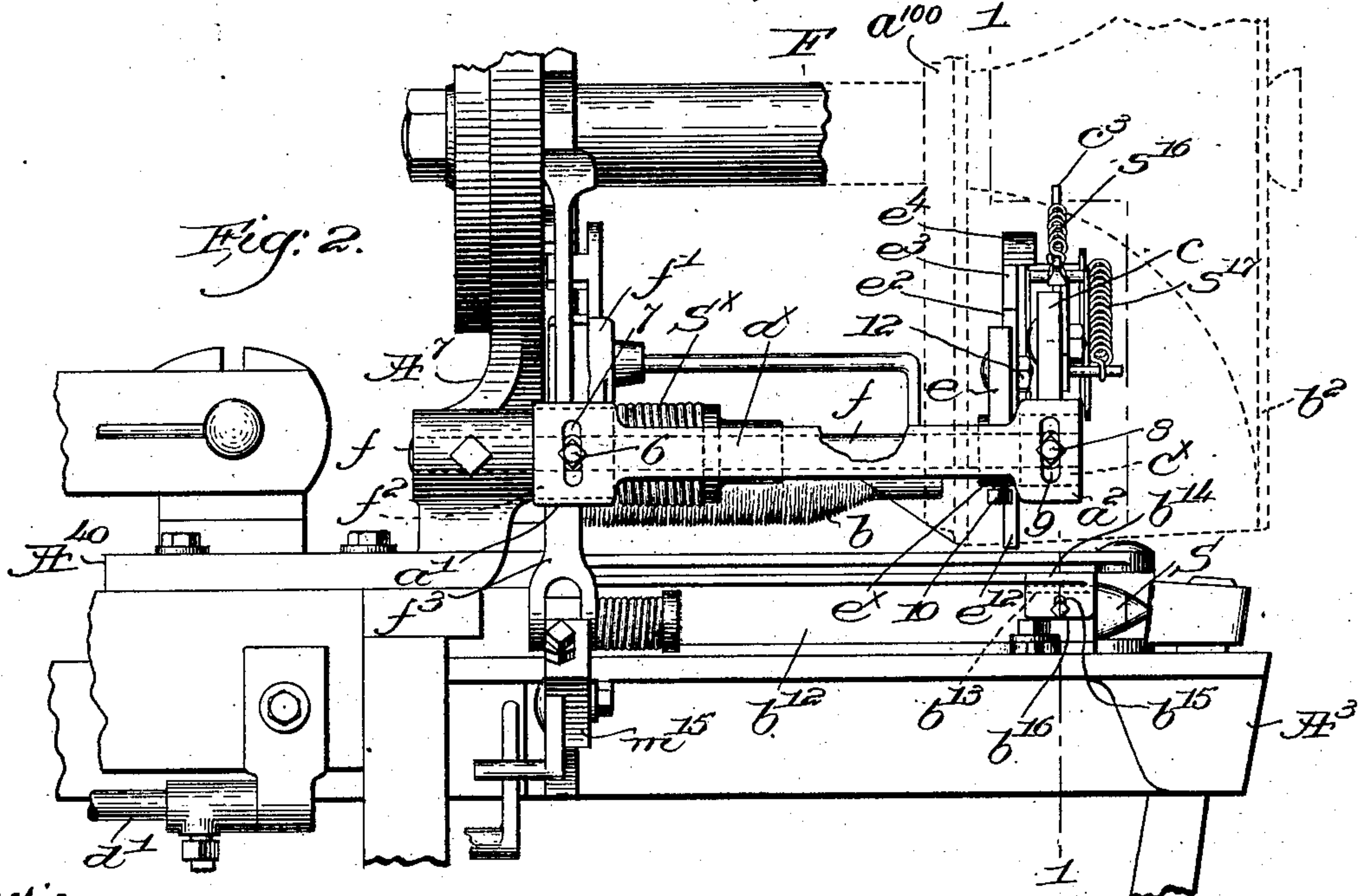
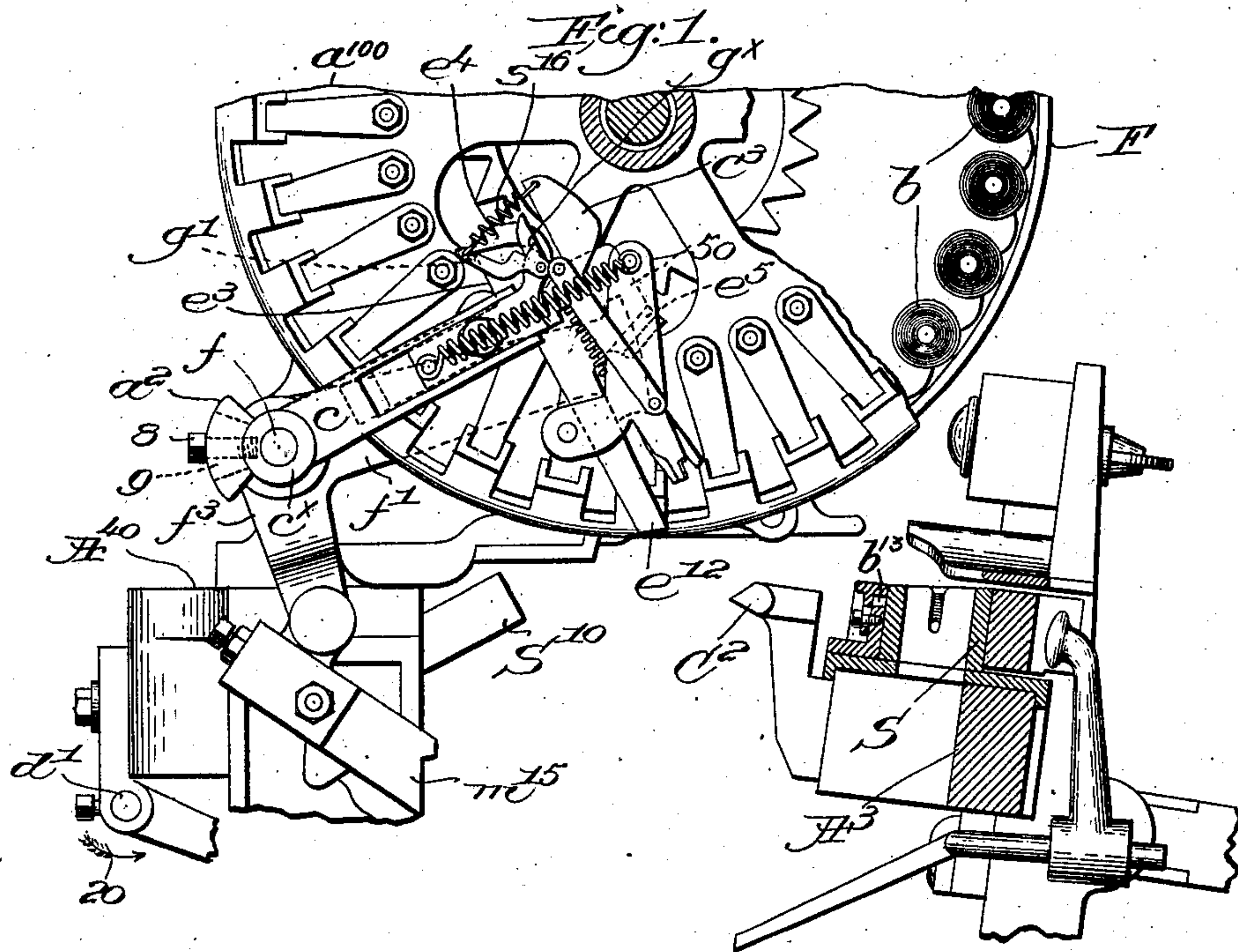


J. NORTHROP.
FILLING REPLENISHING LOOM.

APPLICATION FILED MAY 14, 1903.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses,
Edward H. Allen.
W. C. Simonsford.

Inventor,
J. Northrop,
by Wesley Gregory,
attys.

No. 741,700.

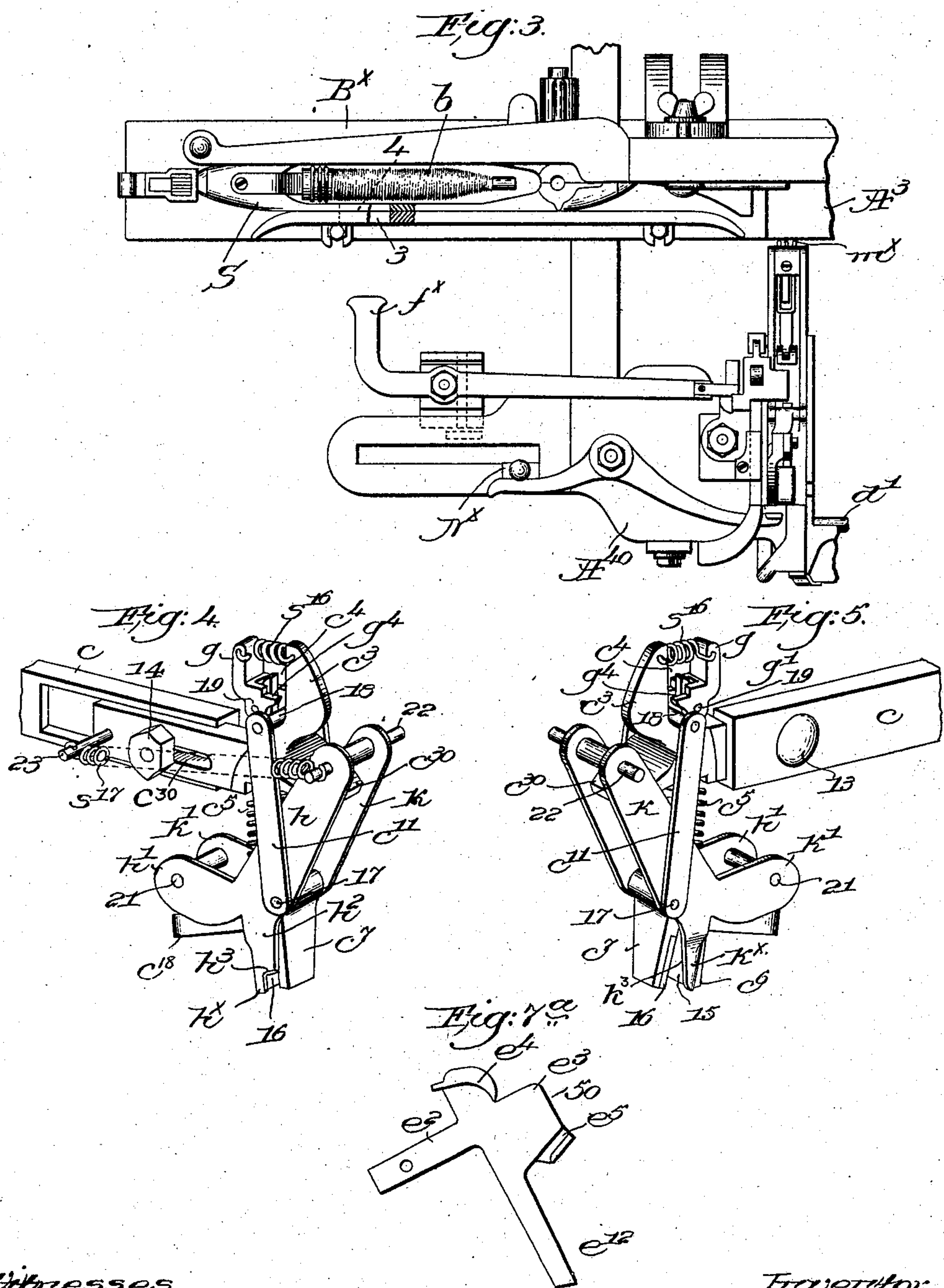
PATENTED OCT. 20, 1903.

J. NORTHROP.
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APPLICATION FILED MAY 14, 1903.

NO MODEL.

4 SHEETS—SHEET 2.



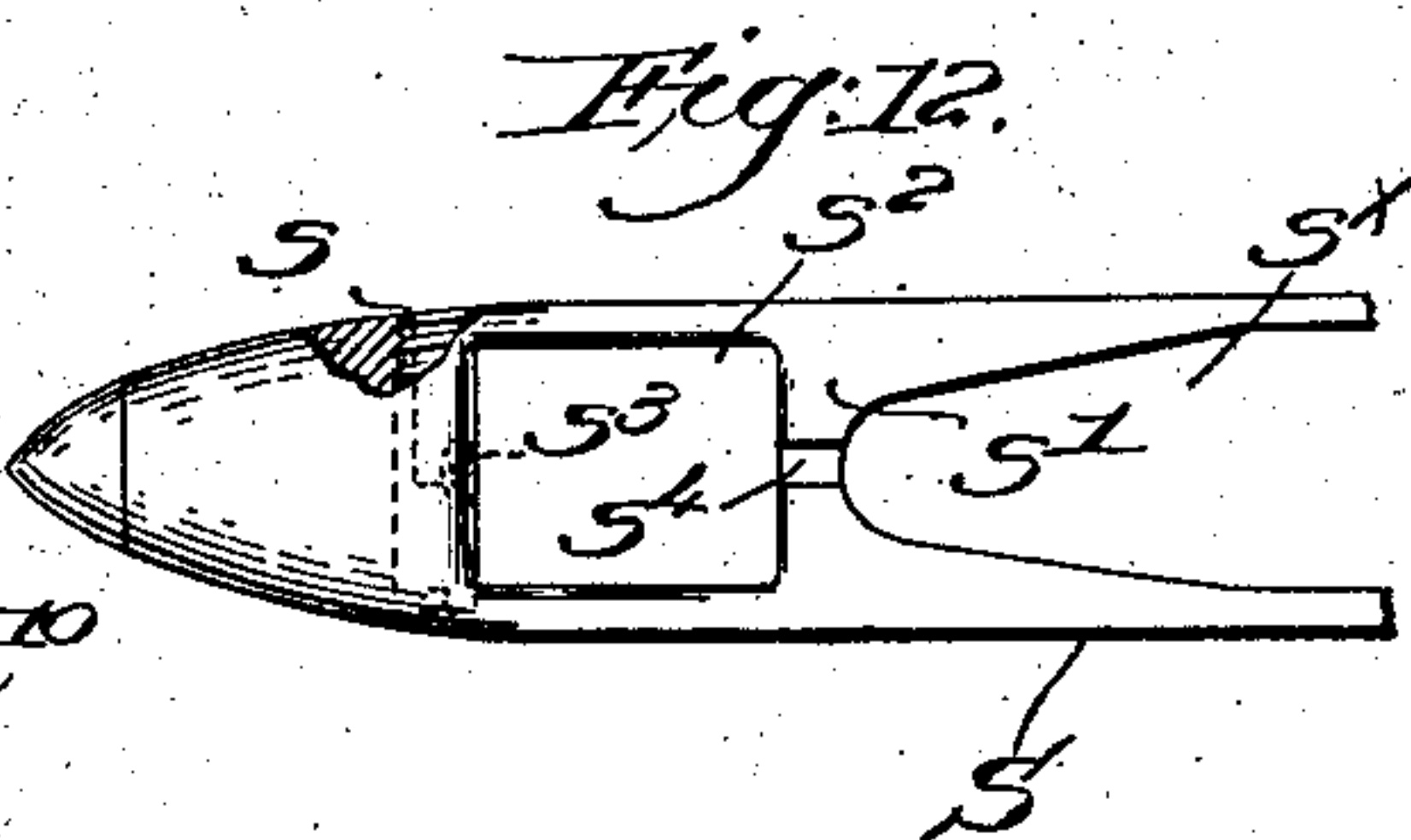
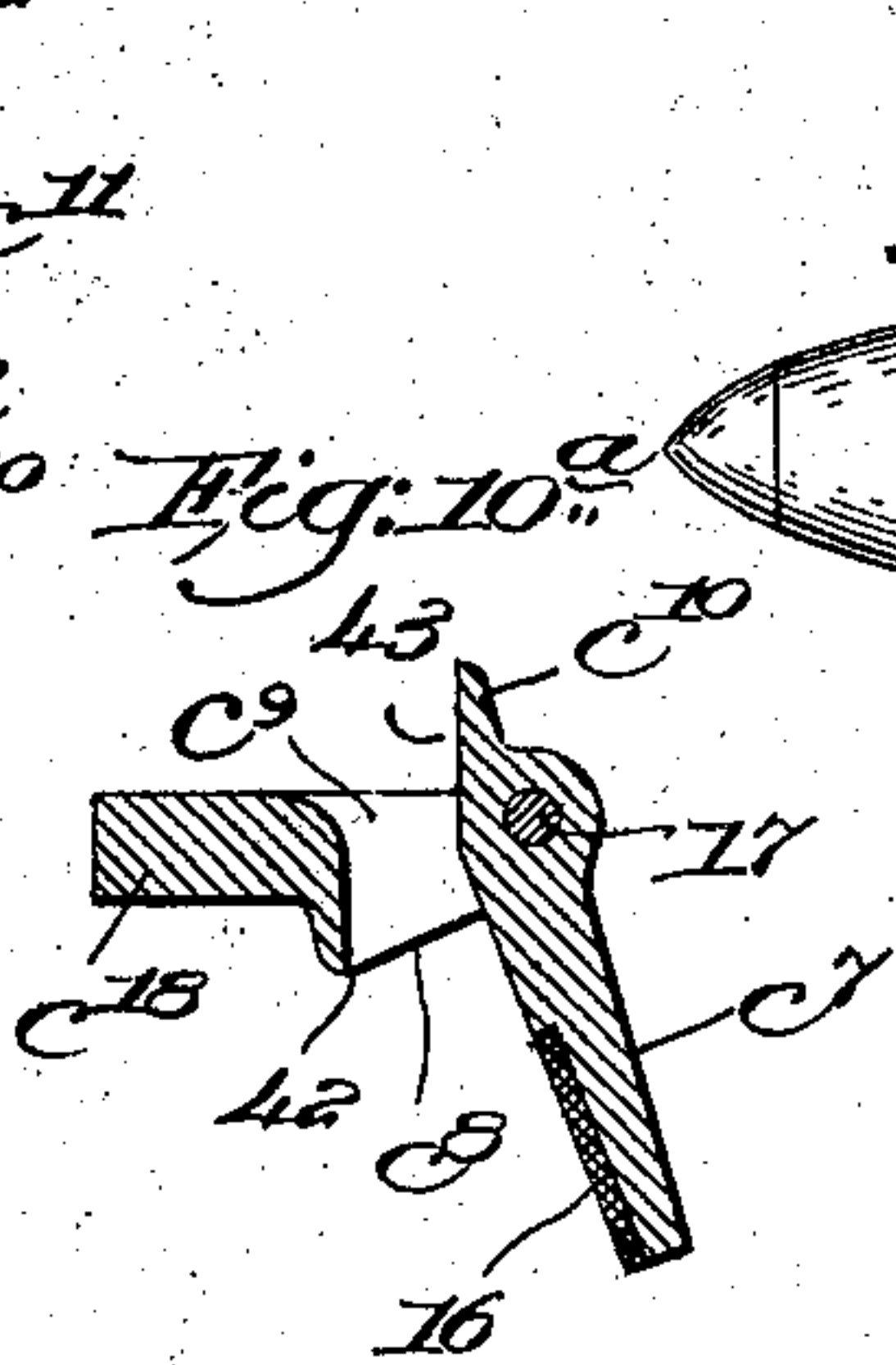
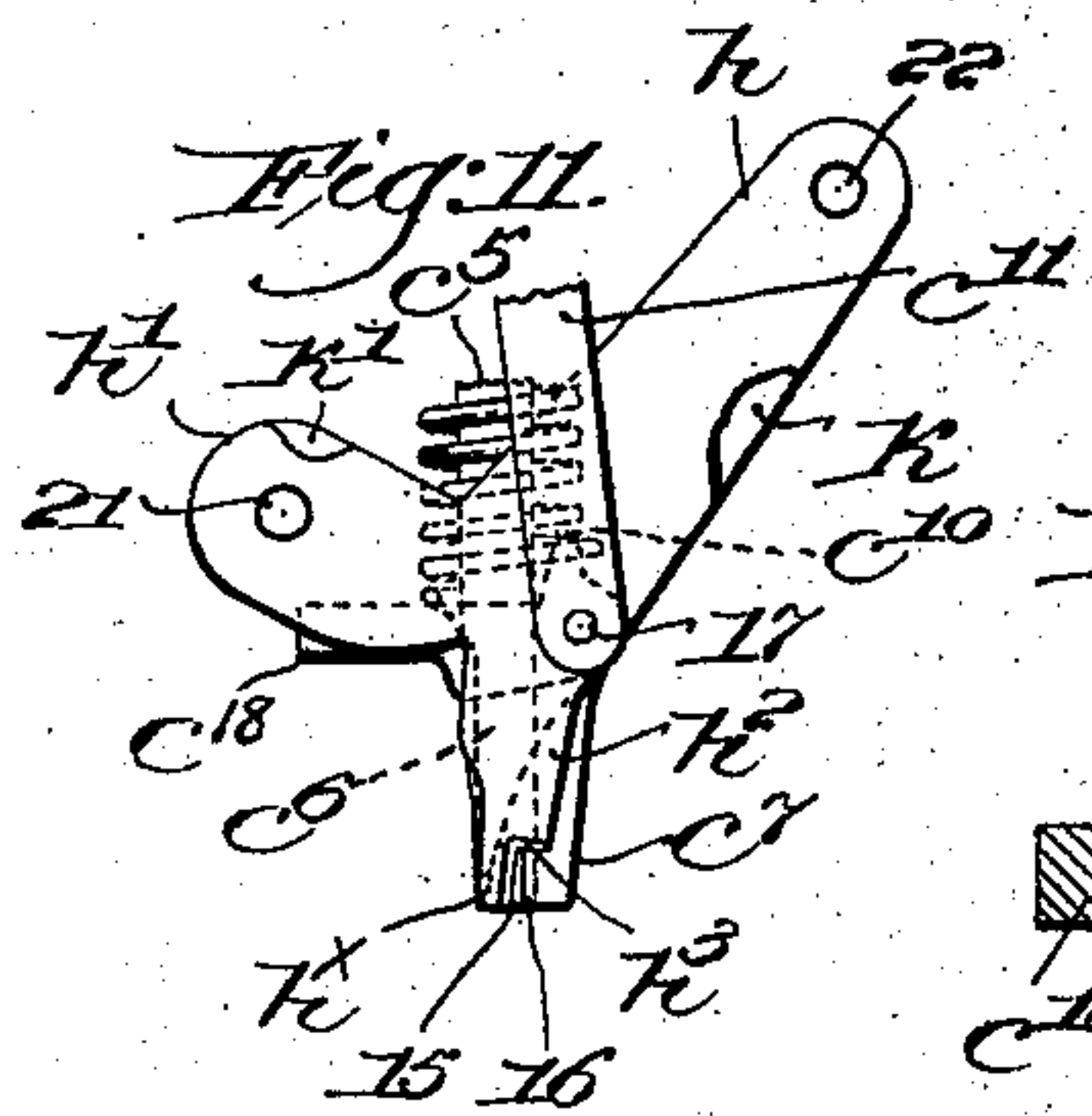
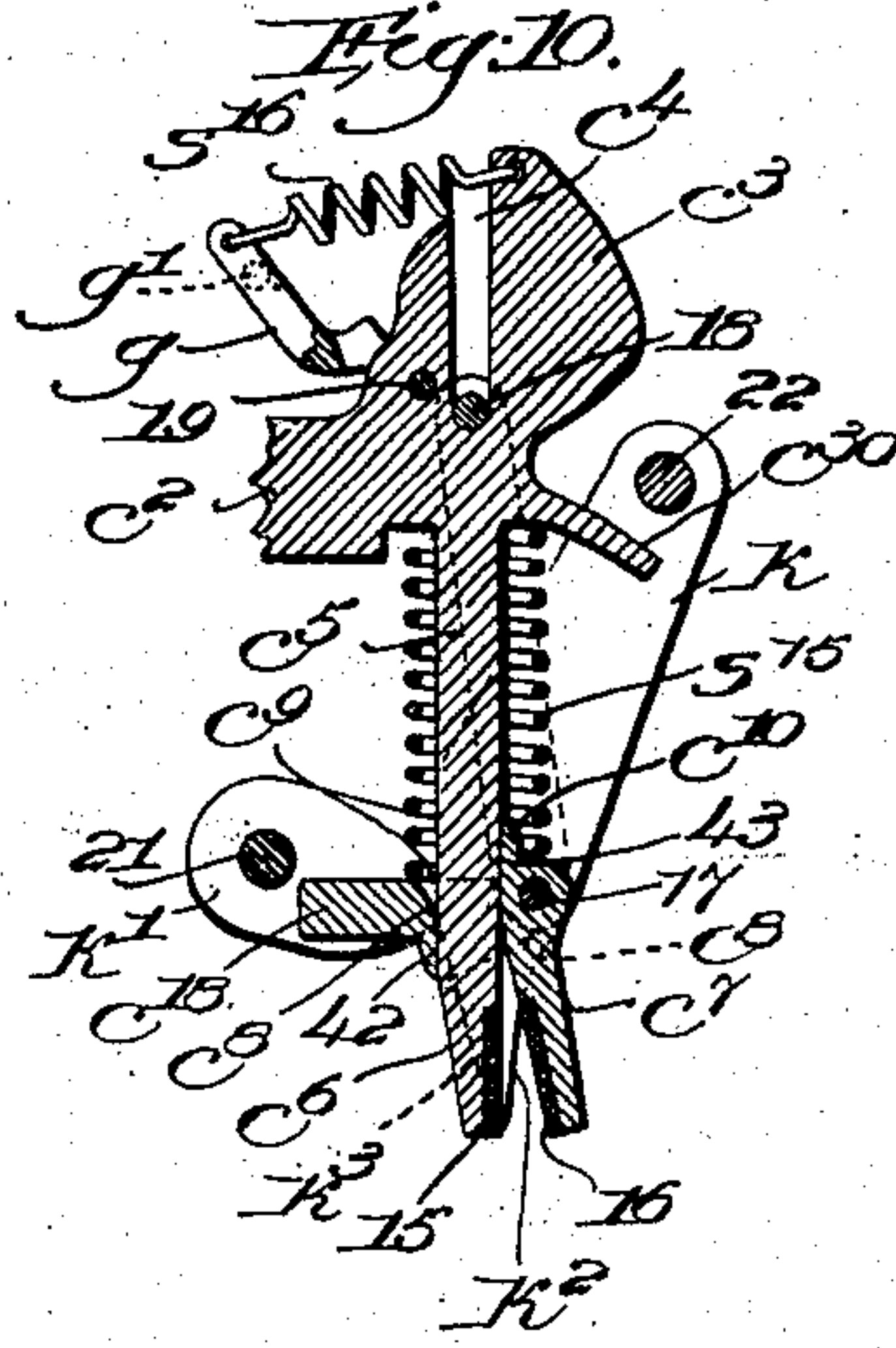
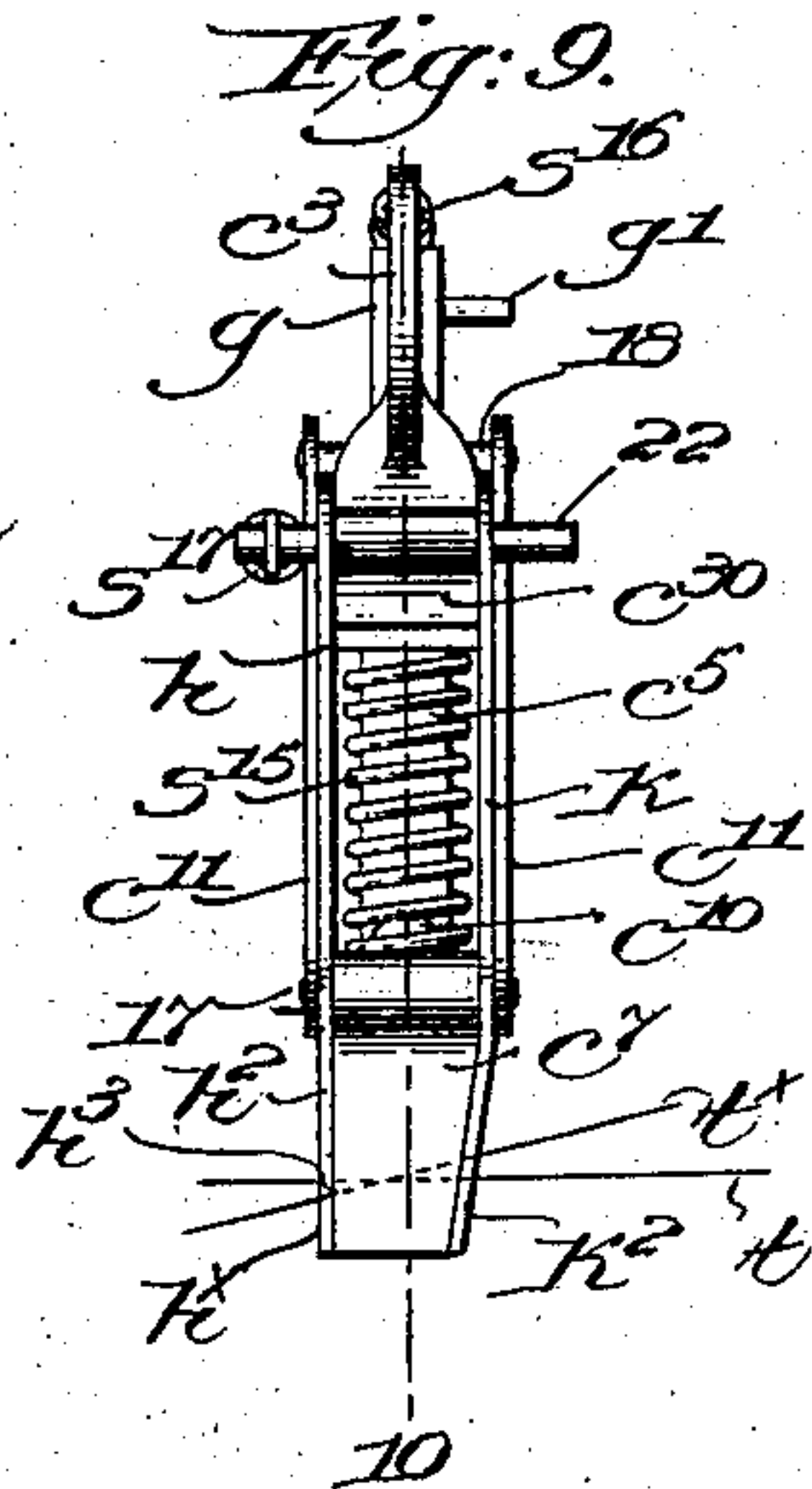
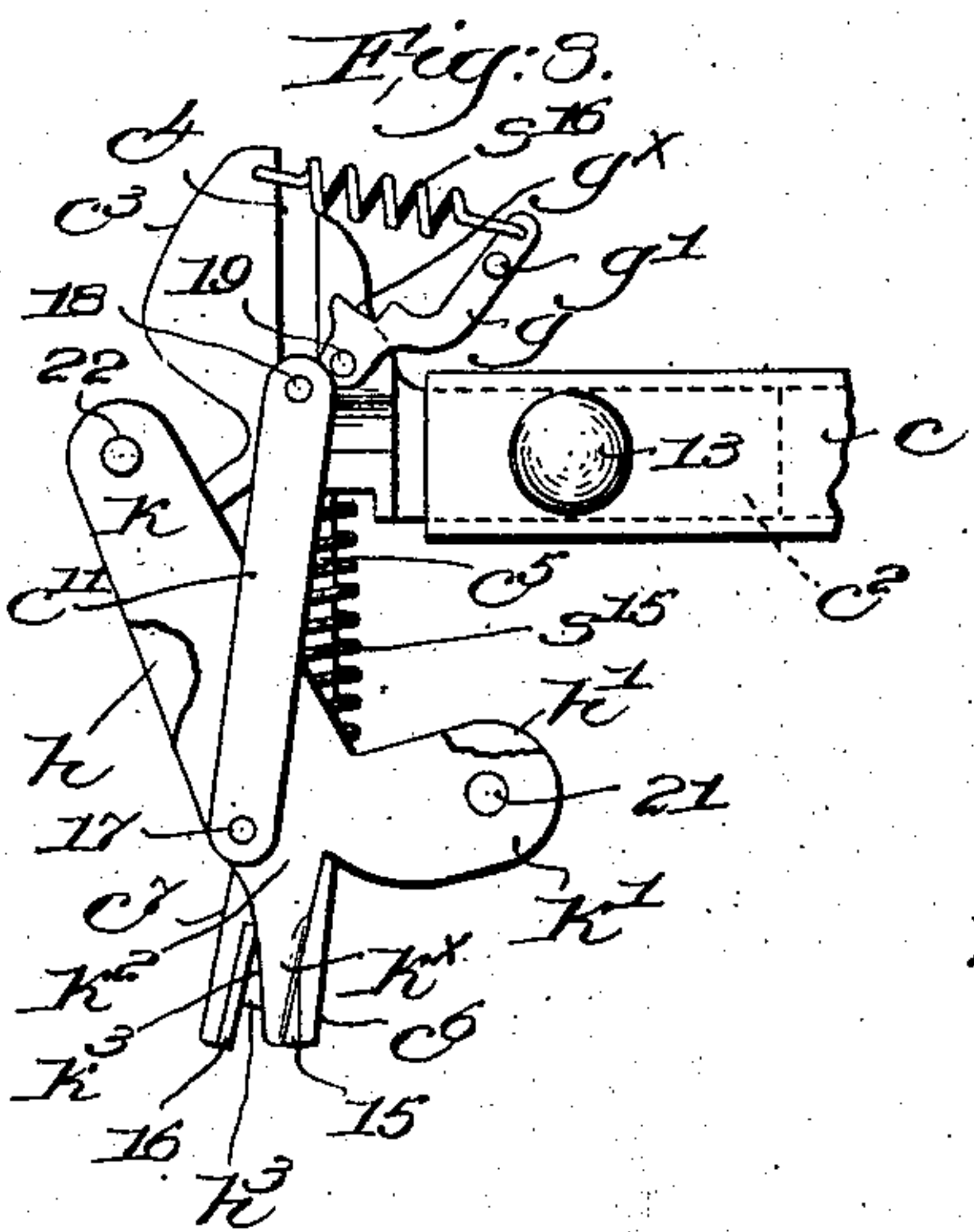
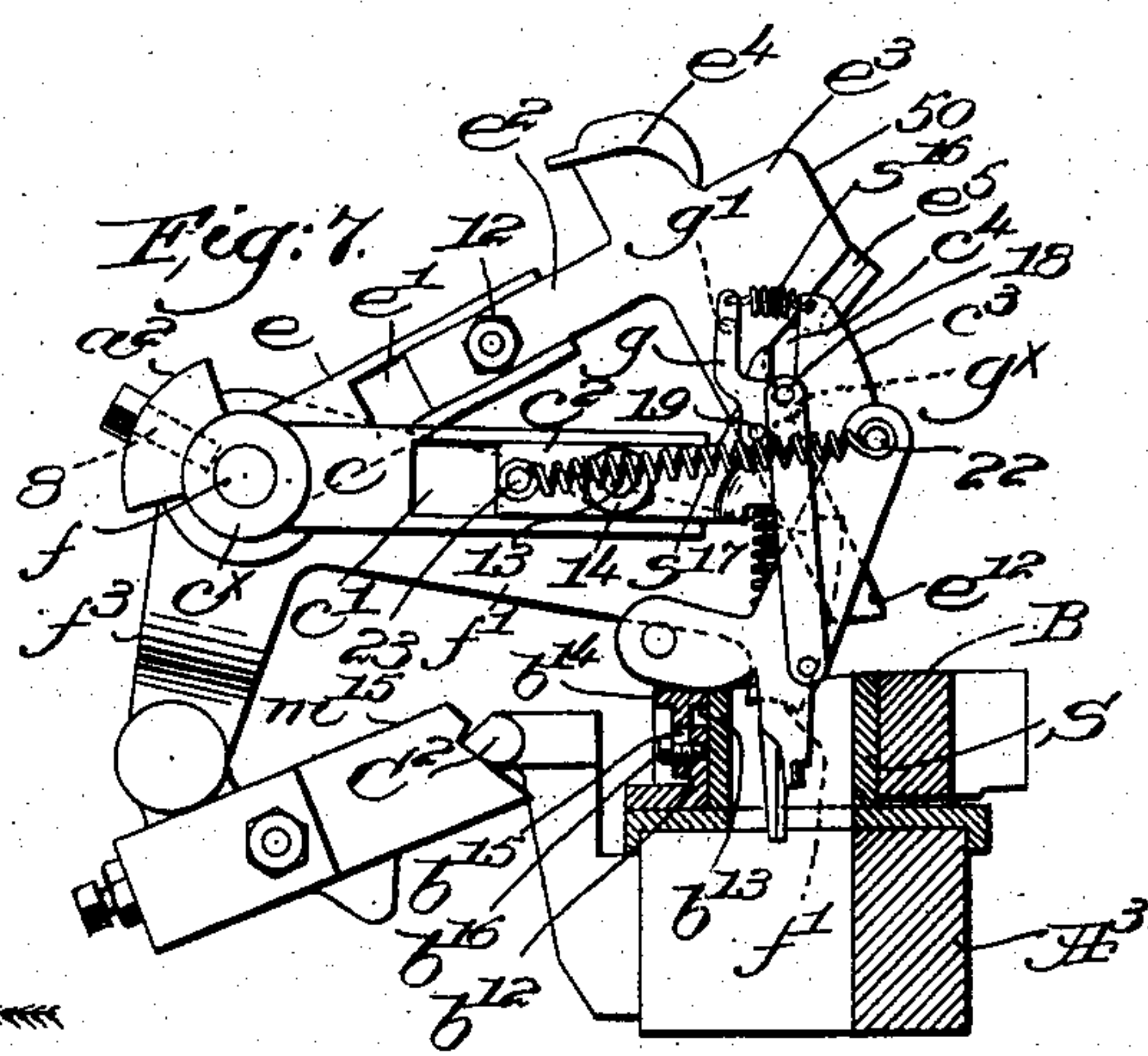
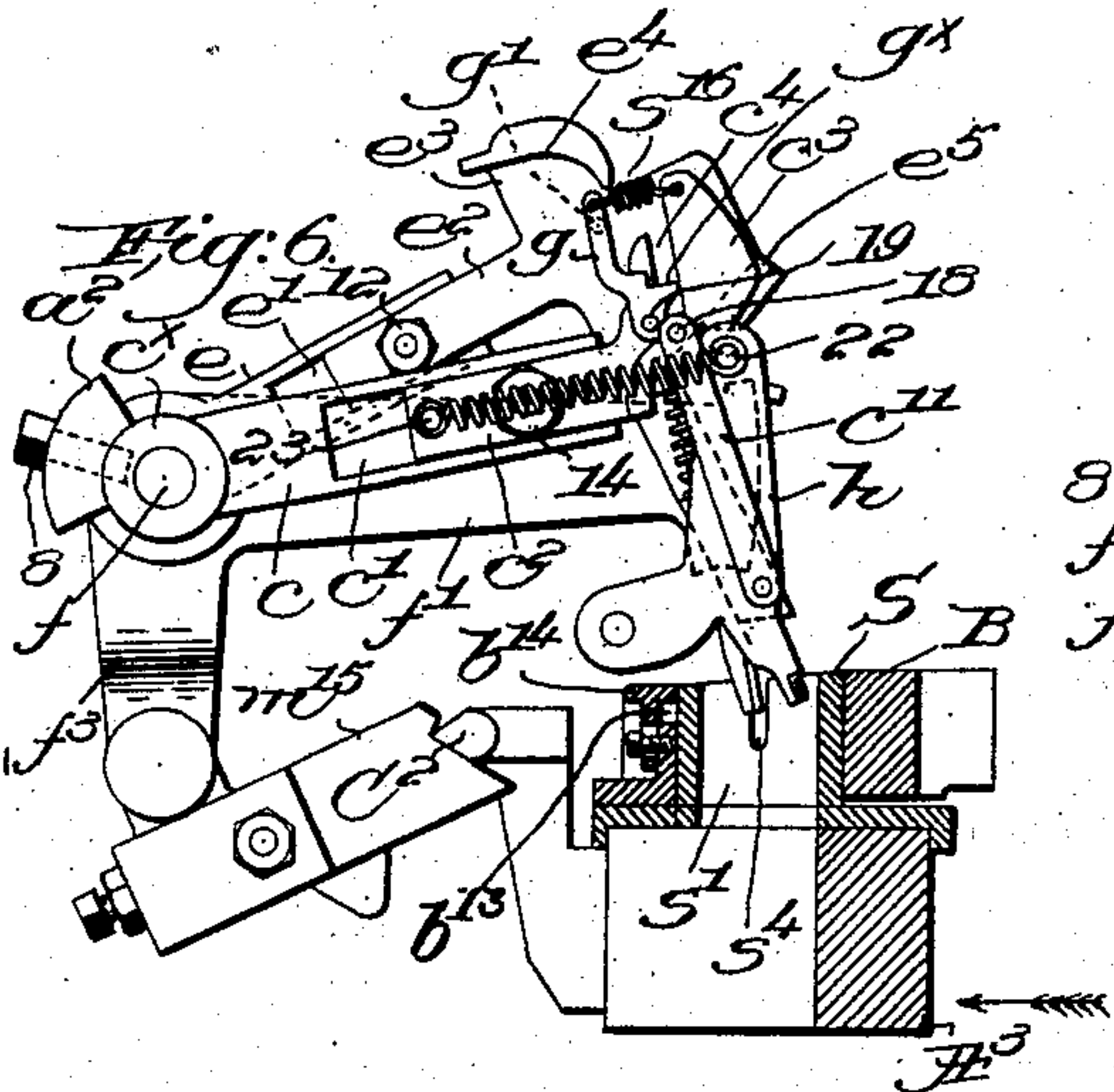
Witnesses,
Edward H. Allen.
W. C. Lumsford.

Fraserston;
Thomas Northrop,
by Henry Gregory.
1845.

J. NORTHROP.
FILLING REPLENISHING LOOM.
APPLICATION FILED MAY 14, 1903.

NO MODEL.

4 SHEETS—SHEET 3.



Witnesses,
Edward H. Allen.
W. C. Linsford.

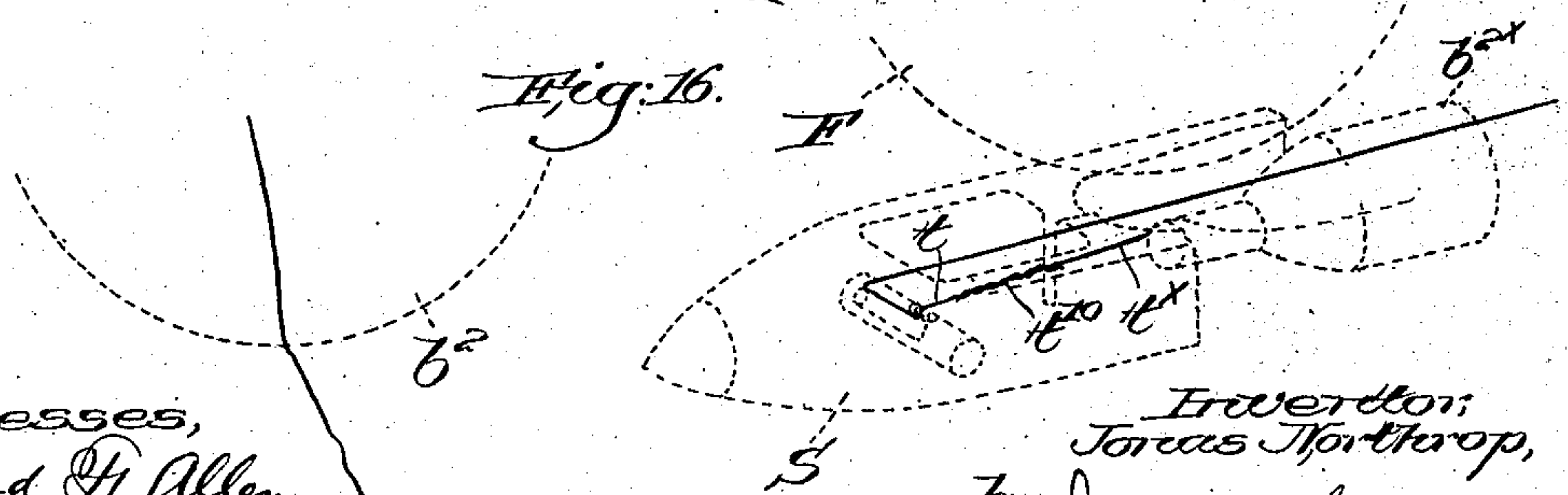
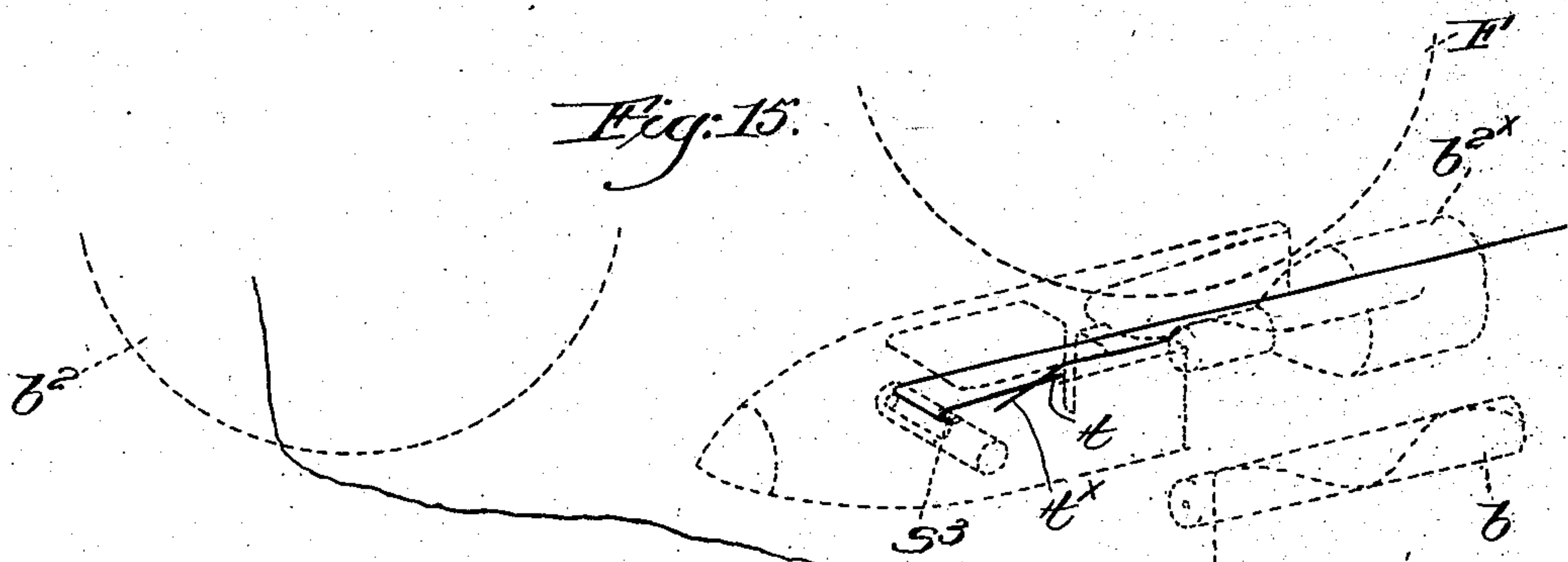
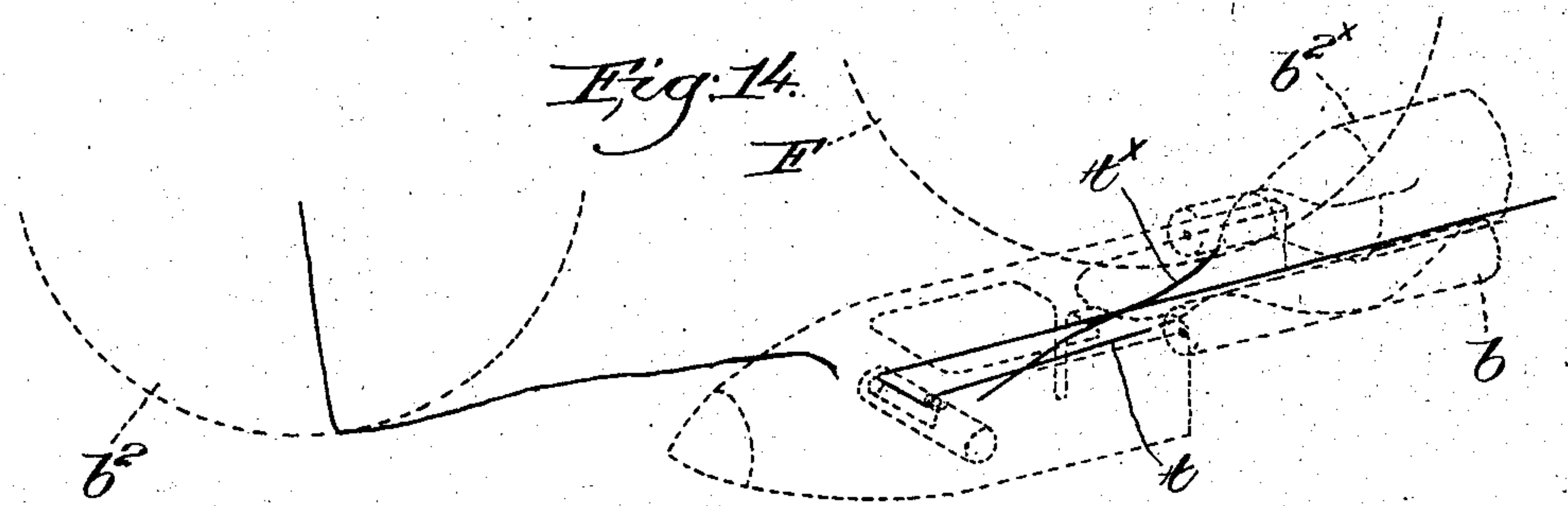
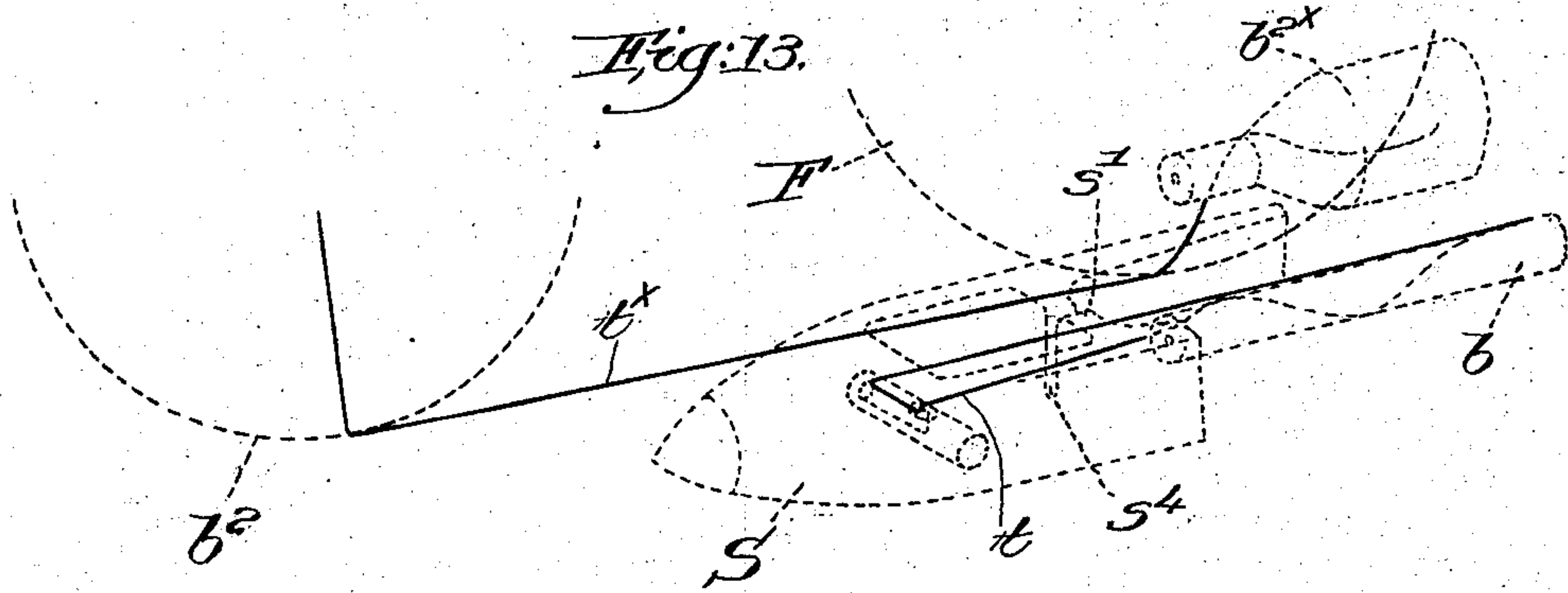
Inventor:
J. Northrop,
by Leasby Ferguson,
attys.

J. NORTHROP.
FILLING REPLENISHING LOOM.

APPLICATION FILED MAY 14, 1903.

NO MODEL.

4 SHEETS—SHEET 4.



Witnesses,
Edward H. Allen.
W. C. Lunsford.

Inverton;
Jonas Northrop,
by Lesley Inverton,
attys.

UNITED STATES PATENT OFFICE.

JONAS NORTHROP, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

FILLING-REPLENISHING LOOM.

SPECIFICATION forming part of Letters Patent No. 741,700, dated October 20, 1903.

Application filed May 14, 1903. Serial No. 157,089. (No model.)

To all whom it may concern:

Be it known that I, JONAS NORTHROP, a subject of the King of Great Britain, and a resident of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Automatic Filling - Replenishing Looms, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to looms provided with mechanism for replenishing automatically the running shuttle with filling when necessary without interfering with the continuous operation of the loom—such, for instance, as forms the subject-matter of United States Patent No. 529,940—and my invention is used in connection with so-called “feeler-loom” of the general class mentioned.

In a feeler-loom filling replenishment is effected prior to complete exhaustion of the supply carried by the running shuttle, thereby obviating the formation of one or more empty or partly-empty picks. An automatically self-threading shuttle is used in such loom, and means have been provided to sever the old filling end and the fresh filling end adjacent the edge of the cloth to avoid the weaving of loose thread ends into the selvage of the cloth, and a part of the severing means is usually mounted on the shuttle-feeling device. While such apparatus has been highly successful and has gone into extensive use, certain practical defects are occasionally made manifest, interfering with the perfect operation of the loom. Sometimes the shuttle fails to thread or when threaded the filling is at times looped and thrown forward out of the threading-passage, causing additional operations of the replenishing mechanism. So, too, the thread-severing means will not operate as promptly as desired upon filling replenishment, or such means may fail to sever the thread, so that the latter is broken and the ends stick out from the edge or are woven into the cloth.

My present invention involves a feature which is, so far as I am aware, broadly new—viz., the positive and automatic union or connection of the old and fresh filling ends—whereby a continuous filling is provided. As

the fresh filling-supply is being transferred from the filling-feeder to the running shuttle the filling end is cut and held, and the old filling end is also cut between the delivery-eye of the shuttle and the outgoing filling-carrier and held. These two ends are then brought together and united automatically by twisting them together, in the present embodiment of my invention the entire operation being effected while the shuttle is in the replenishing shuttle-box, the united filling being released and the devices which have acted thereupon being withdrawn from the path of the replenished shuttle in ample time to permit it to be picked from the replenishing shuttle-box. There are many practical advantages attendant upon such an apparatus, as will be plainly manifest hereinafter. A solid shuttle can be used as distinguished from an automatically self-threading shuttle, avoiding the difficulties referred to as sometimes attendant upon the use of the latter. Again, the ordinary shuttle-feeler thread-cutter is dispensed with, and as a continuous thread of filling is laid no ends are or can be left extending out of the cloth.

In brief, the operation of the mechanism hereinafter to be described and which embodies one practical form of my present invention is substantially as follows: When the fresh filling carrier or supply is transferred to the shuttle, the spent filling-carrier is ejected therefrom, leaving a thread of filling extending from the cloth through the shuttle-eye and down into the receptacle for ejected filling-carriers or bobbins. The filling-uniting device descends with the transfer, and the fresh filling end is grasped and severed between the point at which it is held and the filling-feeder. This held end of fresh filling is carried down into a chamber in the shuttle, and the outgoing filling end is caught and held and severed from the portion extending to the ejected filling-carrier. The two ends of filling—the old and the new—are automatically laid across each other in the shuttle-chamber, and in this position suitable jaws close upon them. The transferrer continues to descend until the fresh filling-carrier is properly inserted in the shuttle; but during the latter part of such movement one

of the jaws referred to is moved or slid longitudinally upon its fellow. Such relative sliding movement of the jaws while closed upon the filling ends twists or rolls the latter securely together. The transferrer then rises and the jaws are opened automatically, releasing the united filling ends between the shuttle-eye and the delivery end of the freshly-inserted filling-carrier, and the jaws then return to normal position and are set automatically in readiness for the next operation. Thereupon the shuttle is picked in usual manner, carrying the united filling-thread into the cloth.

The various novel features of the invention will be described in detail in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a right-hand side elevation and partial section of a portion of an automatic filling-replenishing loom, the section being taken on the irregular line 1 1, Fig. 2, looking toward the left, the outer plate or disk of the filling-feeder being broken out, the transferring mechanism and the means for severing and uniting the filling ends being shown in normal position. Fig. 2 is a front elevation of a portion of the apparatus shown in Fig. 1, the outer end of the filling-feeder being indicated by dotted lines. Fig. 3 is a top or plan view of the left-hand side of the loom, showing the filling-feeder and cooperating devices. Fig. 4 is an enlarged perspective view of the means for severing and uniting the severed ends of the old and new filling viewed from the right-hand side of the loom. Fig. 5 is a similar view, but taken from the opposite or inner side. Fig. 6 is a detail similar to Fig. 1, but showing the filling-replenishing operation as initiated, the transferrer being about to engage and remove the fresh filling-carrier from the filling-feeder, and the fresh filling end has been grasped and severed with the parts in readiness to grasp and sever the old filling end. Fig. 7 is a like detail view, but the transfer of the fresh filling has been completed, the old filling end has been severed, and the two severed ends have been rolled or twisted together, and thereby united, the subsequent movement of the parts back to normal position causing first the release of the united filling and thereafter effecting the setting of the mechanism in readiness for a subsequent operation. Fig. 7^a is a detached detail of the cam-plate shown in Figs. 1, 6, and 7. Fig. 8 is an enlarged inner side elevation of the filling parting and uniting instrumentality in the position shown in Fig. 1. Fig. 9 is a rear elevation thereof viewing Fig. 8 from the left. Fig. 10 is a vertical sectional view on the line 10 10, Fig. 9, looking toward the right. Fig. 10^a is an enlarged sectional view of the movable jaw to be referred to. Fig. 11 is an enlarged detail of the lower portion of the filling parting and uniting devices in a position intermediate the positions shown in Figs.

6 and 7 just at the instant before the connection of the old and new filling ends is effected. Fig. 12 is a top or plan view of the delivery or eye end of the shuttle employed in connection with my present invention. Fig. 13 is a perspective diagrammatic view showing the delivery end of the shuttle and the filling-carrier about to be ejected by the insertion of the fresh filling-carrier, the old and new filling ends being shown in heavy full lines and before severance of either. Fig. 14 is a similar view showing the fresh filling-carrier partly inserted in the shuttle and its filling end severed and carried across the old filling end, such condition closely following the positioning of the parts shown in Fig. 6. Fig. 15 is a view like Fig. 13, but showing the fresh filling end crossed over the old filling end, which latter has been severed, the old filling-carrier being completely ejected, the corresponding position of the filling parting and uniting devices being shown in Fig. 11 in readiness to twist the filling ends together; and Fig. 16 is a diagrammatic view taken after the twisting of the ends together and corresponding to the position of the parts illustrated in Fig. 7, the filling-manipulating means being omitted in all of the diagrammatic figures.

I have shown my invention as applied to a loom wherein a feeler feels the filling in the shuttle at every alternate forward beat of the lay, the feeler operating to effect actuation of the filling-replenishing mechanism prior to complete exhaustion of the filling in the shuttle—as, for instance, in United States Patent No. 662,320, dated November 20, 1900, which shows a convenient form of feeler-loom. The breast-beam A⁴⁰, lay A³, filling-feeder F, Figs. 1 and 2, for the filling-supplies or filling-carriers b, the transferrer f', and the operating or controlling rock-shaft d' are and may be all substantially as in said patent. Referring to Fig. 3, the shipper N^x, the feeler f^x, adapted to intermittently pass through the aperture 3 in the front wall of the shuttle-box B^x and through a slot 4 in the side wall of the shuttle S to feel the filling therein, the devices intermediate the feeler and the rock-shaft d' to turn the latter in the direction of arrow 20, Fig. 1, when the filling in the shuttle is exhausted to the desired extent, and the filling-fork m^x and its cooperating parts may be and are all substantially as in said patent and operate as therein described. It is to be understood, however, that my invention is not restricted to feeler mechanism of this precise character, as the same *per se* forms no novel part of this invention.

The transferrer f' is mounted to rock on the stud f, rigidly secured to the stand A⁷, supporting the filling-feeder F, the stud, however, being extended a considerable distance beyond the outer end of the transferrer-spring S^x for a purpose to be described. The depending end f³ of the transferrer carries a dog m¹⁵ to be engaged by the bunter C² on the lay when

filling replenishment is required in a manner well known to those skilled in the art, the rocking of the controlling-shaft d' by or through the filling-feeder causing the dog to move into the path of the bunter.

As most clearly shown in Fig. 12, the shuttle S has a longitudinal opening s^x extending from the top to the bottom thereof to receive the filling-carrier, which is held therein by suitable holding means, (not shown,) a transverse wall s' separating the opening s^x from a smaller chamber s^2 , with which the tubular side-delivery eye communicates. This eye may be made in any suitable way—as, for instance, by a hollow plug s , screwed into the shuttle-body and having an opening s^3 into the chamber s^2 . An upright notch s^4 is made in the wall s' in alignment with the opening s^3 , the filling drawing through the notch from the delivery end or tip of the filling-carrier passing through the chamber s^2 and thence into the opening s^3 and out at the side of the shuttle through the eye s . Manifestly the shuttle must be threaded manually, and it is to be noted that in the present embodiment of my invention breakage of the filling causes stoppage of the loom by or through the detecting action of the filling-fork m^x in usual manner. Such breakage is of infrequent occurrence, however, and when it does occur the weaver pieces up the broken filling and then starts the loom. A lateral arm a^x has at its ends enlargements a' and a^2 , Fig. 2, concaved on their inner faces, the enlargement a' being adjustably secured to the hub f^2 of the transferrer by a set-screw 6, passed through an elongated slot 7 in the enlargement and screwed into the hub f^2 , the concave face fitting the hub. The arm a^x extends parallel to the stud f , and on the outer end of the latter is loosely mounted the hub c^x of a rocking arm c , the concave face of the enlargement a^2 fitting said hub and being adjustably secured to it by a set-screw 8 passing through a slot 9 in the enlargement and into the hub. By means of the set-screws 6 and 8 the rocking arm c can be set at the requisite angle relative to the transferrer f' , and by reference to Figs. 1 and 2 it will be seen that the said arm extends rearward but outside of the outer disk a^{100} of the filling-feeder.

By reference to Figs. 6 and 7 it will be seen that when the transferrer is rocked the arm c moves in unison with it, and upon said arm the filling parting, holding, and uniting devices are mounted and are moved into and out of operative position by the rocking movement of said arm.

An arm e has its hub e^x rigidly secured upon the stud f by a set-screw 10 adjacent the rocking arm c , inside of the latter, (see Fig. 2,) the fixed arm e being longitudinally recessed on one side at e' to receive a prolongation e^2 of a plate e^3 , a bolt 12 securing the plate to the arm. An overhanging lateral cam-shelf e^4 is formed on the plate for a purpose to be described, and on the same

side of the plate at its rear end an inclined straight groove e^5 is made, as best shown in Figs. 6 and 7. The rocking arm c has in its side an elongated recess c' to receive a longitudinally-adjustable extension c^2 , provided with a slot c^{30} , through which a bolt 13 passes, the bolt being supported in the arm c , and by a nut 14 the arm and its extension are rigidly connected. The extension c^2 terminates in an upturned flattened head c^3 , having an upright slot c^4 substantially in alignment with a long rigid jaw-carrier c^5 , depending from the head (see Fig. 10) and terminating at its lower end in a jaw c^6 , preferably provided with a non-metallic facing 15, of leather, rubber, or other suitable material. A relatively movable cooperating jaw c^7 is provided with a non-metallic facing 16 and is enlarged at its upper end at c^8 and extended forward, the enlargement having a throat c^9 , Figs. 10 and 10^a, through which the jaw-carrier c^5 passes, the lower front edge 42 of the throat being made parallel to the inner face 43 of a stop c^{10} on the top of the enlargement c^8 .

By reference to Fig. 10 it will be seen that the faces 42 and 43 normally engage the adjacent sides of the jaw-carrier respectively below and above a pin 17, passed transversely through the movable jaw c^7 at its upper end, the face 43 being at an obtuse angle to the facing 16. Such normal position of the parts with the jaws open is maintained by the expansive action of a spiral spring s^{15} , surrounding the jaw-carrier between the under side of the head c^3 and the jaw enlargement c^8 , the latter being extended at the front of the jaw-carrier at c^{18} for a purpose to be described. The projecting ends of the pin 17 pass loosely through the lower ends of links c^{11} , connected at their upper ends by a pin 18, adapted to travel in the slot c^4 , the spring s^{15} tending to hold the pin 18 in the bottom of the slot, and downward movement of the jaw c^7 is then limited by the links, the force of the spring being mainly exerted at one side of the fulcrum-pin 17 and keeping the jaws open. Upward pressure upon the extension c^{18} will first rock the jaw c^7 on the fulcrum 17, closing the faces 15 and 16 upon each other, and thereafter continued pressure will slide the jaw c^7 bodily upward against the force of the spring s^{15} , the face 16 rubbing over the opposed face 15 of the jaw c^6 , while the links c^{11} will lift pin 18 in the slot c^4 . A trigger g , bifurcated at its lower end, is fulcrumed at 19 on the head c^3 in front of the said slot, the head being straddled by the bifurcated part of the trigger, a spring s^{16} , attached to the free end of the trigger, moving locking-shoulders g^x thereon across the slot when spring-actuated movement of the trigger is permitted, as in Figs. 6 and 7. When the rocking arm c rises to normal position, Fig. 1, the cam-shelf e^4 engages a lateral projection g' on the trigger, and thereby swings the latter on its fulcrum 19 against the

spring s^{16} , withdrawing the locking-shoulders g^x from the path of the pin 18, for a purpose made manifest hereinafter. Inside the links c^{11} two similar bell-cranks $h h'$ and $k k'$, shown as made of flat metal and rigidly connected by transverse studs 21 and 22, are fulcrumed on the opposite ends of the pin 17 and serve as carriers for the movable blades or cutters which sever the filling ends. One blade coöperates with a shearing cut with one side of the fixed jaw, and the other blade coöperates in a similar manner with the opposite side of the other jaw, as will be explained.

Referring to Figs. 1, 4, 6, 7, and 11, the cutter-carrier $h h'$ is extended below its fulcrum at h^2 , close to the outer side of jaw c^7 , and it is cut away near its end to present a blade h^x , sharpened on its upper edge and projecting beyond the lower end of a transverse shoulder h^3 .

Referring to Figs 5 and 8, the cutter-carrier $k k'$ has an extension k^2 beyond its fulcrum, terminating in a blade k^x , sharpened on its lower edge and flattened on its upper edge k^3 .

As shown in Fig. 9, the inner side of jaw c^7 is slightly inclined and the blade k^x is bent or twisted so that its upper edge will contact with the side of the jaw in one position, and when the cutter-carrier is rocked on its fulcrum, as in Fig. 8, the sharpened edge of the blade will shear over the inner side of the relatively fixed jaw c^6 . A spring s^{17} is attached at one end to the outer end of stud 22, and its other end is secured to a pin 23 on the extension c^2 , the spring acting to rock the upper ends of the cutter-carriers toward the base of the head c^3 . A guide c^{30} , Figs. 4, 5, and 10, projects from the head between the arms h and k below the stud 22 to assist in guiding the cutter-carriers when rocked, the arms h' and k' thereof moving on opposite sides of the extension c^{18} . The inner end of the stud 22, projecting beyond the arm k , is adapted to enter the lower end of the groove e^5 when the rocking arm c rises, and as the latter continues to rise the end of the stud travels to the upper end and out of the groove, and thence along the rear upright edge 50 of the plate e^3 into normal position, (shown in Fig. 1,) at such time holding the cutting-blades h^x and k^x adjacent opposite sides of the jaw c^6 . The plate e^3 is prolonged downwardly and rearwardly to form a stop e^{12} , against which the fresh filling end t^x bears between the outer end of the filling-feeder and the usual thread-holding plate or disk b^2 , (partly shown in dotted lines, Fig. 2, and in the diagrammatic figures,) the filling-supply from which such end leads being the one next to be transferred to the shuttle. The replenishing shuttle-box B has its front wall b^{12} cut away at b^{13} (see Figs. 1, 2, 6, and 7) in the downward path of movement of the extension or jaw-closer c^{18} and the short arms of the cutter-carriers when the lay beats up. A stop b^{14} , having its depending web vertically

slotted at b^{15} , is adjustably secured to the box-wall in the recess b^{13} by a clamp-screw b^{16} , as clearly shown in Figs. 1, 6, and 7, vertical position of the stop being regulated by means of the clamp-screw. The old filling end t leads from the delivery end of the filling-carrier b in the shuttle forward through the slot s^4 in the wall s' and longitudinally across the chamber s^2 to the eye s , and thence out to the cloth, as shown by a heavy full line, Fig. 13, it being supposed that the shuttle is then in the replenishing-box B and that replenishment is about to be effected. The filling end t^x then extends from the filling-supply b^{2x} , next to be transferred, to the holding-plate b^2 of the filling-feeder, and the other parts of the apparatus are in the normal position. (Shown in Figs. 1 and 2.)

When the filling in the shuttle is exhausted to a predetermined extent, the feeler mechanism causes the rock-shaft d' to be turned in the direction of arrow 20, Fig. 1, and the dog m^{15} is thereupon moved into the path of the advancing bunter C^2 in well-known manner, engagement of said parts rocking the transferrer f' and the arm c on the stud f as a fulcrum. The descent of the arm c first moves the jaw c^7 down and behind the fresh filling end t^x , extending above the shuttle, while the cutter h^x descends in front of it, the shoulder h^3 then engaging the filling end and pushing it down off the stop e^{12} , the latter having positioned the filling end therefor. About this time the end of the stud 22 enters and passes down the groove e^5 as the arm c continues its descent, the groove and spring s^{17} acting conjointly to rock the cutter-carriers on their fulcrum 17 into the position shown in Fig. 6. Such movement causes the upper edge k^3 of the blade k^x to confine the fresh filling end between it and the inner side of the jaw c^7 , while the blade or cutter h^x shears or severs the filling end at the outer side of the jaw and nips the severed end, so that the filling end is held across the face 16 of the jaw. By reference to Fig. 6 it will be seen that then there is a clearance between the jaw c^6 and the blades h^x and k^x to receive the old filling end t , extending across the chamber s^2 , and as the lay continues its forward movement the transferrer continues its descent, and the downward movement of arm c inserts the jaws into the shuttle-chamber s^2 and brings the short arms h' and k' of the cutter-carriers and the jaw-closer c^{18} against the stop b^{14} before the descent of the arm c is completed. Their engagement with the stop rocks the jaw c^7 and the cutter-carriers on the pin 17 and nips the old filling end between the opposed faces of the jaws c^6 and c^7 as they close, while the sharp edge of the blade k^x shears across the inner side of jaw c^6 and severs the old filling end t . Such condition of affairs is shown in Fig. 11 and diagrammatically in Fig. 15, the old filling-carrier having then been ejected and the fresh filling-carrier partly positioned in the shuttle,

the final downward movement of the transferrer (shown in Fig. 7) completing the insertion of the fresh filling-carrier, and simultaneously the completion of the downward movement of arm *c* causes the jaw *c*⁷ while in engagement with jaw *c*⁶ to slide upward thereover into the relative position shown in Fig. 7. This sliding movement rubs, rolls, or twists together the two crossed filling ends, firmly uniting them into a continuous thread, as shown in Fig. 16, the jaws when closing and rubbing over each other being within the shuttle-chamber *s*². The twisted part or union *t*¹⁰, Fig. 16, is between the delivery end of the fresh filling-carrier and the eye *s* of the shuttle in the chamber *s*², and as the lay begins to move back the transferrer *f*¹ and the arm *c* begin their rising or return movement, during the first part of which the pressure of the stop *b*¹⁴ upon the cutter-carriers and the jaw-closer *c*¹⁸ is relaxed. Immediately the spring *s*¹⁵ turns the jaw *c*⁷ on its fulcrum away from jaw *c*⁶, and the united part *t*¹⁰ of the filling ends is released, the filling then being free to travel through the shuttle-eye when the shuttle is picked.

It should be noted that when the parts reach the position shown in Fig. 6 at the beginning of the described operation the pin *g*¹ is freed from the control of the shelf *e*⁴, and the trigger-spring *s*¹⁶ throws the shoulders *g*^x across the slot *c*⁴ above the pin 18. Then when the final descending movement of the arm *c* causes the relative sliding of the jaws from the position shown in Fig. 11 to that shown in Fig. 7 the links *c*¹¹ lift the pin 18, and it wipes past the shoulders *g*^x and above them, the spring *s*¹⁶ instantly moving the shoulders back beneath the pin, to thereby lock the jaw *c*⁷ in its elevated position relative to the jaw *c*⁶. Upon the return of arm *c* to its normal position after the opening of the jaws the cam-shelf *e*⁴ engages the pin *g*¹ and retracts the trigger *g*, releasing the pin 18, whereupon the spring *s*¹⁵ expands and slides the jaw *c*⁷ down the jaw-carrier *c*⁵ into the relative position shown in Figs. 1, 8, and 10. The groove *e*⁵ and the edge 50 of the plate *e*³ act upon the end of the stud 22 and govern the movement of the cutter-carriers to hold and sever the fresh filling end *t*^x, while the stop *b*¹⁴ governs their movement to sever the old filling end *t* and also effects the closing of the jaws upon the crossed and severed filling ends.

In order to enable the rubbing or relative sliding movement of the jaws to unite or twist together the filling ends, it is necessary that the severed ends be laid across each other, preferably at rather an acute angle, substantially as shown in Fig. 9, and to effect this crossing I have herein provided means to position the fresh filling end as it is severed and held. When the jaws and adjacent devices are moving downward bodily, the shoulder *h*³ comes down on top of the fresh filling end at the outer side of the jaws and

pushes it down at that side, the filling end extending inward in an upwardly-inclined line across the jaw-face 16 to the delivery end of the filling-carrier next to be transferred and which is then in the filling-feeder. The filling end occupies this diagonal position across the jaw when severed and held, the inclination being shown at *t*^x in Fig. 9 and also in Figs. 14 and 15. The position of the old filling end is determined by the position of the tip of the old filling-carrier *b* in the shuttle and the opening *s*³ of the delivery-eye *s* of the shuttle, and as the jaws descend directly into the chamber *s*² the old filling end is laid transversely across the jaws, when it is grasped by their closing movement and severed. The fresh filling end is first grasped and severed, this step being shown in Fig. 14, before ejection of the old filling-carrier from the shuttle, and then the old filling end is grasped and severed (see Fig. 15) just as the old filling-carrier *b* is ejected by the incoming fresh one.

Inasmuch as a continuous filling-thread is provided by my present invention, there are no ends to stick out of the cloth, and the use of a temple thread-cutter and cutting devices on the shuttle-feeler is obviated.

A shuttle-feeler *S*¹⁰ is shown in Fig. 1, of usual construction, it acting to prevent the operation of the replenishing mechanism should the shuttle be improperly positioned in the replenishing shuttle-box, as in automatic looms of this general type. When the jaws are opened after the union of the filling ends has been effected, the part of the stud 22 between the upper arms *h* and *k* of the cutter-carriers is held against the rear edge of the head *c*³ by the spring *s*¹⁷ keeping the blades *h*^x and *k*^x pressed forward away from jaw *c*⁷ when it opens, so to avoid interference with the filling. It should be noted that when the engagement with the stop *b*¹⁴ closes the jaws upon the crossed filling ends and severs the old filling end by the shearing of the blade *k*^x over the inner side of the jaw *c*⁶ the shearing movement of said blade or cutter also withdraws its upper edge *k*³ from the jaw *c*⁷, thereby releasing the severed fresh filling end. Then when the latter jaw and the cutter-carriers are moved upward bodily relatively to the jaw *c*⁶ and locked there is nothing to interfere with the release of the united filling ends when the jaws open.

I believe my invention herein disclosed in one practical form is broadly novel and that I am the first to devise means for automatically uniting the end of a fresh supply of filling to the filling in the running shuttle to form a practically-continuous filling-thread, and accordingly my invention is not in any sense restricted to the construction and arrangement herein shown and described, for the same is merely one practical embodiment thereof, and various changes, modifications, or rearrangements of parts may be made by those skilled in the art without departing from the spirit and scope of my invention.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a loom, mechanism to replenish automatically the running filling prior to complete exhaustion thereof, and means to unite automatically the filling furnished by said mechanism with the then running filling.
2. In a loom, mechanism to provide automatically fresh supplies of filling from time to time when the running filling is substantially exhausted, and means to unite each filling-supply so provided with the then running filling, to form a substantially continuous filling.
3. In a loom, a shuttle adapted to contain a supply of filling, mechanism to replenish automatically the supply of filling therein, and means to unite the filling in the shuttle with the fresh supply, to form a substantially continuous filling.
4. In a loom, mechanism to replenish automatically the running filling, and means to unite the old and the new filling upon the operation of said mechanism.
5. In a loom, mechanism to replenish automatically the running filling, and means to sever automatically and to unite the old and the new filling ends upon the operation of said mechanism.
6. In a loom, a shuttle adapted to contain a supply of filling, mechanism to replenish automatically the supply of filling therein, and means to sever and then to unite the old and the new filling ends between the delivery end of the fresh filling-supply and the eye of the shuttle.
7. In a loom provided with a shuttle having a delivery-eye and adapted to contain a supply of filling, mechanism to replenish automatically the shuttle with filling prior to the complete exhaustion of the running filling therein, and means to sever the latter between the shuttle-eye and the substantially exhausted supply and to unite the severed filling end with the fresh filling-supply.
8. In a loom provided with a shuttle having a delivery-eye and adapted to contain a supply of filling, mechanism to insert automatically a fresh filling-supply into the shuttle and effect ejection therefrom of the spent supply, and means to sever the filling end of the latter near the delivery-eye and to unite the severed filling end with the filling end of the fresh supply of filling.
9. In a loom provided with automatic filling-replenishing mechanism, a shuttle adapted to contain a supply of filling and having a delivery-eye, and means to sever the filling ends of the fresh and the old filling-supplies and to unite such severed filling ends within the shuttle between its delivery-eye and the delivery end of the fresh filling-supply.
10. In a loom provided with automatic filling-replenishing mechanism, a shuttle adapted to contain a supply of filling and having a side delivery-eye and a chamber communi-

cating therewith through which the running filling travels, and means to sever the running filling within the chamber and to unite the severed filling end with the fresh supply of filling with which the shuttle is replenished.

11. In a loom, mechanism to provide automatically fresh supplies of filling from time to time when the running filling is substantially exhausted, and means to successively hold and sever the fresh supply of filling and the running filling and to unite such severed ends while held.

12. In a loom, mechanism to provide automatically fresh supplies of filling from time to time when the running filling is substantially exhausted, and means to automatically engage and rub or twist together the filling end of each filling-supply so provided with the filling end of its predecessor.

13. In a loom, mechanism to provide automatically a fresh supply of running filling when its predecessor has been substantially exhausted, and means to unite, by rubbing or twisting together, the filling end of a fresh supply of filling with the filling end of the substantially exhausted preceding supply and to sever the latter filling end adjacent the union.

14. In a loom, a shuttle adapted to contain a supply of filling, mechanism to replenish automatically the filling therein, and means operative upon filling replenishment to engage and cross the old and the new filling ends and to unite them by rubbing or twisting the same together.

15. In a loom, a shuttle adapted to contain a supply of filling, mechanism to replenish automatically the filling therein, including a feeder to contain fresh filling-supplies and to which feeder the filling ends of the fresh supplies are attached, and means to engage and sever the fresh filling end between the supply and its point of attachment with the feeder, and the old filling end between the old supply and the shuttle-eye, and to unite said severed filling ends to form a continuous filling.

16. In a loom provided with automatic filling-replenishing mechanism, a shuttle adapted to contain a supply of filling and having a chamber a side delivery-eye communicating therewith, and a transverse wall separating the chamber from the supply of filling, and means operative upon filling replenishment to sever and insert the fresh filling end into said chamber and sever the old filling end therein and thereafter to twist together and unite such severed filling ends.

17. In a loom provided with automatic filling-replenishing mechanism, a shuttle adapted to contain a supply of filling and having a delivery-eye, devices to hold and sever the fresh and the old filling ends and to cross the same between the delivery-eye of the shuttle and the filling-supply therein, and means to unite automatically the crossed filling ends.

18. In an automatic filling-replenishing

loom, a shuttle adapted to contain a supply of filling and having a delivery-eye, jaws, devices to successively sever the new and old filling ends and cross them between the jaws, and means to close the jaws upon the crossed filling ends and effect relative longitudinal movement of the closed jaws, to rub together and unite the crossed filling ends.

19. In an automatic filling-replenishing loom, a shuttle adapted to contain a supply of filling, filling-end-uniting jaws, a device to sever the fresh filling end at the outer side of the jaws and hold it across a jaw-face when severed, means to close the jaws upon said filling end and the old filling end and to sever the latter at the inner side of the jaws, and thereafter to effect relative movement of the closed jaws to twist together and unite the said filling ends.

20. In an automatic filling-replenishing loom, a shuttle adapted to contain a supply of filling and having a delivery-eye, a pair of bodily and relatively movable jaws, a device to cut the fresh filling end at the outer side of the jaws and hold it between them, a cutter at the inner side of the jaws, means to close the latter upon the old filling end and actuate said cutter to sever it simultaneously, and to thereafter effect relative longitudinal movement of the jaws, to twist together the severed filling ends, and means to effect automatically the setting of the jaws and severing devices in readiness for the next filling replenishment.

21. A jaw-carrier having an attached jaw, a cooperating jaw slidably mounted on the jaw-carrier and also having a pivotal movement relatively thereto, cutter-carriers fulcrumed on the jaw-pivot and each having a cutter, said cutters cooperating respectively with the movable and fixed jaws, a spring to open the jaws in operative condition, means to rock the cutter-carriers and cause successive operation of the cutters, and means to close the jaws and then slide one longitudinally upon the other, combined with a shuttle to contain a supply of filling, mechanism to replenish the shuttle with filling, and connections between said mechanism and the jaws and cutting devices, to operate the same upon filling replenishment and sever and twist together the old and new filling ends.

22. In a loom, a shuttle adapted to contain a supply of filling and provided with an eye through which the thread from such supply draws to be delivered, the shuttle having a chamber communicating with the eye, mechanism, including a feeder and an end-holder, to automatically provide the shuttle with filling, means to engage and position the fresh filling end and sever it between the end-holder and the feeder, jaws to close upon the severed filling end and the old filling end and twist them together within the chamber of the shuttle, a device to sever the old filling end adjacent the inner side of the jaws, and

means to operate the jaws and the filling-end-severing devices.

23. In a loom, a shuttle adapted to contain a supply of filling and provided with an eye through which the thread from such supply draws to be delivered, the shuttle having a chamber communicating with the eye, mechanism to automatically provide the shuttle with filling prior to complete exhaustion of the supply therein, means to position the fresh filling end across the old filling end in the chamber of the shuttle and to hold and sever both filling ends when crossed, and jaw-like devices to close upon the filling ends where crossed and unite the same by rubbing or twisting them together.

24. In a loom provided with automatic filling-replenishing mechanism, a shuttle adapted to contain a supply of filling and having a thread-delivering device and a chamber between such device and the filling-supply, and means operating simultaneously with said mechanism to cross and hold the old and new filling ends in the shuttle-chamber and to sever the crossed ends and unite them automatically.

25. In a loom provided with automatic filling-replenishing mechanism, including a feeder and an end-holder, a shuttle adapted to contain a supply of filling and having a side delivery-eye and a chamber communicating therewith, a fixed, depending stop or guide for the fresh filling end, means to engage the latter and position it across the old filling end upon filling replenishment, said means moving the fresh filling end off the stop or guide, jaws to close upon the crossed filling ends and twist them together, and cutting means to sever the fresh filling end at the outer side, and the old filling end at the inner side, of the jaws.

26. In a loom, filling-replenishing mechanism, controlling means therefor, including a feeler to intermittently engage the running filling in the shuttle, a shuttle to contain a supply of filling, and means to unite automatically the running filling and the fresh filling-supply provided by the replenishing mechanism.

27. In a loom, a shuttle to contain a supply of filling, mechanism to replenish the filling therein, means to control the time of operation of said mechanism, said means including a feeler to intermittently engage the filling in the shuttle and prior to complete exhaustion thereof to cause the operation of the controlling means, and means to unite automatically the old and the new filling-supplies upon the operation of the replenishing mechanism.

28. In a loom, mechanism to replenish automatically the running filling prior to complete exhaustion thereof, said mechanism including a feeder to contain a plurality of filling-supplies in reserve, and a transferrer to transfer the latter one by one from the feeder to operative, running position, and an instru-

mentality bodily movable in unison with the transferrer to unite automatically the fresh filling-supply with the then running filling.

29. In a loom, mechanism to replenish automatically the running filling prior to complete exhaustion thereof, said mechanism including a feeder to contain a plurality of filling-supplies in reserve, and a transferrer to transfer the latter one by one from the feeder to operative, running position, and an instrumentality bodily movable in unison with the transferrer to unite automatically the fresh filling-supply with the then running filling, said instrumentality including devices to grasp and sever the fresh filling end and the running filling end, successively, and to twist together the severed ends to form a continuous filling.

30. In a loom, a shuttle adapted to contain a supply of filling, mechanism to replenish automatically the shuttle with filling prior to complete exhaustion of the running filling, and means to hold and sever each filling end at predetermined distances from the delivery end of their respective supplies, and to unite the severed ends while held.

31. In a loom, provided with a shuttle having delivery-eye and adapted to contain a supply of filling, mechanism to replenish automatically the shuttle with filling prior to the complete exhaustion of the running filling therein, and means to sever the fresh and the old filling ends at predetermined points, successively, and to unite such severed ends within the shuttle between the eye thereof and the delivery end of the contained supply of filling.

32. In a loom, a shuttle adapted to contain a supply of filling and having a tubular side delivery-eye and a chamber with which it communicates, mechanism to replenish automatically the shuttle with filling prior to the complete exhaustion of the filling therein, and means to sever the old and new filling ends and to unite the severed ends in the said chamber of the shuttle simultaneously with the replenishment of the shuttle with filling.

33. In a loom, a shuttle adapted to contain a supply of filling, automatic mechanism to replenish the same with filling prior to complete exhaustion of the running filling therein, and means controlled by said mechanism to unite the running filling with the fresh supply of filling to form a continuous filling.

34. In a loom, a shuttle adapted to contain a supply of filling, mechanism to replenish automatically the shuttle with filling prior to complete exhaustion of the supply therein, and means operative upon filling replenishment to engage and cross the old and the new filling ends and twist them together, said means including devices to sever the fresh filling end at the inner end, and the old filling end at the outer end, of the portions thereof to be twisted together.

35. In a loom provided with automatic filling-replenishing mechanism, a shuttle adapt-

ed to contain a supply of filling and having a delivery-eye and a chamber communicating therewith, and an instrumentality operative upon filling replenishment to unite the old and new filling ends, said instrumentality including normally open jaws, devices to sever the new and old filling ends at the outer and inner sides of the jaws, respectively, and cross the ends between the latter, and means to close the jaws upon the crossed and severed filling ends and effect relative longitudinal movement of the closed jaws, to twist together and unite the filling ends, the uniting of the latter being effected within the chamber of the shuttle adjacent its delivery-eye.

36. In a loom provided with automatic filling-replenishing mechanism, a shuttle adapted to contain a supply of filling and having a delivery-eye, and a chamber communicating therewith, a rocking arm, and an instrumentality carried thereby to unite the old and new filling ends upon filling replenishment, said instrumentality including normally open jaws to descend into the shuttle-chamber, devices to sever the new and old filling ends at the outer and inner sides of the jaws respectively, and cross the ends between the latter, and means to close the jaws upon the crossed and severed filling ends and effect relative longitudinal movement of the closed jaws, to twist together and unite the filling ends, the uniting of the latter being effected within the chamber of the shuttle adjacent its delivery-eye.

37. In a loom provided with automatic filling-replenishing mechanism, a shuttle adapted to contain a supply of filling and having a delivery-eye, spring-controlled and normally open jaws, devices to successively sever the new and old filling ends at the outer and inner sides of the jaws, respectively, and to cross them between the jaws, and adjustable means to close the jaws upon the crossed and severed filling ends and effect relative longitudinal movement of the closed jaws, to twist together and unite the filling ends.

38. In a loom provided with automatic filling-replenishing mechanism, a lay having a shuttle-box provided with an adjustable jaw-actuating device, a shuttle adapted to contain a supply of filling and having a delivery-eye, a rocking arm movable into operative position by or through the operation of the replenishing mechanism, normally open jaws carried by said arm and filling-end-severing devices also carried thereby, said severing devices including rocking carriers each having a cutting-blade, a projection on one of the jaws between the cutter-carriers, and stationary means to actuate the latter to sever the fresh filling end and hold it in an inclined position across one of the jaw-faces, descent of the rocking arm thereafter effecting engagement of the jaw-actuating device and cutter-carriers to close the jaws upon the severed filling end and the old filling end and to sever

the latter, the final downward movement of
the rocking arm causing the jaw-actuating
device to act upon the projection of one of
the jaws, and effect a relative longitudinal
5 movement of the closed jaws to twist the old
and new filling ends together.

In testimony whereof I have signed my

name to this specification in the presence of
two subscribing witnesses.

JONAS NORTHROP.

Witnesses:

GEORGE OTIS DRAPER,
ERNEST W. WOOD.