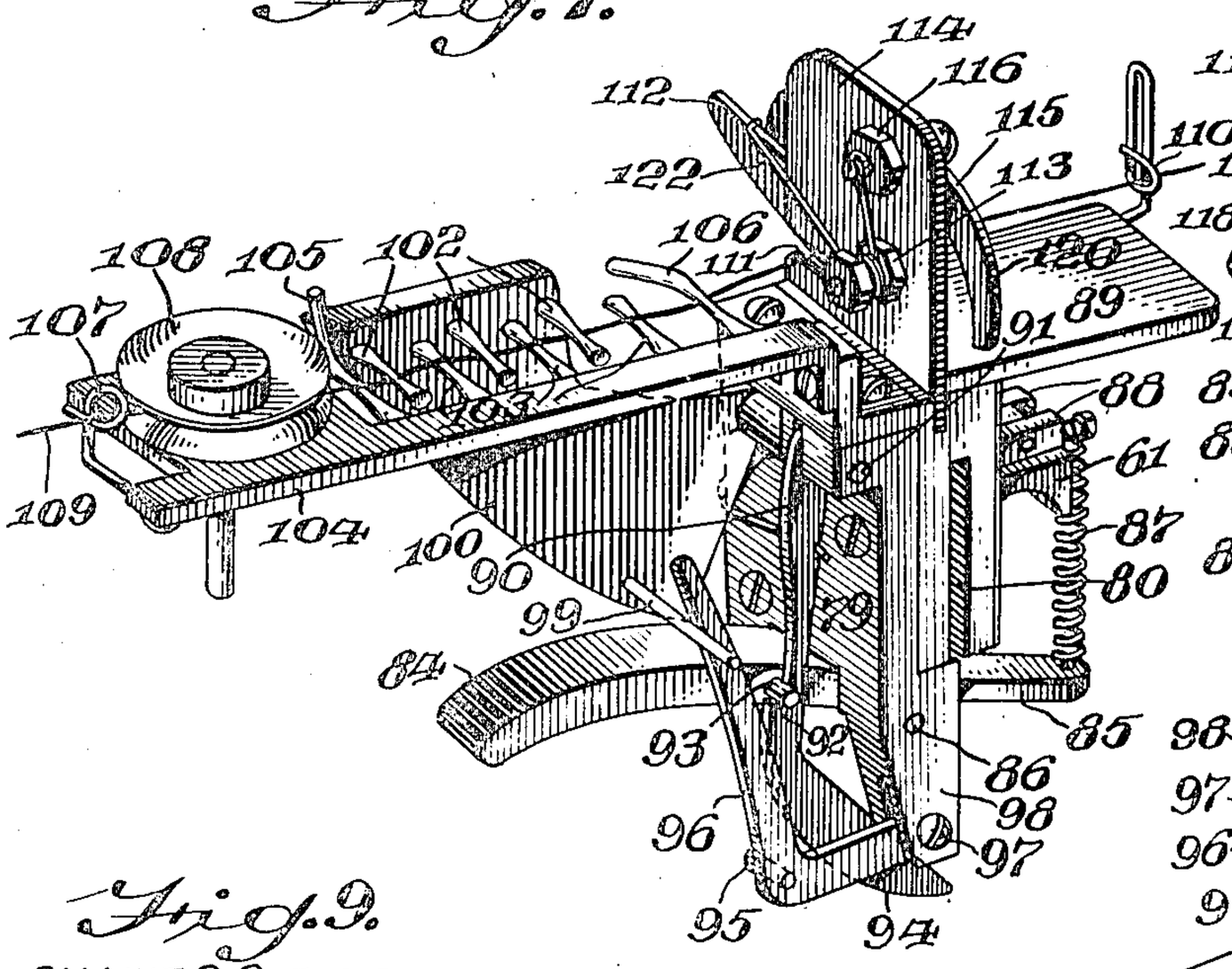



Fig. 8.

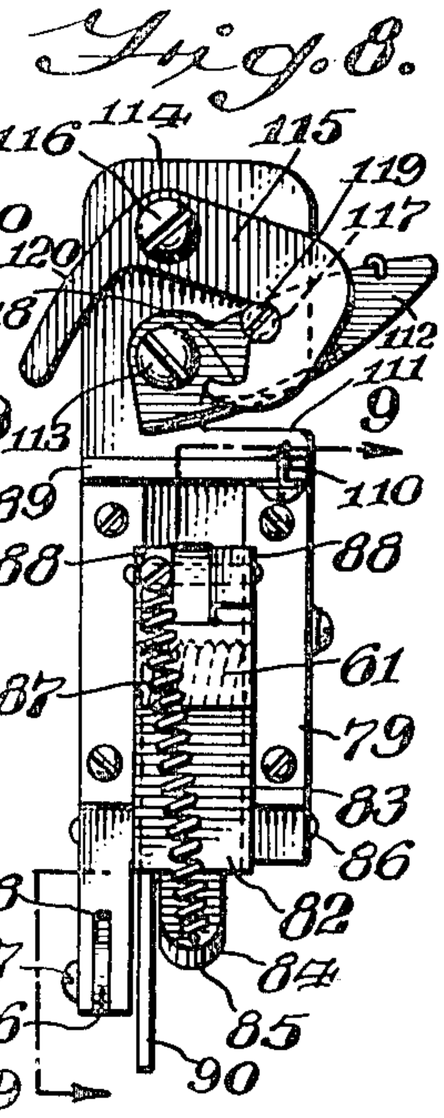



Fig. 9.

ON LINE 9-9, FIG. 8.

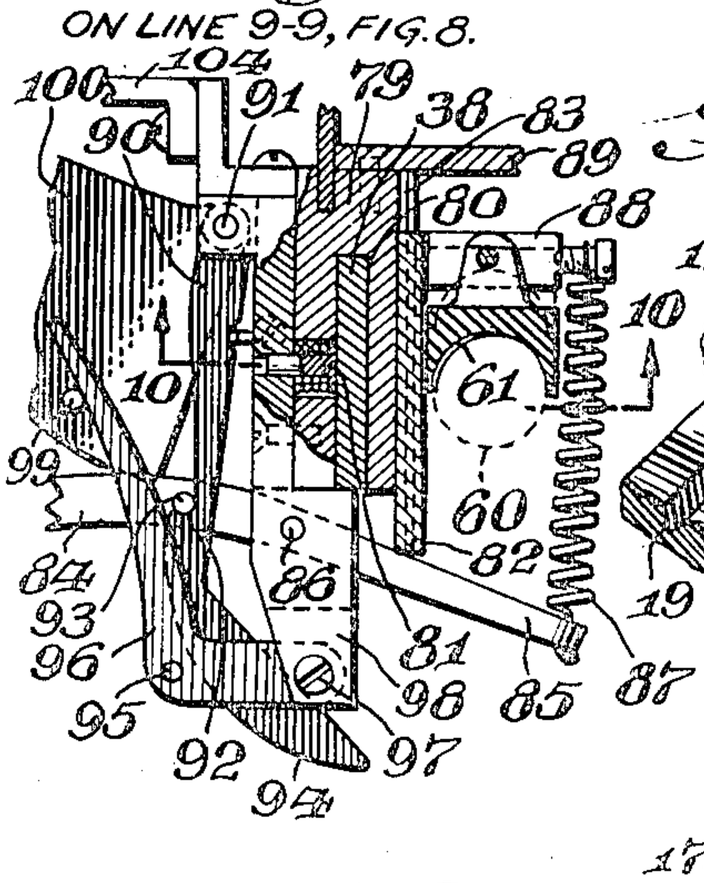



Fig. 11.

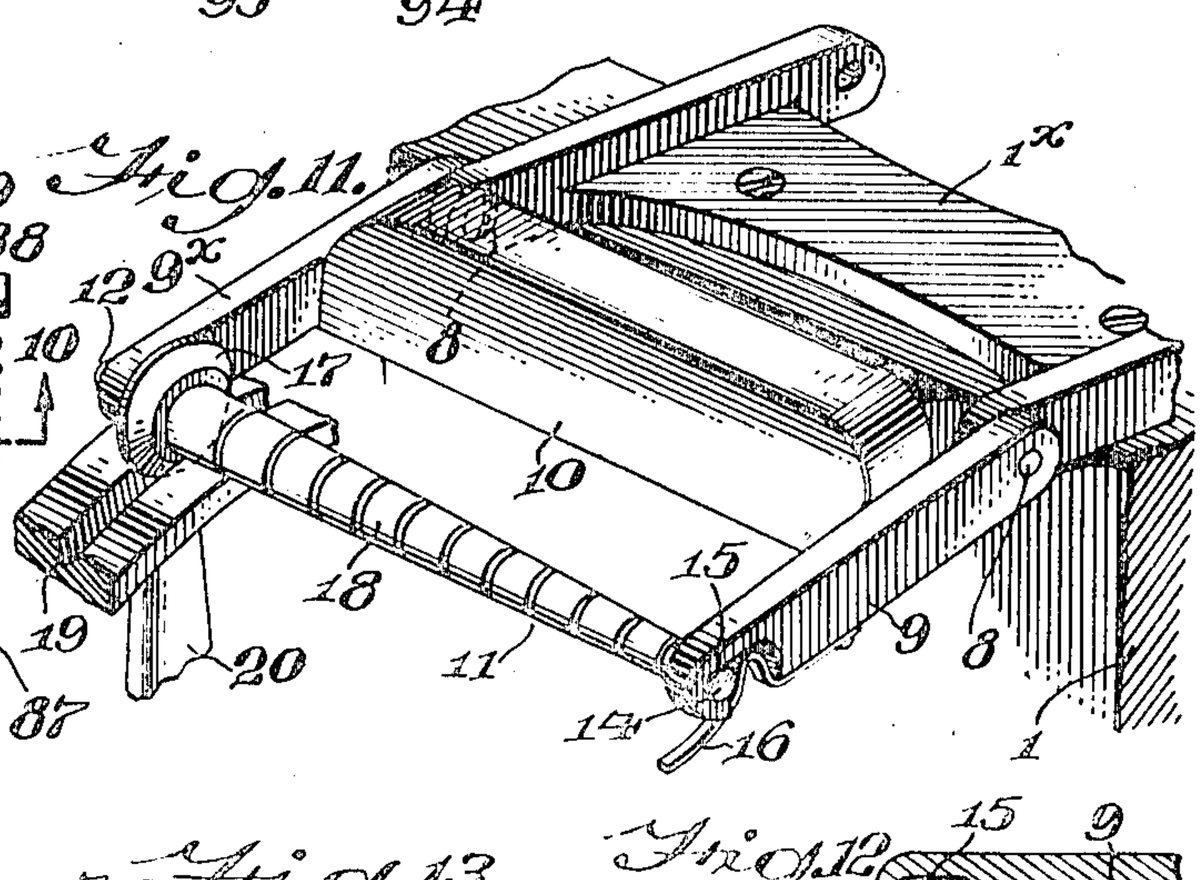



Fig. 10.

ON LINE 10-10, FIG. 9.

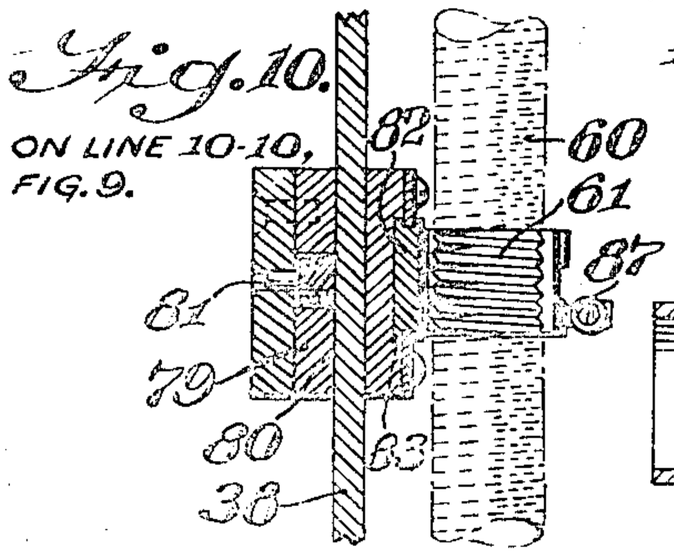



Fig. 13.

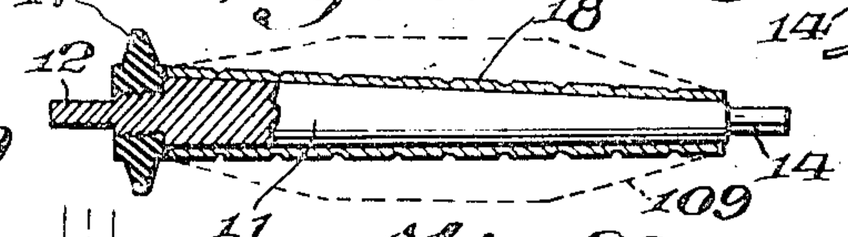



Fig. 12.

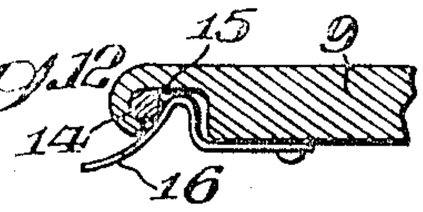
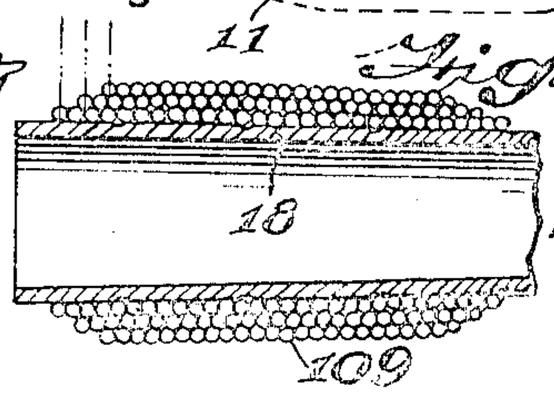



Fig. 20.

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4 SHEETS—SHEET 4.

Fig. 14.

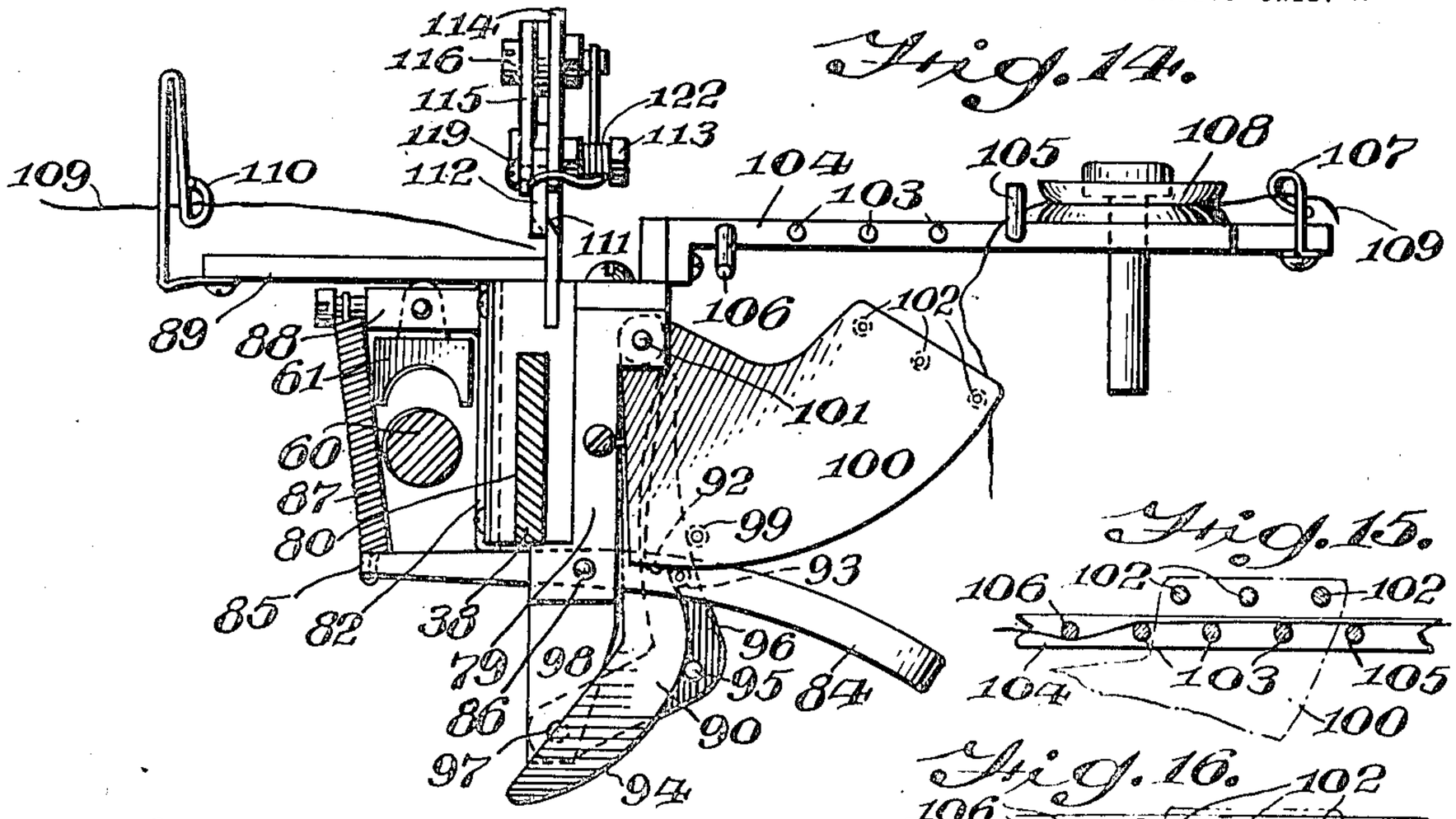



Fig. 15.




Fig. 16.

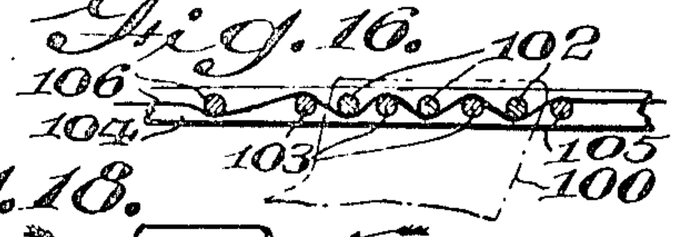



Fig. 17.

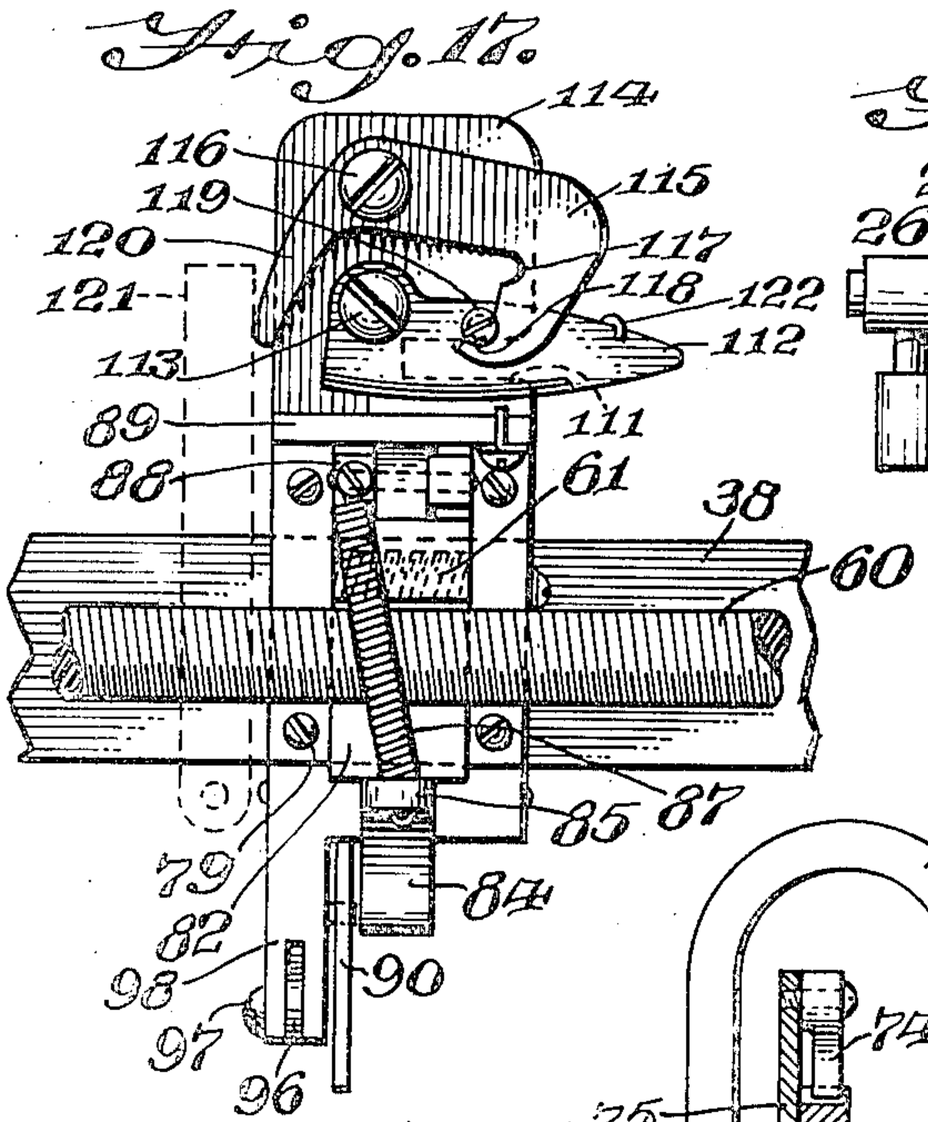



Fig. 18.

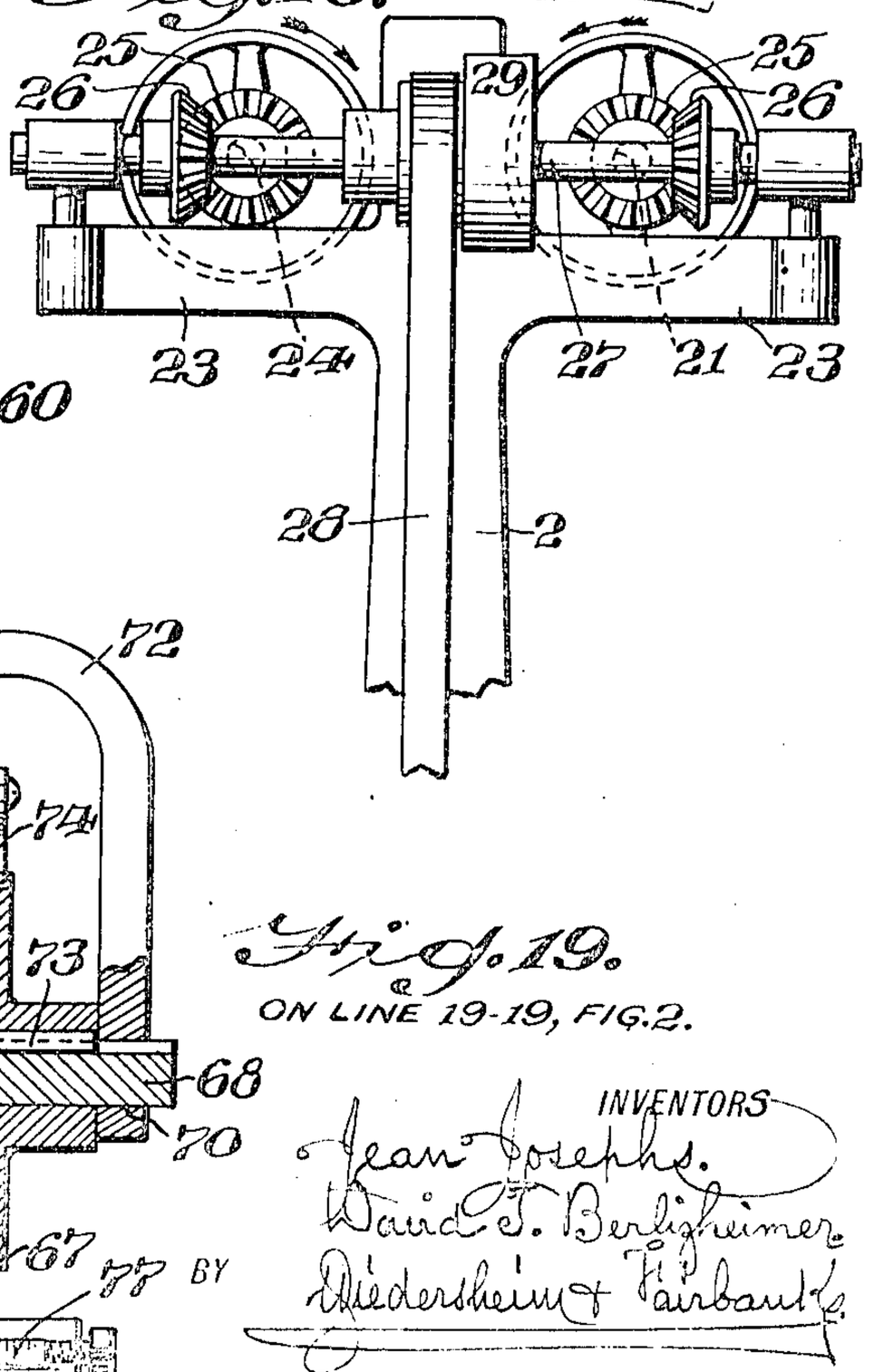
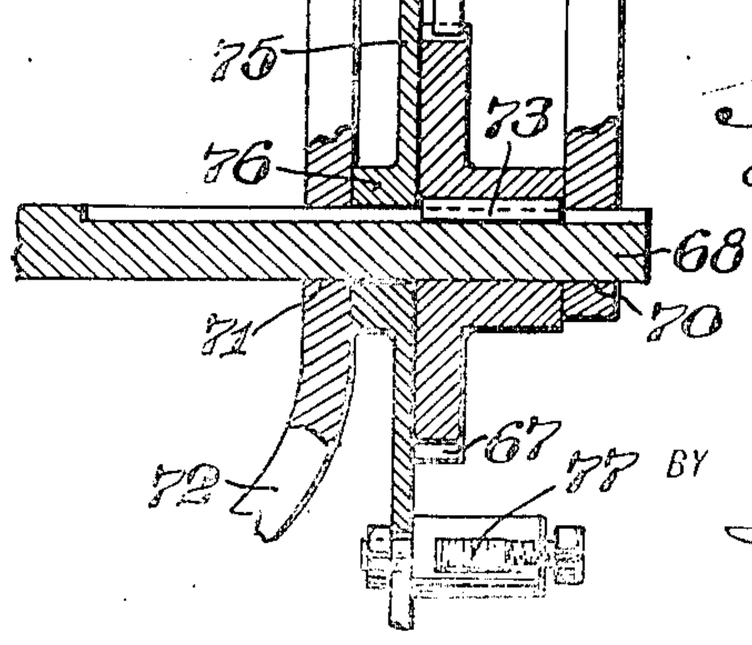



Fig. 19.

ON LINE 19-19, FIG. 2.

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# UNITED STATES PATENT OFFICE.

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## QUILL-WRAPPING MACHINE.

1,298,221. Specification of Letters Patent. **Patented Mar. 25, 1919.**

Application filed May 13, 1918. Serial No. 234,112.

*To all whom it may concern:*

Be it known that we, JEAN JOSEPHS and DAVID THEODORE BERLIZHEIMER, both citizens of the United States, and both residents of the city and county of Philadelphia, State of Pennsylvania, have jointly invented a new and useful Quill-Wrapping Machine, of which the following is a specification.

Our invention relates in general to winding machines of the ordinary spool-winding type in which it has heretofore been customary to take the threads from skeins mounted upon revoluble swifts and first wrap them upon spools and thereafter wrap them from the spools upon the cop-tube, bobbin or kindred tubular or other carrier, which when wrapped with the thread will possess the ultimate form of a, so to speak, doubly conical wrapped product known in the art as "a quill" or "cop".

Our principal object is to so reorganize or reconstruct a typical spool-winding machine as to make it adaptable without the intervention of spools, to wrap a thread upon the cop-tube and form the ultimate cop or quill, by taking the thread directly from the skein.

Our machine is adapted to wind or wrap a thread, whether of silk, artificial silk, cotton, wool, or other fiber, directly upon a cop-tube from a skein, and thereby, as stated, completely eliminate the intermediate operation of winding from the skein to the spool,—with the result that our machine itself is exceedingly compact, takes up but very little floor space, and may be operated to the production of a large number of quills at a minimum of both power and labor costs.

A further object of our invention is to make our machine automatic in the sense that if in the course of the winding of any particular quill the feed of the thread should in any way be stopped, such mechanism of the machine as relates to the feeding and the winding of the thread, will be automatically stopped and when again started will continue its work without leaving marks of identification upon the cop or quill where the stoppage has occurred, and without, therefore, turning out imperfect cops or quills. The result of this capacity is that the machine may be operating continuously as to given quills and yet not be operating as to a particular quill the thread of which has in feeding been broken, until after the thread has been repaired.

Further objects are a simple and compact construction of the elements which in their assemblage constitute our machine, and a general organization which permits of the winding of a very large number of quills.

The special features in which our invention is embodied and which constitute its essential subject-matter, are specifically recited in the claiming clauses. Broadly considered, however, our invention comprehends an automatic machine in which a plurality of cop-tubes can be wound with thread drawn directly from the skeins without the intervention and operation of winding upon spools,—which latter are dispensed with,— and in which in the event of the breaking of any one of the threads from any one of the skeins, the operation of the winding of that particular thread upon its particular cop-tube is automatically stopped until the broken ends of the thread are united, and thereafter is automatically started again to complete the cop the winding of which has for the time being been stopped.

The invention further comprehends an organized machine in which the formation of the thread upon the cop-tube into a cop of double conical form, is uniform and accurate by reason more particularly of the accuracy and regularity with which the thread is caused to be presented to and wound upon the cop-tube.

For the purpose of illustrating our invention, we have shown in the accompanying drawings a certain type and embodiment of it which is at present preferred by us because in practice it will give satisfactory and reliable results.

It is to be understood, however, that the various instrumentalities in which our invention is shown as embodied can be variously arranged and organized, and that our invention is not therefore limited to the precise arrangement and organization of the instrumentalities typified in the construc-

tion shown in the accompanying drawings and hereinafter described.

In the accompanying drawings,—

Figure 1 represents in partial fragmentary, front elevational view, a machine embodying our invention, the swifts being shown as partially broken and but two of the thread carriers and spindle frames being shown.

Fig. 2 is a fragmentary, elevational view taken from the right-hand side of Fig. 1 of the ratchet-operating eccentric and the driven toothed spur wheel which occasions the rotation of the eccentric and the operation of the feed-shaft-actuating ratchet.

Fig. 3 is a fragmentary top plan of the machine as represented in Fig. 1, the duplication of all of the elements which adapt the machine for operation with opposite duplicate sets of spindles, thread carriers and swifts, being omitted.

Fig. 4 is an end elevational view on the line 4—4 of Fig. 3, through one of the boxings which carry the feed shaft.

Fig. 5 is a fragmentary plan of the devices shown in Fig. 4, taken on the line 5—5 of Fig. 4.

Fig. 6 is a left-hand end elevational view of one of the thread carriers in the position which its component arts occupy when the thread has been threaded through it,—the view also illustrating one of the spindle frames and one of the grooved friction wheels upon the driven shaft which operates said wheels to operate the friction pinions of the spindles.

Fig. 7 is a perspective view of one of the thread carriers removed from the machine and in the position which its component parts occupy when a thread has been passed through them.

Fig. 8 is a rear elevational view of the thread carrier of Fig. 7, the thread cutting mechanism being in the open position.

Fig. 9 is a fragmentary, partly sectional, detail, taken from the right hand side of Figs. 1 and 3, of one of the thread carriers in the position which its component parts occupy when a thread has been passed through the carrier.

Fig. 10 is a fragmentary plan, partly sectional on the line 10—10 of Fig. 9, through a portion of the thread carrier, showing in section the carrier bar and the feed screw both in elevation and in dotted lines.

Fig. 11 is a perspective detail of one of the spindle frames, showing a spindle with a cop-tube in place upon it and adapted to be operated upon by a grooved friction wheel of the driven shaft.

Fig. 12 is a sectional, right-hand, end elevational view of the spring-provided socket of a spindle frame which secures the outer end of the spindle.

Fig. 13 is a longitudinal, sectional elevation of a spindle with a cop-tube upon it, and a cop in dotted lines.

Fig. 14 is an end elevational view taken from the left hand side of the machine of one of the thread carriers with its component parts in the position which they occupy when a thread has broken.

Figs. 15 and 16 are diagrammatic details of the positions which the thread fingers occupy in the passing of a thread through the thread carrier.

Fig. 17 is a view similar to Fig. 8 except that the cutting mechanism is in the position which it occupies when the thread has been cut,—the view also showing in additional detail the feed shaft and the carrier bar.

Fig. 18 is a left-hand end elevational view of a mechanism which I find it convenient to employ for the driving of the entire machine.

Fig. 19 is a fragmentary, partly sectional, detail showing the connecting shaft of the feed shaft, and the supporting housing within which said connecting shaft, the ratchet wheel and pawl, and the pawl carrier, are mounted.

Fig. 20 is a diagrammatic enlarged detail typifying a collocation of threads upon a cop-tube resulting from the winding of the latter to form the ultimate cop or quill.

Similar numerals of reference indicate corresponding parts.

In the drawings, a sufficient representation of a double machine is made to illustrate how the machine shown may be organized as a double machine, that is, as one which is operated from both sides,—front and back,—with a plural set of swifts, thread carriers, spindles and spindle frames, on each side,—and by the utilization of a single mechanism for operating duplicate carrier bars and feed shafts.

Throughout the description we at times use the expression "quill" as meaning the completely wound ultimate product which is otherwise technically known as a "cop",—and use the expression "cop-tube" to refer to the conical tubular body which is slipped upon the spindle and upon which the thread is wound to form the product—being the "quill" or "cop" of commerce.

*The framework and prime-moving mechanism.*

Assuming that so much of an ordinary spool winding machine as is necessary to illustrate the incorporation with, and embodiment in, it of the mechanisms in which our invention is embodied, is illustrated in the drawings,—1 designates the longitudinally extending, vertically disposed, frame-beam, supported by standards 2, 2× erected from a base, not illustrated, by and to which, considered together as a framework, all of

bar and the feed shaft and for also occasioning the intermittent rotation of said feed shaft, are merely mechanisms convenient for the purpose, and other devices for effecting the same movements can obviously be substituted for them.

It having already been explained how the spindle frames 9 which carry the spindles 11 and the cop-tubes 18 placed on said spindles, are rotated by the rotation of the friction wheels 20 on the front driven shaft 21, it will be understood that when the cop tubes have been placed upon the spindles and the spindle frames dropped about their pivots 8 until the friction pinions 17 are caused to rotate by the rotation of the grooved friction wheels 20 on the front driven shaft 21, it is the rotation of this shaft 21 which occasions the starting of the rotation of the cop-tubes and their readiness to be wound with the threads which are to form the cops or ultimate products.

Assuming that instead of cop-tubes, spools were mounted upon the spindles and caused to be rotated by the friction wheels, it will be apparent that with the devices already described, namely, the driving shaft 27 and the bevel gears 25 and 26, Fig. 18, the driven shafts 21 and 24 and the swifts 6, the well-known winding machine will be found.

To this typical winding machine our invention first applies the reciprocating carrier bar 38 and the reciprocating, intermittently rotating feed shaft 60 through the operating mechanisms already described and the spindle frames,—and then applies the devices which in this specification are termed the thread-carriers an embodiment of which is the following:—

*The thread carrier and its adjuncts.*

Referring now more particularly to Figs. 7, 8, 9, 14, 15, 16 and 17, the thread guide carrier which herein we call the thread carrier, is a device mounted upon and carried by the carrier bar 38, and adapted to be reciprocated with relation to each cop-tube-carrying spindle and spindle frame longitudinally end for end of the machine to a right and left-hand traverse about equivalent to the length of the finished cop upon the spindle.

One of these thread carriers is applied to operate with each one of the spindle frames so as to carry and otherwise handle the thread from the skein to the cop-tube in a way about to be explained.

Each thread carrier is also operated upon by the intermittently rotating and reciprocating feed shaft 60, the essential function of which in connection with the thread carrier is to cause the latter to stop in its traverse in the event of the breaking of the thread between the skein and the cop-tube.

As all of the desired plurality of thread carriers are of the same construction, a description of one of them will suffice.

Each of the operative elements of a carrier is mounted upon, and assembled with relation to, a carrier body 79 which may be cast as an entirety or made up as shown in the drawings of assembled and connected parts,—it being an essential, however, of the construction that the carrier body should be formed with a slot 80, which is transverse of the length of the carrier body as a whole, but parallel with the carrier bar 38 upon which the body is mounted and accurately fitted and held for frictional adjustment or slippage by means of a spring-controlled pin 81 shown in Figs. 9 and 10, by which adjustment is meant a capacity of controlled slippage or sliding end for end of and upon the carrier bar 38.

The component operative elements of the thread carrier are (*a*) a vertically movable split nut,—(*b*) a nut-control, or balanced counterweighted control of the split nut,—(*c*) a trigger mechanism for locking and unlocking the nut control,—(*d*) a balanced counterweighted thread-finger-carrying device, operative automatically when the thread which passes through the thread carrier from the skein to the cop tube, breaks, which locks and releases the trigger mechanism which controls the nut-control,—(*e*) a series of fixed thread fingers which operate in connection with the movable thread fingers on the balanced counterweighted thread finger-carrying device,—(*f*) a thread tension,—(*g*) thread guides at the front and at the rear of the thread carrier as a whole, and (*h*) an automatic thread cutting device for cutting the thread either first when it breaks in being wrapped, or second when it has been completely wound upon the cop-tube to form the finished cop.

We will explain these elements of a thread carrier, *seriatim*:—

*The split nut.*

The split-nut 61 is internally threaded to correspond in pitch and number of its threads to the threads of the feed shaft 60, so that when the nut is engaged with the feed shaft and the shaft in rotation, the thread carrier will be caused both to reciprocate lengthwise of the machine to the extent of the reciprocation of the carrier bar 38, and to advance to the extent of one intermittent rotation of the feed screw which is as explained correspondent to and coordinated with the reciprocation of the carrier bar.

Normally, in the mounting and assemblage of the parts the threads of the split nut are in engagement with the threads of the feed shaft. To disengage, the nut is adapted to be lifted from the feed shaft by

being itself mounted upon a tongued slide 82 fitted in a grooved slide-way 83 vertically formed in the rear of the carrier body 79 behind the slot 80.

*The split-nut control.*

84 is the balanced counterweighted control of the nut, or nut-control, so called, which is composite of a lever 85 extending rearwardly of the counterweight proper to which the number 84 is applied, from pivots 86 formed near the bottom of the carrier body 79.

A spring 87 connects the rear end of the balanced lever 85, 84, with the nut, and, when the balanced lever has been released from its manually placed normal position of Figs. 7 and 9, serves in connection with the weighted balanced end 84 to lift the lever, slide and nut from the normal position shown in Fig. 6 to the abnormal or elevated position shown in Fig. 14, and in so doing of course occasions the lifting of the nut from the screwshaft by the contact of the lever with the lower end of the slide 82, as shown in all the views.

When the nut has been lifted, it occupies the position shown particularly in Fig. 14 where a bar 88 extending rearwardly from the slide 82 and to which the nut may be conveniently pivoted encounters a rearwardly extending plate 89 which is a part of the carrier body. This of course is a stop construction of convenience, and any stop to limit the upward movement of the slide and nut may be substituted for it.

*The trigger mechanism for the nut-control.*

The trigger mechanism which locks and unlocks the split nut-control is composed of a depending trigger 90 suspended from a pivot 91 to the front of the slot in the carrier body, and is formed or provided about midway of its length with a notch 92 adapted in the forward position of the trigger shown in Figs. 6, 7 and 9, to engage a catch pin or notch pin 93 extending laterally from the counterbalance lever 84, 85.

The lower front portion of the trigger 90 is formed with a rearwardly extending curved surface or curve 94 against which abuts and travels a pin 95 on a bell crank lever 96, pivoted at 97, to a depending portion 98 of the carrier body 79.

*The balanced counterweighted thread finger device.*

The bell crank lever 96 as to the front edge of its upper arm bears against a lever pin 99 extending laterally from what we have termed the balanced counterweighted threaded finger-carrying device, 100,—which device itself is a flat plate paralleling the plane of the fore and aft length of the carrier body, and which to the left of said body as shown in the drawings is pivoted at 101 beneath the upper central portion of the carrier body, its pivot being preferably axially alined with the pivot 91 of the depending trigger 90,—in fact although the pivot of the trigger is designated 91 and the pivot of the finger carrying plate designated 101, they may be the same pivot.

The upper portion of the balanced finger-carrying plate 100 is provided with a plurality, as shown, of three, horizontally disposed fingers 102, which are so placed that in the lift and drop of the plate about its pivot 101, they occupy a staggered relationship, as shown in Figs. 15 and 16, to a plurality of fixed pins 103 on a forwardly extending horizontal plate 104 of said carrier body, as shown in Figs. 6, 7 and 14.

*The thread tension and thread guides.*

To the front and to the rear of the plate 104 are respectively connected an upwardly turned guide finger 105 and a downwardly turned guide finger 106, which, as shown n Fig. 7, coöperate in the threading or passage of the thread 109 along the carrier,—the thread being first passed from the cop tube 18 to which it is carried from the skein 7 and attached,—thence through the thread guide 110,—thence through the open cutter later on described,—thence under the rear guide finger 106,—thence over the fixed finger pins 103 and under the fingers 102 of the plate 100,—thence over the front guide finger 105,—thence through a tension device 108 of any usual character,—and thence through a front thread guide 107 and onward to the skein 7.

In the application to and the carrying along through the thread carrier of the thread between the skein 7 and the cop-tube 18, the carrying plate 100 has been raised, as shown in Fig. 15, so that the thread has been passed over the fixed fingers 103 on the plate 104, beneath the movable fingers 102 on the uplifted swinging plate 100, which is then dropped until its fingers 102 rest upon the thread and bend it as shown in Fig. 16.

The tension and strength of the thread when passed completely along the thread carrier from the skein to the cop-tube is alone sufficient to hold the finger-carrying plate 100 in its upper position, as shown in Figs. 6 and 7, and in such normal position of the operation the plate 100, the trigger 90, the bell-crank lever 96, and the counterweighted lever 84, 85, are all in the locked positions represented in Figs. 6, 7 and 9, with the split nut upon the feed shaft, and in such position they will remain until the thread breaks and permits the plate 100 to drop and through the bell-crank and the

the active elements of the machine are supported and applied.

Although the elements are in duplicate, we will describe only one set of them as applied to the front side of the machine,—describing however an operating means by which such front set of elements and also a duplicate rear set may be simultaneously operated when the machine is a double machine operated by two operatives, one standing upon one side and the other upon the other.

3 are hangers extending obliquely outward and downward from the frame beam 1 and terminating in double socket bearings 4 into which the hubs 5 of the swifts 6 which carry the skeins 7 are adapted to be dropped and permitted to revolve. There are a set of swifts upon each side of the machine.

Mounted upon the frame beam through the carrying cop-plates $1^{\times}$, by being pivotally connected thereto by the pivots 8, are a plurality of spindle frames formed each of a pair of parallel side bars 9, $9^{\times}$ which are connected by a bar 10, which serves as a weight to hold the frames down.

To the outer or front ends of these spindle frames are adapted to be removably applied the spindles 11, Figs. 11 and 13, the trunnion 12 on one end of each of which is adapted to be entered within a socket 13, Fig. 6, and the trunnion 14 on the other end of each of which is adapted to be entered and snapped within another socket 15, Fig. 12, and held therein by a spring 16.

Upon the inner end of each spindle is a preferably removable friction pinion 17, best composed of fiber, adapted when the cop-tube 18 has been slipped upon the spindle 11 and the spindle frame has been dropped to its operative position, to make contact with a groove 19 in a friction pulley 20 mounted upon the front driven shaft 21 which extends longitudinally across the front of the machine and is mounted in bearings 22 supported conveniently by transversely extending standard arms 23, Fig. 3, or by some other preferred part of the framework.

In the assembled machine when arranged to operate as a double machine, the front driven shaft 21 which, as explained, parallels the front face of the frame beam 1, has a counterpart rear driven shaft 24, shown, broken off, in Fig. 3, as mounted in the bearing $22^{\times}$, and both of these shafts extend in parallelism with each other and with the frame beam for the length of the machine, and terminate at the left-hand end as shown in Fig. 18 and are respectively connected through two bevel gears 25 and 26 with a driving shaft 27 driven by a belt 28 and pulleys 29 from any source of power.

Obviously, in the rotation of the driving shaft through the bevel gears, the front driven shaft and the rear driven shaft will rotate oppositely in the direction of the arrows shown in Fig. 18.

*The thread carrier carrying-bar and its actuating mechanism and adjuncts.*

The actuation of the motive mechanism of the thread carriers through the carrier bars and feed shafts is effected and controlled in the following manner:—21 designates a front driven shaft which at its right-hand end is provided with a toothed pinion 30, meshing with a toothed spur wheel 31, mounted upon a fixed shaft 32 which extends horizontally and outwardly from the right-hand standard 2 of the frame, conveniently by means of a bracket 33, as shown in Fig. 1.

Connected with the spur wheel 31, conveniently by being hubbed to it at 34, on the shaft 32, is an eccentric 35, Figs. 2 and 3, and also a side face cam 36, itself preferably hubbed at 37 to the eccentric,—so that all three,—spur wheel, eccentric and cam,—are rotatable together on the shaft 32.

The function of the eccentric is to occasion the intermittent rotary movement of the screw or feed shaft 60, and the function of the cam to occasion the longitudinal reciprocation of both the carrier bar 38 and the screw shaft, as hereinafter explained.

Before describing the thread carriers which are mounted upon the carrier bar so as to be susceptible both of intermittent reciprocation with and of frictional movement endwise upon it, it should be explained that the carrier bar 38 itself is a horizontally disposed, vertically set, metal bar paralleling the frame beam of the machine, and supported for reciprocatory movement longitudinally of the machine in bearings 40 erected upon bearing supports 41 attached to the frame beam, its movement being made easy by providing for it to rest and move upon, within the bearings 40, anti-friction rolls 42, as seen in Fig. 1.

A given reciprocation of the carrier bar 38 will, as is obvious, occasion a given reciprocation of each of the thread carriers attached to said carrier bar. The desired reciprocation of the carrier bar may be effected by many means, but we find it convenient to effect it by connecting the bar by a link 43 with a compound system of rocker arms of the following construction:—

44 is a rocker arm fulcrumed midway of its length at 45 to a bracket 46, $46^{\times}$, attached to the right-hand standard 2 of the framework,—the link 43 being pivoted at 47 to the right-hand outer end of the carrier bar 38, and by a nut and long bolt adjustment 48, Figs. 1 and 3, working through a slot 49, connected to the upper end of said rocker arm 44 above its fulcrum 45.

The lower end of this rocker arm 44 is slotted at 50 and by another nut and bolt

adjustment 51 is connected with a second rocker arm 52 pivoted at its lower end at 53 to a stud 54 on the standard 2, and extending upwardly to abreast the cam 36 against the outer side face of which it bears by a roller 55, Figs. 1 and 3, so that in the rotation of the cam, said rocker arm 44 is deflected about its pivot 53 and through its connection 51 with the rocker arm 44 will be deflected outwardly and inwardly so as to occasion the right and left, or out and in, movement of the link 43 and the consequent reciprocation of the carrier bar 38 to an extent determined by the configuration of the acting side face of the cam and the proportioning of the rocker arms 44 and 52 relatively to each other through the fulcrum 45 and the pivot 53 and their nut and bolt adjustment or connection 51.

While, of course, the outer side face of the cam 36 by its contact with the roller 55 will occasion the right-hand or outward throw of the rocker arm 52, the roller 55 on said rocker arm must always be retained against the cam face. This retention we conveniently accomplish by means of a transversely extending pressure-retaining bar 56 which extends between the outer face of the rocker arm 52 and the outer face of a counterpart rocker arm 57, which is provided with a roller 58, which also bears against the diametrically opposite working side face of the cam 36.

The retaining bar 56 is held in contact with both the rocker arms 52 and 57 by being itself connected with a spring 59 fast to the framework.

Although we have fully illustrated only the rocker arm 57 which is the counterpart of the rocker arm 52, it is of course to be understood that in the dual organization of the machine, that is, when the machine is operated from both sides, there is provided another rocker arm, not shown, except as 44× in plan in Fig. 3, which is the counterpart of the rocker arm 44, and that the connection of these last-mentioned two rocker arms 57 and 44× is similar, by a link, not shown, connecting them with a second carrier bar also not shown, to a link connection 43 already described with reference to the carrier bar 38.

*The thread carrier feed shaft and adjuncts.*

60 is a feed shaft for occasioning as hereinafter explained, predetermined movements of continuing but intermittent right-hand advance of the several thread carriers, the uniform but controllable predetermined reciprocation and intermittent rotation of which is also indirectly through the thread carriers occasioned by the reciprocation of the carrier bar, as also hereinafter explained.

The feed shaft is a continuous screw shaft the pitch and number of the threads of which are so calculated that the shaft is in effect a worm shaft which operates to occasion the right-hand advance of each thread carrier by being engaged with a correspondingly threaded mutilated or split nut 61 connected with the thread carrier.

This feed shaft normally reciprocates with the carrier bar by which it is carried and to which it is connected conveniently by the shaft boxings 62, Figs. 3, 4 and 5, which are semi-cylindric bearings within which the feed shaft is free to rotate and which conveniently possess the form shown in Fig. 4 and are shaped to embody the slots 63 so that the boxings can be slipped from beneath upwardly from the carrier bar and fastened to it by the bolts 64.

As shown in Fig. 5, the upwardly open socket 65 of the boxing 62 is fitted with a bushing 66 passing through it and having a smooth bore within which the threads of the feed shaft turn. Any desired number of these boxings may be employed. The feed shaft 60 is adapted to have imparted to it normally both a movement of constant longitudinal reciprocation with the carrier bar 38, because its threads are normally in engagement with the threads of the split nuts 61 within the thread carriers on said bar,—and also a movement of intermittent rotation by connection with a ratchet wheel 67, which is keyed upon a connecting shaft 68, Fig. 19. This connecting shaft is a continuous alined connection or extension of the feed shaft 60, being connected to the latter by a coupling 69, Fig. 3, and it is conveniently housed for rotation in bearings 70 and 71, Fig. 19, formed in a supporting loop 72 conveniently supported from the standard 2 of the framework and serving to house the ratchet wheel 67, which as is shown in Fig. 19, is connected by a key 73 to the connecting shaft 68.

Obviously, the rotation of the ratchet wheel 67 under the control of a pawl 74 will occasion the rotation of the connecting shaft 68 and through its coupling 69, Fig. 3, the rotation of the feed shaft 60. This rotation of the ratchet wheel is intermittently occasioned through the pawl 74 by mounting the pawl in a swinging pawl carrier 75 pivoted at 76 to the frame and connected by an eccentric link 77 and eccentric strap 78 with the eccentric 35, as best shown in Fig. 2.

In the throw of the eccentric 35 which the rotation of the toothed spur wheel 31 occasions, the swinging pawl carrier 75 will obviously be swung about its pivot, and swinging the pawl 74 will cause a predetermined rotation of the ratchet wheel 67 and a consequent predetermined rotation of the connecting shaft 68, as already referred to.

All of the foregoing instrumentalities for occasioning the reciprocation of the carrier

trigger and the nut lever all being released from their set position, will occasion the lifting of the nut.

*The thread cutting mechanism.*

The thread cutting mechanism which when the thread has been passed through the guides, tension device and fingers, as already described, is normally open for the thread to pass through it, as shown in Figs. 6, 7 and 8,—is composed of a fixed cutting blade 111 rightangular of the carrier body and extending preferably across the rear face of the plate 89, and of a pivoted cutting blade 112, the pivot of which is 113, erected in a vertically disposed cutter-carrying plate 114 erected from the carrier body 79, and which is adapted to be locked in its forward or non-cutting position, as shown in Figs. 7 and 8, by a pivoted latch 115 the pivot of which is 116 and which is formed with an upper notch 117 and a lower notch 118 into one or the other of which is adapted to be entered and engaged a notched pin 119 extending laterally from said pivoted cutting blade,—as shown in the uncutting position in Figs. 6, 7 and 8 and in the cutting position in Figs. 14 and 17.

The normal or open position of the pivoted cutting blade being that represented in Fig. 8, it will be observed that beyond its pivot 116, the latch is formed with an unlatching arm 120 which in the travel of the thread carrier from the left to the right of the machine is adapted to encounter a stop 121 on the carrier bar 38 and be by it deflected so as to deflect the latch and release the notched pin 119 from the upper notch 117 by throwing the latch into the position represented in Fig. 17 in which position the pivoted cutting blade will then be thrown down by the action of a blade controlling spring 122, as shown in Figs. 7, 8 and 14.

The return of the cutting blade to its lifted position as in Fig. 8, from its dropped position as in Fig. 17, is effected by the operative who depresses the unlatching arm 120 inwardly from the position shown in Fig. 8 to the position shown in Fig. 17, with the result of lifting the cutting blade 112 against the resistance of its spring 122 until the upper notch 117 engages the notched pin 119, as shown in Fig. 17.

When at the completion of the traverse of a carrier with reference to the spindle and cop-tube with which it operates, it becomes necessary to sever the thread, the cop having been completely formed, the unlatching arm 120 encounters the stop 121 and occasions the cutting of the thread.

In the event, which is unlikely, that the finger carrying plate 100 should not have dropped at the completion of the operation of the winding of the cop, we assure its dropping by providing a cam stop 123 fixed on the carrier bar 38, which stop is adapted to be encountered by the bell-crank lever 96 and automatically through the trigger 90 to release both the nut lever 84, 85, and the finger-carrying plate 100.

*The operation of the machine.*

Having now described the operative elements of our machine as a whole, and in doing so described more or less fully the operations of each element,—the general operation of the machine is the following:—

Assuming the required number of cop-tubes to have been put in position upon the spindles, and assuming the threads from the corresponding swifts and skeins to have been drawn through the thread carriers and connected with the cop-tubes, the prime moving or motive mechanism of the machine shown in Fig. 18 is then put into operation with the result that it will, first, occasion the rotation of both of the driven shafts 21 and 24, and through the pinion 30 and spur wheel 31, the throw of the eccentric 35 and rotation of the cam 36, so as also to occasion the throw of the ratchet wheel 67 and through the pawl 74 and pawl carrier 75, the intermittent rotation of the feed shaft 60,—and also through the rotation of the cam 36 occasion the oscillation of the compound rockers,—and with the further result,—second,—that the feed shaft 60 will be caused both to intermittently rotate and to reciprocate, and the carrier bar 38 to reciprocate constantly,—the operations of reciprocation and rotation referred to being predetermined by calculated dimensions and movements of the operative devices referred to.

Assuming, further, that the operation of the driven shafts through the friction wheels 20 will occasion through the friction pinions 17 the desired rotation of the spindles 11 in the spindle frames, it is obvious that the connection of the threads with the cop-tubes upon the spindles, will, in the rotation of the spindles, occasion the drawing of the threads through the thread carriers, the assembled operative mechanisms of which are initially in the position particularly represented in Fig. 7 with the thread 109 drawn through the thread guide 107, the tension device 108, the guide finger 105, beneath the fingers 102 of the finger carrying plate 100, above the fixed fingers 103 of the frame plate 104, beneath the guide finger 106, between the then separated cutting blades 111 and 112 of the thread cutting mechanism, and, finally, through the rear thread guide 110 on to the cop-tube.

So long, then, as no break occurs in any

thread from any skein, the continuing calculated end for end reciprocation of the thread carriers will, under the proper timing of the rotation of the spindles and the calculated movement relative thereto of the thread carriers, cause in each right-hand reciprocation of the thread carriers a thread-wrapping of such length of the cop-tubes as equals the then calculated advance reciprocation of the thread carriers, while after the return reciprocation of said thread carriers,—their intermittent advance occasioned by the rotation of the feed shaft taking place simultaneously with the return movement of the thread carrier,—there will follow a succeeding right-hand advance of said thread carriers which will start and occasion the winding of the thread upon a new surface-layer, so to speak, which will progressively overlie the underlying wound surface.

This operation is really one compound operation due primarily to the conjoint reciprocation of the carrier bar 38 and the feed shaft 60, but secondarily due to the intermittent rotation of the feed shaft which without regard to its reciprocation occasions a continuing although slight forward advance of the thread carriers through the action of the threads of the feed shaft on the split nuts, the same being a continuing advance throughout the length of the cop-tube, with the result that the winding is performed in a uniform way but layer upon layer, so to speak, the beginning of each layer at the basal end of the cop-tube being a progressive advance upon each succeeding layer until the cylindric central portion of the cop-tube has been covered and the cop as to such central portion made uniformly cylindric, while afterward the continuing forward laying is a progressively diminishing laying, so to speak, to form the diametrically narrower outer end portion of the ultimate cop.

The typical diagrammatic view of Fig. 20 while of course entirely out of proportion in both the numbers and the diameters of the threads as laid and wound, will give an idea of the operation as practically conducted at great speeds and with threads of the smallest commercial diameters.

Thus, as explained, if no thread breaks and the machine is in continuous normal operation, each of the cop-tubes will be wound in such a way as to have formed upon it a double conical cop or quill of a completed commercial character.

If, upon the contrary, during the progress of the operation one of the threads from any one of the skeins should break, as typically indicated in Fig. 14, the instant effect of the break will be that the finger-carrying plate 100 which the normal tensile strength of the thread itself has been sufficient to maintain in the elevated position represented in Figs. 6 and 7, will gravitatively drop into the position shown in Fig. 14, and in dropping will occasion the instant and simultaneous operation of the bell crank lever 96, the trigger 90 and the counterbalanced lever 84, 85, with the result of occasioning the lifting of the split nut so as to free the thread carrier from the feed shaft and stop such longitudinal movement of said feed carrier as is due to the operation of the shaft upon the nut.

It will now be apparent that the above-described machine is adapted to effectuate the objects which we have enumerated as desirable, and that, as already mentioned, modifications in detail of the several elements may obviously be resorted to without departing from the spirit or scope of our invention or sacrificing any of its advantages.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is:—

1. In a cop-wrapping machine, the following elements in combination:—a supporting frame;—a plurality of revoluble swifts which carry skeins of thread;—a plurality of spindles for holding cop-tubes which receive the threads from the skeins;—means for occasioning the rotation of the spindles;—a plurality of reciprocatory thread-carriers intermediate the swifts and the spindles, through which threads from the skeins pass to the cop-tubes;—mechanism for occasioning the constant longitudinal reciprocation of the thread carriers with respect to both the swifts and the spindles, which comprises a constantly reciprocating carrier-bar and a both intermittently reciprocating and intermittently rotatable feed shaft;—and mechanism for occasioning the constant reciprocation of the carrier-bar and the intermittent reciprocation and rotation of the feed shaft.

2. In a cop-wrapping machine, the following elements in combination:—a supporting frame;—a plurality of revoluble swifts which carry skeins of thread;—a plurality of spindles for holding cop-tubes which receive the threads from the skeins;—means for occasioning the rotation of the spindles;—a plurality of reciprocatory thread-carriers intermediate the swifts and the spindles, through which threads from the skeins pass to the cop-tubes and which are provided with means for controlling both the reciprocation and the rotation of the feed shaft;—mechanism for occasioning the constant longitudinal reciprocation of the thread carriers with respect to both the swifts and the spindles, which comprises a constantly reciprocating carrier-bar and a both intermittently reciprocating and intermittently rotatable feed shaft;—mechanism for occasioning the constant reciprocation of the carrier-bar;—and mechanism coöperat-

ing with the controlling means upon the thread carriers for occasioning the intermittent reciprocation and rotation of the feed shaft.

3. In a cop-wrapping machine, the following elements in combination:—a supporting frame;—a plurality of revoluble swifts which carry skeins of thread;—a plurality of spindles for holding cop-tubes which receive the threads from the skeins;—means for occasioning the rotation of the spindles;—a plurality of reciprocatory thread-carriers intermediate the swifts and the spindles, through which threads from the skeins pass to the cop-tubes, and which are provided with means for controlling both the reciprocation and the rotation of the feed shaft, and with cutting means for severing the thread when the cop has been completed;—mechanism for occasioning the constant longitudinal reciprocation of the thread carriers with respect to both the swifts and the spindles, which comprises a constantly reciprocating carrier-bar and a both intermittently reciprocating and intermittently rotatable feed-shaft;—mechanism for occasioning the constant reciprocation of the carrier bar;—and mechanism coöperating with the controlling means upon the thread carriers for occasioning the intermittent reciprocation and rotation of the feed shaft.

4. In a cop-wrapping machine, the following elements in combination:—a supporting frame; a plurality of revoluble swifts which carry skeins of thread;—a plurality of spindles for holding cop-tubes which receive the threads from the skeins;—means for occasioning the rotation of the spindles;—a plurality of reciprocatory thread carriers intermediate the swifts and the spindles, through which threads from the skeins pass to the cop-tubes, and which are provided with means for controlling both the reciprocation and the rotation of the feed shaft, and with cutting means for severing the thread when the cop has been completed;—means for occasioning the operation of the cutting means to cut the thread when the cop has been completed;—mechanism for occasioning the constant longitudinal reciprocation of the thread carriers with respect to both the swifts and the spindles, which comprises a constantly reciprocating carrier-bar and a both intermittently reciprocating and intermittently rotatable feed shaft;—mechanism for occasioning the constant reciprocation of the carrier bar;—and mechanism coöperating with the controlling means upon the thread carriers for occasioning the intermittent reciprocation and rotation of the feed shaft.

5. In a cop-wrapping machine, which comprises in combination the elements of, a supporting frame, a plurality of revoluble swifts, a plurality of rotatable spindles, means for rotating the spindles, and means for supporting and intermittently reciprocating a plurality of thread carriers intermediate the swifts and the spindles, which means comprises a constantly reciprocating carrier bar and an intermittently reciprocating and rotating threaded feed shaft,—a plurality of thread carriers each of which comprises in combination the following elements, namely, a means for frictionally but not positively connecting the body of the thread carrier with the carrier bar, means for connecting and disconnecting the body of the thread carrier with the feed shaft, and means brought into operation by the breaking of a thread for throwing into and out of connection the connecting and disconnecting means between the body of the thread carrier and the feed shaft.

6. In a cop-wrapping machine in which are combined the elements of a supporting frame, a plurality of revoluble swifts, a plurality of rotatable spindles, means for rotating the spindles, and means for supporting and intermittently reciprocating a plurality of thread carriers intermediate the swifts and the spindles, which means comprises a constantly reciprocating carrier bar and an intermittently reciprocating and rotating threaded feed shaft,—a plurality of thread carriers each of which embodies in combination a spring-controlled means for frictionally but not positively connecting the thread carrier with the carrier bar, a movable threaded nut connection adapted to be engaged with or disengaged from the threaded feed shaft, a balanced counterweighted device for controlling the movement of the nut relatively to the feed shaft, a trigger mechanism for locking and unlocking said counterweighted nut control device, and a balanced counterweighted thread finger device which operates when the thread breaks to release the trigger mechanism and the nut control.

7. In a cop-wrapping machine in which are combined the elements of a supporting frame, a plurality of revoluble swifts, a plurality of rotatable spindles, means for rotating the spindles, and means for supporting and intermittently reciprocating a plurality of thread carriers intermediate the swifts and the spindles, which means comprises a constantly reciprocating carrier bar and an intermittently reciprocating and rotating threaded feed shaft,—a plurality of thread carriers each of which embodies in combination a spring-controlled means for frictionally but not positively connecting the thread carrier with the carrier bar, a movable threaded nut connection adapted to be engaged with or disengaged from the threaded feed shaft, a balanced counterweighted device for controlling the movement of the nut relatively to the feed shaft, a trigger mechanism for locking and unlocking said counter-

weighted nut controlled device, and a balanced counterweighted thread finger device which operates when the thread breaks to release the trigger mechanism and the nut control, and which also embodies fixed thread fingers and movable thread fingers arranged in alternating relationship on said balanced thread finger device.

8. In a cop-wrapping machine in which are combined the elements of a supporting frame, a plurality of revoluble swifts, a plurality of rotatable spindles, means for rotating the spindles, and means for supporting and intermittently reciprocating a plurality of thread carriers intermediate the swifts and the spindles, which means comprises a constantly reciprocating carrier bar and an intermittently reciprocating and rotating threaded feed shaft,—a plurality of thread carriers each of which embodies in combination a spring-controlled means for frictionally but not positively connecting the thread carrier with the carrier bar, a movable threaded nut connection adapted to be engaged with or disengaged from the threaded feed shaft, a balanced counterweighted device for controlling the movement of the nut relatively to the feed shaft, a trigger mechanism for locking and unlocking said counterweighted nut control device, and a balanced counterweighted thread finger device which operates when the thread breaks to release the trigger mechanism and the nut control, and which also embodies fixed thread fingers and movable thread fingers arranged in alternating relationship on said balanced thread finger device, and also a thread tension in advance of said thread finger device.

9. In a cop-wrapping machine in which are combined the elements of a supporting frame, a plurality of revoluble swifts, a plurality of rotatable spindles, means for rotating the spindles, and means for supporting and intermittently reciprocating a plurality of thread carriers intermediate the swifts and the spindles, which means comprises a constantly reciprocating carrier bar and an intermittently reciprocating and rotating threaded feed shaft,—a plurality of thread carriers each of which embodies in combination a spring-controlled means for frictionally but not positively connecting the thread carrier with the carrier bar, a movable threaded nut connection adapted to be engaged with or disengaged from the threaded feed shaft, a balanced counterweighted device for controlling the movement of the nut relatively to the feed shaft, a trigger mechanism for locking and unlocking said counterweighted nut control device, and a balanced counterweighted thread finger device which operates when the thread breaks to release the trigger mechanism and the nut control, and which also embodies fixed thread fingers and movable thread fingers arranged in alternating relationship on said balanced thread finger device, a thread tension in advance of said thread finger device, and thread guides in advance of and beyond the thread tension.

10. In a cop-wrapping machine in which are combined the elements of a supporting frame, a plurality of revoluble swifts, a plurality of rotatable spindles, means for rotating the spindles, and means for supporting and intermittently reciprocating a plurality of thread carriers intermediate the swifts and the spindles, which means comprises a constantly reciprocating carrier bar and an intermittently reciprocating and rotating threaded feed shaft,—a plurality of thread carriers each of which embodies in combination a spring-controlled means for frictionally but not positively connecting the thread carrier with the carrier bar, a movable threaded nut connection adapted to be engaged with or disengaged from the threaded feed shaft, a balance counterweighted device for controlling the movement of the nut relatively to the feed shaft, a trigger mechanism for locking and unlocking said counterweighted nut control device, and a balance counterweighted thread finger device which operates when the thread breaks to release the trigger mechanism and the nut control, and which also embodies fixed thread fingers and movable thread fingers arranged in alternating relation on said balance thread finger device, a thread tension in advance of said thread finger device, thread guides in advance of and beyond the thread tension, and an automatic thread cutting device for cutting the thread when the thread has been completely wound to form the cop.

11. In a cop wrapping machine, the following elements in combination:—a supporting frame;—a plurality of revoluble swifts which carry skeins of thread;—a plurality of horizontally disposed spindle frames pivotally connected with the supporting frame;—a plurality of spindles for holding cop tubes which receive the threads from the skeins, and which are adapted to be detachably connected with the spindle frames;—means for occasioning the rotation of the spindles;—a plurality of reciprocatory thread-carriers intermediate the swifts and the spindles, through which threads from the skeins pass to the cop-tubes;—mechanism for occasioning the constant longitudinal reciprocation of the thread carriers with respect to both the swifts and the spindles, which comprises a constantly reciprocating carrier-bar and a both intermittently reciprocating and intermittently rotatable feed shaft;—and mechanism for occasioning the constant reciprocation of the carrier-bar and the intermittent reciprocation and rotation of the feed shaft.

12. In a cop wrapping machine, the fol-

lowing elements in combination:—a supporting frame;—a plurality of revoluble swifts which carry skeins of thread;—a plurality of horizontally disposed spindle frames pivotally connected with the supporting frame;—a plurality of spindles for holding cop tubes which receive the threads from the skeins, and which are adapted to be detachably connected with the spindle frames;—means for occasioning the rotation of the spindles;—a plurality of reciprocatory thread carriers intermediate the swifts and the spindles, through which threads from the skeins pass to the cop-tubes and which are provided with means for controlling both the reciprocation and the rotation of the feed shaft;—mechanism for occasioning the constant longitudinal reciprocation of the thread carriers with respect to both the swifts and the spindles, which comprises a constantly reciprocating carrier-bar and a both intermittently reciprocating and intermittently rotatable feed shaft;—mechanism for occasioning the constant reciprocation of the carrier-bar;—and mechanism cooperating with the controlling means upon the thread carriers for occasioning the intermittent reciprocation and rotation of the feed shaft.

In testimony whereof we have hereunto signed our names this second day of May, 1918.

JEAN JOSEPHS.
DAVID THEODORE BERLIZHEIMER.

In the presence of—
J. BONSALL TAYLOR.
C. D. MCVAY.