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9 Sheets—Sheet 1.

J. JONSON.

EMBROIDERING MACHINE.

No. 277,289. Patented May 8, 1883.

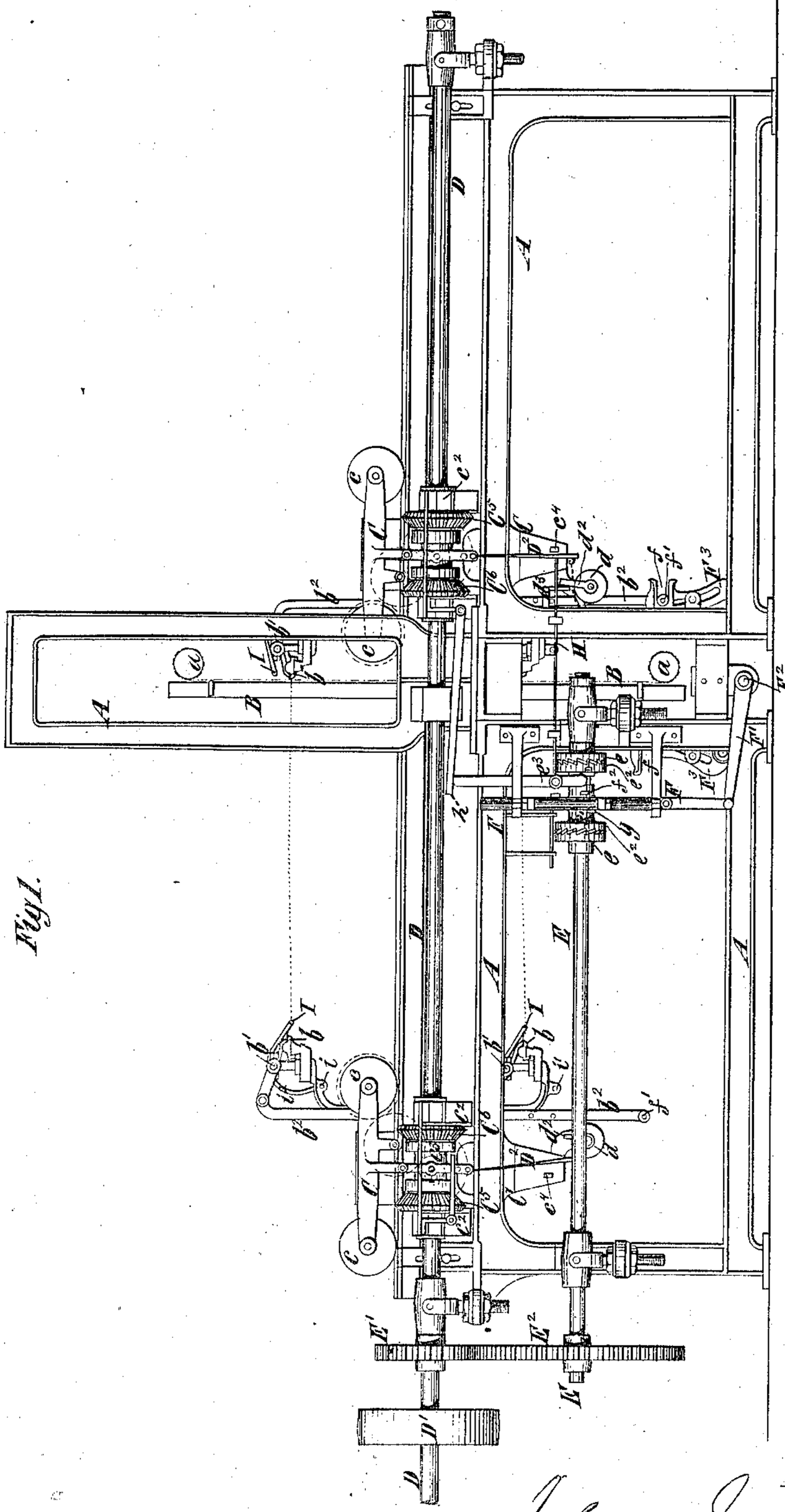

Fig. 1.

Witnesses:
Fred'k Haynes
Ed. Moran

Inventor:
Julius Jonson
by his Attorneys
Brown & Brown

(No Model.) 9 Sheets—Sheet 2.

J. JONSON.

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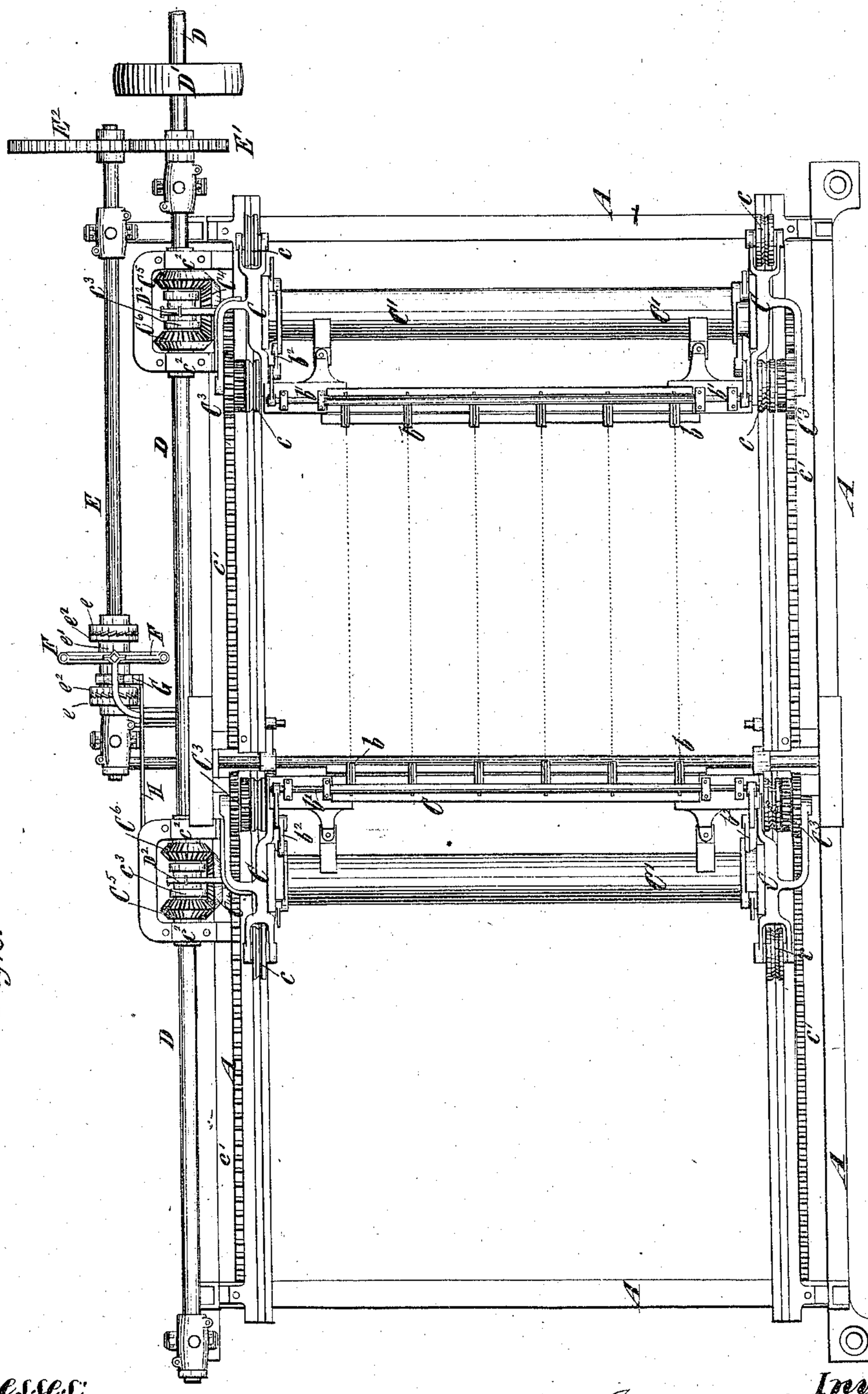

Fig 2.

Witnesses:
Fred K Haynes
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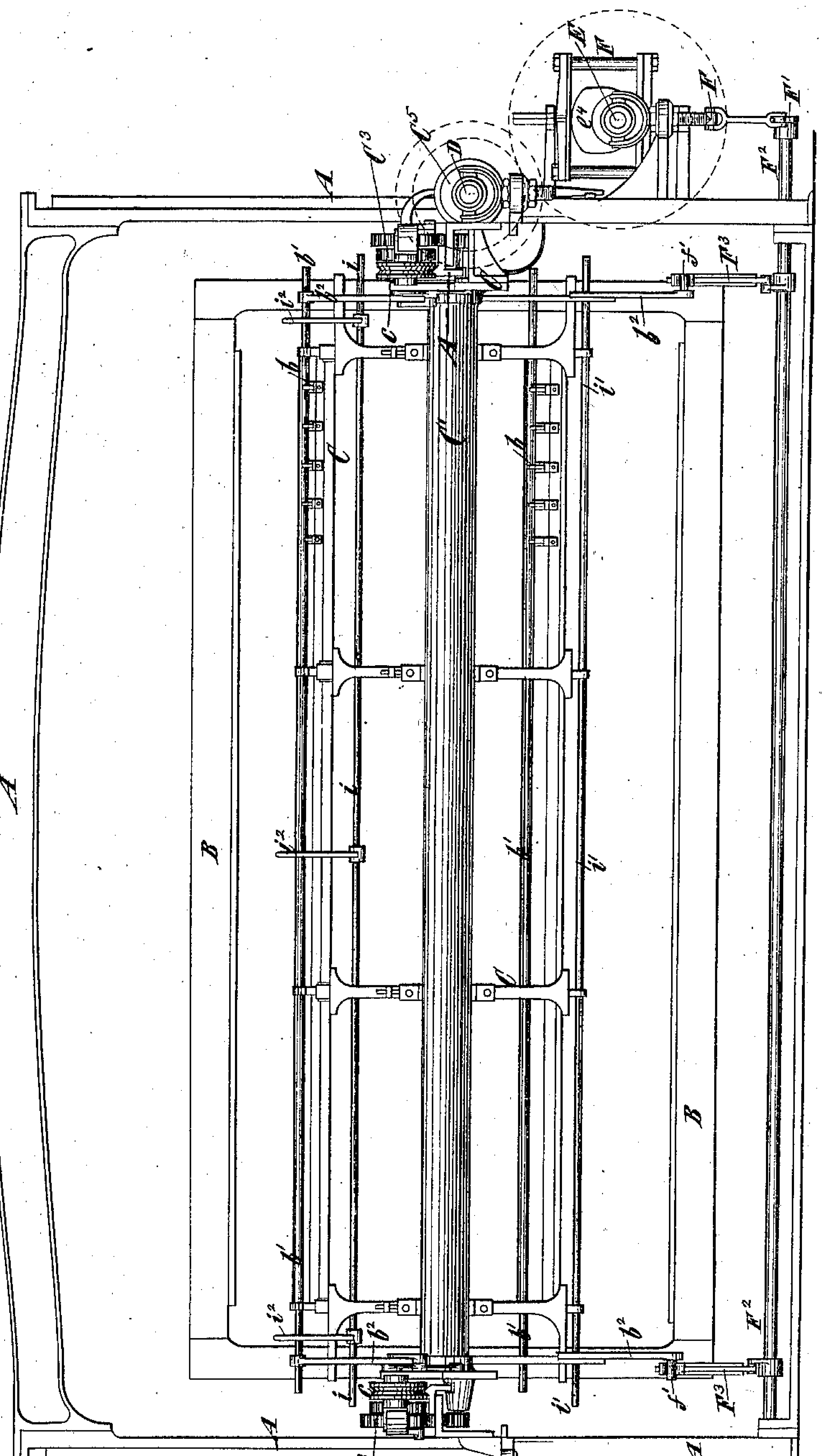
(No Model.) 9 Sheets—Sheet 3.

J. JONSON.

EMBROIDERING MACHINE.

No. 277,289. Patented May 8, 1883.

Fig. 3.



Witnesses:

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(No Model.) 9 Sheets—Sheet 4.

J. JONSON.

EMBROIDERING MACHINE.

No. 277,289. Patented May 8, 1883.

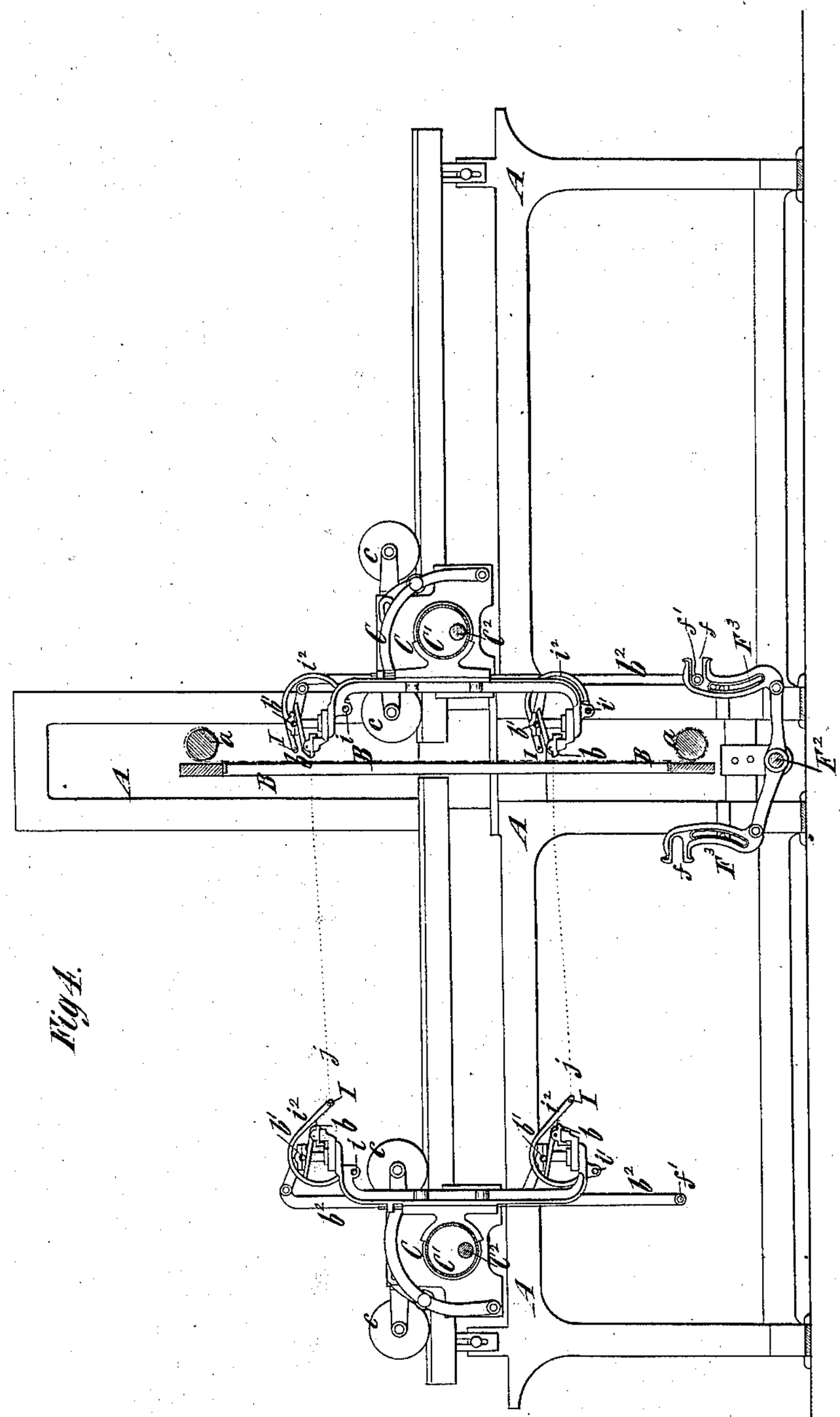

Fig 4.

Witnesses:
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(No Model.) 9 Sheets—Sheet 5.

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EMBROIDERING MACHINE.

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Fig5.

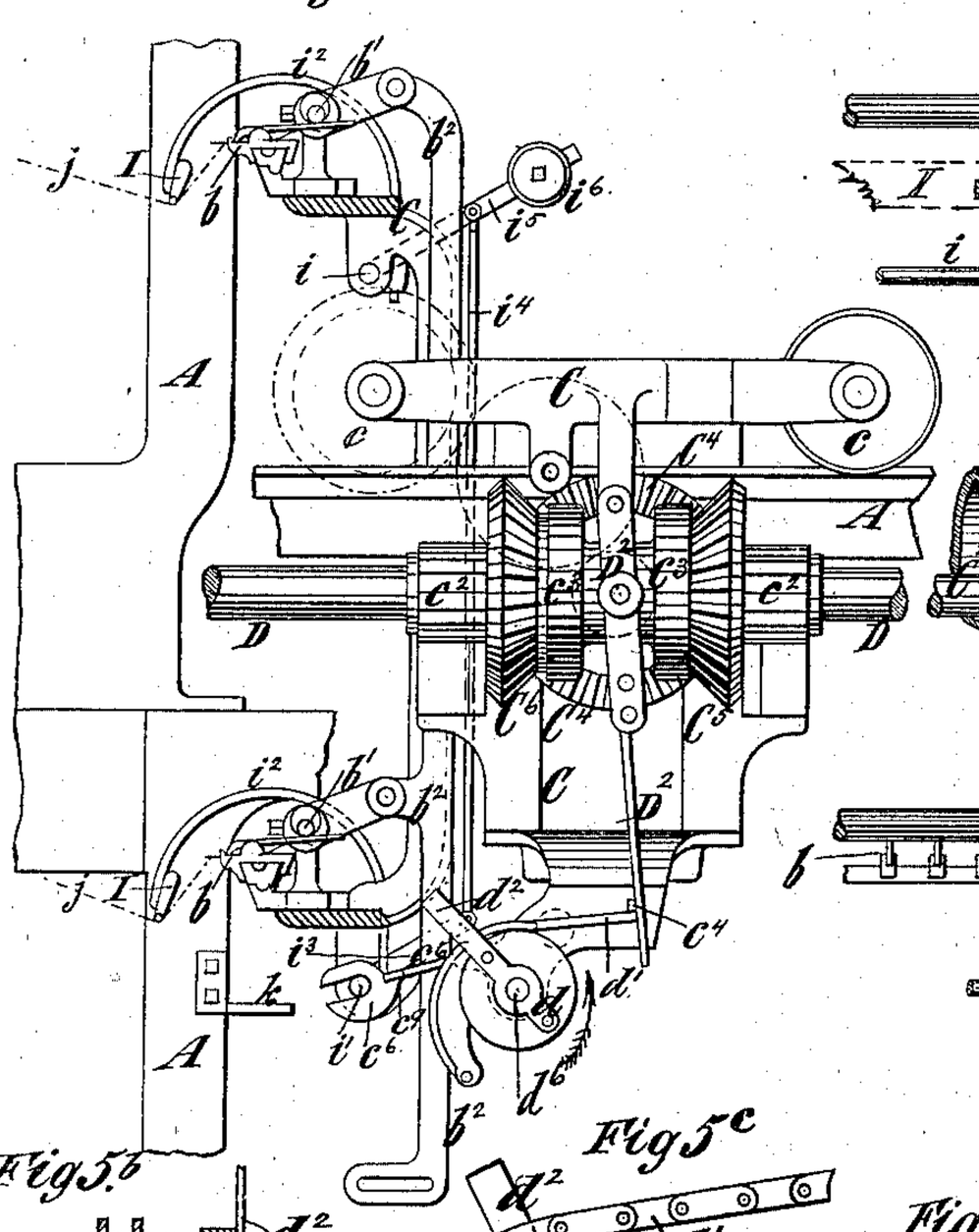


Fig6

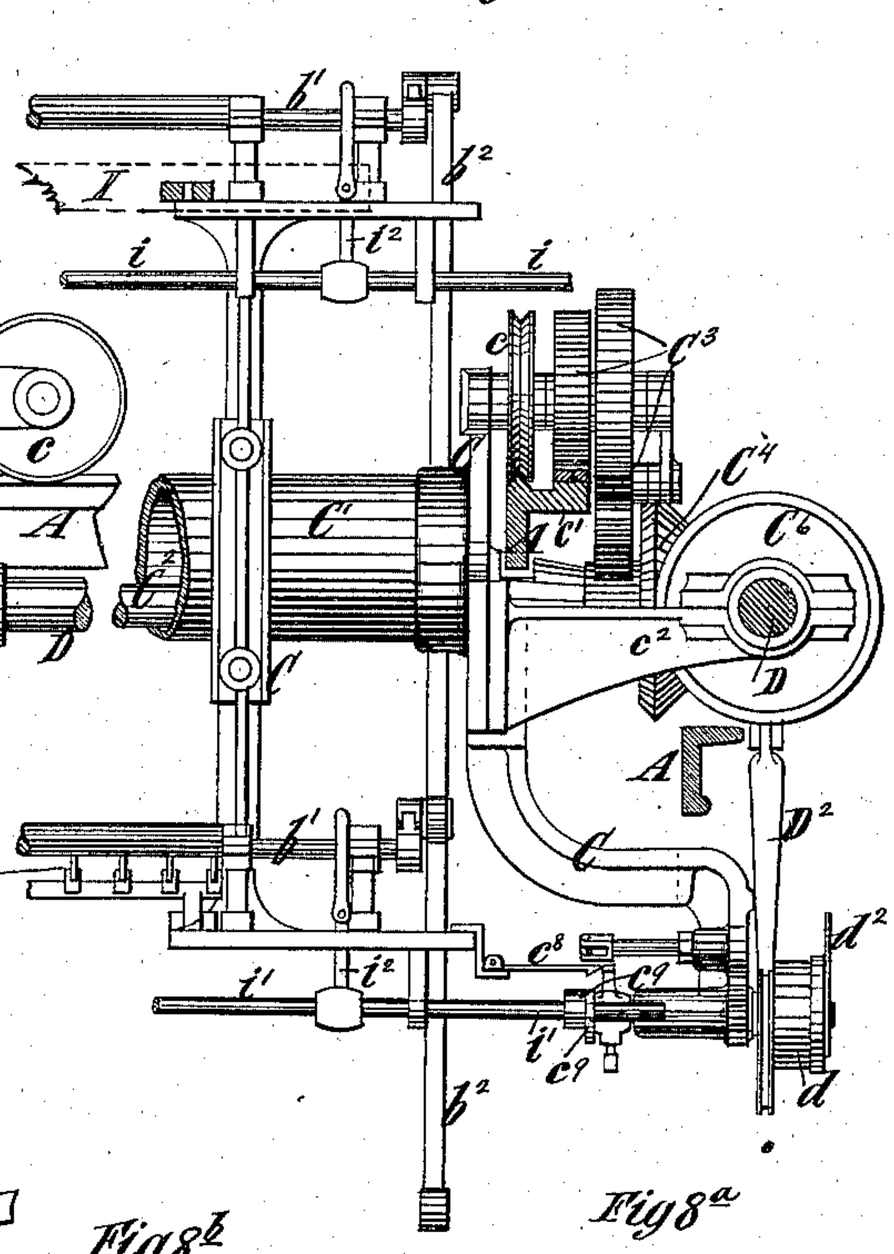


Fig5b

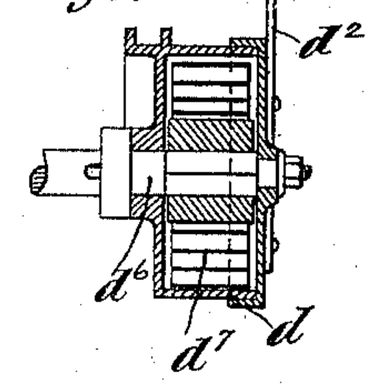


Fig5c

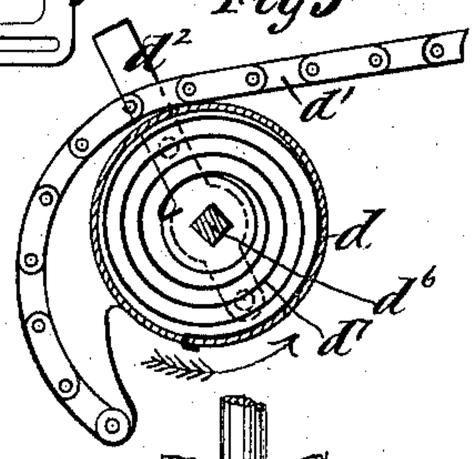


Fig8b.

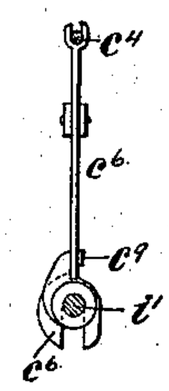


Fig8a

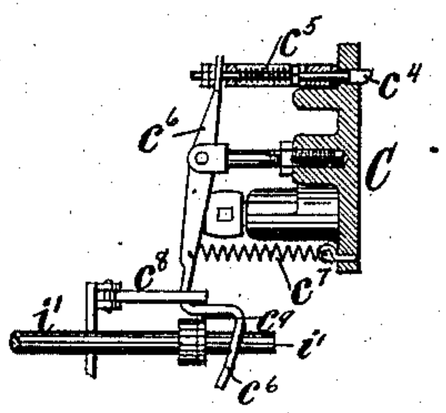


Fig7.

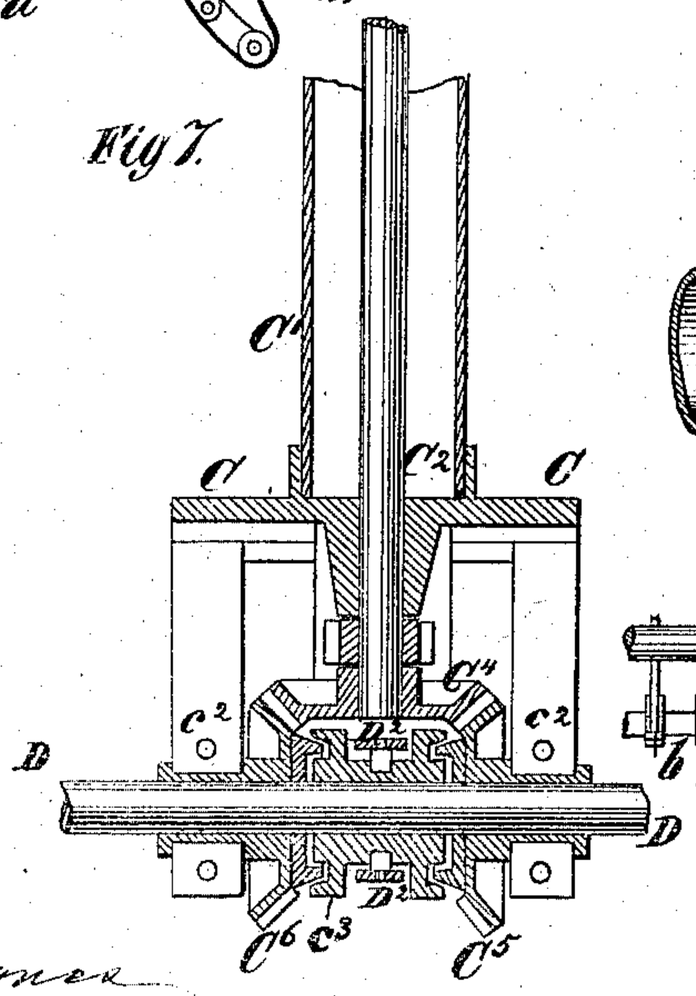
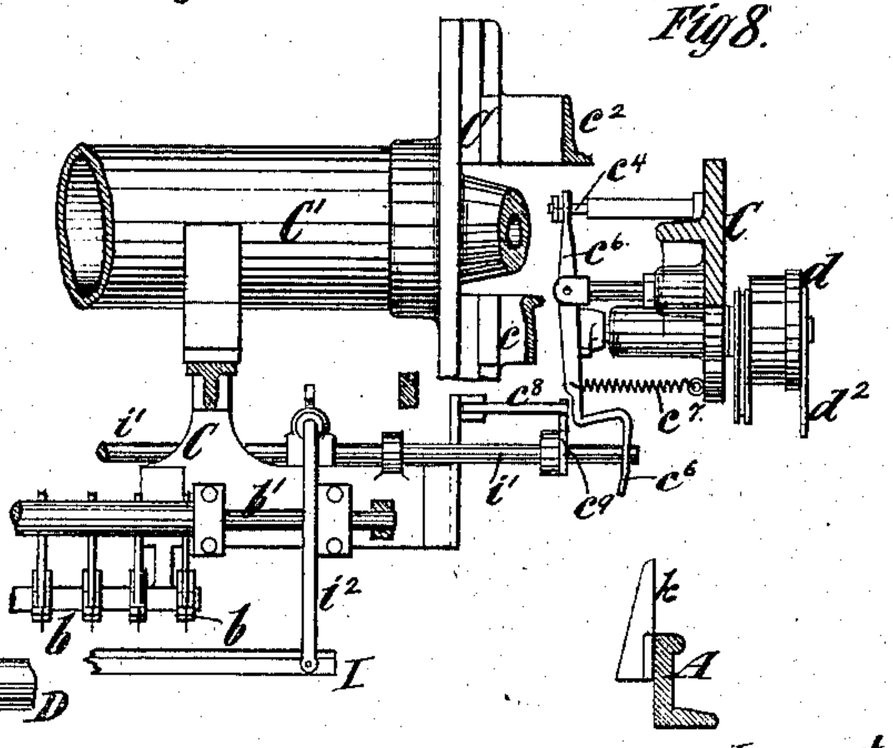


Fig8.



Witnesses:

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(No Model.) 9 Sheets—Sheet 6.

J. JONSON.

EMBROIDERING MACHINE.

No. 277,289. Patented May 8, 1883.

Fig 6a

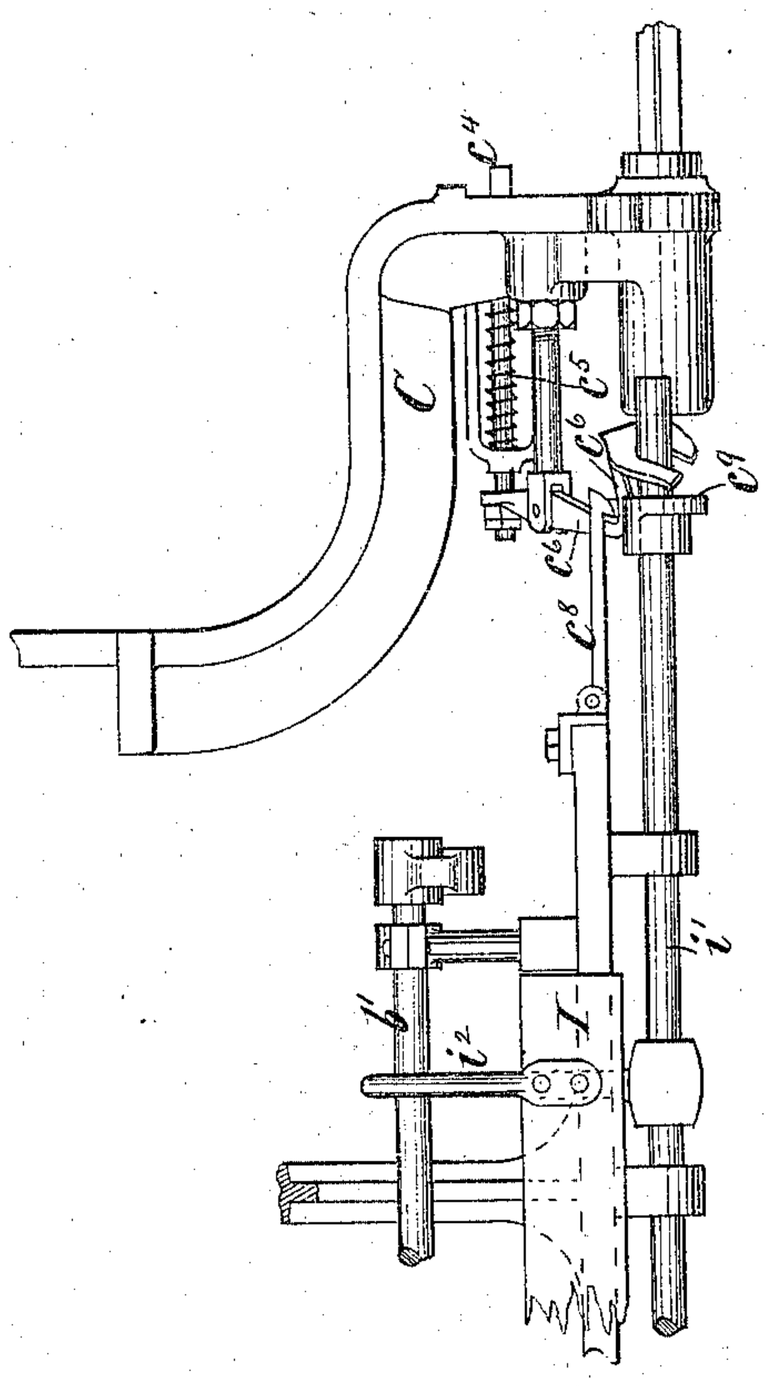


Fig 5a

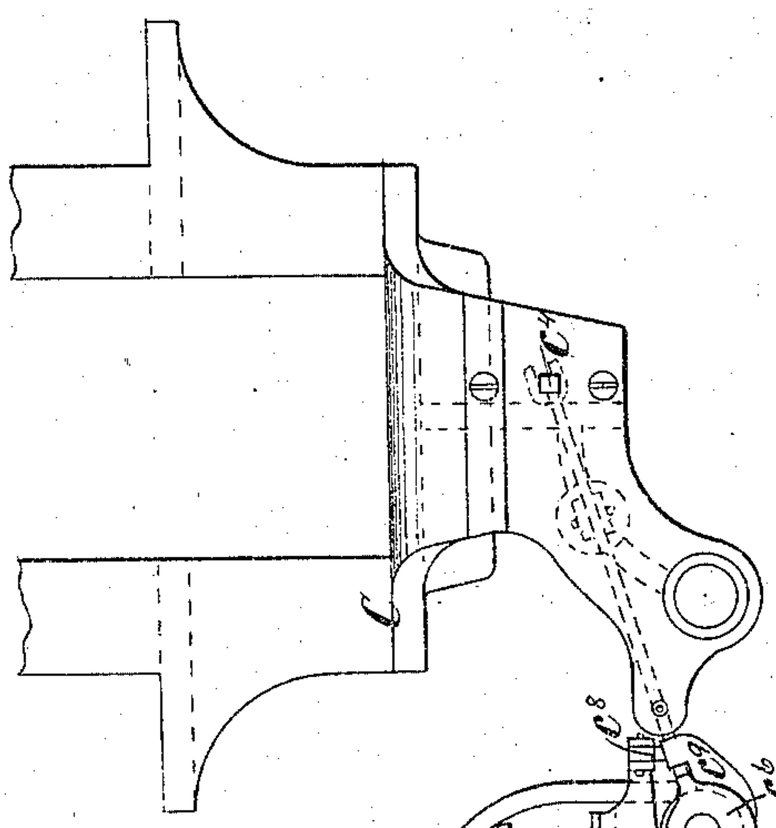
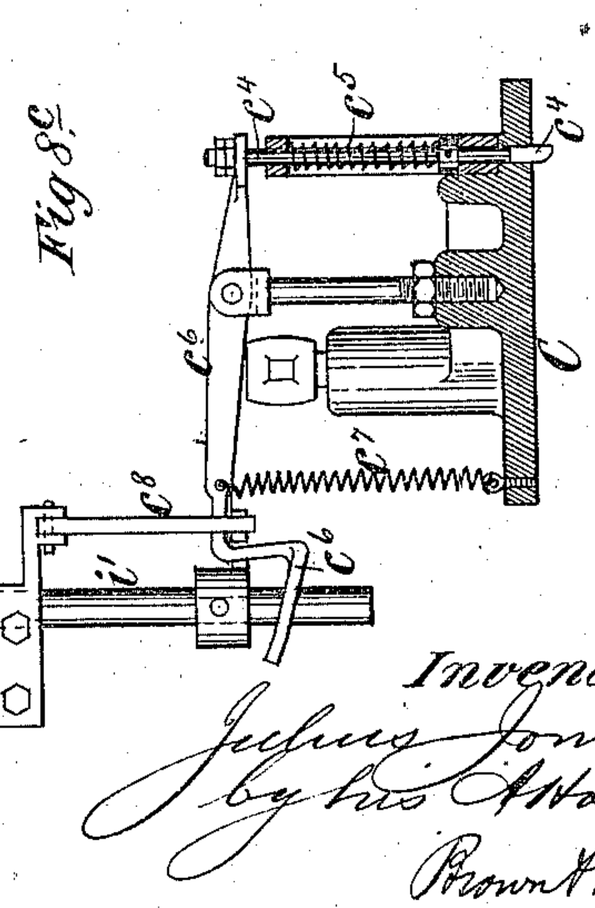


Fig 8a



Witnesses:
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(No Model.) 9 Sheets—Sheet 7.

J. JONSON.

EMBROIDERING MACHINE.

No. 277,289. Patented May 8, 1883.

Fig 10.

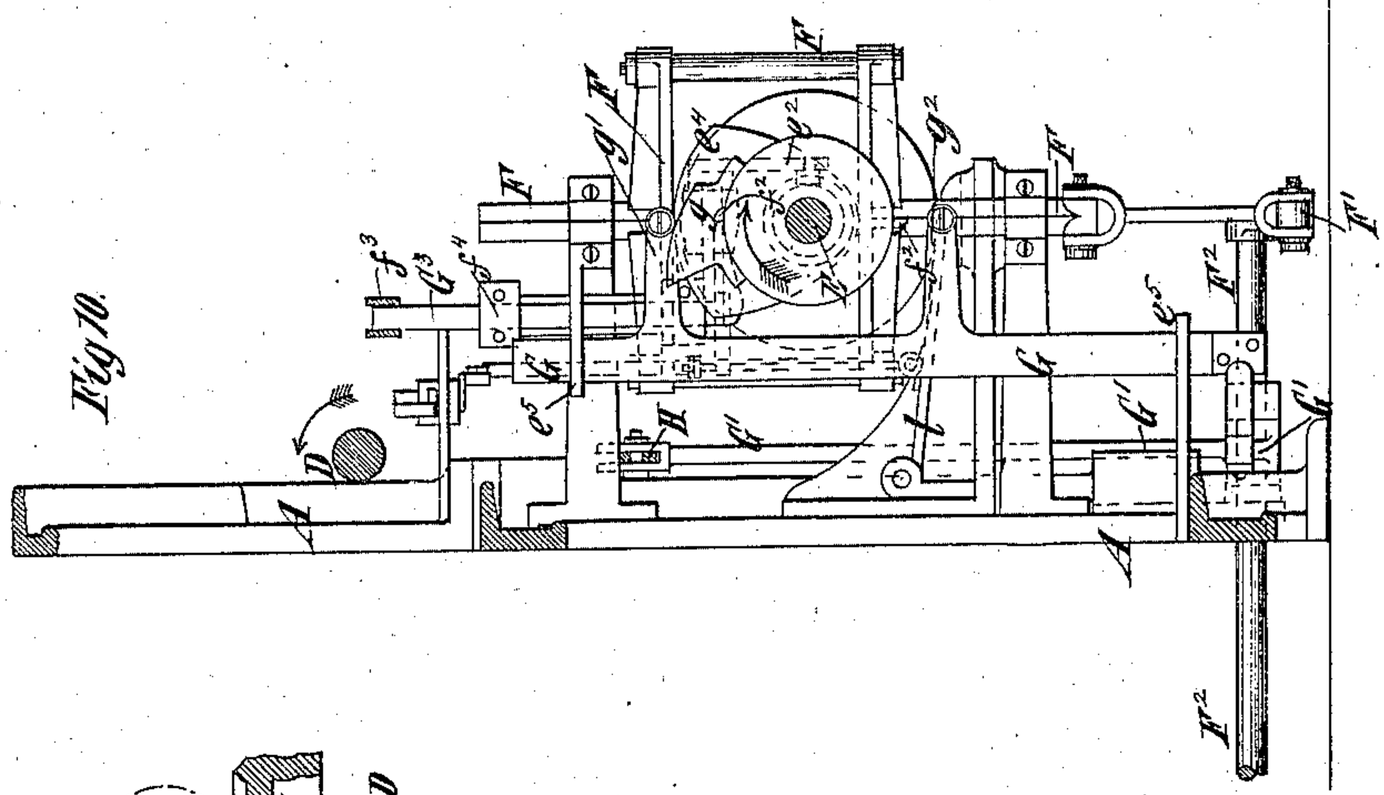
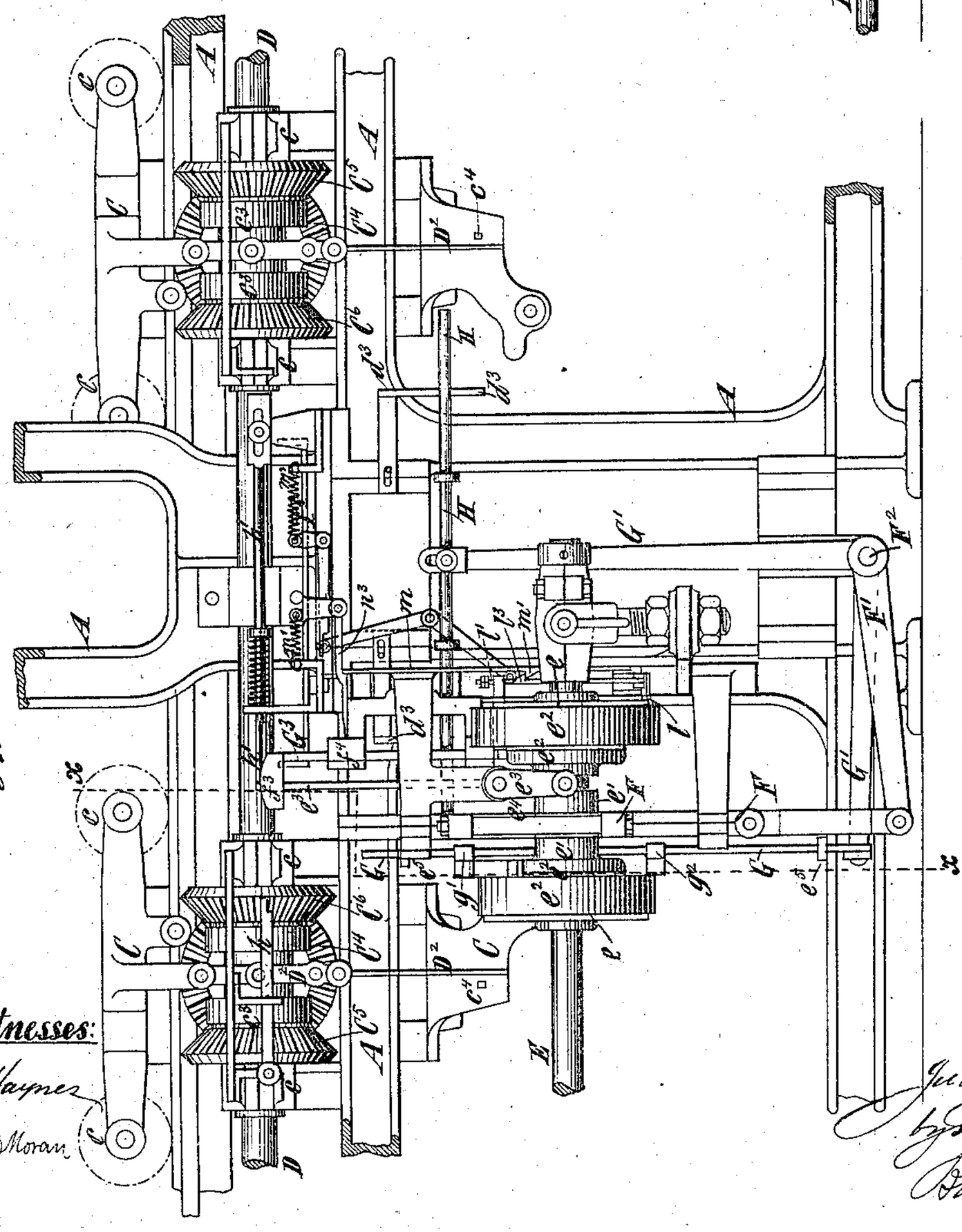


Fig 9.



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(No Model.)

9 Sheets—Sheet 8.

J. JONSON.

EMBROIDERING MACHINE.

No. 277,289. Patented May 8, 1883.

Fig 15.

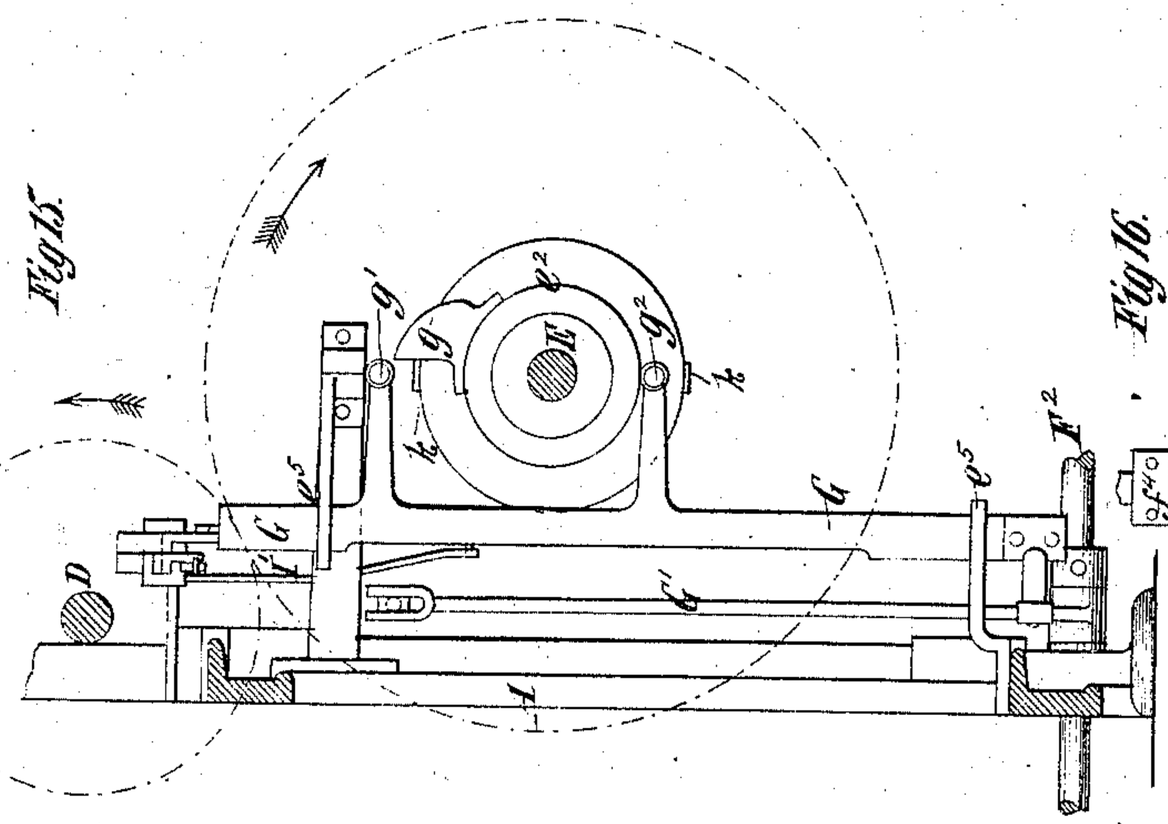


Fig 16.

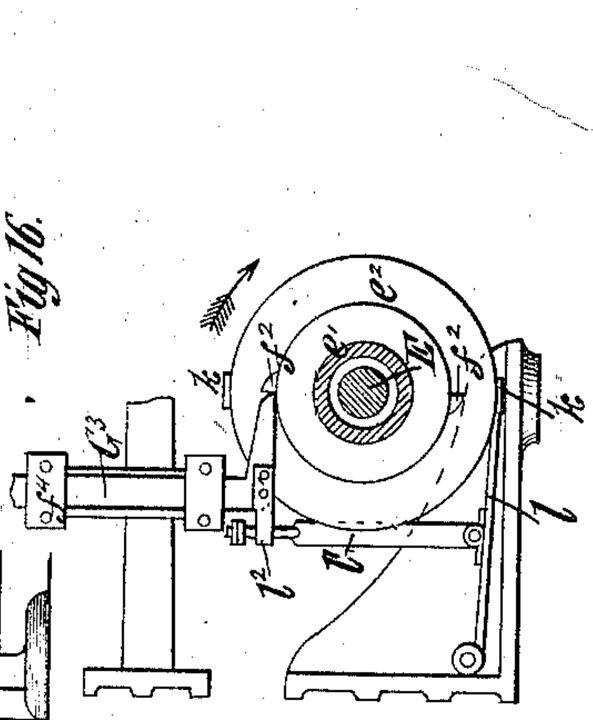


Fig 13.

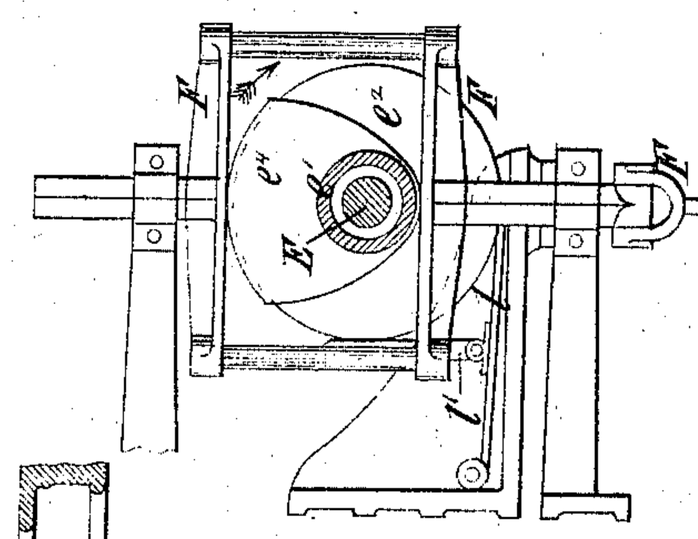


Fig 14.

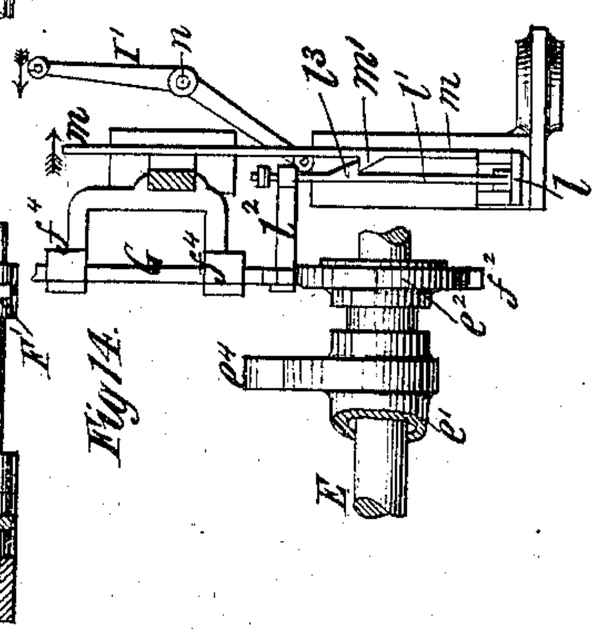


Fig 11.

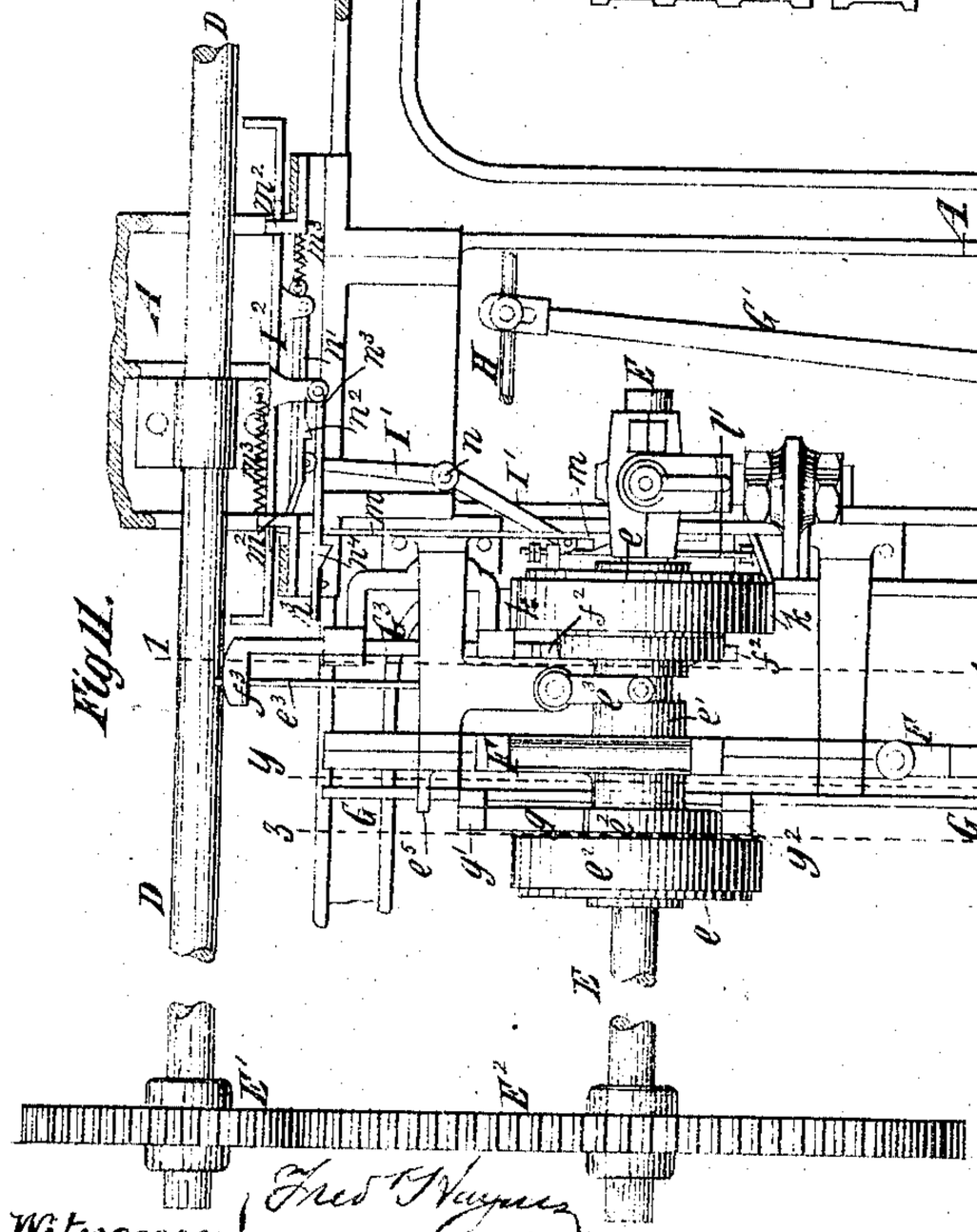
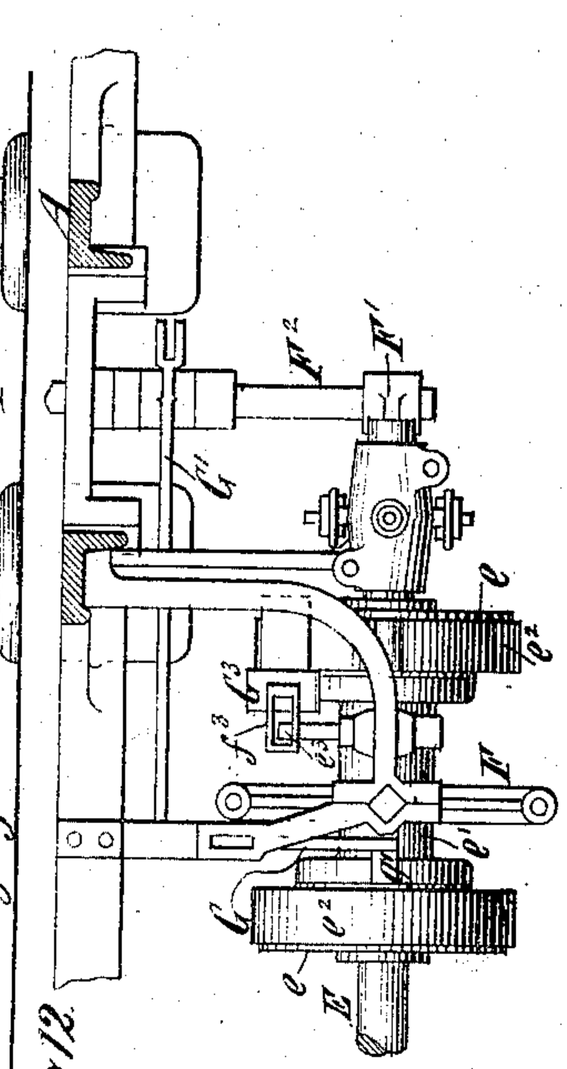


Fig 12.



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(No Model.) 9 Sheets—Sheet 9.

J. JONSON.

EMBROIDERING MACHINE.

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Fig 17.

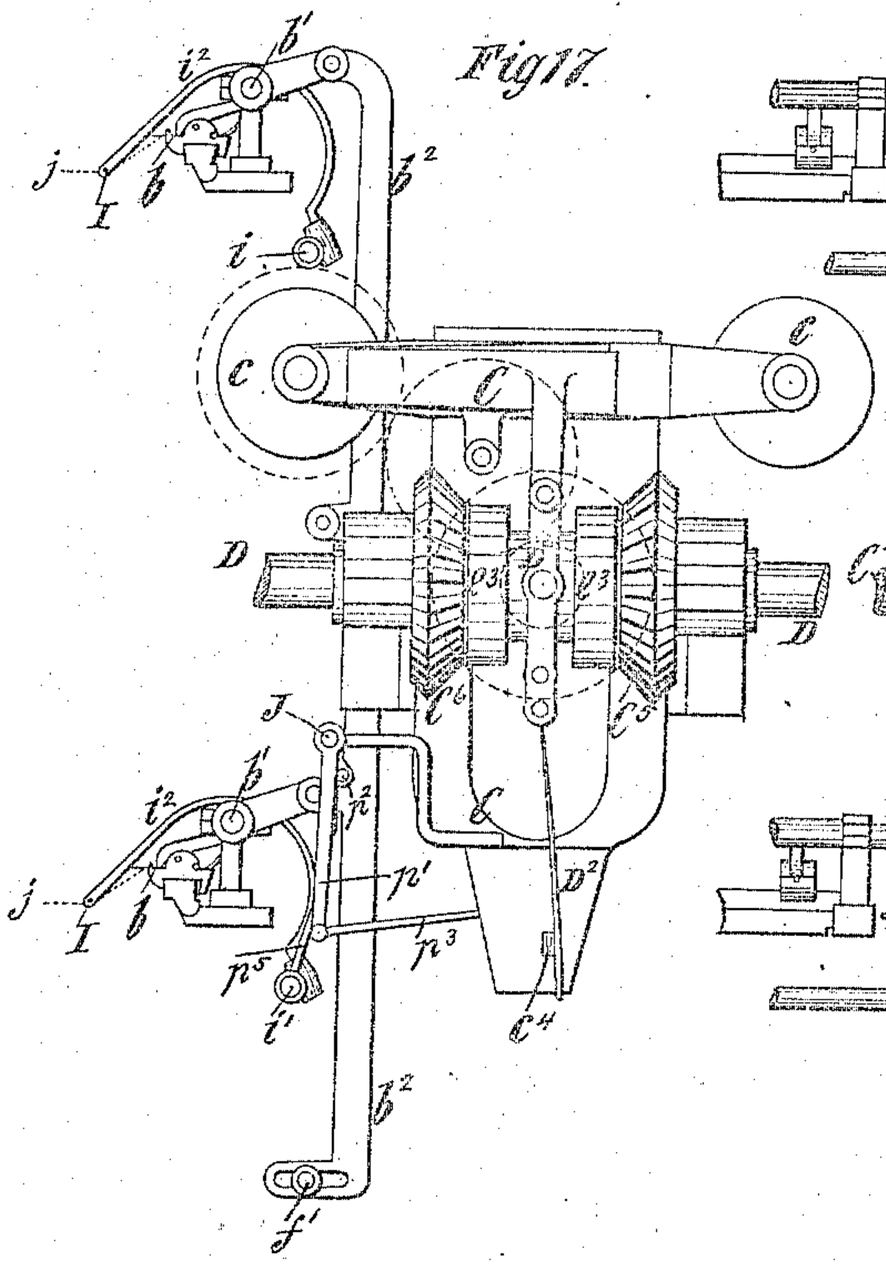


Fig 18.

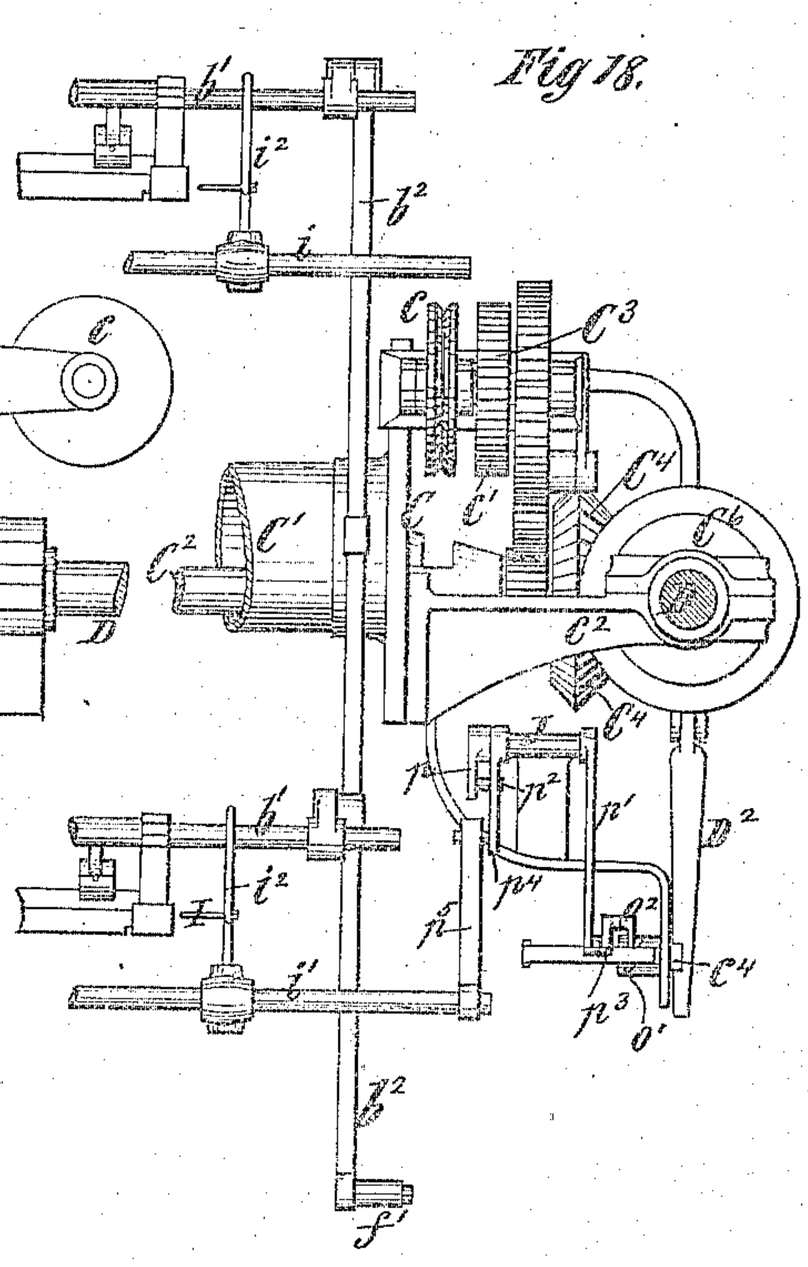


Fig 19.

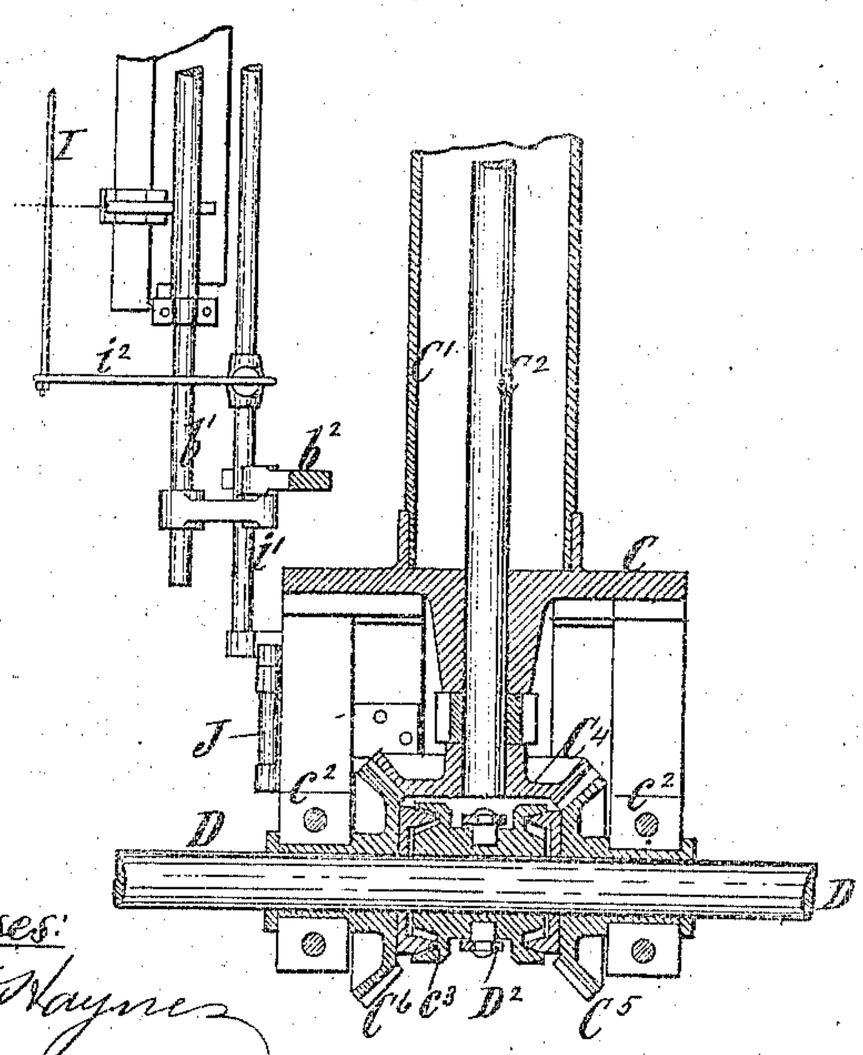
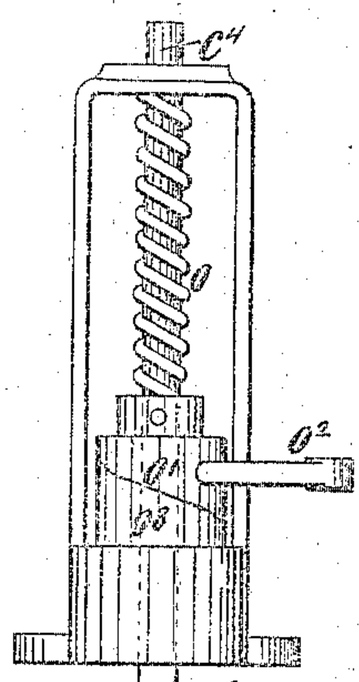


Fig 20.



Witnesses:
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Ed. Moran

Inventor:
D. Julius Jonson
by his Attorneys
Brown & Brown

UNITED STATES PATENT OFFICE.

JULIUS JONSON, OF NEW YORK, N. Y., ASSIGNOR TO THE JONSON POWER EMBROIDERY MACHINE COMPANY, OF SAME PLACE.

EMBROIDERING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 277,289, dated May 8, 1883.

Application filed April 26, 1882. (No model.)

To all whom it may concern:

Be it known that I, JULIUS JONSON, of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Embroidery-Machines, of which the following is a specification.

My invention relates to what are commonly known as the "Heilmann" or "Swiss" embroidery-machines, in which the fabric to be embroidered is stretched between beams or rollers in a balanced frame which is moved to produce the pattern, and the work is performed by double-pointed needles having eyes at about the middle of their length, and which are passed through the fabric from side to side, and each of which carries a length of thread. In machines of this class there are commonly employed two distinct sets of needles arranged in two horizontal rows and operated by means of two needle-carriages arranged on opposite sides of the fabric and movable toward and from the fabric to insert the needles alternately from each side of the fabric and draw them and the thread carried by them through the fabric, and as the work progresses the length or extent of movement of the carriages diminishes owing to the shortening of the threads, and consequently the mechanism for operating or driving the needle-carriages must be reversed a little sooner, or after a shorter outward movement in each succeeding stitch-producing operation. For the purpose of reversing the needle-carriages, I employ on each needle-carriage a tension-bar for each set of needles, such tension-bar bearing upon the threads and rising and falling as the threads are drawn out. Such tension-bars are not new, in themselves, in machines of this kind; but my invention consists, essentially, in the combination, with the fabric-frame and the needle-carriage, of a continuously-rotating shaft, a stationary rack, driving mechanism upon said carriage, engaging with said rack for imparting motion to the carriage from said shaft, a reversing-gear upon said carriage, adapted to act automatically when released for reversing said driving mechanism, and a tension-bar so connected with such reversing-gear that the rising motion of the bar upward by the tightening of the threads as the carriage approaches the end of its outward movement will release the reversing-gear, and thus cause the reversing of such driving mechanism and the starting of the carriage inward toward the fabric-frame.

The invention also consists in a novel construction of the devices through which the rising and falling tension-bar operates to release the reversing-gear, and in certain novel combinations of such devices, hereinafter particularly described and claimed. In exceptional cases I may employ devices substantially like those hereinabove referred to for reversing the carriage-driving mechanism without connecting them with the tension-bar, and operate them by some suitable tripping mechanism; and I therefore consider said devices, combined substantially as hereinafter described, as a feature of my invention.

The invention also consists in the combination, with the needle-carriages and their driving mechanism, of novel devices whereby the driving mechanism is reversed to terminate the inward movement of each needle-carriage, and is then allowed to dwell, while the opposite carriage, which carries the needles, moves outward and returns.

In the accompanying drawings I have represented an embroidery-machine embodying my invention; but I have only shown such parts of the machine as are necessary to illustrate my invention.

Figure 1 is a side view of the machine. Fig. 2 is a plan thereof, the fabric-frame being omitted. Fig. 3 is an end view thereof. Fig. 4 is a longitudinal section between the sides of the machine. Fig. 5 is a side view, partly in section, of one portion of the frame of the machine, one of the needle-carriages and its driving mechanism upon a larger scale. Fig. 5^a is a view similar to Fig. 5 of certain of the parts shown therein, upon a still larger scale. Fig. 5^b is a sectional view of a spring-box and spring which are carried upon the needle-carriage, taken in a plane parallel with the axis of the spring-box. Fig. 5^c is a sectional view of the spring-box and spring in a plane transverse to the axis. Fig. 6 is a side view at right angles to Fig. 5, and on the same scale of the parts shown therein. Fig. 6^a is a view similar to Fig. 6 of certain of the parts shown therein, but on a larger scale. Fig. 7 is

a horizontal section of a portion of a needle-carriage and its driving mechanism upon the same scale as Figs. 5 and 6. Fig. 8 is a plan of a portion of the needle-carriage with its reversing devices and appurtenances upon the same scale as Figs. 5, 6, and 7. Fig. 8^a is a plan of certain of the parts shown in Fig 8, representing them in different positions. Fig. 8^b is a side view of a lever shown in Fig. 8^a, and devices for operating it. Fig. 8^c is a view of the parts shown in Fig. 8^a, but on a larger scale. Fig. 9 is a side view of the central portion of the machine, illustrating upon a larger scale the mechanism for reversing the carriage-driving mechanism at the end of the inward movement of the carriage. Fig. 10 is a vertical section upon the dotted line *x x*, Fig. 9. Fig. 11 represents a side view similar to Fig. 9, but omitting many of the parts shown in the latter figure. Fig. 12 represents a plan of certain of the parts shown in Fig. 11. Fig. 13 represents a vertical sertion on the dotted line *y y*, Fig. 11. Fig. 14 represents a side view of certain of the parts shown in Fig. 11, illustrating more clearly their mode of operation. Fig. 15 represents a transverse vertical section on the dotted line *z z*, Fig. 11. Fig. 16 represents a similar section of certain parts on the dotted line 1 1, Fig. 11. Figs. 17, 18, and 19 represent views similar to Figs. 5, 6, and 7, illustrating a slight modification of my invention. Fig. 20 represents a detail view of one of the parts employed in such modification upon a larger scale.

Similar letters of reference designate corresponding parts in all the figures.

A designates the main frame of the machine, which is suitably constructed to support the operating mechanism and to give all the desired strength; and B designates the fabric-frame, which extends from side to side of the machine, and is provided with beams or rollers *a*, on which the fabric is carried and by which it is stretched. The fabric-frame B may have motion imparted to it in a vertical and horizontal direction, for producing the desired pattern, by a pantograph, Jacquard mechanism, or other suitable devices such as are commonly used for this class, and which are not here represented, as they form no part of my invention.

C designates the two needle-carriages, which are arranged on opposite sides of the fabric-frame B, and which are or may be constructed like those used in the "Heilmann" or "Swiss" machine, before referred to. The needle-carriages C are provided each with upper and lower rows of needle-clamps, *b*, which are made and attached to the carriages in the usual way, and which may be opened to receive and deliver the needles by means of rock-shafts *b'*, provided with eccentric portions or cams which bear on the tails of the movable jaws of the pincher-like needle-clamps. All the clamps of each carriage may be opened by a vertically-moving rod, b^2, connected with the rock-shaft *b'* of each carriage, as best shown in Fig. 4. This mechanism for operating the needle-clamps is the same as has been before used. Each carriage C is composed of two end frames or castings, between which extends a hollow brace, C', through which extends a counter-shaft, C^2. At each end of the carriage are supporting wheels or rollers *c*, which run upon ways provided for them on the frame of the machine, and the carriage is moved along said ways by gearing C^3, which is set in operation by the counter-shaft C^2, one wheel of said gearing engaging with a stationary rack, *c'*, on the frame, as best shown in Fig. 6. On one end of each of the counter-shafts C^2 is a bevel-wheel, C^4, and each wheel C^4 engages with a pair of bevel-wheels, C^5 C^6, which are supported in brackets c^2 on the carriages.

D designates a driving-shaft arranged in suitable bearings upon the side of the machine, as shown in Fig. 1, and which may be rotated continuously in one direction by a belt passing round a pulley, D', or in any other suitable way. The pairs of wheels C^5 C^6 are entirely loose upon the driving-shaft D, and between the wheels of each pair is a clutch-piece, c^3, which is locked to the shaft D, so as to turn therewith, by a spline or feather, and which may move freely longitudinally thereon. Each clutch-piece c^3 is operated by a lever, D^2, which extends downward, and may be slightly resilient or elastic, as shown in Figs. 1, 5, and 9, so that when it is deflected its resilience will hold the frictional surfaces of the clutch-piece c^3 in engagement with the frictional surfaces of the wheels C^5 C^6, to which it is desired to transmit motion. Consequently it will be seen that by moving the lever D^2 in one direction or the other, one or the other of the wheels C^5 C^6 will be locked to the driving-shaft D, and will impart motion to the counter-shaft C^2 in a proper direction to move the carriage toward or from the fabric-frame B.

I will now describe how the carriage-driving mechanism is adjusted for moving the carriages away from the fabric-frame.

To give such movement to the carriage the lever D^2 must be adjusted to hold the clutch-piece c^3 in engagement with the wheel C^5, as shown in Figs. 5 and 7, and the lever is held in such position by a sliding latch or bolt, c^4, projecting horizontally from the side of the carriage, as best shown in Figs. 5, 8^a, and 8^c. When the lever D^2 is moved in a direction to engage with the latch or bolt c^4 it acts upon the inclined end thereof and pushes it inward; but after the lever passes the latch or bolt the latter springs outward in front of the lever under the impulse of a light spring, c^5, applied as shown in Fig. 8^a. To the rear or inner end of the latch or bolt c^4 is connected a pivoted lever, c^6, and to the opposite end of said lever is applied a spring, c^7, as shown in Figs. 8 and 8^a, so that when the lever is not held by a pivoted hook, c^8, as shown in Fig. 8^a, the spring c^7 will vibrate the lever to pull back the latch or bolt c^4 and release the lever D^2. Upon each carriage C is attached a rotary spring-box, *d*,

(shown most clearly in Figs. 5 and 6,) in which is arranged a coiled spring in a well-known manner, and as best shown in Figs. 5b, 5c. The box *d* is adapted to turn on a stud or pin, d^6, fixed in the side of the carriage, and the coiled spring d^7, within the box, is attached at one end to said stud or pin and at the other end to said box, so that it has a constant tendency to turn the box in the direction of the arrow, Figs. 5 and 5c. The spring-box is connected with the lever D^2 by a strap, chain, or other connection, *d'*, so that when the latch or bolt e^4 is withdrawn to release the lever D^2 the latter will be pulled quickly over by the rotation of the spring-box *d* to carry the clutch-piece e^3 out of engagement with the wheel C^5 and into engagement with the wheel C^6 to move the carriage inward toward the fabric-frame B. The spring-box *d*, with its connections, constitutes a reversing-gear for reversing the driving mechanism. A weight might be used instead of the spring; but I consider the weight as the equivalent of the spring.

E designates an auxiliary shaft, arranged parallel with and below the driving-shaft D, and deriving motion therefrom through gear-wheels E' E^2, as shown most clearly in Fig. 1. Upon the shaft E are secured two clutch-pieces, *e*, which rotate therewith, and between them is arranged a sleeve, *e'*, carrying two clutch-pieces, e^2, and movable upon said shaft. The sleeve *e'* is adapted to be moved longitudinally by means of a lever, e^3, and when it is adjusted into its intermediate position the clutches e^2 will be freed from the clutches *e* and the sleeve *e'* will remain stationary, while the shaft E continues its rotation.

Referring now more particularly to Figs. 9 and 10, and also to Figs. 11 to 16, inclusive, e^4 designates a cam on the sleeve *e'*, the form of which is shown in Figs. 10 and 13, and this cam, when rotated, imparts motion to a vertically-movable yoke, F, which is connected to an arm, F', fixed upon a rock-shaft, F^2, as shown most clearly in Figs. 9 and 10. Upon the rock-shaft F^2, within the frame A of the machine, is a rocking yoke, F^3, (shown best in Fig. 4,) and provided in opposite sides with jaws or recesses *f*. As the carriages C approach the end of their inward movement the jaws *f* receive rollers or pins *f'* upon the vertically-movable rods b^2, before described, and which are connected with mechanism for opening the needle-clamps *b*, and as the rock-shaft F^2 is oscillated the rocking yoke f^3 moves the bar b^2 of one carriage up to open the needle-clamps, and moves the bar b^2 of the other carriage downward to allow the clamps of the last-said carriage to close upon the needles. The sleeve *e'* and its attached cam e^4 are designed to rotate intermittently, as hereinafter described, and at each operation the cam is rotated half a turn before stopping. The form of the cam e^4 is shown clearly in Fig. 10, and in said figure it is shown in the position which it will occupy after completing one-half its movement. During the first portion of its movement the cam does not impart any motion to the yoke F; but afterward it raises or lowers the yoke and holds it in a raised or lowered position, as shown in Fig. 10, at the close of its movement.

Upon the sleeve *e'*, on one side of the cam e^4, are two projections, f^2, placed diametrically opposite each other, and one of which is shown in Fig. 1, and on the sleeve adjacent to said cam is a projection, *g*, of a form shown clearly in Fig. 10.

G designates a vertically-movable yoke or frame arranged in guides, e^5, in the same plane as the projection or cam *g*, and provided with two arms, *g' g²*, between which said projection or cam works. The yoke or frame G is connected with a bell-crank or elbow lever, G', as shown clearly in Fig. 9, and through said lever operates a horizontally-movable stop-bar, H, as also shown in Fig. 9, for a purpose hereinafter described. When the cam e^4 acts upon the yoke F to raise it, as shown in Fig. 10, the projection or cam *g* acts upon the upper arm, *g'*, of the frame or yoke G and raises the latter, so as to move the stop-bar H toward the right, and at the next operation of said cam e^4, when it moves the yoke F downward, the said projection or cam *g* acts upon the lower arm, g^2, of the frame or yoke G and moves it down, so as to move the stop-bar H toward the left. In the same vertical plane as the projections or cams f^2 is a bar, G^3, which carries at its upper end a socket or hollow head, f^3, through which the lever e^3 projects, as shown most clearly in Fig. 9, and when said bar G^3 is moved vertically in its guides f^4, by the projections or cams f^2, the socket or head f^3 is raised just above the end of the lever e^3, so as to throw upward or off anything bearing on said lever.

Upon the left-hand carriage C (shown in Fig. 9) is pivoted a pawl or trip-bar, *h*, as shown clearly in Fig. 9, and when said carriage moves inward toward the fabric-frame B the free end of said pawl or trip-bar is adapted to engage with the top of the lever e^3, and so shifts the sleeve *e'* as to carry the left-hand clutch-piece e^2 into engagement with the left-hand rotary clutch *e*, and so rotate the sleeve and the cam e^4.

In Fig. 1, I have shown a trip-bar similar to the bar *h*, pivoted to the right-hand needle-carriage, and I may use this or a sliding trip-bar, *h'*, (shown in Fig. 9,) which is so placed that the right-hand carriage C will strike it in terminating its movement toward the fabric-frame B, and will thereby push it against said lever e^3, and move said lever so as to shift the sleeve *e'* and carry the right-hand clutch-piece e^2 into engagement with the right-hand rotary clutch-piece *e*, and so rotate the sleeve and the cam e^4. The sliding trip-bar *h'* is held or supported at one end by a stud or pin which passes through a slot therein, and at the other end it rests in a forked support, so that in addition to its sliding movement its end which is adjacent to the lever e^3 may be raised and

the bar swung upward on the aforesaid stud or pin as a pivot. The trip-bar *h* (shown in Fig. 1) has no independent sliding movement, but moves with the carriage.

As before described, each carriage C has attached to it a spring-box, *d*, and as each carriage is about terminating its inward movement an arm, d^2, on the spring-box comes in contact with a stationary projection or stop, d^3, arranged upon the frame of the machine, as shown in Fig. 9, and thereby rotates the spring-box and winds up or compresses the coiled spring therein.

In each carriage C are journaled the rock-shafts *i i'*, adjacent to the upper and lower rows of needle-clamps, *b*, as best shown in Figs. 5 and 6, and each rock-shaft has connected with it, by curved arms i^2, a bar, I, which extends parallel with and the entire length of the row of needles. The bars I rest upon the threads *j*, as shown best in Fig. 5, and deflect the threads downward, thus putting and keeping a suitable tension upon them, and said bars may therefore be aptly termed "tension-bars." When either tension-bar rises by the increased pull upon the threads which it controls it rotates its rock-shaft *i* or *i'*, and the two shafts are provided with arms i^5 i^3, which are connected by a rod, i^4, wherefore any rising or falling movement of either tension-bar will effect the turning of the lower rock-shaft, *i'*.

In Figs. 1, 4, 17, and 19 the tension-bars I are shown as consisting of small rods, while in Figs. 5, 5^a, 6, and 6^a they are represented as consisting of wooden bars. Either form of tension-bars may be used.

Different degrees of tension are required for different-sized threads, and to regulate the tension I provide either of the arms i^3 or i^5 of the rock-shafts *i i'* with an adjustable weight, i^6. This weight is shown in Fig. 5 as applied to the arm i^5 of the rock-shaft *i*. The weight i^6 serves to more or less counterbalance the weight of the tension-bars I, and by shifting the weight i^6 outward on the arm i^5 the tension produced by the bar I will be diminished, while by shifting said weight inward the tension will be increased, because the lesser proportion of the weight of the bars I will be counterbalanced by the weight i^6.

Turning now to the mechanism previously described for retaining the levers D^2 while the carriages C are moving outward, it will be observed that the end of the lever c^6 which holds the latch or bolt c^4 is bifurcated and straddles the rock-shaft *i'*, as shown in Figs. 8 and 8^a, and said lever c^6 is bent so as to form a shoulder inward of its end, with which the hook c^8 engages. Adjacent to said lever c^6 and hook c^8 is a rotary catch, c^9, which is best shown in Fig. 8^b, and which is fixed upon the lower rock-shaft, *i'*, and when said rock-shaft is moved in one direction the said catch c^9 rises under the hook c^8 and presses the hook up out of engagement with said lever c^6, and holds said lever upon its point, as seen in Fig. 8^b. As soon as the rock-shaft *i'* rotates in the reverse direction it carries the rotary catch c^9 away from in front of the lever c^6, and allows the latter to spring forward under the impulse of the spring c^7, thereby withdrawing the latch or bolt c^4 from in front of the clutch-lever D^2, and allowing the spring-box *d* to draw forward the last-named lever to carry the clutch-piece c^3 into engagement with the wheel C^6, and so reverse the driving mechanism of the carriage C. When the rock-shaft *i'* carries the rotary catch c^9 away from the front of the lever c^6 the hook c^8 would naturally follow the catch; but the said catch does not hold the lever c^6 quite so far inward as does the hook c^8, and consequently when the rotary catch raises the hook out of engagement with the lever it allows the spring c^7 to move the lever slightly outward and beyond the reach of the shoulder of the hook, so that when the rotary catch releases the lever the hook cannot catch it, and it flies outward under the impulse of the spring c^7.

Turning now to the operation of my machine, it will be understood that in this machine, as in other machines of the same class, the needles are all carried forward and thrust through the fabric by the forward movement of one carriage, after which the needle-clamps of said carriage are opened, and the needle-clamps of the opposite carriage are closed on the needles, and they are drawn through the fabric by the outward movement of said carriage, leaving the first-mentioned carriage stationary in its inward position. The second carriage now returns with the needles and thrusts them through the fabric into the open needle-clamps of the first-mentioned carriage, which are then closed on them and the carriage moves outward.

It will be understood that during the inward movement of each carriage the lever D^2 is pulled over by the action of the spring-box *d* to hold the clutch-piece c^3 in engagement with the wheel c^6; and it will likewise be understood that the latch or bolt c^4 is retracted by the action of its lever c^6, which is pulled upon by the spring c^7, as shown in Fig. 8.

Upon the frame A of the machine are secured stationary inclines *k*, (shown in Figs. 5 and 8,) and said inclines are directly in the path of the bent ends of the levers c^6 of the two carriages, C. When one carriage C—say the right-hand carriage shown in Fig. 1—has nearly completed its inward movement, but before its motion is slackened, it strikes the end of the movable trip-bar *h'*, and pushes the same against the end of the lever e^3; or if the pivoted trip-bar *h* (shown in Fig. 1) be used the carriage carries it against and causes it to push the lever e^3. The movement of the lever e^3 moves the sleeve *e'* and its right-hand clutch into engagement with the right-hand rotary clutch *e*, and setting the cams e^4, f^2, and *g* in rotation. In Fig. 10 I have represented the cams e^4 and *g* in the position which they occupy when they have completed one-half their movement. During

the first part of the movement, after being started, the cam e^4 does not move the yoke F^3, and the needle-clamps of the right-hand carriage retain their hold on the needles and have carried them through the fabric. The cam e^4 then moves the yoke F downward, and through the arm F′ and rock-shaft F^2 oscillates the rocking frame or yoke F^3, which transmits its motion through the vertical bars b^2, releasing the needles from the clamps of the right-hand carriage and closing the clamps of the left-hand carriage upon them. Just before the termination of the inward movement of the right-hand carriage the tension-bars I have been raised and swung over backward to allow the needle-clamps *b* to go close to the fabric, and this movement of the tension-bars slightly turns the shaft *i*′ and the rotary catch c^9. During the whole inward movement of the carriage the lever c^6 is held in the position shown in Fig. 8, and at this time the rotary catch c^9 and hook c^8 are idle and do not operate on said lever in any way. As the functions of the hook c^8 and rotary catch c^9 are not in the least affected by this rising of the tension-bars at the end of the inward movement of the carriage, I have not thought it necessary to show the mechanism for thus raising the tension-bar; but it may be the same as that always used in machines of this class for that purpose.

At the same time that the tension-bars I have been swung backward the bent end of the lever c^6 has made contact with the incline *k* in Figs. 5 and 8, and by said incline has been moved inward, thereby distending the spring c^7 and carrying the lever under the hook c^8, which drops down over and retains it, thereby causing the bolt or latch c^4 to protrude laterally from the carriage C. At the same time the movement of the carriage has brought the arm d^2 of the spring-box *d* against the stop d^3, (shown in Figs. 1 and 9,) and has thereby turned the spring-box and slackened the chain or strap *d*′, which connects it with the lever D^2, thereby releasing the lever and breaking the contact between the clutch-piece c^3 and the wheel C^6 and stopping the inward movement of the carriage. During the movement of the cam e^4 the projection *g* acts upon the arm g^2 of the yoke G and moves it downward, thereby throwing the sliding bar H to the left, and, by its striking the lever D^2 of the left-hand carriage, carrying said lever back of the latch or dog c^4, where it is held, locking the clutch-piece c^3 of said left-hand carriage to the wheel C^5, and causing said carriage to travel outward, after which its driving mechanism is reversed, as hereinafter described with reference to the right-hand carriage. At the same time that the projection or cam *g* acts upon the yoke G one of the projections or cams f^2 moves the bar G^3 upward, thereby raising its hollow head or socket f^3, and lifting or swinging the trip-bar *h*′ upward on the stud which passes through its slot, and out of engagement with the lever e^3, whereupon the latter moves back, carrying the left-hand clutch e^2 away from the rotary clutch *e*, and stopping the sleeve *e*′, with its cams e^4, f^2, and *g*.

The lever e^3 is slightly elastic, and when acted upon by the trip-bar *h*′ is bent or put under tension. When the head or socket f^3 rises and releases the lever e^3 it moves back by its own resilience; or it may have a spring or springs applied to it to effect such movement.

The clutches *e* e^2, as shown in Figs. 1 and 2, differ somewhat from those shown in Fig. 9, in that the former are toothed clutches, while the latter are friction-clutches. I have made this variation so as to indicate that either form of clutch may be used; but it is necessary to remark that if the toothed clutches are used the lever e^3, which shifts the sliding clutches or clutch-pieces e^2, should have springs applied to opposite sides thereof, so that when the trip *h* or *h*′ is knocked off by the rising of the socket or hollow head f^3 the lever e^3 will be moved instantly by one of the attached springs sufficiently to disengage the toothed clutches. With the friction-clutches such springs would be unnecessary, as all that is required is to release the lever e^3, and thus break the frictional contact between the clutches.

I have before stated that the sleeve *e*′, with its several cams, e^4, f^2, and *g*, is turned half a revolution at each operation; and in order to stop the sleeve after such range of movement and prevent the momentum from carrying it ahead after it is released from the rotary clutches or clutch-pieces *e*, I may employ a stop which I will now describe, reference being had particularly to Figs. 9, 11, 14, and 16.

Upon the periphery of one of the clutches or clutch-pieces e^2 are two lugs or projections, *k*, (shown most clearly in Fig. 16,) and *l* designates a pivoted stop which is adapted to be raised and lowered into and out of engagement with said lugs or projections. The lugs or projections *k* should be properly placed relatively to the cams f^2, as shown in Fig. 16.

Projecting upward from the stop *l* is a rod, *l*′, which plays through a projection, l^2, on the bar G^3, as shown in Fig. 16, but which is adapted to be raised by the projection l^2 striking against a shoulder formed by nuts upon the said rod.

Upon the side of the rod *l*′, as shown clearly in Fig. 14, is an inclined tooth or projection, l^3, which is adapted to engage with a corresponding tooth or projection, *m*′, on a stationary bar, *m*, which is flexible, or is hinged for a purpose hereinafter described.

As before stated, one of the projections or cams f^2 at a proper time acts upon bar G^3, and through it raises the hollow head or socket f^3 sufficiently to throw off the trip *h* or *h*′, and thereby release the lever e^3 and disengage the sleeve *e*′, with its cams, from the driving-shaft E. At the same time that the bar G^3 rises it lifts the stop *l*, and just as the sleeve *e*′ and its cam are disengaged from the clutches *e* the stop *l* is obtruded in the way of one of the projections or lugs *k*, and thereby instantly stops the sleeve and cams. As soon as the cam or projection f^2 passes the bar G^3 the lat-

ter falls into the position shown in Fig. 16; but the stop *l* cannot drop, because of the tooth or projection l^3 catching upon the corresponding tooth or projection, *m'*, and hence the sleeve *e'*, with its cams, is effectually stopped at the proper time and prevented from running ahead by reason of its momentum. Before the sleeve *e'* can be again rotated it is necessary that the bar *m* should be bent or deflected sufficiently to carry its tooth *m'* out from under the tooth l^3, and thus permit the rod *l'* to move downward and the stop *l* to drop out of engagement with the lug or projection *k*.

I^2 (see Figs. 9 and 11) designates a bar adapted to be slid horizontally in either direction in guides m^2, and having springs m^3 attached to it for returning it after moving in either direction.

I' designates a lever fulcrumed at *n*, and one end of which is adapted to act upon the bar *m*.

To the bar I^2 is pivoted a dog, *n'*, having an inclined projection or tooth, n^2, which is adapted to act upon the upper end of the lever I'.

The sliding bar I^2 also has pivoted to it a dog, n^3, having an inclined projection or tooth, n^4, which is placed so as to act upon the upper end of the bar *m*.

Just before the right-hand carriage strikes against the trip-bar *h'*, (shown in Fig. 9,) so as to impel the latter against the lever e^3 for moving the latter to start the sleeve *e'* and its cams, the said carriage strikes against the sliding bar I^2 and moves the latter toward the left, thereby causing the tooth n^2 to vibrate the lever I', and through it to deflect the bar *m* sufficiently to remove its tooth *m'* from below the tooth l^3. This allows the rod *l'* to move downward and the stop *l* to drop out of engagement with the lug *k*, and thus leaves the sleeve *e'* and its cams free to rotate. So, also, just before the pivoted trip *p* of the left-hand carriage strikes against the lever e^3 said carriage strikes the bar I^2 and moves the latter toward the right, thereby causing the tooth n^4 of the dog n^3 to deflect the bar *m*, so as to carry its tooth *m'* out from below the tooth l^3, and thus permit the stop *l* to drop out of engagement with the lug or projection *k*. As soon as the needles have been again transferred from the left to the right hand carriage, and the cams e^4 and *g* have again operated, the bar H is thrown to the right, striking the lever D^2 and moving it to carry it behind the latch or bolt c^4, and to move the clutch-piece c^3 into engagement with the wheel C^6, whereupon the right-hand carriage moves outward. As the right-hand carriage recedes from the fabric-frame B the tension-bars I are swung forward and rest upon the threads *j*, and thereby the lower rock-shaft, *i'*, is turned and the rotary catch c^9 is moved upward against the under side of the hook c^8, raising the latter out of engagement with the lever c^6, and remaining stationary to hold the said lever during the whole outward movement of the right-hand carriage. As the carriage approaches the end of its movement outward the threads *j* become more nearly straight by the tension upon them, thereby raising the tension-bars I, and before the threads are drawn straight the said tension-bars I, in their rising, turn the rock-shaft *i'* sufficiently to carry the rotary catch c^9 away from the lever c^6, and thereby release the latter, whereupon it is vibrated by the spring c^7, and the bolt or latch c^4 is drawn inward or retracted. The spring in the spring-box *d* thereupon draws back the lever D^2, draws the clutch c^3 into engagement with the wheel C^6, and reverses the motion of the carriage. The movement of the left-hand carriage is reversed in the way just described with relation to the right-hand carriage.

The devices through which the movement of the tension-bars operate to reverse the driving mechanism of the carriages may be varied as may be desired to suit circumstances.

Referring now to Figs. 17, 18, 19, and 20, all parts which are lettered as in Figs. 5, 6, and 7 are exactly similar, the only difference being in the devices through which the rotation or rocking of the lower rock-shaft, *i'*, operates to withdraw the latch c^4, and thus permit the reversing-gear to move the lever D^2 and reverse the driving mechanism. The latch c^4 is caused to protrude in the way of the lever D^2 by a spring, *o*, which forces it outward, and which is arranged as clearly shown in Fig. 20. Upon said latch is fixed a rotary cam, *o'*, which may be rocked or turned by a lever or arm, o^2, and acts in conjunction with a fixed cam, o^3, when so turned, to withdraw or retract the latch c^4.

J designates a short rock-shaft having two arms, *p p'*, fixed upon it, and the former of said arms is provided with a projecting pin or stud, p^2, while the latter is connected by a link, p^3, with the arm or lever o^2 of the rotary cam *o'*.

Upon the rock-shaft J is a loose arm, p^4, which rests against the pin or stud p^2, and upon the rock-shaft *i'* is an arm, p^5, which is adapted to bear against a pin or stud projecting from the loose arm p^4, as best shown in Fig. 18. When the tension-bars I are raised by the tension of the threads *j* the rock-shaft *i'* is turned, and the arm p^5, acting upon the loose arm p^4, presses the latter against the pin or stud p^2, and through the arm *p* turns the rock-shaft J. This turning movement of the rock-shaft J is transmitted, through the arm *p'* and link or rod p^3, to the rotary cam *o'*, and turns said cam sufficiently to withdraw the latch c^4 and release the lever D^2. As the tension-bars I fall, the arm p^5 on the rock-shaft *i'* carries the loose arm p^4 away from the stud or pin p^2, thus enabling the said arm p^5 to pass the loose arm p^4 without operating it to turn the rock-shaft J.

In some exceptional cases it may not be desirable to utilize the movement of the tension-bar to reverse the movement of the carriage, because of the extreme fineness or small number of threads, and in such cases I may employ a reversing mechanism substantially like that herein described, the rotary catch c^9 be-

ing removed from the rock-shaft i', and a mechanism similar to that by which the stroke of a metal-planer is altered being employed to trip the latch or bolt c^4 to release the lever D^2, making such mechanism adjustable while the machine is in operation. In case of such a change a device independent of the reversing mechanism would be employed to produce the proper tension on the threads.

One very important feature of my machine is the arrangement of the continuously-rotating shaft D transversely to the direction of movement of the needle-carriages, and the arrangement of both the driving mechanism and the reversing-gear upon the carriages. By this arrangement I am enabled to have the least possible number of parts between the point where the driving mechanism is reversed and the carriage, and the point of reversing is brought close to the carriage, so that the instant the driving mechanism is reversed the direction of movement of the carriage will change.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an embroidery-machine, the combination, with a fabric-frame and a needle-carriage movable toward and from the same, of a continuously-rotating shaft, a stationary rack, driving mechanism upon said carriage, engaging with said rack for imparting motion to the carriage from said shaft, a reversing-gear, also arranged upon said carriage for automatically reversing said driving mechanism, a rising and falling tension-bar, and devices through which said tension-bar acts in rising to release said reversing-gear, substantially as herein described.

2. In an embroidery-machine, the combination with a fabric-frame, and a needle-carriage of a continuously-rotating shaft, a stationary rack, driving mechanism upon said carriage, engaging with said rack for imparting motion to the carriage from said shaft, a clutch movable with said carriage, and through which said shaft operates said driving mechanism, a lever for controlling said clutch, a rising and falling tension-bar, devices adapted to be operated by the movement of the tension-bar to release said lever, and a spring or its equivalent, and connections upon said carriage for moving said lever, when released, to reverse the movement of said carriage, substantially as herein described.

3. In an embroidery-machine, the combination, with a fabric-frame and a movable needle-carriage, of a continuously-rotating shaft, a stationary rack, driving mechanism upon said carriage, engaging with said rack for imparting motion to the carriage from said shaft, a clutch movable with said carriage, and through which said shaft operates said driving mechanism, a latch and connections for holding said clutch in one operative position, a spring or its equivalent upon said carriage, and connections through which it acts upon said clutch to reverse it, a rising and falling tension-bar connected with said latch for withdrawing it, and stops for retracting said spring or its equivalent at the termination of the inward movement of the carriage, and for moving the clutch into engagement with the latch, substantially as herein described.

4. The combination of the fabric-frame B, needle-carriage C, gearing C^3, wheels C^5 C^6, clutch c^3, lever D^2, latch c^4, lever c^6, spring-box d, tension-bar I, rock-shaft i', connections between the bar I and shaft i', and rotary catch c^9, substantially as herein described.

5. The combination of the fabric-frame B, needle-carriage C, gearing C^3, wheels C^5 C^6, clutch c^3, lever D^2, latch c^4, lever c^6, spring c^7, hook c^8, spring-box d, tension-bar I, rock-shaft i', connections between the bar I and shaft i', and rotary catch c^9, substantially as herein described.

6. In an embroidery-machine, the combination, with a fabric-frame and a movable needle-carriage, of a continuously-rotating shaft, a stationary rack, driving mechanism upon said carriage, engaging with said rack for imparting motion to the carriage from said shaft, a clutch movable with said carriage, and through which said shaft operates said driving mechanism, a latch and connections upon said carriage for holding the clutch in one position, a spring or its equivalent and connections upon the carriage for reversing said clutch, and means for automatically withdrawing the latch to release the clutch, substantially as herein described.

7. In an embroidery-machine, the combination, with a fabric-frame and a movable needle-carriage, of a continuously-rotating shaft, a stationary rack, driving mechanism upon said carriage, engaging with the rack for imparting motion to said carriage from the shaft, a clutch movable with said carriage, and through which the shaft operates said driving mechanism, a latch and connections for holding the clutch in one position, a spring or its equivalent and connections upon the carriage for reversing the clutch, means for automatically withdrawing said latch, and stops for retracting the spring or its equivalent, and for returning the clutch into engagement with the latch at the termination of the inward movement of said carriage, substantially as herein described.

8. In an embroidery-machine, the combination, with a fabric-frame and needle-carriages movable toward and from the same, of two intermittently-rotating cams adapted to operate simultaneously, and to be connected with their operating mechanism by the inward movement of either carriage, devices through which one of said cams acts to connect either carriage with its driving mechanism for moving it outward, and devices through which the other of said cams acts to disconnect said cams from their operating mechanism, substantially as herein described.

9. In an embroidery-machine, the combination, with a fabric-frame and needle-carriages

movable toward and from the same, of the intermittently-rotating sleeve comprising the cams e^4 and f^2, a stop for arresting the movement of said sleeve, and devices adapted to be acted upon by either carriage in its inward movement for connecting said sleeve with its operating mechanism and for removing said stop, substantially as herein described.

10. The combination, with the fabric-frame B and needle-carriages C, of the continuously-rotating shaft D, the racks c', the driving mechanism and clutches movable with said carriages, the clutch-levers D^2 for reversing the driving mechanism of said carriages, an intermittently-rotating cam adapted to be connected with its operating mechanism by either carriage in its inward movement, and devices through which said cam acts upon said clutch-levers for connecting either carriage with its driving mechanism for moving it outward, substantially as herein described.

11. The combination, with the fabric-frame B and carriages C, of the clutch-lever e^3, the intermittently-rotating cam or cams f^2, the trips h h', adapted to be operated by said carriages to act upon said lever, and the bar G^3 for throwing said trips off said lever, substantially as herein described.

JULIUS JONSON.

Witnesses:
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HENRY T. BROWN.