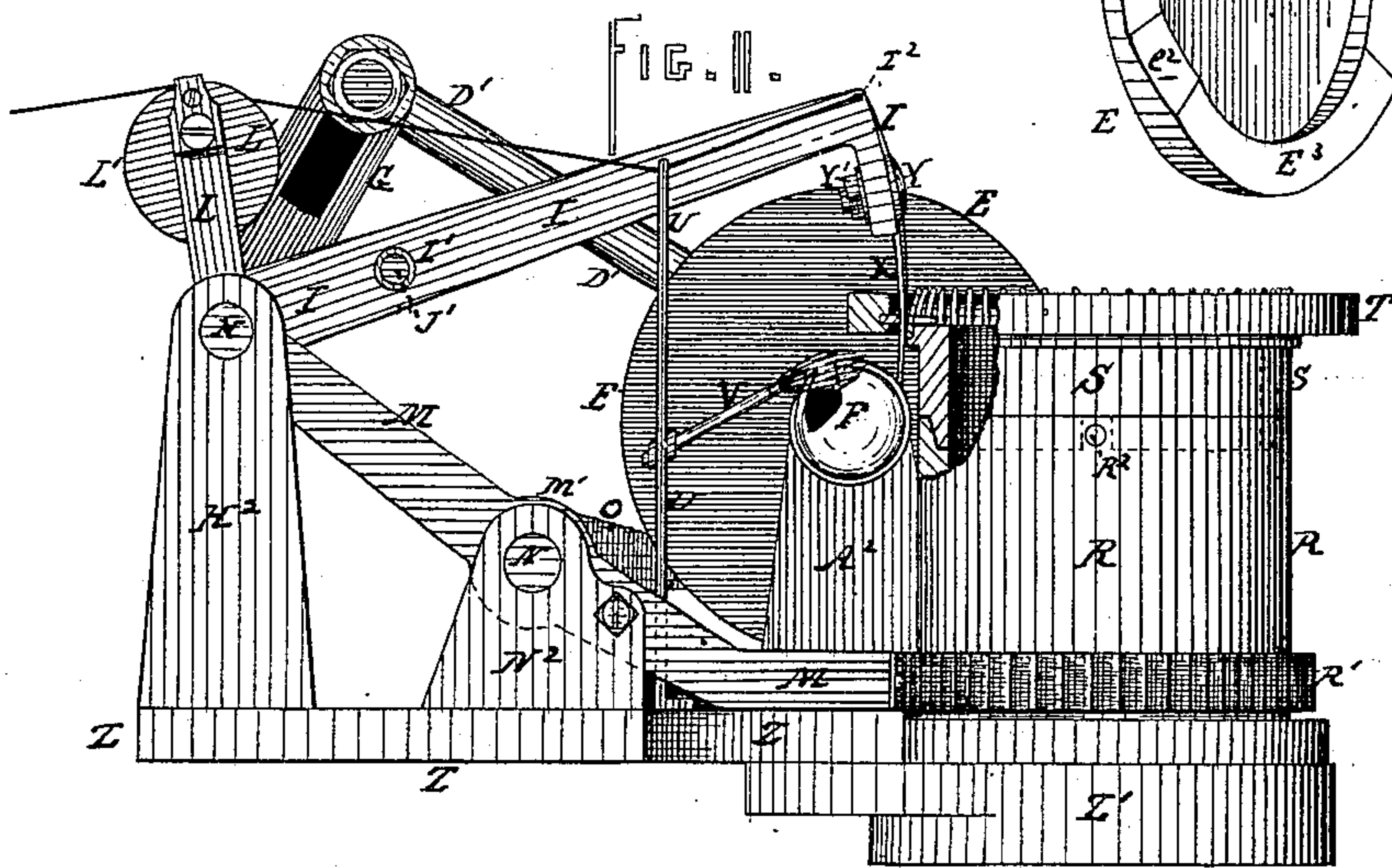
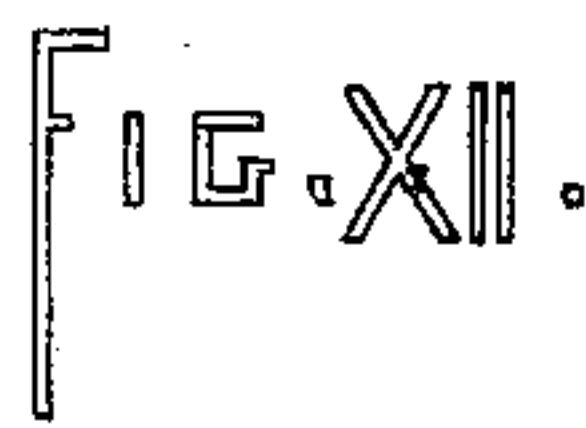


2 Sheets—Sheet 1.

MACHINE FOR UNITING LOOPED FABRICS.

No. 300,760.

Patented June 24, 1884.



Witnesses:
Albat E. Guchard
Orto F. Guchard

Inventor
John R. Bridges

(No Model.)

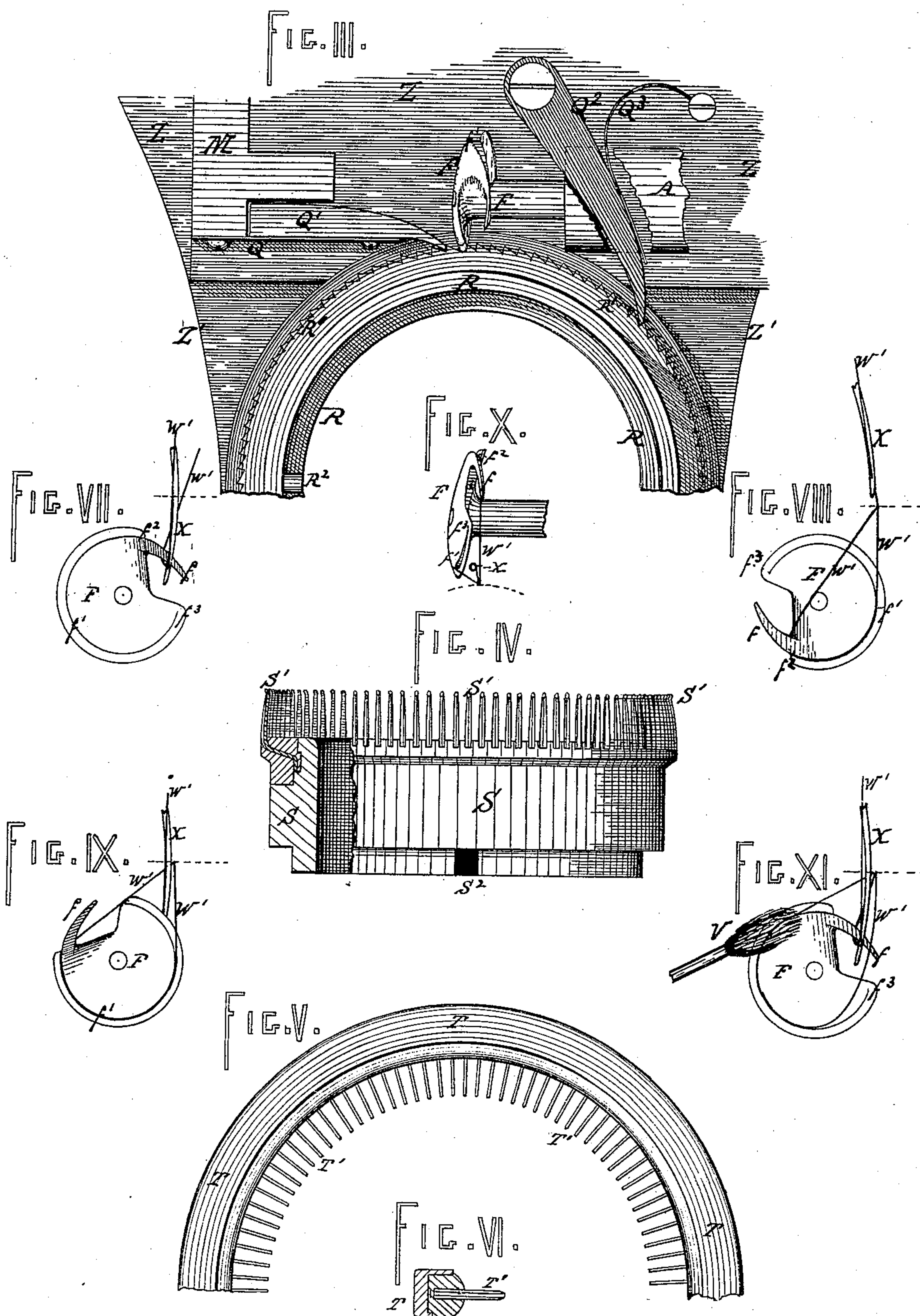
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J. R. BRIDGES.

MACHINE FOR UNITING LOOPED FABRICS.

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UNITED STATES PATENT OFFICE.

JOHN R. BRIDGES, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR UNITING LOOPED FABRICS.

SPECIFICATION forming part of Letters Patent No. 300,760, dated June 24, 1884.

Application filed August 29, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. BRIDGES, of the city and county of Philadelphia, State of Pennsylvania, have made certain new and useful Improvements in Machines for Uniting Looped Fabrics, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part hereof.

My improvements, which relate more particularly to machines for joining "tops" to socks, "bottoms" to drawers, "cuffs" to undershirts, and adapted to operate upon small circular or tubular work generally, consist, first, in the combination, with the thread-needle and web-cylinder provided with impaling-points, of mechanism to conjointly impart to said needle a lateral and to said cylinder an intermittent rotary movement, as hereinafter described, whereby said needle is caused to follow and its point held or preserved in a line with the loops upon the contiguous impaling-point of said cylinder, as said needle is being actuated to penetrate and passes through said loops, means for actuating the needle to so penetrate said loops, and means for coacting with said needle to form stitches; secondly, in the combination of the thread-needle, a rotating web-cylinder provided with vertically-set projecting impaling-points, mechanism to actuate said needle in the direction of its length, and means for coacting therewith to form stitches, said cylinder being detachable and interchangeable with other cylinders, substantially as and for the purposes hereinafter set forth; and, lastly, in the combination, with the thread-needle, a web-cylinder provided with vertically-set projecting impaling-points, mechanism to actuate the needle in the direction of its length, mechanism to actuate said web-cylinder, and means for coacting with the needle to form stitches, of a ring provided with loop-lengthening pins, all constructed and arranged substantially as shown, and as hereinafter set forth.

To enable others skilled in the construction and operation of machines of the class referred to to practically apply my improvements, I will now proceed to describe the same in detail.

In the drawings, Figure I is a top view of

a machine containing my improvements. Fig. II is an end elevation of the same, with the web-cylinder and loop-extending ring partly broken to show the relation of the parts to better advantage. Fig. III is a detached top view of a portion of the bed-plate and bed-ring, showing the springs and pawls for actuating and holding the web-cylinder. Fig. IV is a broken elevation of the detachable portion of the web-cylinder, showing the manner in which the impaling-points are secured thereto. Fig. V is a detached top view of a segment of the loop-extending ring. Fig. VI is a sectional view of said ring. Figs. VII, VIII, IX, X, and XI are a top and side views of the rotary hook, showing the manner in which the thread is manipulated in the formation of a uniting-loop. Fig. XII is a detached perspective of the cam-wheel, showing particularly the actuating-face thereof.

A is the hook-shaft, mounted in the bearings A' A². B is a hand-crank secured to said shaft, which also carries the tight and loose pulleys C C', respectively, whereby the machine may be actuated or the operation thereof suspended at will. Also mounted upon shaft A is the eccentric D, and secured thereon the cam-wheel E and (Figs. II and III) rotary hook F. From the periphery of eccentric D extends a connecting-rod, D', which at its other end is pivoted to the crank G, which in turn is rigidly secured to the needle-arm shaft H, said shaft H being supported in bearings H' H². Upon the last-mentioned shaft is mounted loosely the needle-arm I, and also fixedly secured thereto is the needle-arm-vibrating crank J, pin J' of which passes through eye I' of said needle-arm. Around the hub of the last-mentioned arm is coiled a spring, K, the object of which will hereinafter be explained. Free to slide along said shaft H are also tension arm and wheel L L' and cross-head M, through a second hub, M', of which passes shaft N, the latter being supported by bearings N' and N². To said shaft N is rigidly secured an arm, O, that is caused to bear against the cam edge or face of wheel E by the tension of a spring, P, coiled around said shaft between bearing N' and cross-head M. Said cross-head, while loosely passing over or mounted upon shaft H, is fixedly secured to

shaft N, so that by the to-and-fro movements imparted to said shaft by the action of the cam-faces of wheel E upon bearing-arm O and the tension of spring P a lateral reciprocating movement is communicated to said cross-head M, and thereby, in conjunction with the tension of spring K, to tension and needle arms L I.

To the foot of cross-head M is secured a spring, Q, carrying a pawl, Q', that is caused to engage with the ratchet-teeth R', and thereby actuate the web-cylinder R S by the above-described reciprocating movements of said cross-head. Q' is a holding or restraining pawl, caused to engage with the teeth R' by tension of hair-spring Q', said pawl and spring being pivoted and secured, respectively, to the bed-plate Z of the machine, as shown. Web-cylinder R S is mounted upon the bed-ring Z', which is bolted or otherwise secured to bed-plate Z. The lower portion, R, of said cylinder is provided with the ratchet-teeth R', before referred to, and upon the upper inner periphery of said portion is located a pin, R', which is designed to engage with the recess S' of the detachable portion S of the cylinder, and thus lock the parts together in their proper relative positions. To said upper portion, S, are secured or soldered in the usual manner a series of impaling-points, S'.

T, Figs. I and V, is a ring provided with a series of loop-lengthening pins, T', corresponding in number with the impaling-points S' of the web-cylinder, said ring T when in position circumscribing said cylinder, and the pins T' projecting between the impaling-points S', there being sufficient space between the inner periphery of said ring and the outer periphery of said cylinder to permit the unobstructed passage of the needle as the latter is vibrated, as shown in Figs. I and II.

U is an ordinary thread-guide, to which is secured a brush, V, substantially in the manner indicated in the last-mentioned figures, the purpose of which brush will hereinafter be explained.

W is an adjustable screw for regulating the length of the throw of cross-head M, to the end that said throw may accord with the number and size of the teeth R' upon the periphery of the web-cylinder, the number of said teeth being equal to the number of impaling-points, so that for every tooth the said cylinder is moved a point S' is brought in position under the needle, the special object or purpose of said screw W being to meet any change that may be made in the number of such points, and consequently of the ratchet-teeth, and to adjust the length of the throw of the cross-head M and pawl Q' accordingly.

X is the needle, passing through a screw-threaded button, Y, which in turn passes through and is secured in position upon the downwardly-projecting portion of needle-arm I by a nut, Y', as shown in Fig. II.

W' is the thread, which is run from the or-

dinary spool or bobbin over tension-wheel L', through thread-guide U, thence through the eye I' of the needle-arm, and, finally, through the eye of needle X, as also shown.

The superiority of the machine thus constructed results from the increased speed at which it may be actuated in practice when run with power. I have caused the shaft A, and consequently the attached rotary hook F, Figs. I and III, to make between five hundred and six hundred revolutions per minute. Heretofore the web plate or cylinder has formed a fixed and inseparable part of machines in general use, the work being set up upon the impaling-points during the continued operation of the machine, said plate or cylinder, however, being actuated at a slow speed to admit of such setting up. I construct a number of rings or detachable portions, S, of my web-cylinder all precisely similar, each provided with a series of impaling-points equal in number to the loops in a single course of the fabrics to be united, and thus a number of hands are kept constantly employed in setting up work exclusively to meet and accommodate the extremely high speed at which my machine is run.

The fabrics upon which the machine is to operate—say a top and sock—are each provided with the usual slack course of loops at the point at which they are to be united, and said fabrics set up upon the detachable ring or portion S of my web-cylinder substantially in the same manner as knitted work is set up upon other looping-machines, (there being an impaling-point S' for every loop through which the needle X is to be passed,) the body of each of said fabrics depending upon the interior of said ring S and the outer or extraneous portion or edges thereof, raveled down to such loose or slack course of loops through which the said impaling-points S' project. As before stated, to accommodate the speed at which my machine is run I employ a number of hands, usually small girls, in thus setting up the fabrics upon said rings S. The operator of the machine then takes one of such rings, with the work thus set up thereon, and places over the same a ring, T, Figs. I, II, and V, which is provided with a series of loop-lengthening pins, T', corresponding in number with the impaling-points S', when in position said pins T' projecting between said points and resting upon the fabrics impaled thereon, (said pins T' being rigidly secured or soldered to ring T in any suitable manner.) Crank B is given a turn that, through eccentric D, rod D', and crank G, shaft H, and crank J, raises needle-arm I and needle X to the top of their vibrations, and actuates wheel E in such manner that by the tension of spring P arm O is caused to bear against the lower portion, E', Fig. XII of the cam-face thereof, forcing backward shaft N and cross-head M, and, with the latter, needle-arm I and pawl Q', until said cross-head comes in contact

with set-screw W, which of course has first been properly adjusted, and said pawl by the tension of its spring Q thus enabled and caused to engage with one of the ratchet-teeth R'.

5 A detachable ring or portion, S, with the work and loop-extending ring T thereon, is then placed upon the fixed portion R of the web-cylinder and locked thereon by pin R², engaging with slot or recess S², said pin R² and slot S² being so located upon said respective portions R
10 S with respect to the impaling-pins S' and needle X that when the said portions are thus locked a loop of the fabrics upon one of the said points S' is brought directly below and
15 in a line with the point of said needle. The operator then taking hold of the loose end of the thread W', crank B is given a few turns by hand, when the actuating-belt (not shown in the drawings) is shifted from loose pulley
20 C' to fixed pulley C, and the various parts of the machine actuated by power, which operation I shall presently describe in detail.

The cam-face of wheel E, Figs. I and XII, is divided into six sections—to wit, lower
25 portion or section, E', middle section, E², elevated section E³; the first rise, e, from said lower to said middle section, the second rise, e', from said middle to said elevated section E³; and the descent e² from said elevated to said
30 lower section, said first rise, e, being long and gradual, while the descent e² is steep and abrupt. Now, when the detachable ring or portion S of the web-cylinder is first mounted upon the fixed portion R, the cross-head M,
35 and consequently needle-arm I and pawl Q', will occupy their rearmost positions, and said pawl, by the tension of spring Q, thus enabled and caused to engage with a ratchet-tooth, R', the arm O, by the tension of spring P, Fig. I,
40 bearing upon the lower section, E', of the cam-face of wheel E, as before described. The operator, retaining hold of the loose end of the thread W', gives crank B a turn in the direction that will cause the first rise, e, of said cam-
45 face to slowly force the bearing-arm O forward, and with it shaft N and cross-head M, which movement being thence communicated to needle-arm I, which is thus actuated laterally, and through pawl Q' to the web-cylinder
50 R S, said needle will follow said cylinder, and thus hold or preserve the needle directly above the loops next to be united. Simultaneously as said first rise is thus brought to bear against said arm O, and the parts actuated, as just described, by the action of eccentric D, (resulting from the turn or revolution of crank B,) through rod D' and crank
55 G, shaft H and crank J are rocked and the downward stroke of its vibration imparted thereby to needle-arm I, and consequently to the attached needle X. In other words, needle-arm I receives simultaneously a forward lateral movement to accord with the intermittent movement of the web-cylinder and the
60 downward stroke of its vibratory movement, whereby the needle X is held or kept in po-

sition, with respect to the loops to be united, as it is being actuated to penetrate and passes through them. Now, the parts are so constructed and arranged that when the needle
70 shall thus have passed through the loops upon the contiguous impaling-pin, and neared the limit of its downward movement, the continued revolution of cam-wheel E will have caused the first rise, e, of its cam-face to force the
75 bearing-arm O forward to the middle section, E², whereby shaft N and cross-head M are held stationary, and the lateral movement of needle-arm I and needle X, and the rotary movement of the web-cylinder suspended for a short
80 period, during which the finger f of hook F will, as it (said hook) is rotated by the revolution of shaft A, penetrate and pass between said needle and that portion of the thread that projects from the eye of said needle,
85 and the end of which is still retained by the operator. At this point the revolution of crank B being continued through eccentric D, rod D', crank G, shaft H, and crank J, needle-arm I will be caused to begin the upward move-
90 ment of its vibration, and when the point of the needle shall thus have cleared the periphery of hook F the bearing-arm O will begin to mount the second rise, e', of the cam-face of
95 wheel E, and the forward movement of shaft N and cross-head M, the forward lateral movement of the needle-arm, and the intermittent movement of the web-cylinder resumed as the before-mentioned upward movement of the
100 needle is continued until said bearing-arm O shall have reached the summit of the rise e', when the forward throw of shaft N and cross-head M will have been completed. Said arm
105 O bearing then upon the elevated section E³ of the cam-face of wheel E, said shaft and cross-head will remain at rest, as will also the web-cylinder R S, and the forward lateral movement of the needle-arm I also concluded. By
110 the continued revolution of shaft A the said needle-arm will near the limit of its upward stroke or movement as section E³ of the cam-face passes the bearing-arm O, which, by the
115 tension of spring P, is carried down the abrupt incline e² to the lower section, E'. Said spring P being thus enabled to draw arm O backward and cause it to bear against said
120 lower section, E', obviously a corresponding backward movement is necessarily thereby imparted to shaft N and cross-head M, which latter is thus again brought into contact with ad-
125 justing or regulating screw W, and pawl Q', by the tension of its spring Q, enabled and caused to engage with a second ratchet-tooth R' of the web-cylinder, needle-arm I being caused to follow such backward movement of
130 cross-head M by the tension of spring K. While the parts are being thus actuated, hook F is being rotated by the continuous revolution of shaft A. Figs. VII, VIII, IX, X, and XI show the manner in which the thread is
135 manipulated in the course of a complete rotation of said hook. Fig. VII shows the finger

f as having passed between the thread and the needle, the latter being about to begin its upward movement, and the lateral movement thereof having been suspended, as before described. Fig. VIII shows the relative position of the hook and thread as the needle reaches the limit of said upward movement, said hook in the course of its rotation to this point having drawn upon the thread still retained by the operator and wound the same around its screw-shaped periphery. Now, the needle-arm I reaches the limit of its upward stroke after bearing-arm O is drawn by the tension of spring P to the lower section, E', of the cam-face of wheel E, as before described, and begins its second descent or downward stroke just before bearing-arm O begins to mount first rise, *e*. The revolution of crank B being continued, said bearing-arm is caused to mount said rise *e*, and thus impart the second forward movement to shaft N, cross-head M, and pawl Q', and a second forward lateral movement to needle-arm I as the downward movement of the latter is continued, and a second intermittent rotary movement to the web-cylinder, whereby the needle is again held and preserved in a line with the loops upon the second impaling-point to be united as it (said needle) is being actuated to penetrate and passes through them. Fig. IX shows the position of the hook F as the needle nears the limit of its said second downward stroke or movement, while Fig. X, being a corresponding top view, shows the manner in which the thread encircling said hook is opened by the screw-shaped periphery to afford a free and unobstructed entrance for said needle. Fig. XI shows the finger *f* a second time penetrating and passing between the needle and that portion of the thread that was carried by the needle upon the previous backward throw of shaft N and cross-head M over an extending-pin T', that lay upon the fabrics to be united between the two impaling-points S' down the grooves of which the said needle has thus far passed, and the end of which portion of said thread is still retained by the operator. Now, before needle X in its last downward movement shall have reached the periphery of hook F, bearing-arm O, by the continued revolution of wheel E, will have been forced up to the middle section, E², of the cam-face thereof, and rotary movement of the web-cylinder and the forward lateral movement of the needle and needle-arm simultaneously suspended. The said downward movement of the needle being continued, the finger *f*, by the rotation of hook F, is enabled and caused to penetrate and pass between said needle and the projecting thread, as before described, and shown in Fig. XI, just previous to the upward movement of the needle being begun. The shoulder *f'* of the hook, Figs. III and X, at the point *f*² is broad and grooved, but narrows gradually, and dwindles finally to *nil* at the point *f*³. The result of this construction is,

that when for the first time the finger *f* passes between the needle and thread, as before described, said thread, as hook F is rotated, lies in the groove of said shoulder *f'*, and is wound around and held thereon until said finger *f* a second time, upon the before-described second descent of the needle, passes between the latter and the projecting portion of thread, when, said needle having begun its upward stroke, and the finger *f* drawing upon said thread, as shown in Fig. XI, the loop thus formed will begin to slip from said shoulder at the point *f*³, though still upheld against the face of the hook by the pressure of brush V, and thus prevented dropping in front of said finger *f* and being caught thereby, until the hook in its continued rotation, drawing upon the thread as before, finally closes it (said loop) up under the edges of the fabrics thereby united. The revolution of crank B is continued by hand and the end of the thread retained by the operator until, a number of uniting-loops having been formed by the co-operation of the needle and hook F in the manipulation of the thread, as before described, and all danger of said end being pulled through the fabrics by the drawing propensity of said hook obviated, an actuating-belt from the driving shaft or pulley may be shifted from loose pulley C', over which it would until now have passed, to fixed pulley C, and the operation of the machine continued by power, the needle, as before, at each downward pass carrying the thread over, and thus inclosing one of the loop-lengthening pins T'. The edges of the fabrics having thus been united by a complete rotation of the web-cylinder, the belt is shifted onto loose pulley C', and the operation of the machine thus suspended. Crank B is given a turn, that elevates the needle to admit, upon the severance of the uniting-thread, of the removal of the ring or detachable portion S of the web-cylinder with the fabrics thereon impaled, and loop-extending ring T. The latter and said fabrics are next raised from said detachable portion S, and the fabrics in turn are drawn from the pins T', inclosed by the uniting-thread, as hereinbefore described. The said ring T is then placed in position upon a second ring or detachable portion S of the web-cylinder, upon the impaling-points of which work has been set up, and said ring S mounted and locked upon the lower fixed portion, R. Crank B is actuated by hand for a few passes of the needle, during which the operator retains the end of the uniting-thread, when the actuating-belt is shifted onto the fixed pulley C, and the machine thus run by power, as hereinbefore set forth.

My improvements are especially designed, as before stated, to be applied to machines for uniting the edges of knit fabrics, which fabrics as is well known, are of an elastic or springy nature. The purpose of ring T, with its pins T', is to endow the uniting-loops with a fixed certain uniform degree of slackness, rendering

them susceptible of distention with the said fabrics, the tension-wheel L' in my machine being employed merely to give the thread a nominal degree of tautness. Furthermore, it will be
 5 evident that the slackness of the said loop may be varied by varying the size of said pins, while, on the contrary, said ring and pins T T' might be dispensed with and the character of
 10 said loops regulated by said tension-wheel in the ordinary manner; but because of its liability to disarrangement and of its being within the control of the operator and subject to his capricious judgment, as before stated, I employ said wheel L' merely to impart to the
 15 thread a nominal degree of tautness, and regulate the slackness or elasticity of the uniting-loops by the extending pins T' alone.

I am aware that the uniting-loops have heretofore been slackened by distending or stretching the fabrics to their farthest extent, and uniting or joining them while in that condition; but the objection to this method is that the
 20 extending or distention renders it almost impossible to distinguish the slack course of loops, and consequently the work of "setting up" extremely difficult.

I am also aware that machines have been heretofore constructed with detachable web-holders provided with radially-projecting impaling-points. Such an arrangement of points
 30 in machines designed to unite small circular or tubular work—such as tops to socks, cuffs to shirts, and bottoms to drawers—by reason of the excessive stretching to which the fabrics are subjected in setting up, renders it very difficult to distinguish the slack course of stitches
 35 usually provided to facilitate this work, while the removal of the united fabrics upon the conclusion of the stitching operation is obviously equally as difficult, if not more so. In
 40 my machine, however, the vertically-set projecting points may be set so close together as to make the diameter of such ring of points no greater than that of the fabrics as they come
 45 from the knitting-machine, so that the slack course may be clearly distinguished, rendering

it possible to set up the work without previous skill, thus lessening the cost of such work and enabling the operator to soon become expert in this usually difficult operation, especially when work of very fine gage is concerned, while the removal of the united fabrics is merely the work of raising them from the points.

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

1. The combination, with the thread-needle and web-cylinder provided with impaling-points, of mechanism to conjointly impart to
 60 said needle a lateral and to said cylinder an intermittent rotary movement, as described, whereby said needle is caused to follow and its point thus held or preserved in a line with the loops upon the contiguous impaling-point of
 65 said cylinder as said needle is being actuated to penetrate and passes through said loops, means for actuating the needle to so penetrate said loops, and means for coacting with said
 70 needle to form stitches, substantially as set forth.

2. The combination of the thread-needle, a rotating web-cylinder having vertically-set projecting impaling-points, mechanism to
 75 actuate said needle in the direction of its length, and means for coacting therewith to form stitches, said cylinder being detachable, substantially as shown, and for the purposes set forth.

3. The combination of the thread-needle, a web-cylinder provided with impaling-points, and a ring, T, having pins T', mechanism to
 80 actuate said web-cylinder, mechanism to actuate the needle in the direction of its length, and means for coacting with said needle to
 85 form stitches, all substantially as shown, and for the purposes set forth.

JOHN R. BRIDGES.

Witnesses:

JOHN FITZPATRICK,

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