

No. 708,480.

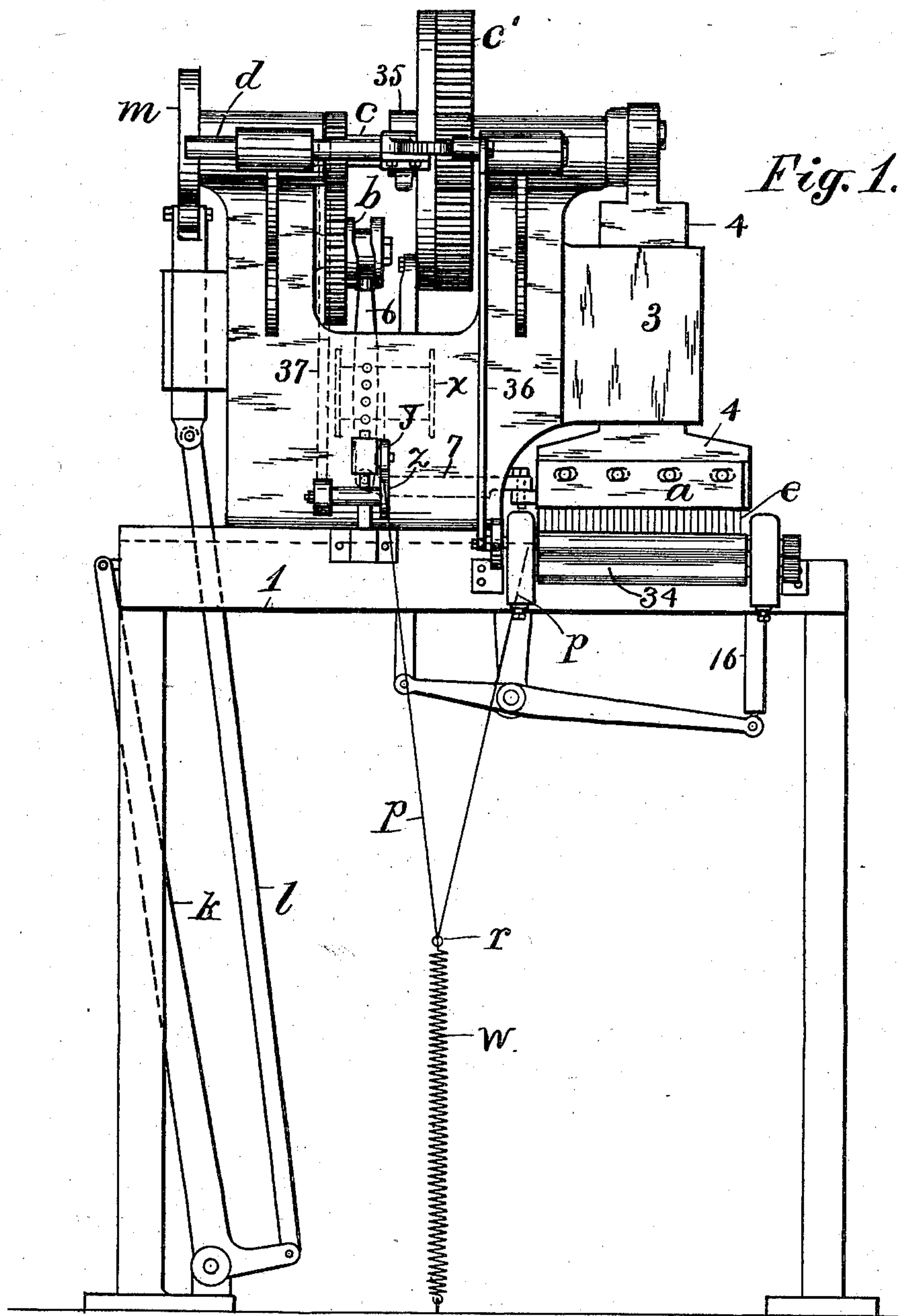
Patented Sept. 2, 1902.

J. W. HYATT.
FABRIC SEWING MACHINE.

(Application filed Jan. 23, 1901. Renewed Jan. 11, 1902.)

(No Model.)

4 Sheets—Sheet 1.



Attest:
L. L. Lee.
Notary Public

Inventor.
John W. Hyatt, per
Thos. S. Crane, Atty.

No. 708,480.

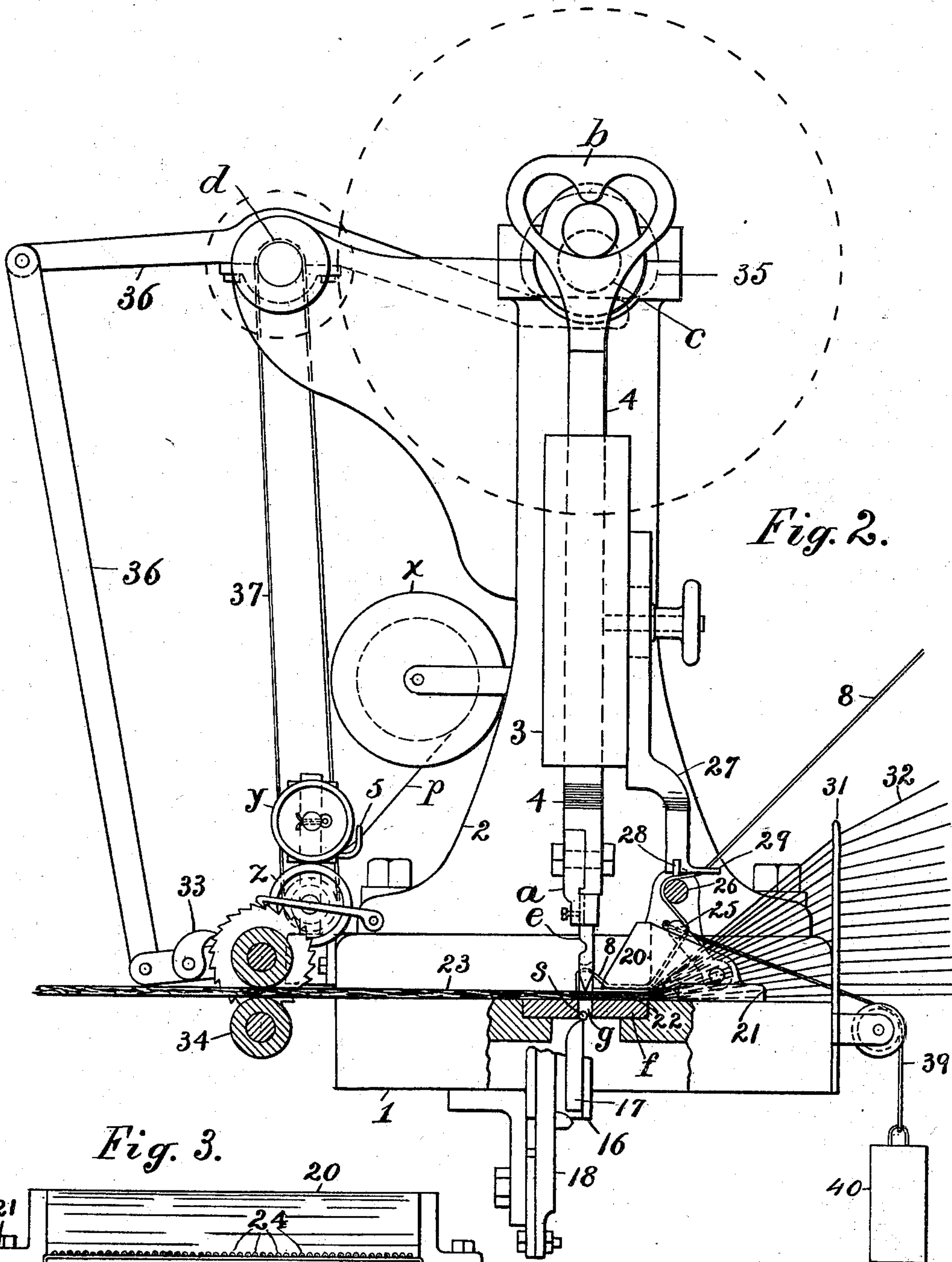
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4 Sheets—Sheet 2.



Attest:
L. L. Lee.
1902

Inventor.
John W. Hyatt, per
Thos. S. Crane, Atty.

No. 708,480.

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J. W. HYATT.

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Fig. 4.

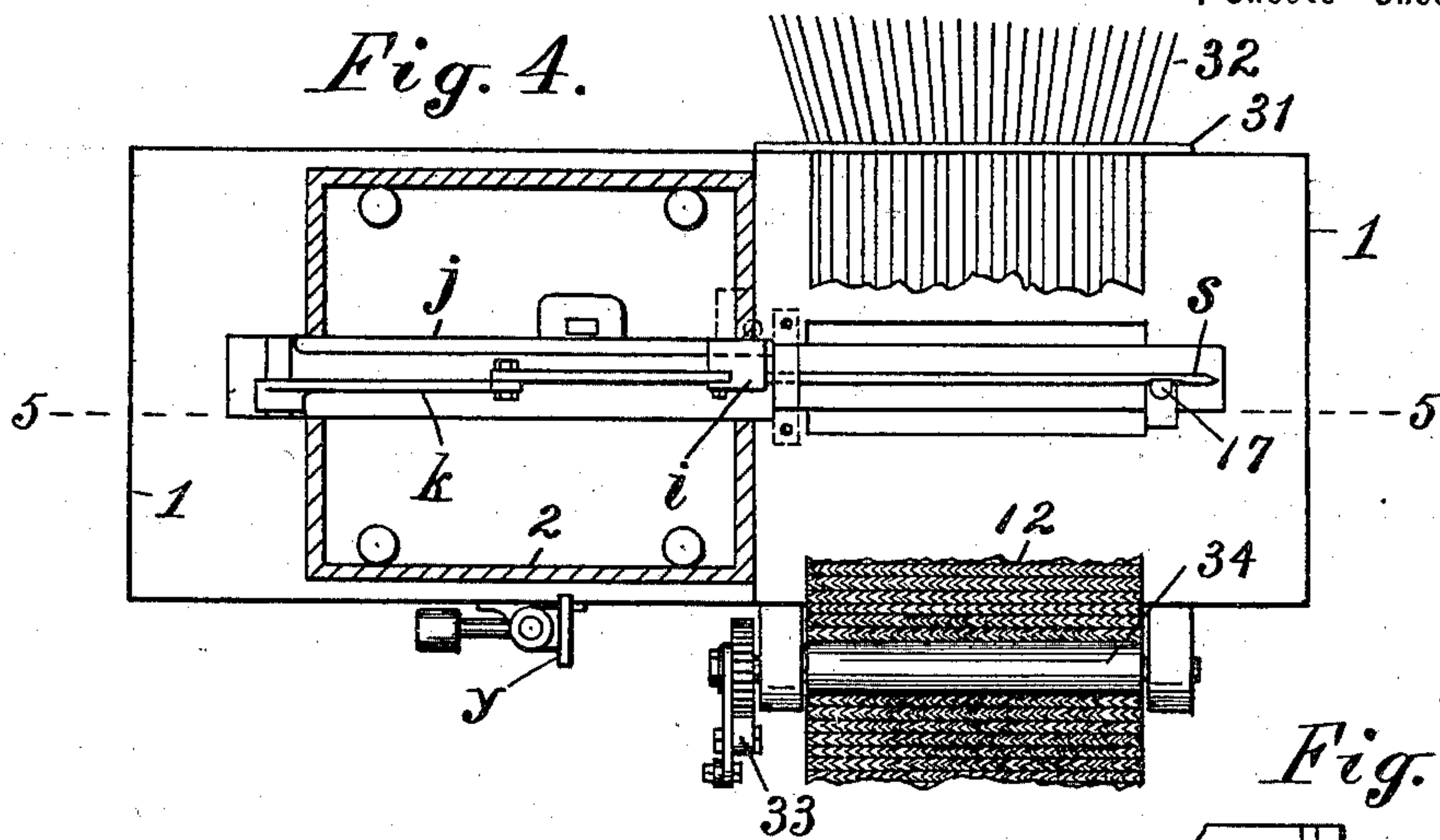


Fig. 6.

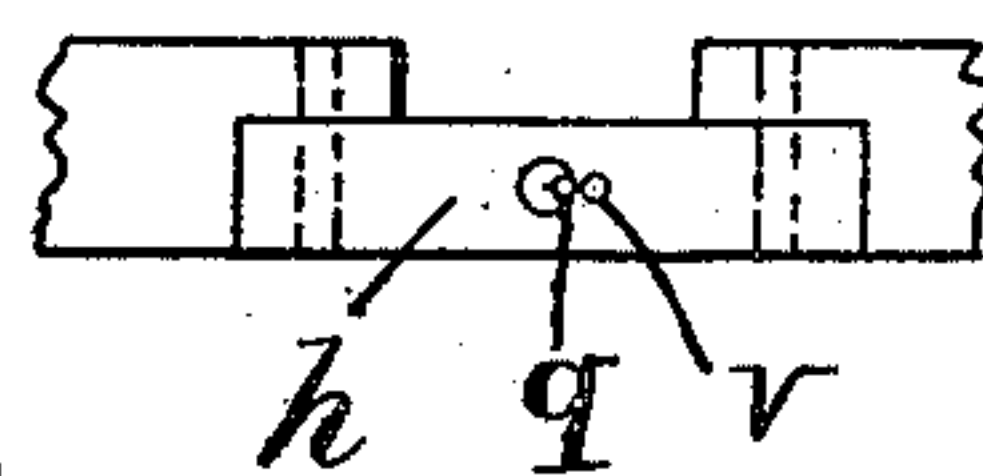


Fig. 5.

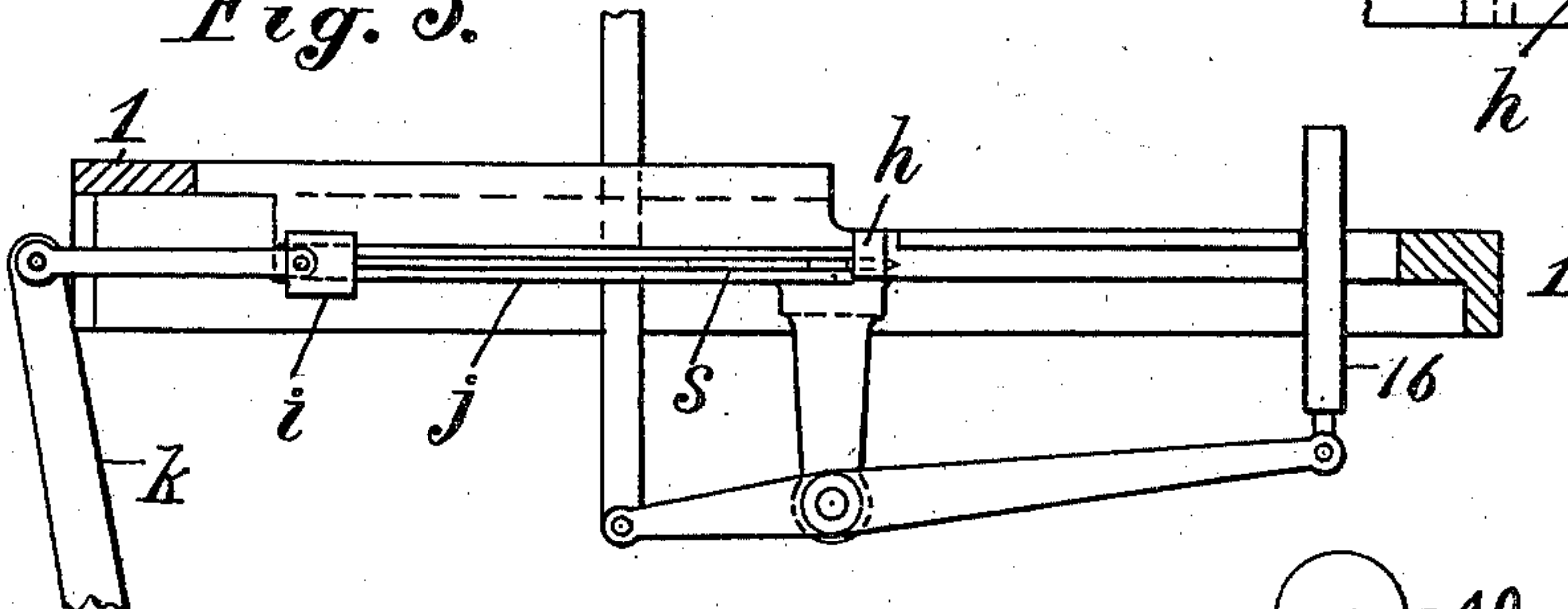
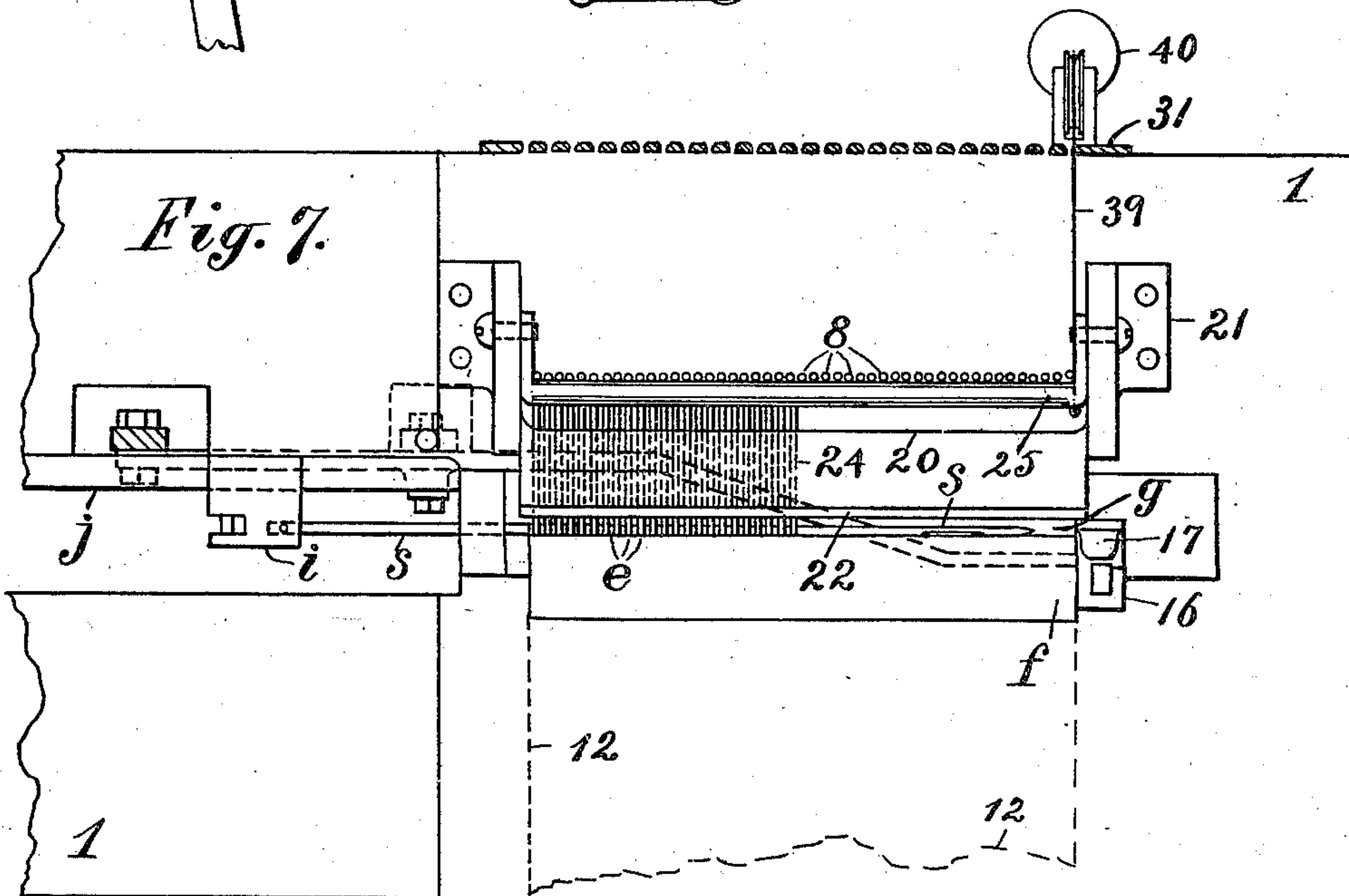


Fig. 7.



Attest:

L. Lee.
Repd 9 Jan.

Inventor.

John W. Hyatt, per
Thos. J. Crane, Atty.

No. 708,480.

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4 Sheets—Sheet 4.

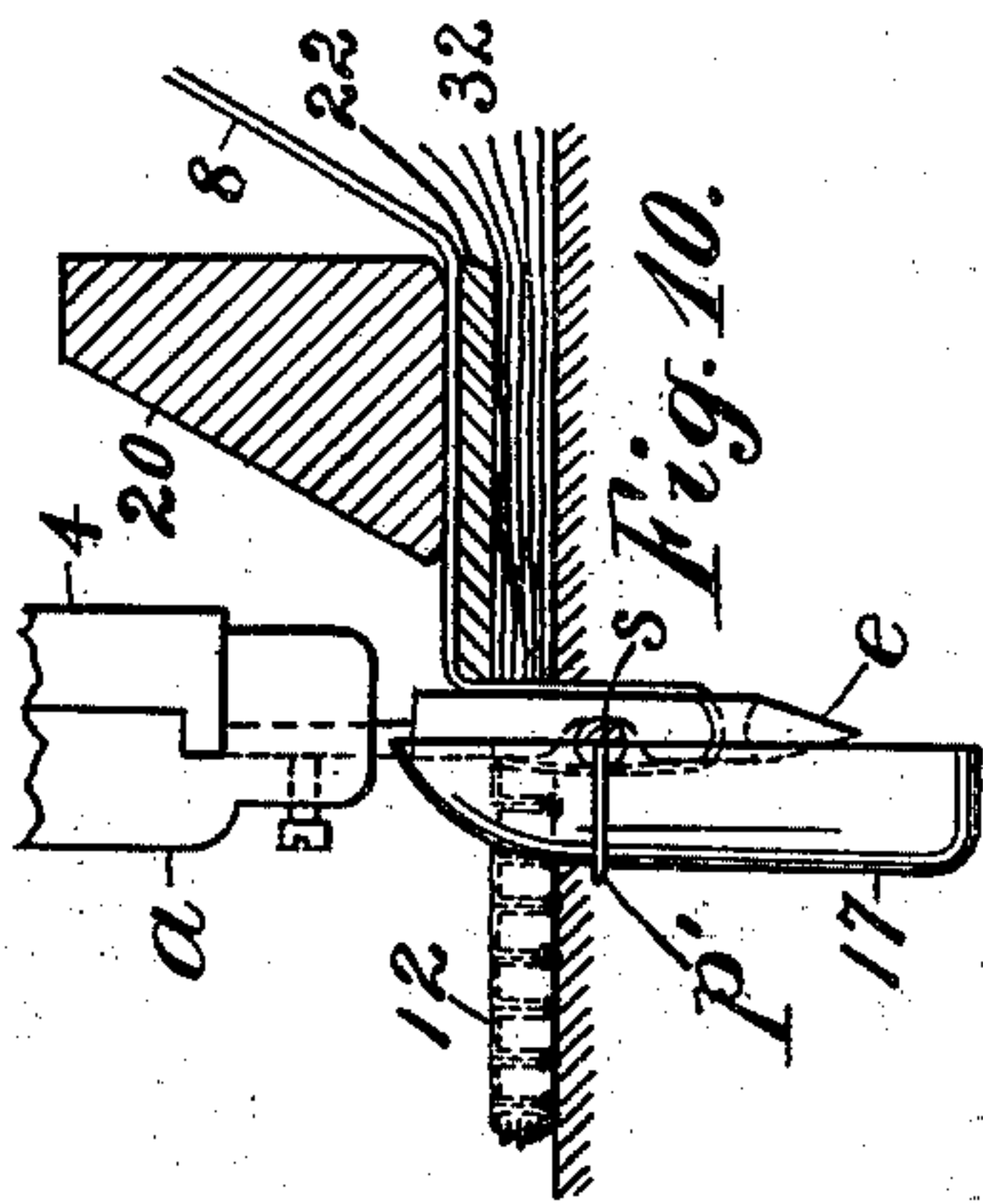


Fig. 10.

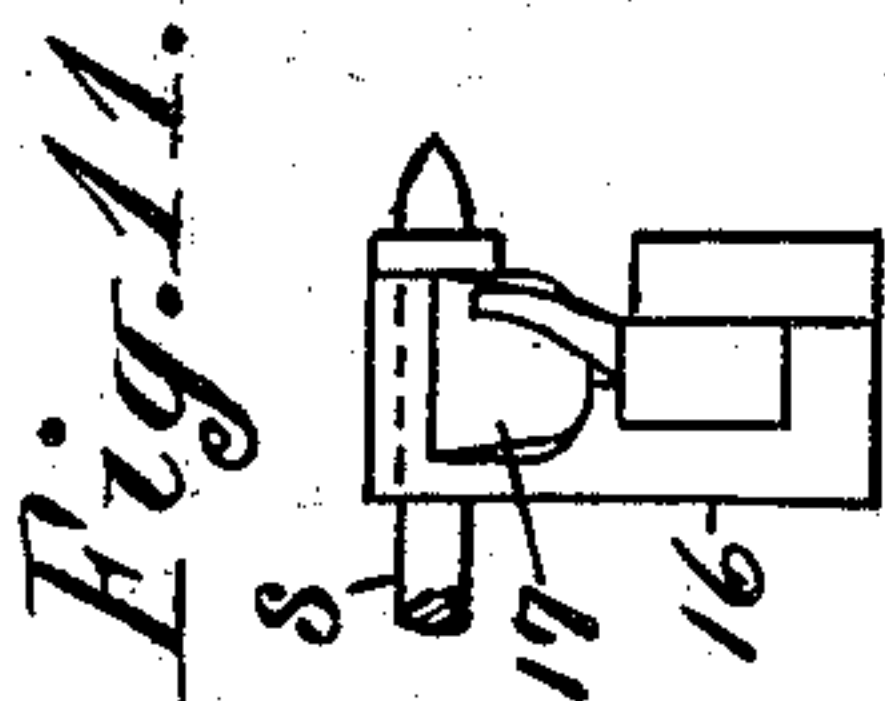


Fig. 11.

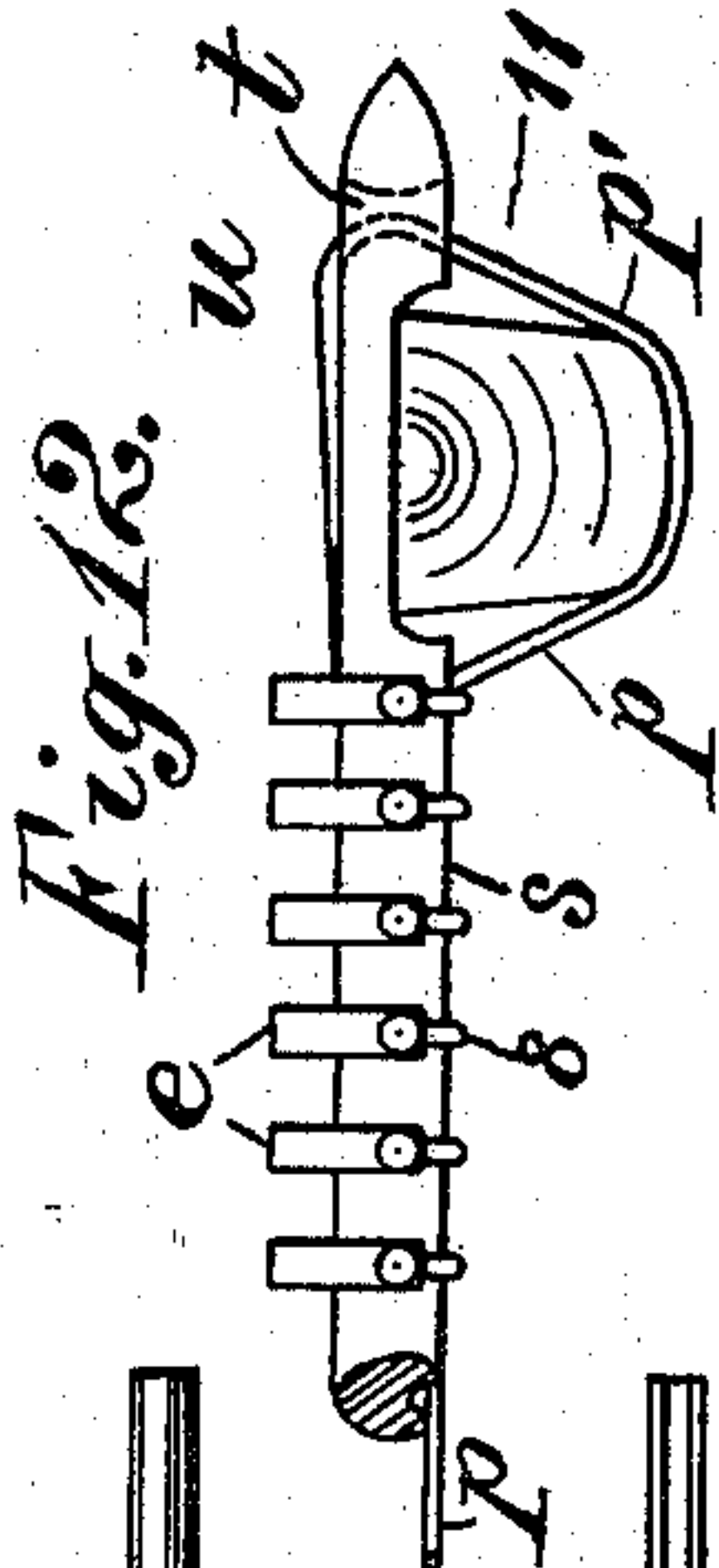


Fig. 12.

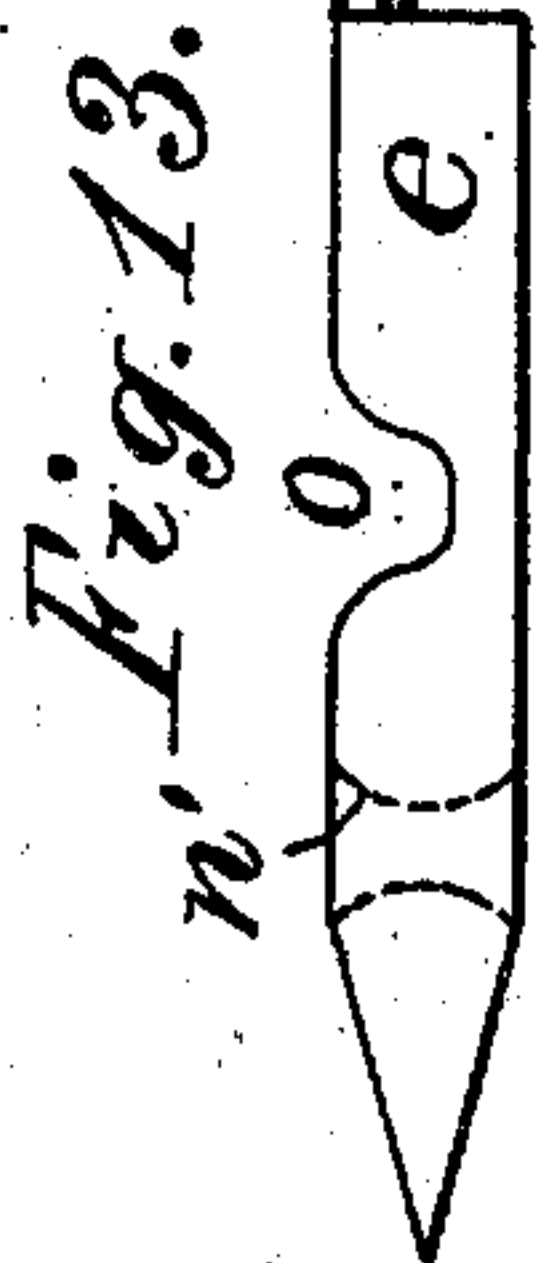


Fig. 13.



Fig. 14.

Attest:
L. Loeg.
Superintendent

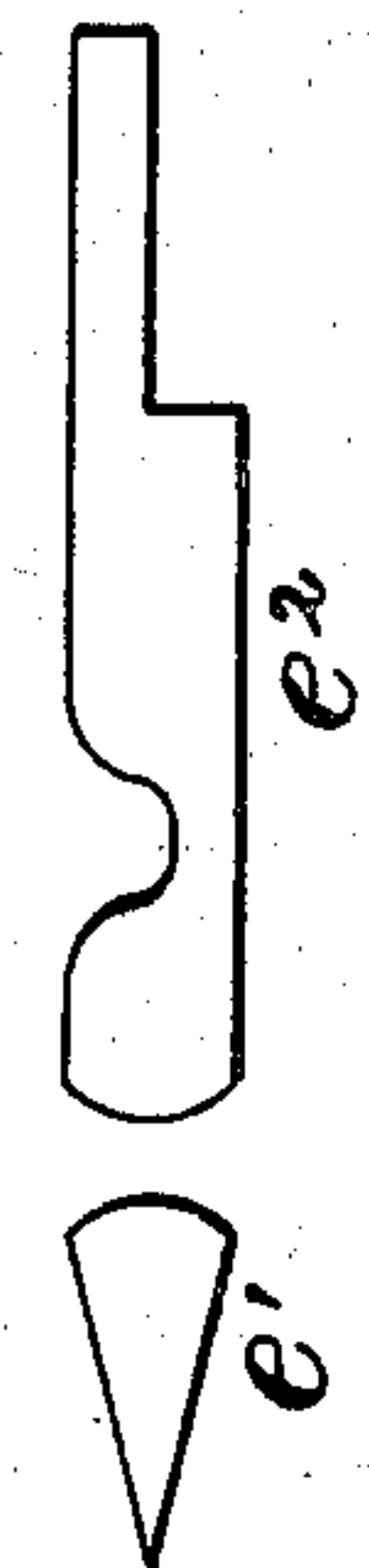


Fig. 15.

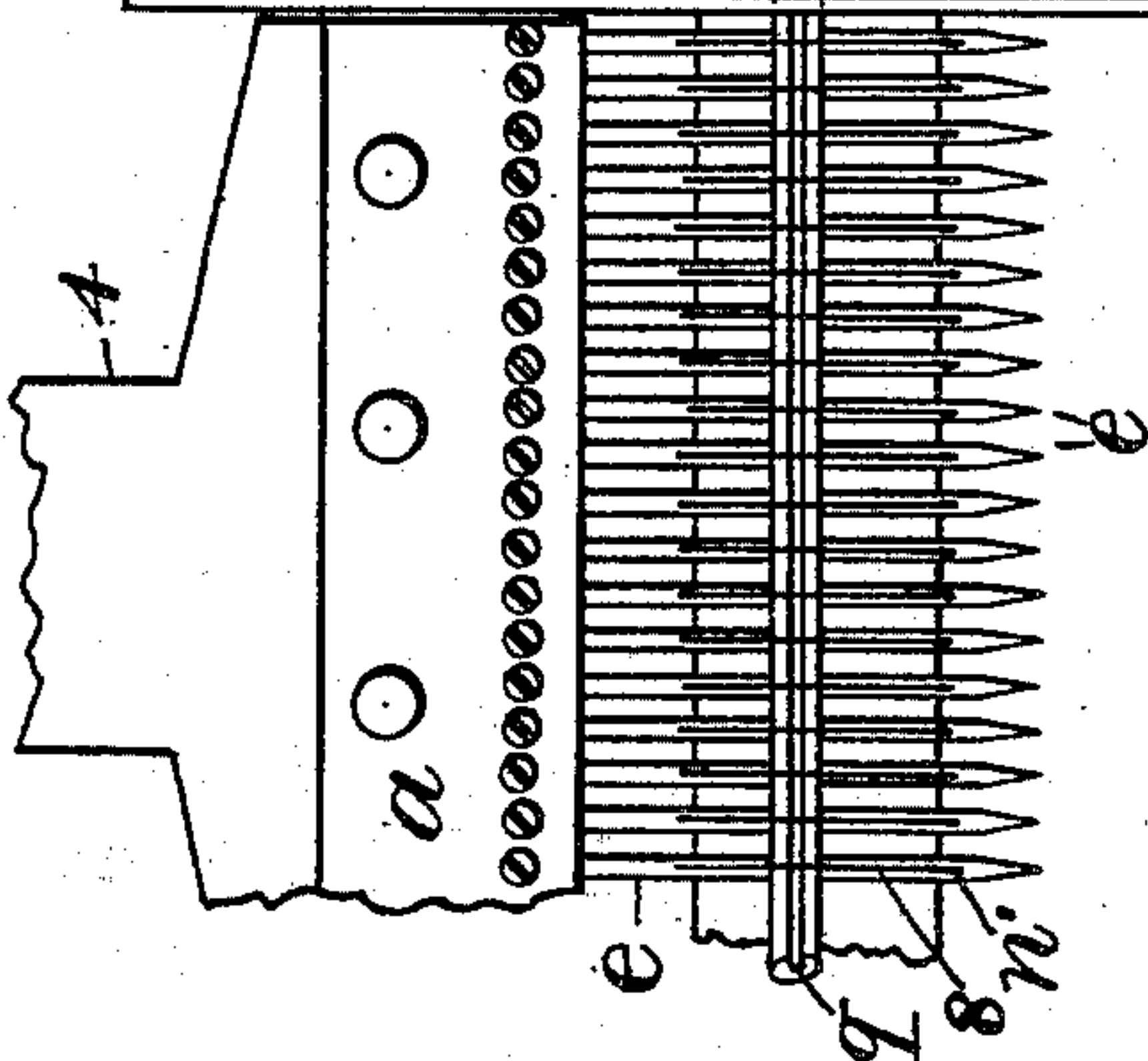


Fig. 16.

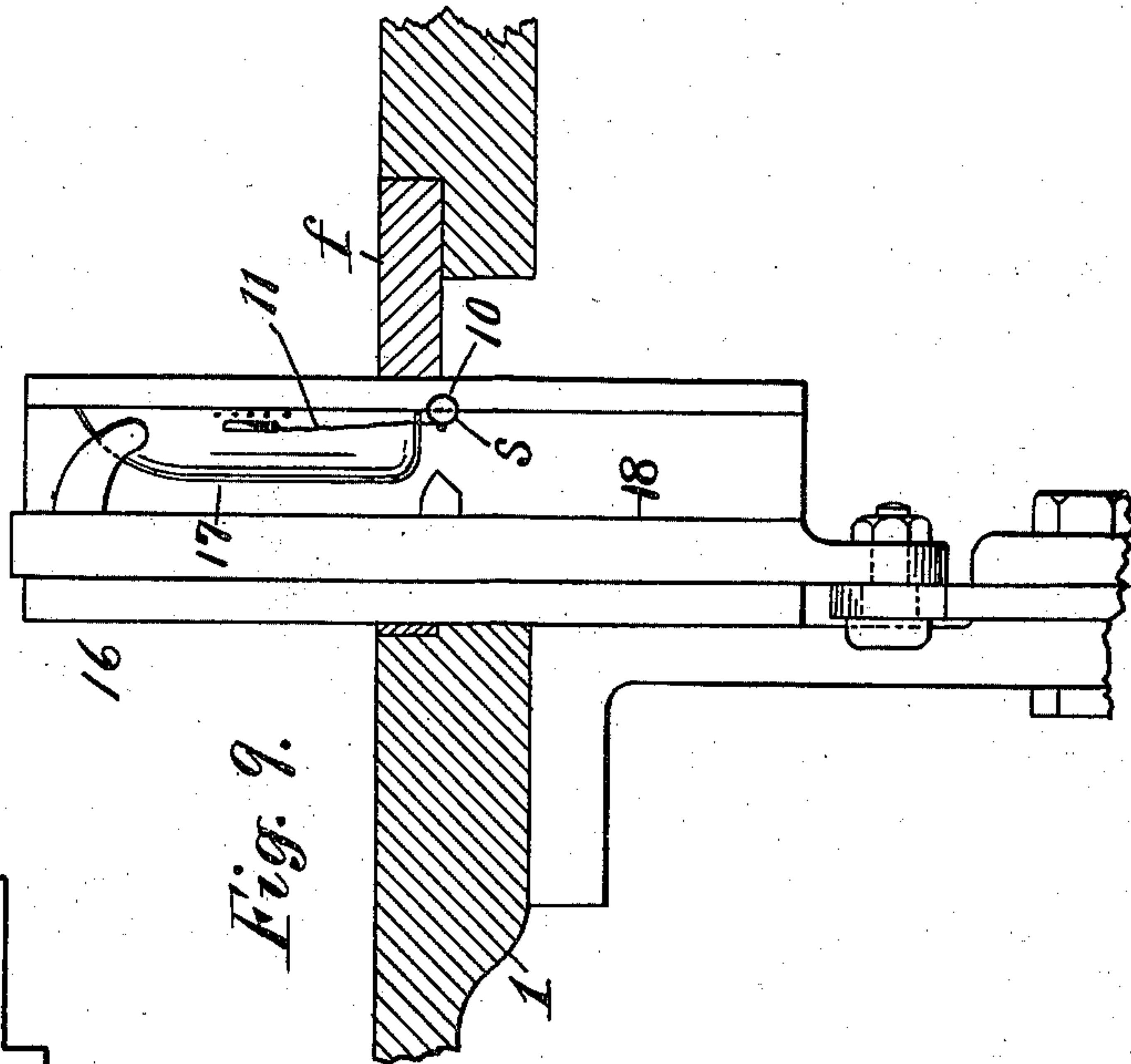


Fig. 9.

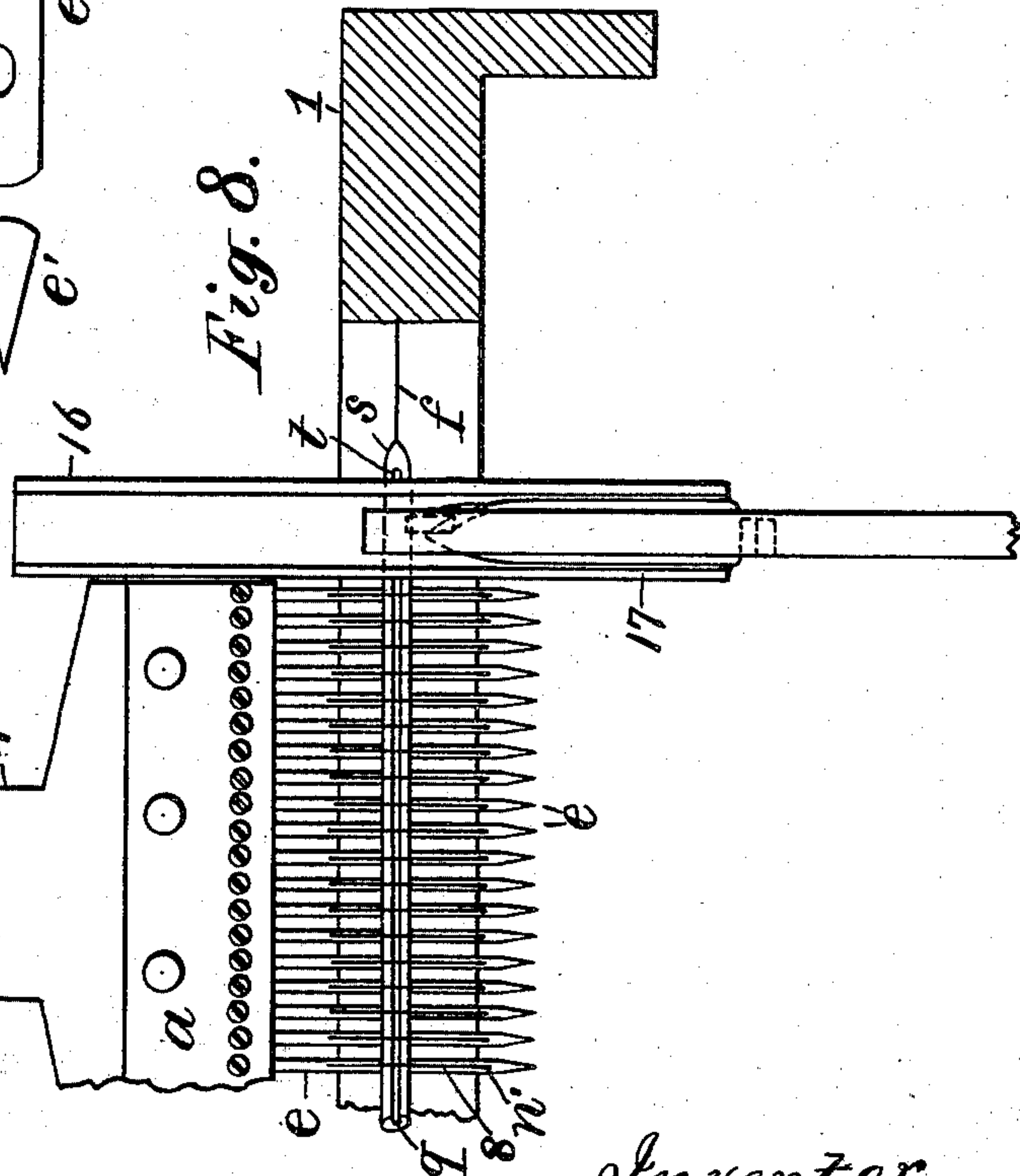


Fig. 8.

Inventor.
John W. Hyatt, per
Thos. J. Crane, Atty.

UNITED STATES PATENT OFFICE.

JOHN W. HYATT, OF NEWARK, NEW JERSEY.

FABRIC-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 708,480, dated September 2, 1902.

Application filed January 23, 1901. Renewed January 11, 1902. Serial No. 89,340. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. HYATT, a citizen of the United States, of 141 Commerce street, Newark, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Fabric-Sewing Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 The machine which embodies my present improvements was designed, primarily, for connecting a series of warp-threads laterally by zigzag stitches, so as to form a new fabric in a continuous band to be used for a driving-belt or for any analogous purpose in which the parallel disposition of the warp-threads is advantageous. Each row of loops formed upon the under side of the fabric by the needles is connected by a transverse lock-thread extended across the whole fabric, which binds the warp-threads together laterally independent of the zigzag stitches. Such a fabric can be made with more ease in a sewing-machine than in a loom and offers great advantages in a driving-belt, as its longitudinal warp-threads are not twisted or braided together and are not, therefore, liable to stretch, while the zigzag stitches which connect the threads laterally serve to secure the lacing or coupling at any point where the ends of the belt may be connected. In making a continuous web of fabric in a sewing-machine the maximum width of the web will be limited by the length of the row of needles upon the needle-bar, and narrower webs may be made by removing the redundant needles from the needle-bar or by omitting one of the needles and the warp-threads at a suitable point in the width of the fabric, thus producing two bands of the fabric connected chiefly by the lock-threads upon the under side. The strips of fabric may be separated by cutting the lock-threads and may be fitted for use, if desired, by applying any suitable binding to their separated edges.

45 The objects of the invention are, first, to furnish an improved construction for a multiplex sewing-machine in which forty or more needles may be carried on a single needle-bar. This object is attained by forming the needle-bed with a longitudinal slot through which the entire row of needles may move freely, and providing the front of each needle with an open notch through which when

the notch is carried beneath the fabric the looper is reciprocated. I find it a great advantage where the needle-carrier is reciprocated laterally to form zigzag stitches to use a continuous slot in the needle-bed for the passage of the needles, as it permits the lock-thread to be drawn up close to the under side of the fabric without obstruction. Second, to furnish an improved means for operating a lock-thread to engage the loops of the needle-threads. This object is attained by forming the looper with a closed eye in the point and a longitudinal notch at one side in the rear of the eye, with a groove extended backwardly from such notch to receive the lock-thread from its source of supply. The eye and the notch are carried in operation beyond the end of the row of needles, and a loop-retainer is provided to enter the notch, and thus engage the loop of the lock-thread. To produce a continual tension upon the lock-thread, it is fed through rolls, which feed it continuously but insufficiently to the looper, and a spring take-up is provided between the feeding-rolls and the looper, and the means for pressing the feeding-rolls together is adapted to yield under the draft of the looper to permit the slipping of the threads in the rolls to supply the deficiency. Third, to furnish a means of making a fabric in a sewing-machine by extending a layer of warp-threads across the needle-bed and securing the same together laterally by a lock-thread and a series of interlocking zigzag stitches. This object is attained by furnishing at one side of the row of needles a perforated guide to receive warp-threads under tension and at the opposite side a pair of feed-rolls or equivalent means of drawing the finished fabric intermittently across the row of needles during the stitching operation. The warp-threads are conducted under a presser adjacent to the row of needles, and the needles are preferably flattened transversely to the longitudinal needle-carrier, which makes their breadth greater than their thickness in the direction of the warp-threads. The breadth of the needles produces no increased resistance to their movement, as they pass between the warp-threads before such threads are bound together laterally. Fourth, to furnish an improved means for engaging the loops of the lock-threads together upon the edge of the fabric to form a selvage thereon. This ob-

ject is attained in the present construction by reciprocating a shuttle through the loops of the lock-thread, by which it is drawn through the last loop of needle-thread when the latter is carried over the edge of the fabric by the zigzag movement of the needle-carrier. The invention also includes various details of construction, which are hereinafter pointed out and claimed.

In the drawings, Figure 1 is a side elevation of a machine embodying my improvements with the spool x shown in dotted lines only. Fig. 2 is an end elevation with the bed and the feed-rolls in section at the middle line of the feed-rolls upon a larger scale than Fig. 1. Fig. 3 shows the front face of the presser-foot 20. Fig. 4 is a plan of the base-frame with the needle-bed removed and the body-frame in section just above the base. Fig. 5 is a longitudinal section of the base on line 5-5 in Fig. 4. Fig. 6 is an elevation of the looper-guide h . Fig. 7 is a plan of the part of the base-frame with the body-frame removed and the warp-guide shown in section through one row of the holes. The needle-threads are also shown in section at the side of the lower tension-bar 25. Fig. 8 is a side elevation of the shuttle-guide and a part of the needle-carrier, including the needle-bed, and a vertical section of the base-frame at the outer end of the same. Fig. 9 is an end elevation of the shuttle-guide with a transverse section of the needle-bed and base-frame adjacent thereto. Fig. 10 shows the bottom of the needle-carrier in end elevation with the needles, the needle-bed, the shuttle, and a part of the presser-foot. Fig. 11 is a plan of the shuttle-guide with the end of the looper extended through the same. Fig. 12 is a plan of the needles at the outer end of the row with the outer end of the looper extended beyond the same and the shuttle engaging the lock-thread. Fig. 13 is a side view of one of the needles, and Fig. 14 an edge view of the same with lines showing the longitudinal sections at the opposite sides of the eye. Fig. 15 is a side view of the section below the eye, and Fig. 16 a side view of the section above the eye.

The base-frame 1 of the machine supports a body-frame 2, having a vertical guide-box 3 to sustain the needle-bar 4 movably. The needle holder or carrier a is reciprocated across the bottom of the needle-bar by a vibrator-cam b , which is connected by gearing with the main cam-shaft e . A lever 6 and link 7 connect the cam with the needle-carrier a . (See Fig. 1.) The cam-shaft c is actuated by gearing from the driving-shaft d and is connected by gearing with a cam b . The gearing c' is shown only in dotted lines in Fig. 2. The needle-bar 4 is actuated by a crank-pin upon the cam-shaft c operating in a heart-shaped slot upon the top of the needle-bar. A row of needles e is shown secured by screws in the needle-carrier a , which is held movably upon the bottom of the needle-

bar. The needle-bed f , Figs. 2 and 6, is formed with a continuous slot g through the same of suitable width to permit the passage of the needles e , a part of which are for illustration shown in the slot g in Fig. 7 and the remainder omitted to show the looper. The needles are of much greater width than thickness and are set transverse to the carrier a and slot g .

Tension devices.—A presser-foot 20 is secured by lugs 21 to the base-frame 1 and is provided with a steel face-plate 22 to press upon the fabric 23. The front edge of the face-plate is coincident with the rear edge of the slot g . A series of thread-grooves 24 is formed in the presser just above the face-plate, one for each needle, and the needle-threads 8 are guided by such grooves to the eyes of the needles. A lower tension-bar 25 is hinged adjustably to the lugs 21, and an upper tension-bar 26 is supported upon said lugs, and a weight 27 is held movably upon the guide-box 3 to press an india-rubber strip 28 toward the tension-bar 26. The nearer support for the bar 26 is omitted in Fig. 2 to expose this bar and the contiguous rubber strip above it. A thread-guide 29 is attached to the weight 27, and the needle-threads 8 are thus guided beneath the rubber strip and back and forth over the tension-bars to the rear ends of the grooves 24. The weight 27 is proportioned to press the rubber strip 28 upon the tension-bar with the force required for any particular class of work that is being done in the machine, and the lower bar 25 is pressed constantly away from the presser-foot 20 by a cord 39 and weight 40 to draw the threads 8 from their spools during the ascent of the needles and yields during their descent. With this tension device a uniform tension can be secured simultaneously upon forty or fifty needle-threads.

Feeding devices.—A guide 31, consisting of a plate with numerous rows of guide-holes, is affixed at one side of the row of needles to gather the warp-threads 32 from their respective spools, and the warp-threads are led from such holes underneath the face-plate 22 of the presser. The ends of the face-plate 22 may be bent downward, as shown in Fig. 3, to determine the width of the fabric. A pair of feed-rolls 34 is shown at the opposite side of the row of needles to draw the sewed fabric along, the rolls being actuated intermittently by a ratchet-wheel having a pawl 33, which is vibrated by a cam 35 and suitable connections 36. The cam 35 has a concentric body with flat face upon one side and operates to feed the sewed fabric forward when the needles are raised. The commencement of such feeding movement is shown in Fig. 2. The concentric face of the cam 35 operates to hold the pawl and the feed-rolls in their advanced position when the needles are depressed and until the needles are nearly ready to rise, when the reverse movement of the pawl permits the nat-

ural tension of the warp-threads 32 (which is due to their elasticity) to draw the fabric backwardly, and thus press the last row of stitches firmly against the succeeding rows.

5 To permit such backward movement of the fabric, the pawl 33 is vibrated at each stroke sufficiently to feed the required number of teeth upon the ratchet-wheel and an additional distance equal to the backward rotation induced in the ratchet-wheels. For example, if it were necessary to feed two teeth at each stroke of the pawl and the pawl were only moved a space equal to that occupied by two teeth it is obvious that the backward

10 rotation of the rolls would move the teeth backward a portion of such space, so that the pawl in its extreme backward movement would not engage the second tooth, but only the first, and would feed only one tooth at a

15 time instead of two, as desired. The pawl is therefore moved a space equal to an integral number of teeth and an additional fraction equal to the amount which the ratchet is reversed by the elastic draft of the warp.

20 With needles set close together in a row, so that forty or fifty are inserted in a single foot of length, they offer a combined resistance which is sufficient to press the rows of stitches very firmly together when the fabric is thus

25 retracted, and the combined elasticity of two or three hundred warp-threads (required to form a fabric twelve inches wide) is sufficient to draw the fabric backward with great force to produce such effect upon the stitches.

30 Such beating or pressing together of the stitches serves the same object as the "lay" in a loom, which forces the filling into the warp, and thus greatly consolidates the fabric.

Construction of loopers.—The looper *s* is

40 movable through a guide *h* under the rear end of the needle-bed, and the looper is attached to the cross-head *i*, movable upon a dovetailed slide *j* underneath the base-frame, which cross-head is reciprocated by connection to an arm *k*, which is vibrated by a connection *l* to a looper-cam *m* on the cam-shaft.

45 Each of the needles is formed with an eye *n*', extended through its breadth adjacent to the point, and an open notch *o* upon its front side above the eye, and the notch and the eye are

50 carried through the fabric when forming a stitch, and the looper *s* is reciprocated through the row of notches. The looper, Fig. 11, has a horizontal eye *t* near the point and a longitudinal notch *u* upon one side adjacent to the

55 eye, and a groove *q*, Fig. 7, on the same side as the notch, extending from the notch backwardly to receive the lock-thread *p*. A hole *v* for the lock-thread is formed through the

60 guide *h* at the side of the looper, Fig. 5. The cam which actuates the needle-bar is constructed to drive the notches in the needles below the fabric and to hold the needles stationary in their lowest position, so as to maintain the needle-threads under tension at the

65 front side of the notches. The notches thus form a channel which positively guides the

looper in its movement beneath the fabric, the channel having walls upon both sides, formed, respectively, by the bottoms of the 70 notches and the threads under tension. Such threads form a continuous obstruction to any lateral divergence of the looper, and thus serve as an efficient guide, whatever the width of the fabric and the length of looper required 75 to carry the lock-thread across the same. If the row of needles and the looper were six feet in length, the looper would be guided perfectly through the entire six feet across the under side of the fabric by the sides of the 80 notches in the needles and the continuous series of vertical needle-threads held under tension at the outer sides of such notches. It is common to retract the needles slightly after their passage through the fabric to open or 85 form a loose loop in the needle-thread for the passage of a looper; but such a construction and operation would be fatal in my apparatus, as the looper would be deprived of any efficient guide upon the outer side of the notch 90 and would be liable to deviate from the proper path in traveling a long distance without such guide. The use of the notched needles, with means to maintain the tension of the needle-threads when the notches are passed below 95 the fabric, is a very material part of the invention, which enables me to carry the looper in safety across a fabric of any desired width. The lock-thread *p* (see Figs. 1 and 2) is fed to the looper from a spool *x* by an upper feed-roll *y*, pressed by its weight upon the lower 100 feed-roll *z*. The bearing of the roll *y* slides upon a standard which carries the rolls *z*, which is rotated at a uniform speed by a belt 37, extended from the driving-shaft *d*. A 105 guide 5 directs the lock-thread *p* through the feed-rolls, from which it passes (before it reaches the hole *v* in the guide *h*) through an eye *r* upon the free end of a long spiral spring *w*. The rolls are adjusted to feed during each 110 stroke of the looper nearly the entire amount of lock-thread required, the spring *w* contracting when the looper is retracted, thus taking up the slack of the thread. The forward and backward movements of the looper are 115 rapid; but its cam *m* is constructed to give it a long rest in its rear position, (shown in Fig. 6,) during which time the lock-thread rolls *y z* feed forward the lock-thread required for the next forward stroke. The spring is con- 120 structed to yield easily when the looper moves forward, and the thread for the loop is thus supplied under a light tension, and the strain upon the lock-thread and upon the looper is avoided which would be occasioned if the 125 lock-thread were drawn directly from the spool by the looper in its rapid movement. The feed-roll *z* is rotated at a speed slightly less than is required to supply the thread to the looper; but the upper feed-roll *y*, which 130 drives the thread by its weight and frictional pressure, is constructed to slip when the looper requires any additional supply. As it is impossible to feed exactly the amount the looper

requires, this arrangement maintains the looper-thread under constant tension. A shuttle-guide 16 is mounted vertically near the front end of the slot *g* in the needle-bed and provided with a hole 10 to admit the forward end of the looper *s*. The shuttle 17 is reciprocated by a carrier 18 past the notch *u* in the looper, (see Figs. 8 to 12,) and thus carries the shuttle-thread 11 through the loop *p'* of the lock-thread and by its succeeding reciprocation links such loop to the succeeding loop *p'*. One of the loops of the needle-thread in the under needle is carried over the edge of the fabric at each alternate reciprocation of the needles, and the loop *p'* of the lock-thread which passes through such loop of the needle-thread is intersected by the shuttle-thread 11. The shuttle-thread in the retraction of the lock-thread (upon the withdrawal of the looper) is drawn close to the last loop of needle-thread which is carried through the body of the fabric, and the shuttle-thread thus carries with it the loop of needle-thread which passed over the edge of the fabric. The shuttle-thread thus connects all the loops of lock-threads, and the alternate loops of the needle-thread where carried beyond the edge of the fabric, so that such latter loops form a perfect selvage upon the outer strands of the fabric. The position of the needles, the looper, and the shuttle, with the needle-thread 8, the lock-thread *p*, and the shuttle-thread 11, are shown in Fig. 10, with a portion of the sewed fabric 12, with one row of stitches shown in dotted lines. The aspect of the fabric upon the upper side is indicated at 12 in Fig. 4, where the material of the fabric is broken away over the space for the needle-bed. This view shows the indenting of the zigzag stitches one within another, by which the longitudinal strands of warp-threads are connected together independently of the lock-thread upon the under side. The under side of the fabric exhibits merely the series of transverse lock-threads intersected by the loops of the needle-threads. In making the zigzag stitches the end needle upon the carrier *a* passes alternately inside and outside of the margin of the fabric, and its loop is in both cases engaged by the lock-thread. The successive loops of the lock-thread are connected by the shuttle-thread 11, and the lock-thread is prevented from pulling the shuttle-thread into the loops of the needle-threads by the tension of the bobbin in the shuttle, which is made somewhat greater than that of the lock-thread. The shuttle stands normally above the looper during the backward and forward movements of the same and descends rapidly below the looper before the looper reaches the forward position. (Shown in Figs. 7, 8, 9, 10, and 12.) The shuttle rises immediately to engage the loop of the lock-thread, and thus links the last-formed loop *p'* to the next preceding one. The notch *o* in the front of each needle greatly facilitates the passage of the looper through the loops of the needle-threads,

as is shown in Figs. 8 and 10, and such notch necessitates a very broad needle, to which there is no objection in sewing a loose aggregation of warp-threads, such as is shown in the drawings. It is, however, difficult to form a flat or oval eye through a broad thin needle, and I therefore prefer to make the needle in longitudinal sections, with the middle section divided to form the eye. The two side sections are continuous, as shown in Fig. 14; but the middle section is divided to form the eye, the portion *e'* below the eye being shown in Fig. 15 and the portion *e''* above the eye being shown in Fig. 16. These parts are made of sheet-steel of suitable thickness, and when they are brazed or soldered together the eye is readily smoothed out and is thus produced without drilling or mortising. The shank portion formed by the three layers is fitted to the carrier *a*, in which it is secured by set-screw or other suitable means.

The fabric produced by the operation of this machine is made the subject of a separate patent application, Serial No. 5,574, filed March 11, 1901; but attention is directed herein to the fact that great variations in the appearance and finish of the fabric can be produced by varying the stroke of the needle-carrier (which makes the stitches zigzag) in relation to the distance between the several needles. For instance, the needles may be disposed upon the carrier one-quarter of an inch apart and the carrier reciprocated also one-quarter of an inch, which has the effect of turning the warp-threads into parallel strands (or groups of warp-threads) each one-quarter of an inch wide and carrying the stitching-thread of each needle back and forth over the top of the same strand. With such a movement of the needles the strands are connected together only by the locking-threads upon the under side of the fabric, as none of the stitching-threads extend from the body of one strand into the body of another strand. By doubling the stroke of the needle-carrier—that is, making it one-half inch—each needle-thread is carried over two of the strands, thus locking them together laterally, while the alternate needles upon the needle-carrier lock different pairs of the strands together, so that the whole is firmly united laterally independent of the locking-threads. Other proportions of the stroke to the distance between the needles may be made, and the disposition of the stitches upon the surface and the grouping of the warp-threads into strands may be correspondingly modified. The reaction of the fabric which is permitted by the feeding-rolls while the needles are depressed operates to crowd the successive rows of stitches firmly into contact with one another, and thus serve to cover the entire surface of the fabric with the stitching-threads. To cover and ornament the surface of woven fabrics, it is common to weave “pile” loops upon the fabric and to subsequently cut such loops; but my method of manufacture produces a fabric with its sur-

face entirely covered and ornamented by the transverse threads at very much less expense than is involved in forming a pile fabric.

It is obvious that this process is capable of producing a fabric with much greater rapidity and cheapness than any woven process, as the needles travel only a very short distance compared with the shuttle of a loom which is thrown the entire width of the fabric.

10 In making a fabric by my invention the needle-threads may be made of an entirely different class of material (as silk or worsted) from the warp-threads, which may be made of cotton, jute, or other cheap material

15 possessing the requisite strength.

A ribbon having an entire silk surface may be produced by my invention or a rug having an all-wool surface regardless of the material in the warp, and by supplying different needles or groups of needles (upon the needle-carrier) with threads of different colors or material bands and stripes of various breadths may be formed upon the surface of the fabric and the latter thus ornamented in a considerable degree.

Although my machine is designed primarily for combining a series of warp-threads by transverse stitching, the machine may obviously be used to sew any class of fabric upon which it is adapted to operate.

Having thus set forth the nature of the invention, what is claimed herein is—

1. In a multiplex sewing-machine having a reciprocating needle-bar, a row of eye-pointed needles carried thereby, and a needle-bed having an open slot for the passage of the needles, the combination, with such bed and needles, of a thread-carrying looper movable longitudinally next the needles and having an eye in the point and a longitudinal notch at the side in the rear of the eye, a guide *h* at the base of the looper with a guide *v* and means for supplying a lock-thread to the guide *v* and the eye of the looper, means for reciprocating the looper and carrying the eye and the notch beyond the end of the row of needles, a shuttle-guide mounted vertically at the end of the row of needles, and a shuttle with means for reciprocating it vertically through the notch of the looper to engage the loop of the lock-thread, substantially as herein set forth.

2. A multiplex sewing-machine having a needle-bar with means for reciprocating it vertically, a needle-holder with means for reciprocating it horizontally upon the needle-bar, and a row of eye-pointed needles carried by such holder, a needle-bed with longitudinal slot and a thread-carrying looper with means for reciprocating it next the needles, the looper having an eye in the point with a lock-thread carried thereby, and a shuttle with means for reciprocating it through the loop of such lock-thread.

3. In a multiplex sewing-machine, the combination, with the needle-bar and a row of flat eye-pointed needles of much greater

breadth than thickness transversely to the row, and having each an eye extended transversely to the row and an open notch upon its front side above the eye, of a needle-bed having an open slot for the passage of the needles, means for reciprocating the needle-bar to carry the notches beneath the fabric and maintain the tension upon the needle-threads before the said notches, and a looper supplied with an independent lock-thread reciprocated in the series of notches between the needles and the needle-threads under tension, to engage the loops formed by the said needles, substantially as herein set forth.

4. In a multiplex sewing-machine, the combination, with the needle-bar, and the row of flat eye-pointed needles of much greater breadth than thickness and having each an eye extended transversely to the row, and an open notch upon its front side above the eye, of a needle-bed having an open slot for the passage of the needles, means for reciprocating the needle-bar to carry the notches beneath the fabric and maintain the tension of the needle-threads, and a looper having an eye in the point and a lock-thread carried thereby, with means for reciprocating such looper in the series of notches, between the needles and the needle-threads under tension and carrying the loop of the lock-thread beyond the end of the row, and means for securing the successive loops of the lock-threads together.

5. In a multiplex sewing-machine having a reciprocating needle-bar, a row of eye-pointed needles, and a needle-bed beneath the needle-bar, the combination, with such bed and needles, of a thread-carrying looper having an eye in the point, means for reciprocating the same next the needles, means for engaging the loop formed by such looper, means for continuously feeding the lock-thread to such looper, and a spring take-up between the feeding device and the looper for maintaining the tension upon the lock-thread.

6. In a multiplex sewing-machine having a rotary driving-shaft, a needle-bar reciprocated by the same, a needle-carrier with row of eye-pointed needles, and a needle-bed beneath the needle-bar, the combination, with such parts, of a thread-carrying looper having an eye in the point, means for reciprocating the same next the needles, means for engaging the loop formed by such looper, lock-thread rolls rotated continuously by the driving-shaft, a guide for directing the lock-thread through the same, and a spring having eye applied to the lock-thread between the feed-rolls and the looper, for maintaining the tension upon such thread during the reciprocation of the looper.

7. In a multiplex sewing-machine, the combination, with means for operating a row of eye-pointed needles and locking the loops of the threads carried thereby, of a needle-bed having an open slot for the passage of the row of needles, the perforated guide 31 at one

side of the needle-bed, and the feed-rolls 34 at the opposite side, and a presser-foot for pressing the warp-threads into a layer adjacent to the slot in the needle-bed, whereby a series of warp-threads may be drawn across the needle-bed under tension transversely to the row of eye-pointed needles.

8. In a multiplex sewing-machine, the combination, with means for operating a row of eye-pointed needles and locking the loops of the threads carried thereby, of a needle-bed, means for guiding a series of warp-threads in a flat layer across the surface of the needle-bed and means for vibrating the needle-carrier, to form zigzag stitches and connect such warp-threads together laterally.

9. In a multiplex sewing-machine, the combination, with a reciprocating needle-bar and a row of eye-pointed needles carried thereby, and a needle-bed and means for locking the loops formed by the needles, of means for guiding a series of warp-threads in a flat layer across the surface of the needle-bed, and means for vibrating the needle-carrier to form zigzag stitches to lock such warp-threads together laterally.

10. In a multiplex sewing-machine, the combination, with a needle-bed and a transverse slot across the same, and means for locking the loops formed by the needles, of means for guiding a series of warp-threads in a flat layer across such slot, and a needle-bar with carrier having a series of broad flat needles adapted to pass between the warp-threads and having eyes extended fore and aft through the same, and means for vibrating the carrier to form zigzag stitches and connect the warp-threads together laterally.

11. In a multiplex sewing-machine, the combination, with a reciprocating needle-bar and a row of eye-pointed needles carried thereby, of a needle-bed with means for guiding a series of warp-threads in a flat layer along the needle-bed across the path of the needles, means for vibrating the needle-carrier to form zigzag stitches to connect the warp-threads into a fabric, a lock-thread-carrying looper having an eye in the point, means for reciprocating the looper and carrying the loop of the lock-thread beyond the edge of the fabric, and means for securing the loops of the lock-threads together upon the edge of the fabric to form a selvage thereon.

12. In a multiplex sewing-machine, the combination, with means for operating a row of eye-pointed needles and locking the loops of the threads carried thereby, of a needle-bed, a guide and a presser-foot at one side of the needle-bed for guiding a series of warp-threads in a flat layer across the surface of the needle-bed, means for vibrating the needle-carrier to form zigzag stitches and connect such warp-threads laterally, feed-rolls at the opposite side of the needle-bed adapted to draw the sewed fabric from the needles, a ratchet-wheel upon the feed-rolls, and a pawl reciprocated a fraction more than the space

of an integral number of teeth upon the ratchet-wheel, whereby the elasticity of the fabric operates to reverse the movement of the feed-rolls while the needles are in the fabric, and the last row of stitches is pressed against the forward side of the needles to beat the rows of stitches together.

13. In a multiplex sewing-machine having a reciprocating needle-bar, a row of eye-pointed needles and a needle-bed beneath the needle-bar, the combination, with such bed and needles, of a thread-carrying looper having an eye in the point, means for reciprocating the same next the needles, means for engaging the loop formed by such looper, rolls for continuously but insufficiently feeding the thread to such looper, a spring take-up between the feeding-rolls and the looper, and means for pressing the feeding-rolls together adapted to yield under the tension of the take-up to permit the slipping of the thread in the rolls to supply the deficiency.

14. In a multiplex sewing-machine having a reciprocating needle-bar, a row of eye-pointed needles and a needle-bed beneath the needle-bar, the combination, with such bed and needles, of a thread-carrying looper movable longitudinally next the needles with an eye extended horizontally through the point, a vertical notch at the side in the rear of the eye, and a groove in the side of the looper extended backwardly from such notch, means for reciprocating the looper and carrying the eye and the notch beyond the end of the row of needles, and a shuttle with means for reciprocating it vertically through the notch of the looper to engage the loop of the lock-thread.

15. In a multiplex sewing-machine, the combination, with the needle-bed and means for guiding a series of warp-threads in a flat layer across the surface of the same, of a needle-carrier having a row of eye-pointed needles flattened in the direction of the warp-threads, and having each an eye extended through the breadth of the same, and a looper, with means for operating the same, for locking the loops of the needle-threads, substantially as herein set forth.

16. In a multiplex sewing-machine having a reciprocating needle-bar, a needle-bed and means for locking the loops of the needle-threads underneath such bed, of a series of needles flattened transversely to the length of the needle-carrier and having each an eye extended through the breadth of the same, and the body of each needle formed in longitudinal sections one at each side of the eye, one each above and below the eye, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN W. HYATT.

Witnesses:

FRANK L. MORTON,
THOMAS S. CRANE.