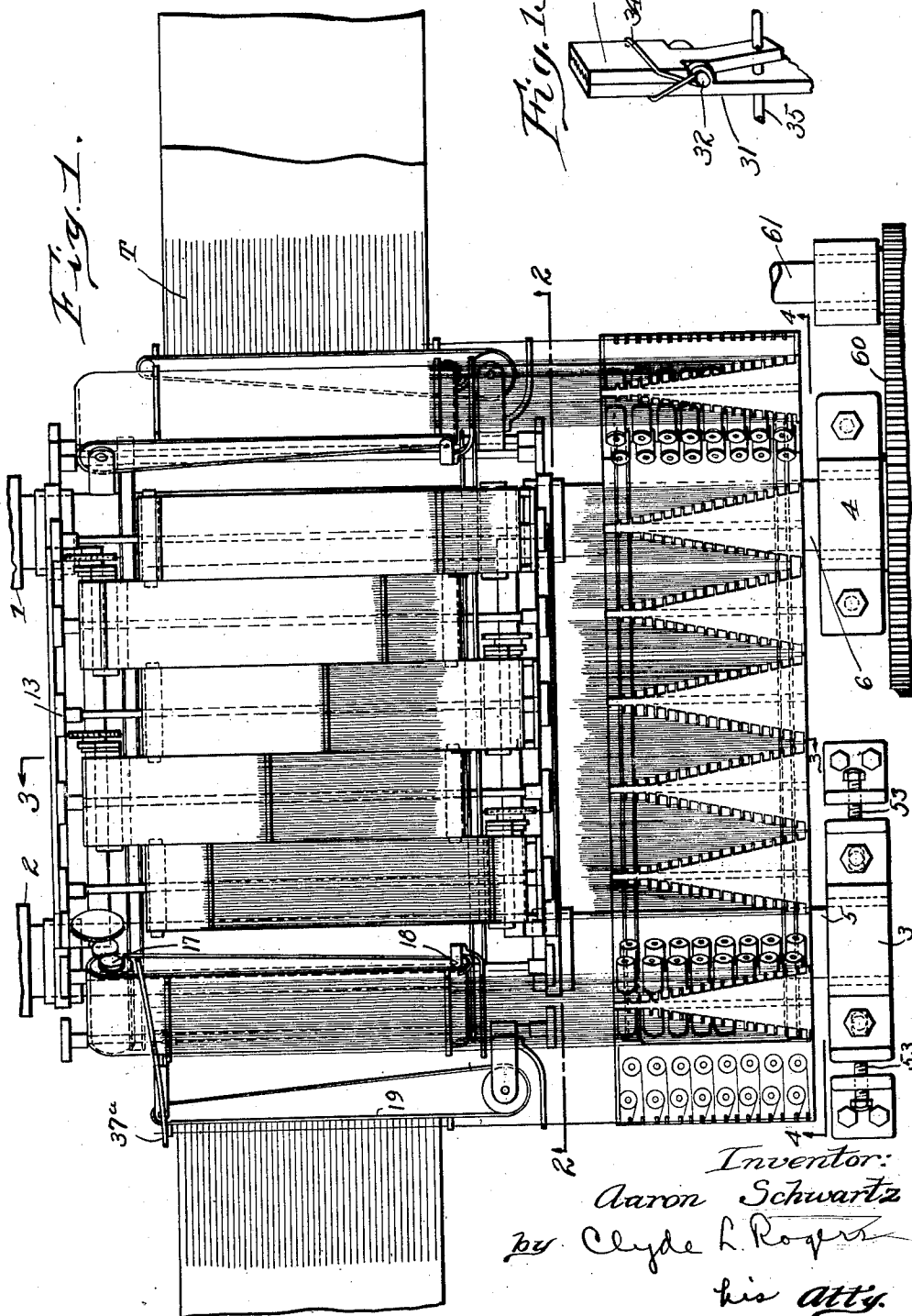


1,383,243.

A. SCHWARTZ.
PAPER REINFORCING MACHINE.
APPLICATION FILED AUG. 6, 1918.

Patented June 28, 1921.

5 SHEETS—SHEET 1.



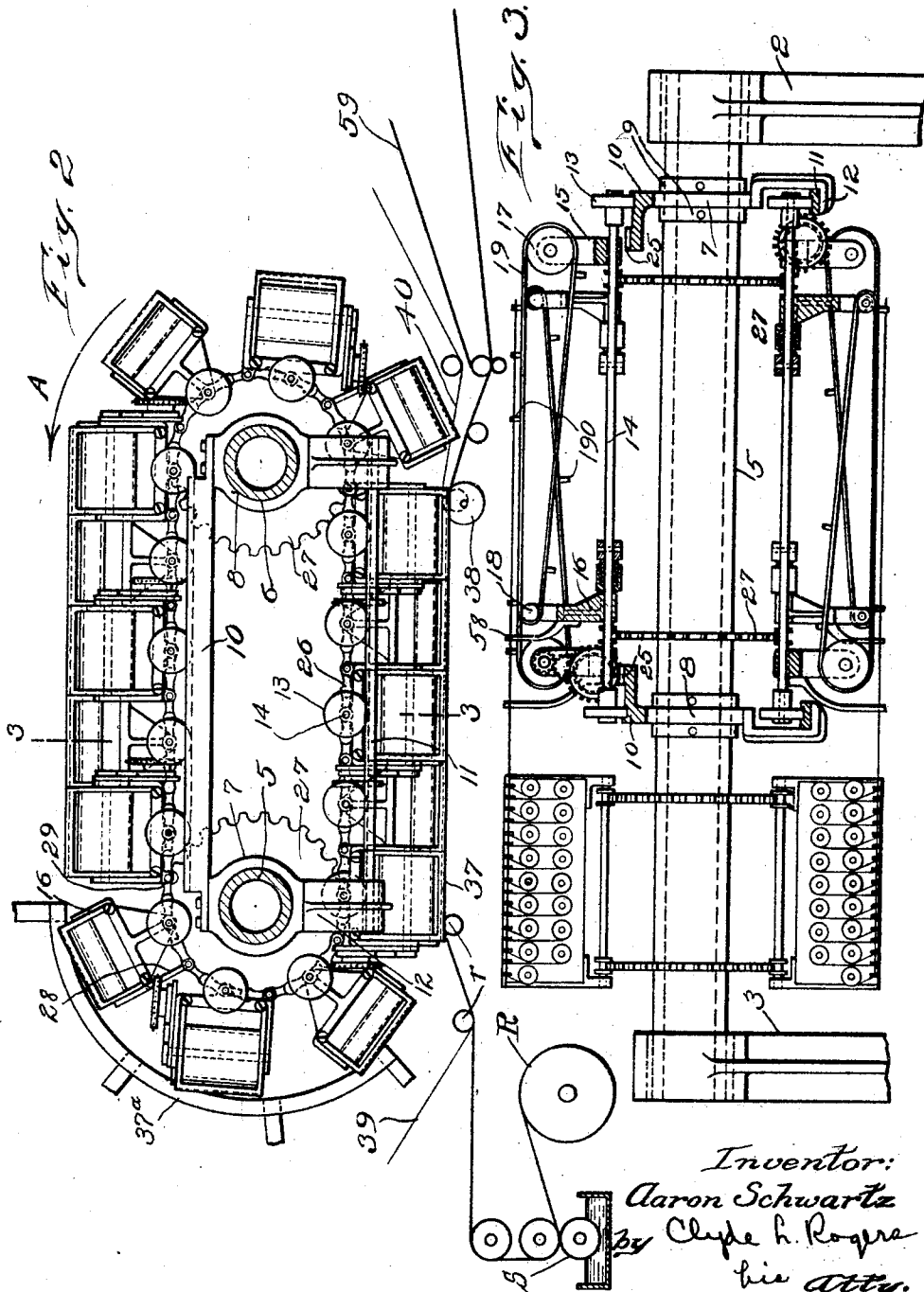
Inventor:
Aaron Schwartz
by Clyde L. Rogers
his atty.

1,383,243.

A. SCHWARTZ.
PAPER REINFORCING MACHINE.
APPLICATION FILED AUG. 6, 1918.

Patented June 28, 1921.

5 SHEETS—SHEET 2.

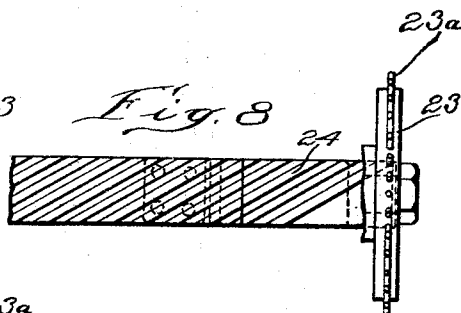
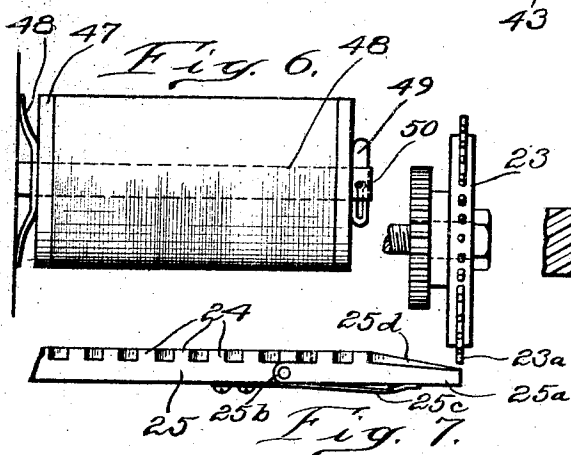
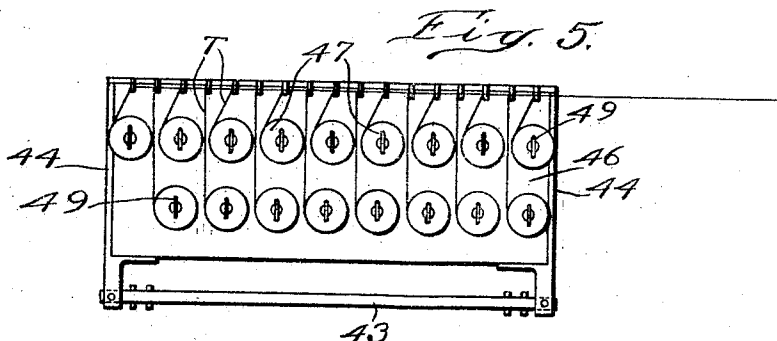
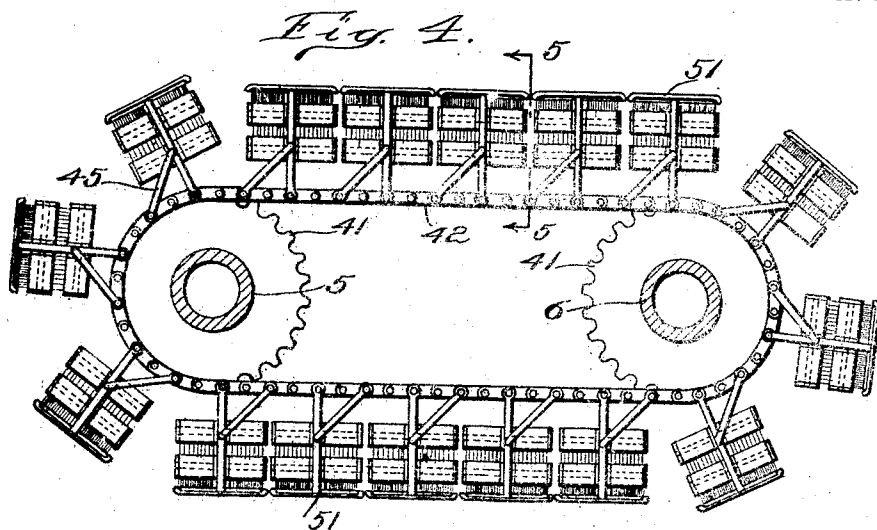


1,383,243.

A. SCHWARTZ.
PAPER REINFORCING MACHINE.
APPLICATION FILED AUG. 6, 1918.

Patented June 28, 1921.

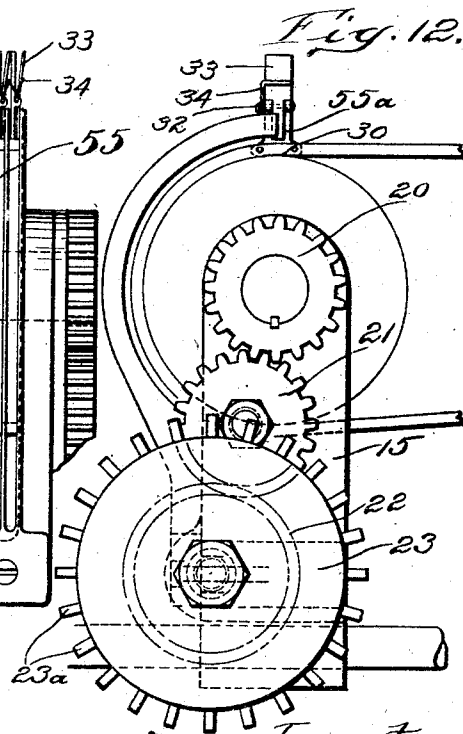
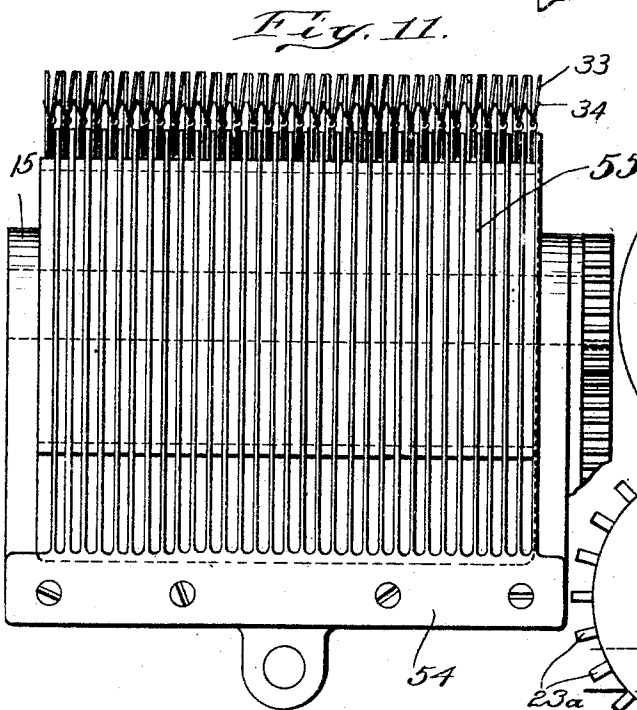
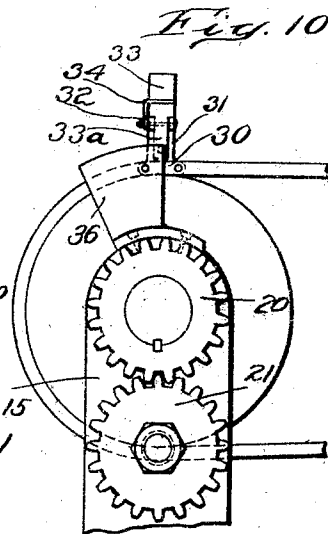
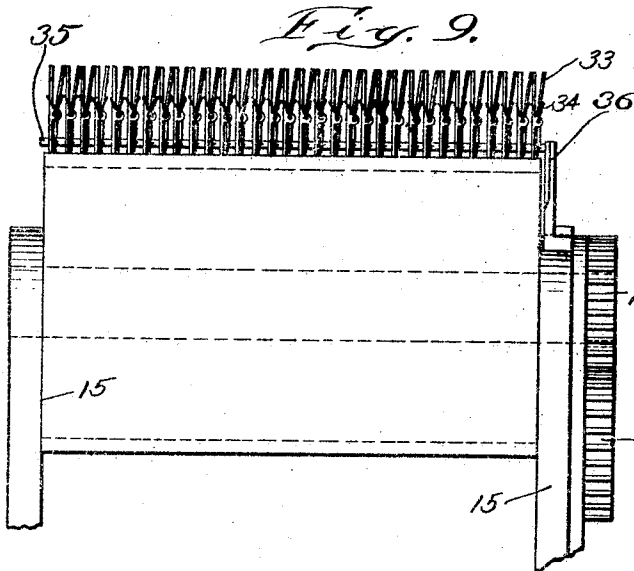
5 SHEETS—SHEET 3.



Inventor:
Aaron Schwartz
by Clyde L. Rogers
his atty.

1,383,243.

Patented June 28, 1921.
5 SHEETS—SHEET 4.



Inventor:
Aaron Schwartz
by Clyde L. Rogers
his atty.

1,383,243.

A. SCHWARTZ.
PAPER REINFORCING MACHINE.
APPLICATION FILED AUG. 6, 1918.

Patented June 28, 1921.
5 SHEETS—SHEET 5.

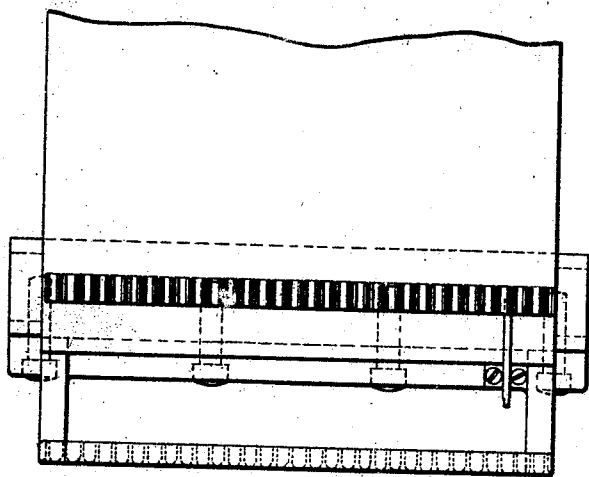


Fig. 14.

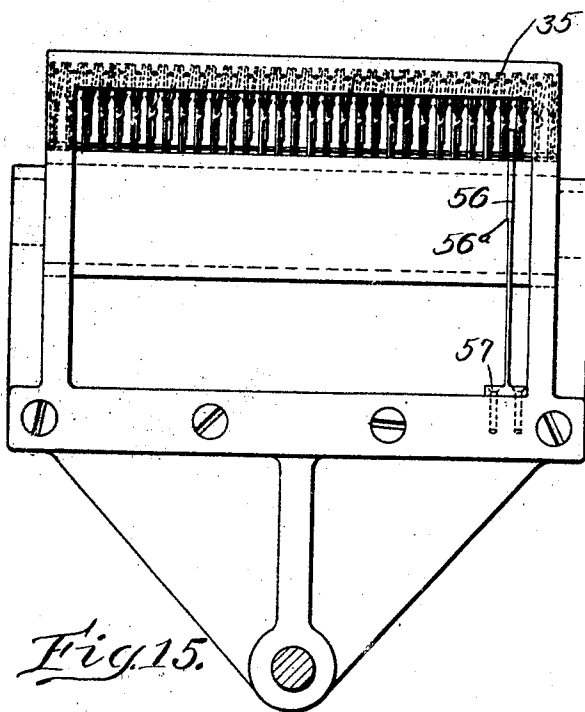


Fig. 15.

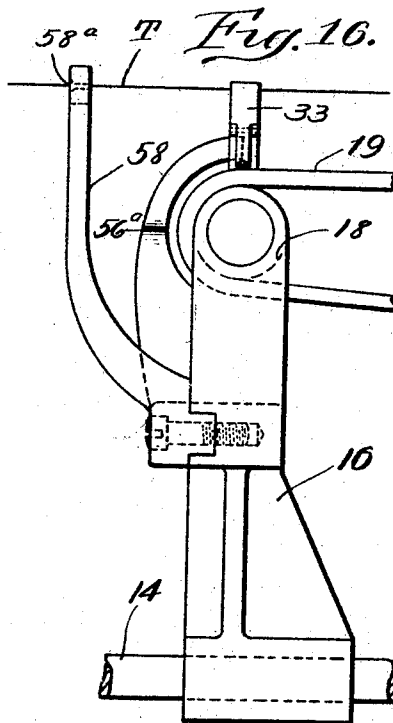


Fig. 16.

Inventor:
Aaron Schwartz
by Clyde L. Rogers
his Atty.

UNITED STATES PATENT OFFICE.

AARON SCHWARTZ, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO SAFEPAK MILLS, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

PAPER-REINFORCING MACHINE.

1,383,243.

Specification of Letters Patent.

Patented June 28, 1921.

Application filed August 6, 1918. Serial No. 248,640.

To all whom it may concern:

Be it known that I, AARON SCHWARTZ, a citizen of the United States, and resident of Brookline, county of Norfolk, Commonwealth of Massachusetts, have invented an Improvement in Paper-Reinforcing Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts in each of the several views.

This invention relates to apparatus for laying threads or filaments of textile or metallic wire upon the surface of a paper or like web which has been previously treated with adhesive which may be a waterproofing pitch or like coating. More particularly the invention has to do with improved mechanism for applying transverse threads or filaments to an adhesive coated web as the web is moved continuously forward and with a capability of relatively high speed operation. In accordance with my invention transverse threads may be applied with any desired spacing and as close together as may be desired these threads running straight across the web and at right angles to the lengthwise threads or filaments which may be deposited by any suitable or usual means with which the invention is not directly concerned. A prime object of the invention is to provide a relatively simple and compact mechanism that while capable of coöperative action to lay the transverse threads with the required spacing on a paper web moving at a relatively high rate of speed, still requires no high speed of movement in any part of the mechanism itself, the invention for this purpose including improved means whereby the longest possible interval is allowed for the drawing of the threads into position across the paper web, and likewise a maximum interval during which the threads are pressed and held taut against the coated surface so as to be properly laid and impressed in the hot pitch or like coating. To this end I provide a series of uni-directional moving members equipped to draw threads or filaments transversely of the paper web while out of operative alinement with respect thereto, and having a range of movement lengthwise of the paper web and inwardly with respect thereto to deposit the threads upon the coated surface and hold them in engagement therewith for the required

interval. The foregoing and other objects and advantages of the invention will more fully appear from the following detailed description, and the distinctive features of novelty will be pointed out in the appended claims.

Referring to the drawings:

Figure 1 is a plan view showing an apparatus constructed in accordance with my invention;

Fig. 2 is a lengthwise vertical section on line 2—2 of Fig. 1;

Fig. 3 is a transverse vertical section on line 3—3 of Fig. 1;

Fig. 4 is a lengthwise vertical section on line 4—4 of Fig. 1;

Fig. 5 is an enlarged transverse vertical section on line 5—5 of Fig. 4;

Fig. 6 is a further enlarged detail elevation illustrating the mounting of a thread supply spool;

Fig. 7 is a fragmentary detail showing a portion of the means for operating the thread drawing elements;

Fig. 8 is a plan view of the parts shown in Fig. 7;

Fig. 9 is an enlarged detail side view with parts broken away showing an end of one of the thread drawing elements;

Fig. 10 shows an end view of the thread drawing element of Fig. 9;

Fig. 11 is a side elevation corresponding to Fig. 9 but showing a modified form;

Fig. 12 is an end view of the device of Fig. 11 but showing some little more of the operating means;

Fig. 13 is a detail view of one of the thread gripping members.

Fig. 14 is a partial plan view showing a means of controlling the thread drawing elements associated with the idle rolls;

Fig. 15 is an end view thereof; and

Fig. 16 is a side view thereof.

Upon a suitable base or floor upright journal posts 1, 2, 3, 4 are mounted, these being equipped with journal bearings for spaced apart shafts 5, 6 which are horizontally mounted in parallel relation. These shafts which require to be strong and substantial since they support the working frame of the machine as later described, are shown as of substantial diameter and hollow so as to obtain greater stiffness and strength. These shafts have journaled thereon and support, pairs of yoke brackets 7, 8, the pair of brack-

ets 7 is located adjacent one end of the shafts 5, 6 while the other pair of brackets 8 is spaced therefrom toward the other end of said shafts a distance somewhat greater than the width of the paper web on which the threads are to be laid. These yoke brackets are held in this position by suitable collars 9 fixed on the shafts at each side of the yokes of these brackets which encircle and fit on the shafts. The pairs of yoke brackets 7, 8 of each pair are secured together by having top rails 10 bolted or otherwise secured thereto and also having bottom rails 11 also secured thereto some little distance beneath the brackets being shown as formed with offset portions constituting seats 12 to receive the lower rails 11. The yoke brackets 7, 8 and the pairs of upper and lower rails 10, 11 thus mounted on the shafts 5, 6 constitute a working frame or support on which the operative parts of the machine are mounted and guided for operation. The upper and lower rails 10, 11 are each formed with track ways adapted to receive and guide rolls 13 journaled at the ends of stationary shafts or axle rods 14 on each of which shafts is mounted one of the units of the mechanism which draws the threads transversely of the paper web. Each of these thread drawing units consists in journal posts 15, 16 fixed to the axle rods 14 adjacent the ends thereof. These journal posts are equipped with bearings for rolls 17, 18 on which is mounted a belt 19, these belts bearing the thread gripping jaws or fingers to be later described. One of these rolls, shown as the roll 17, is larger than the other and is equipped with means to receive driving impulse so as to operate the belt 19. For thus driving the several rolls 17 each of them has on its shaft and rigid therewith a gear pinion 20 in mesh with another gear pinion 21 on a stub shaft carried by the post 15 and in turn driven by another pinion 22 which is rigid with a pin wheel 23 or like gear element journaled at the base of the post 15. The pins 23^a of the pin wheel 23 during the period that the thread drawing units are being moved along the upper rails 10, engage with the teeth 24 of an inclined toothed rack 25 which is carried on the rails 10 and shown as integral therewith and produced on an inwardly extending flange thereof, though this showing is merely illustrative. Since it is requisite that the thread drawing units be disposed closely adjacent one another so that there will be no break in the series of threads, I preferably arrange the driving connections for alternate units at opposite sides of the machine as shown so as to allow the necessary room for the pin wheels 23 and the driving train therefrom. This necessitates the provision of one of the racks 25 on the rails 10 at both sides of the machine so that one thereof will be in position to engage and drive the series of pin wheels of each of the two oppositely arranged series of units. In carrying out this opposite disposition of alternate units the small idle rolls 18 may be mounted on their posts 16 just within the adjacent driving roll 17 of the adjacent belt and so as to be out of the way of the described driving connections thereto. For advancing the thread drawing and holding units, the axle rods 14 thereof are connected together by sprocket chains 26 at the two sides of the machine, these sprocket chains being mounted on sprocket wheels 27 fixed on the shafts 5, 6. Thus the series of thread drawing and laying units comprised by the belts 19 with their thread gripping fingers, are given a continuous uni-directional movement, one portion of which is in a straight path as guided by the rails 10 when these units are elevated from and away from the paper, and during which time the transverse threads are drawn out transversely across the paper web, and another portion of which movement is also in a straight path as guided by the lower rails 11, during which time the transversely drawn threads are pressed into contact with the coated sheet and moved along therewith for the requisite interval until they are cut off by suitable severing devices to be described. For holding the journal posts 15, 16 steady with respect to the sprocket chains 26 which advance them, suitable means shown as links 28 associated with the posts 16 and ears 29 associated with the post 15 may be provided to tie the sides of these yoke posts to the chains and prevent angular displacement thereof about the rods 14. For insuring proper coöperative engagement of the pins 23^a of the pin wheels 23 with the inclined teeth of rack 24 as each pin wheel comes into engagement with the advance end of said rack I preferably provide said rack with a downwardly yielding forward extremity 25^a pivoted at 25^b to the body of the rack and normally pressed upward into an operative plane by a leaf spring 25^c engaging thereunder. The teeth at this extremity are beveled off as seen at 25^d so that should a pin 23^a come initially against an end of a tooth instead of against a side thereof, said extremity may yield downward and thus avoid damage, until the continued forward movement of the pin wheel locates the pin within the inclined groove between the teeth whereupon the turning movement thus initiated in the pin wheel will insure coöperative engagement thereof with the succeeding inclined teeth.

The belts 19 as shown are of substantial width and each end is equipped with means to grip and draw over a considerable number of threads or filaments, the number handled by each belt of course depending on the spacing apart desired in the threads to be laid,

and as shown each belt having means for gripping and drawing thirty-two threads. As thread gripping and drawing means I provide each belt with rows or series of thread gripping jaws 190 extending there-
 5 across, these series of jaws being spaced apart a distance a little greater than the width of the paper web to be handled so that when the belts with their grippers
 10 are stationary as they are in their passage along the lower stretch of their circuit, the threads are held taut between these grip-
 15 ping jaws during the time they are pressed against the coated paper surface and until they are cut off. The length of the belts
 19 is so proportioned with reference to the width of the paper web to be handled and the distance between the rows of gripping
 20 jaws that the length of the entire belt will be an exact multiple of the distance between the rows of jaws, and as shown the length
 25 of the belt is three times the distance between rows of jaws this of course being the minimum possible having in mind the stretch of the belt required to extend around the rolls.
 For securing the rows of thread gripping fingers to the belts any suitable provision may be adopted but preferably and as shown
 30 the belts, or at least the portions of them on which the rows of gripping fingers are mounted are composed of chain links as seen at 30 having outstanding therefrom and rigid therewith finger projections 31 constituting stationary jaws, these projections
 35 being spaced apart across the width of the belt a distance corresponding to the desired spacing of the transverse threads or filaments to be laid on the paper. Each of these finger projections or stationary jaws
 40 has pivoted thereto at an intermediate point at 32 a movable jaw 33, the outer end of which is pressed against the stationary jaw to grip the thread therebetween by suitable means shown as a spring 34 anchored about
 45 the pivot 32 and having its active end engaging the outer portion of the movable jaw. It is requisite that suitable means be provided for opening these jaws as they come up into the range of the threads being
 50 drawn off and then releasing them to close for gripping the threads as soon as they are positioned therein. One form of such means associated with the driving rolls 17 is shown in Figs. 9 and 10 wherein the tail portions
 55 33^a of the movable jaws are all simultaneously engaged by projections on a rod 35 which is guided through the stationary jaws 31, and the end of this rod which is normally projected outward by the springs of the
 60 movable jaws is engaged as the jaws swing upward toward operative position by a cam piece 36 fixed to the forked journal posts 15, this cam piece terminating at a point directly over the axis of the roll 17 so that
 65 as the jaws reach upright position with the threads located therein the movable jaws will be released to grip the threads and draw them transversely across the paper, this action continuing preferably throughout substantially the entire extent of travel of the
 70 drawing units on the rails 10 and thus affording a maximum interval for drawing the threads out so that a relatively low speed pulling movement on the threads as drawn from the spools is required. As the pin
 75 wheels pass out of engagement with the inclined racks 25, the movement of the drawing belts ceases and the threads thus held taut between the spaced apart rows of gripping jaws are transferred by the move-
 80 ment of the units on the chains 26 downward into engagement with the paper web which is moved continuously forward on a suitable platform 37 which extends just
 85 beneath the lower stretch of the line of drawing units and in position so that the coated sheet thereon will have the threads thus held by the gripping jaws deposited and pressed thereonto, the platform 37 for this
 90 purpose preferably extending a little above the plane in which the threads would be held by the gripping jaws so that they are pressed on to the coated surface of the paper to the required extent. Since the pin wheels
 95 23 do not always engage the inclined racks at exactly the same point, and for other reasons a slight irregularity in the extent of transverse movement of the thread drawing
 100 belts 19 may result, I preferably arrange the mechanism as described, to operate these belts normally a little farther than the position for correct register of the rows of
 105 thread gripping jaws at each side of the paper web, and then provide means for moving the belts backward to the very small extent required to bring them into precise and correct register. For this purpose I show a
 110 curved rail 37^a stationarily mounted at the end of the machine where the thread drawing units turn downward, at the side of the machine toward which the belts move
 115 as seen in Fig. 1, these rails gradually inclining inward and being in position to engage the row of gripping jaws and move them with the belt by which they are car-
 120 ried slightly backward to the required extent for alinement after they have been released by the disengagement of the pin wheel from the end of the inclined rack. It will be understood that the paper web
 125 should move forward continuously in exact synchronism with the forward movement of the threads as carried by the sprocket chains 26 and this may be accomplished either by permitting the paper to be moved forward
 130 freely by the frictional engagement of the threads with the coated surface thereof, or separate positive gear connections of any suitable and usual type (not shown) may be employed to connect a feed for the paper

with the driving means which revolve the shafts 5, 6 and thus operate the thread laying mechanism. It is requisite that the threads be severed at each edge of the paper web as the gripping jaws near the end of their travel with the paper and for this purpose suitable cutters 38 which may be arranged as stationary shear knives are mounted in position to cut off the threads just inside of the nippers at each side of the web. Since reinforcing threads extending lengthwise of the paper web are also usually employed, a suitable source of supply of these lengthwise threads is indicated at 39 where they are delivered on to the paper just in advance of the transverse thread laying mechanism, and in cases where it is desired to lay a second series of longitudinal threads over the transverse threads a second lengthwise thread laying mechanism 40 may be positioned just in advance of the transverse thread laying mechanism described to lay the second series of longitudinal threads over the cross threads and immediately after the laying thereof,—these longitudinal thread laying devices being however of usual or suitable type well known in the art and forming *per se* no part of the present invention. For supplying the transverse threads to the thread laying mechanism described, it is of course requisite that carrier mechanism be provided for a number of spools corresponding to the number of threads employed and movable in synchronism with the thread laying units. For this purpose I mount on the shafts 5, 6 and adjacent the thread laying mechanism described a second set of sprocket wheels 41 having fitted thereon sprocket chains 42, these chains bearing rods 43 extending therebetween and serving as a mounting for outwardly extending staffs or posts 44 fixed at each end thereof which staffs may be braced by the links 45 extending from an intermediate point thereof obliquely down to the chain. The staffs 44 have fixed thereto a plate mounting 46 on which are secured a series of spools 47 in sufficient number to supply the threads for the respective thread laying units described, it being understood that the number of these thread supply units will correspond to that of the thread laying units with a thread supply unit in alignment with each thread laying unit as clearly shown in Fig. 1. In order to hold the spools 47 to best advantage on the plates 46 they are preferably mounted on both sides of these plates as best seen in Fig. 4 so that each unit may hold the required number of spools without having them too close together. The spools 47 may be held on the plates 46 in suitable manner to provide the requisite tension, this being shown as accomplished by interposing a plate spring 48 at the base of each spool which is fitted on the arbor and held in place thereon by a slotted cross bar 49, the slot at one end of which engages a pin at the end of the arbor as seen at 50 to permit easy release and at the same time a secure locking of the spools in place, the inner end of said slot being for the purpose slightly widened to make a seating recess for the pin as shown. For guiding the threads T from the spools a suitable guide plate 51 may be mounted at the tops of the staffs 44, the plates being preferably as shown in Fig. 1 tapering in form with thread guiding projections or pins 52 along the tapering sides thereof, over each of which a thread is guided to the nipper jaws of the thread and laying mechanism. Since it is requisite that the sprocket chains 26, 42 be substantially taut and without slack for proper operation, the bearing uprights at one end, shown as the uprights 1, 2 for the shaft 5, are adjustable on the base or floor by suitable adjusting screw means indicated generally at 53. In Figs. 11 and 12 I show a slight modification of the means for opening the movable jaws 33 to receive the threads, this consisting in a plate member 54 secured to the yoke posts 15 and having a comb tooth formation as seen at 55, the projections or teeth of which are adapted to engage the movable jaws as these swing around the roll 17, the outer ends of these jaws and the fixed jaws being first guided into the spaces between these teeth and then as the jaws swing farther around the tail portions passing into such spaces and opening the jaws as seen in Fig. 11. The projections of this comb formation extend around to a point over the axis of the roll 17 as seen at 55^a to hold the movable jaws open long enough to receive the threads as the jaws come up on to the upper stretch of their travel and then permitting these jaws to close and grip the threads as already described.

For operating the movable jaws at the end of the belt stretch where they pass around the small idle rolls 18 a modification of the described means is requisite since such means must not extend beyond the ends of the roll. In this case as shown in Figs. 14-16 the movable jaws connected together for simultaneous operation as described by the rods 35 are engaged at an intermediate point by a rigid curved arm 56 which is fixed to the post 16 as seen at 57 and extends up around the belt passing around the roll 18 with a beveled formation as seen at 56^a adapted to engage between the tail of one of the movable jaws and the adjacent fixed jaw as the row of jaws swings upward to thus open the entire row of jaws simultaneously by a movement transmitted through the rod 35. A thread guiding plate 58 is also fixed to the post 16 extending up into the plane of the threads

T where it is formed with thread guiding passages 58^a adapted to guide the threads and hold them alined for engagement in the gripping jaws as they swing upward.

5 Driving means for the described mechanism may be transmitted as shown to the shaft 6 by a spur gear train 60 from a drive shaft 61 which may be considered the prime drive shaft of the present machine and which may
10 be suitably connected with the paper feeding mechanism to operate the same in unison with the thread laying instrumentalities.

The operation of the apparatus having been already indicated in connection with
15 the structural description need be only briefly summarized. The paper web is drawn from a suitably located and mounted roll R through a coating station S where the pitch or like adhesive coating is applied
20 thereto and thence past guide rolls *r* over the platform 37, the lengthwise threads or filaments 39 being delivered in suitable manner to the surface of the paper as it passes to said platform. Power may be imparted to
25 either of the shafts 5, 6 but preferably to the shaft 6 as described so that there will be a pulling action of the sprocket chains 26 on the thread laying units as they are in contact with the paper web. As each successive thread laying unit moving in the direction of the arrow A is moved upward
30 around the sprocket wheels on the shaft 6, its pin wheel 23 coming into engagement with the inclined teeth 24 of one of the racks 25 initiates a thread drawing movement of the belt 19 which will draw the series of threads handled by that unit from the bank of spools on the corresponding thread supply unit, this movement continuing gradually and at a relatively low speed as illustrated in Fig. 1. preferably throughout the
40 upper stretch of travel of these units and until they come opposite the sprocket wheels on the shaft 5 to be swung downward into operative position thereby, whereupon the pin wheel moving out of the inclined rack, the thread drawing movement of the belt ceases. If desired means may be provided for superposing another layer of paper over
45 the threads on the coated surface, this being indicated at 59 at the delivery end of the apparatus and adjacent the means for laying the second series of longitudinal threads. I consider of special value and importance the
50 provision of means whereby the threads are constantly held and kept in control by the gripping and drawing out devices, this with the unidirectional transverse drawing out belts 19 being embodied in the successive series of gripping jaws 33 which successively
60 move up to operative position and grip the thread before it is cut off or released by the preceding jaw. Thus the possibility of failure in the gripping action to draw out the
65 threads which has been an objection to ma-

chines hitherto proposed wherein new holds have to be taken on the thread ends at each movement is avoided. I am aware that the invention may be embodied in other specific forms without departing from the spirit or
70 essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing
75 description to indicate the scope of the invention.

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

1. Apparatus of the kind described, comprising means for supporting and advancing a paper web in longitudinal continuous movement, and means continuously moving longitudinally for depositing transverse
80 threads thereon during the web movement mounted for a cycle of movement into and away from operative relation with the paper web, and having means coöperative therewith for drawing the threads transversely
85 of the web while out of operative relation with the web.

2. Thread laying apparatus, comprising means for supporting and advancing a paper web in longitudinal continuous movement, and mechanism for laying transverse threads continuously thereon during such web movement consisting in thread carriers having a cycle of movement, one portion of which presents the threads to the paper surface
90 and holds them pressed thereagainst for a substantial interval as the paper moves forward, said carriers having means associated therewith causing each carrier successively to draw out required lengths of threads during an inoperative portion of the carrier
95 cycle of movement.

3. Thread laying apparatus, comprising means for supporting and advancing a paper web in longitudinal continuous movement, and thread carriers mounted to coöperate therewith having a uni-directional cycle of movement to present the threads to the paper and press them thereagainst during one portion of such cycle, and having means associated therewith and operated thereby for drawing out required lengths of threads transversely of the paper while said carriers are in an inoperative portion of their cycle
100 of movement.

4. Apparatus of the kind described, comprising means for supporting a paper web for continuous movement, thread carriers mounted for an operative cycle of movement with respect thereto, one portion of such
105 cycle presenting the threads to the paper surface and holding them pressed thereagainst for a substantial interval as the paper moves forward, and means having a unidirectional movement transversely of the
110 120 125 130

paper for drawing out the threads during an inoperative portion of the cycle of movement of said carriers.

5 5. Apparatus of the kind described, comprising means for supporting a paper web for continuous movement, thread carriers mounted for an operative cycle of movement with respect thereto, one portion of such cycle presenting the threads to the paper
10 surface and holding them pressed thereagainst for a substantial interval as the paper moves forward, and means having a uni-directional movement transversely of the paper and having operative connections to be
15 actuated by the carrier movement for drawing out the threads during an inoperative portion of the cycle of movement of said carriers.

20 6. Apparatus of the kind described, comprising a support for a paper web, thread carriers mounted for a cycle of movement to deposit and press threads upon the paper on said support, and means for drawing out the threads transversely of the paper web consisting in a plurality of gripping devices for
25 each thread having a uni-directional movement, and having provision for the opening of each thereof to receive the thread and for then closing to grip the thread before it is
30 released from the control of the preceding gripping device.

7. In a thread laying apparatus, means for drawing out the threads transversely of a paper web consisting in a plurality of successively acting grippers having uni-directional movement, and carriers on which said
35 grippers are mounted for an operative cycle of movement into proximity of the paper surface and away therefrom.

40 8. In a thread laying apparatus, means for drawing out the threads transversely of a paper web consisting in a plurality of suc-

cessively acting grippers having uni-directional movement, carriers on which said grippers are mounted for an operative cycle
45 of movement into proximity of the paper surface and away therefrom, and means for imparting said transverse movement to said grippers by the movement of said carriers.

9. In a thread laying apparatus, means
50 for drawing out the threads transversely of a paper web consisting in a plurality of successively acting grippers having uni-directional movement, carriers on which said grippers are mounted for an operative cycle
55 of movement into proximity of the paper surface and away therefrom, and means for imparting said transverse movement to said grippers by the movement of said carriers, the path of said carriers being orbital and so
60 arranged that while the carriers traveling in a lower stretch of said orbital path are presenting their threads to the paper surface those traveling in an upper stretch are being successively replenished.

10. In a thread laying apparatus, means
65 for drawing out the threads transversely of a paper web consisting in a plurality of successively acting grippers having uni-directional movement, carriers on which said
70 grippers are mounted for an operative cycle of movement into proximity of the paper surface and away therefrom, and means for imparting said transverse movement to said grippers, the path of said carriers being orbital and so arranged that while the carriers
75 traveling in a lower stretch of said orbital path are presenting their threads to the paper surface those traveling in an upper stretch are being successively replenished.

80 In testimony whereof, I have signed my name to this specification.

AARON SCHWARTZ.