

K. WANDEL.
PAPER REINFORCING MACHINE.
APPLICATION FILED FEB. 15, 1919.

1,368,588.

Patented Feb. 15, 1921.

7 SHEETS—SHEET 1.

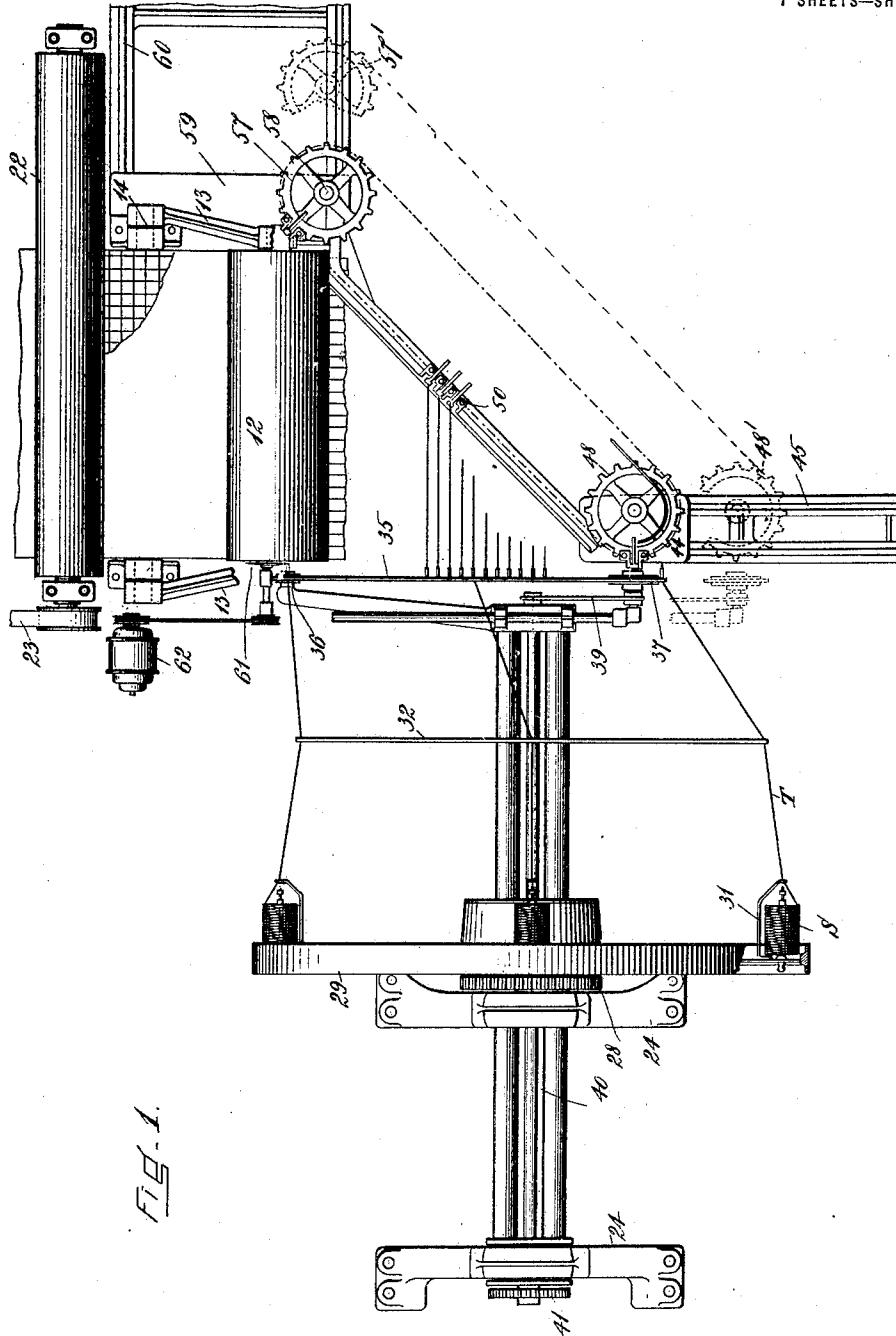


FIG. 1.

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By his Attorney
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7 SHEETS—SHEET 2.

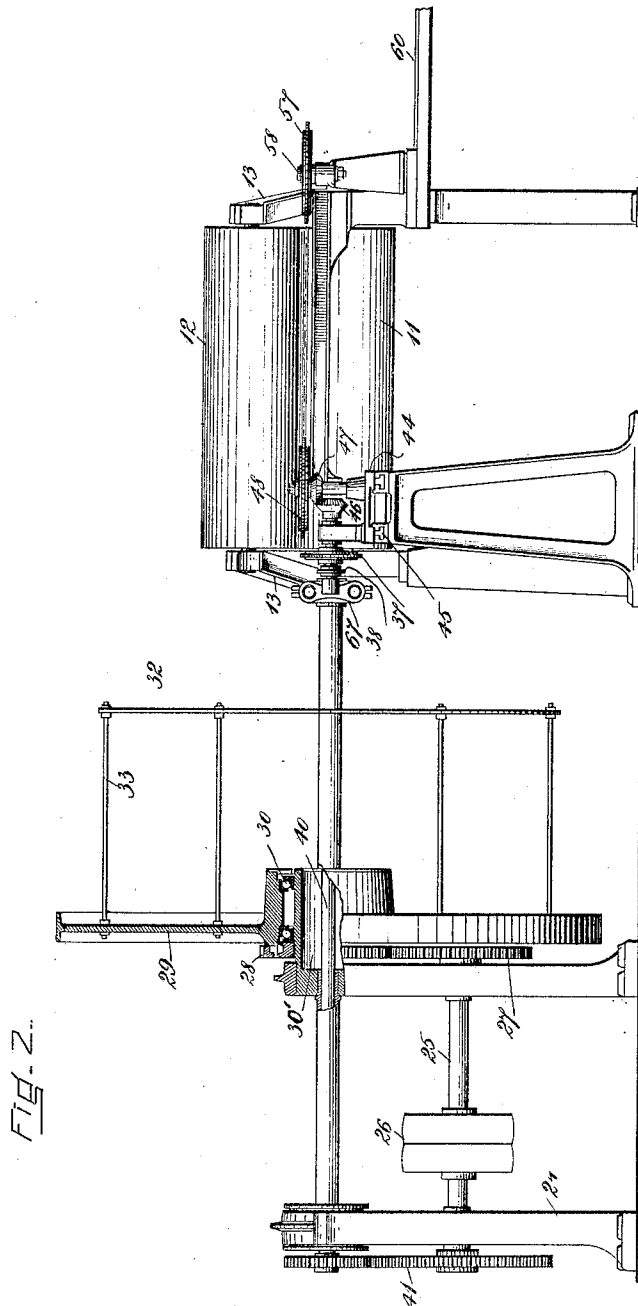
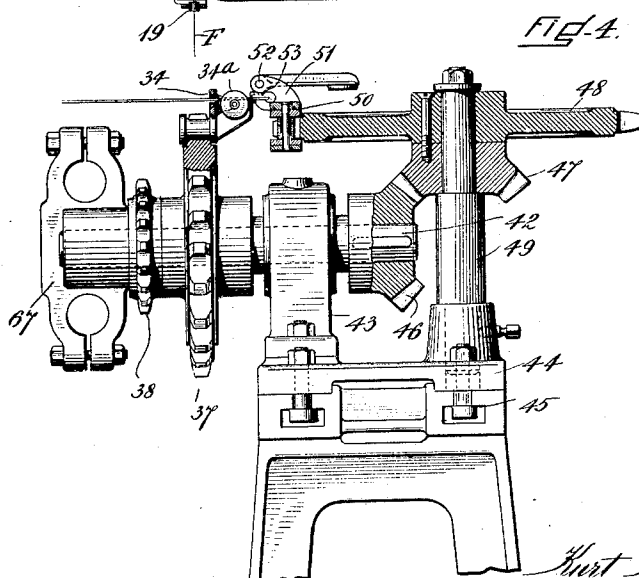


FIG. 2.

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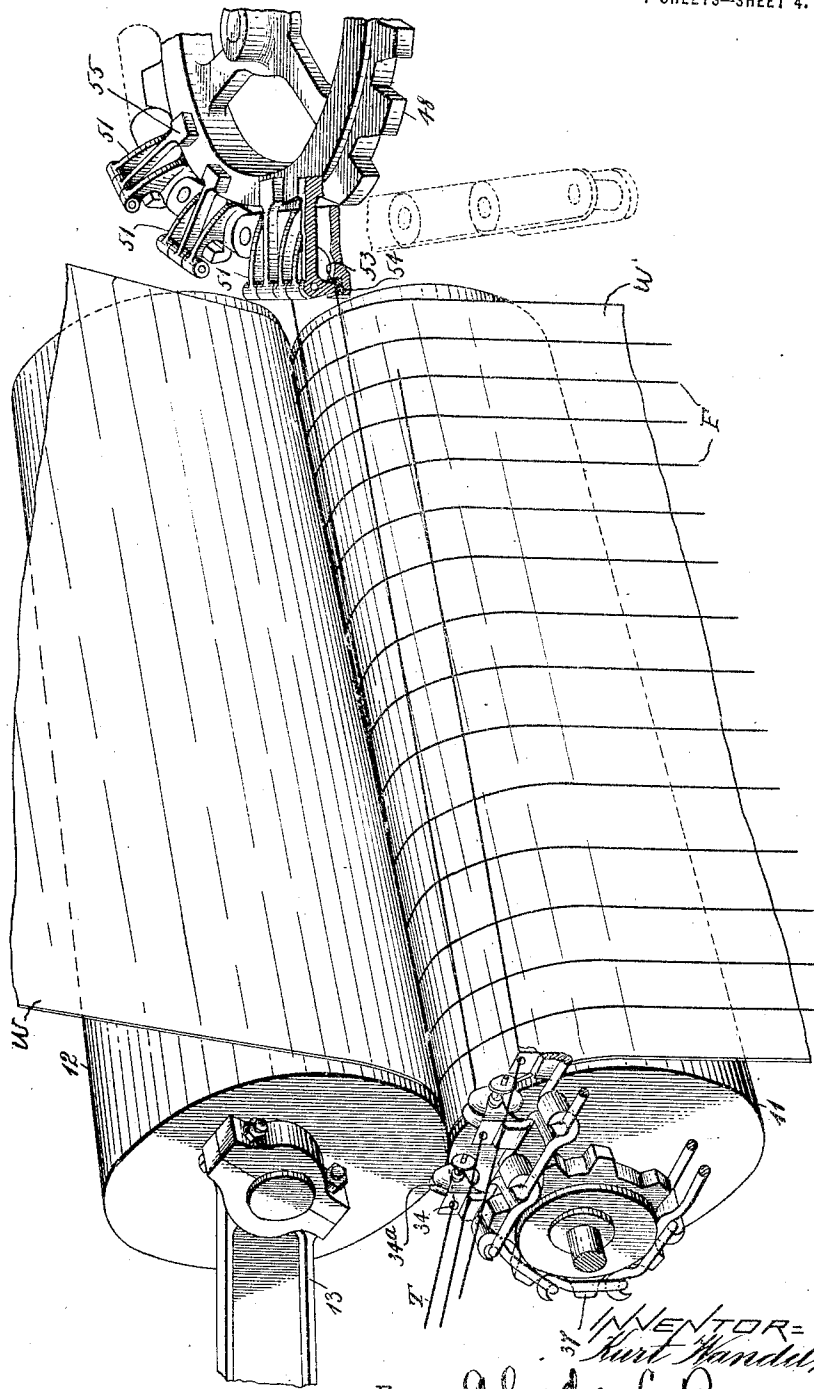
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7 SHEETS—SHEET 4.

FIG. 5.



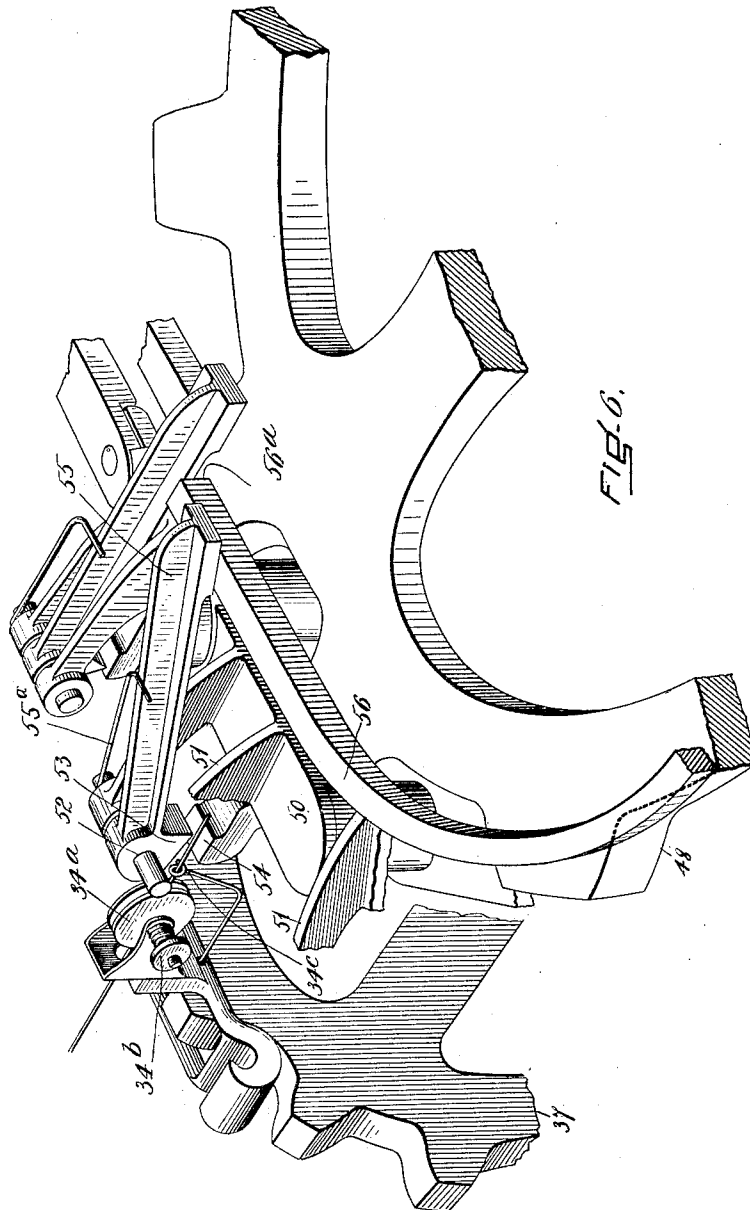
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7 SHEETS—SHEET 5.

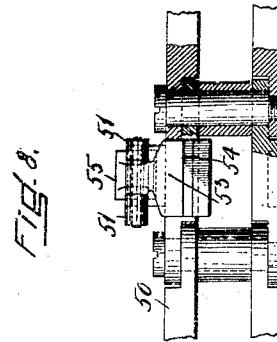
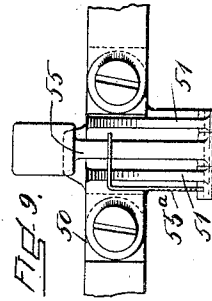
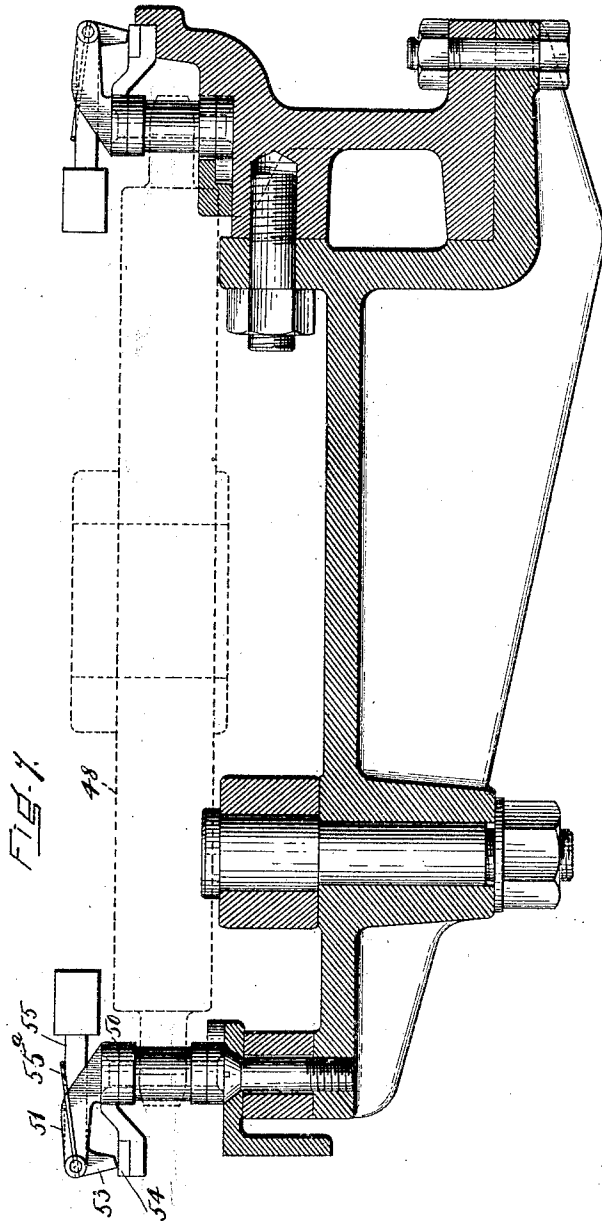


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 7 SHEETS—SHEET 6.



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7 SHEETS—SHEET 7.

Fig. 10.

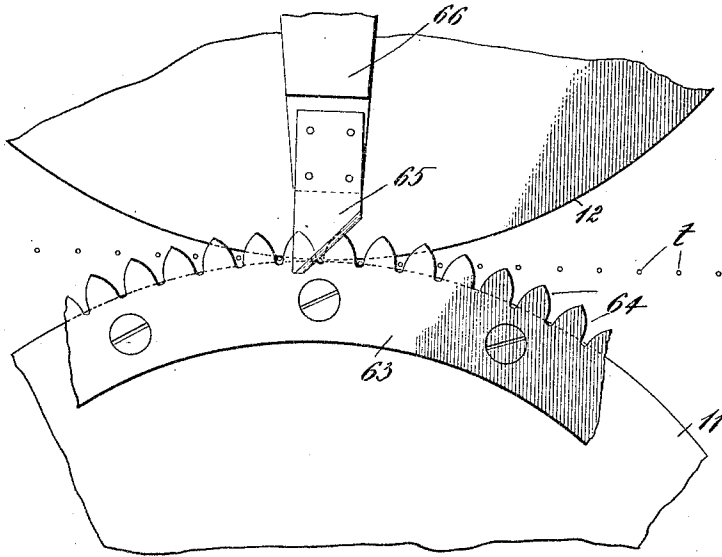


Fig. 11.

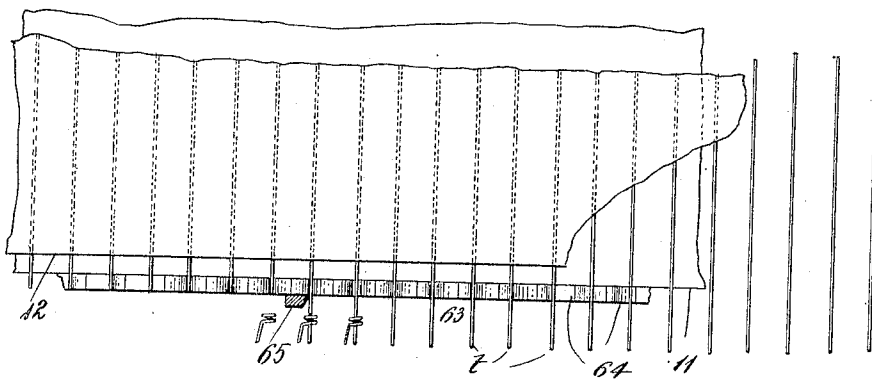
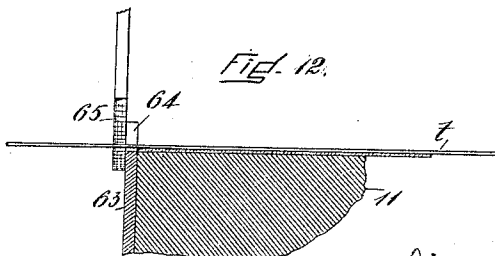


Fig. 12.



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UNITED STATES PATENT OFFICE.

KURT WANDEL, OF NEW YORK, N. Y.

PAPER-REINFORCING MACHINE.

1,368,588.

Specification of Letters Patent.

Patented Feb. 15, 1921.

Application filed February 15, 1919. Serial No. 277,287.

To all whom it may concern:

Be it known that I, KURT WANDEL, a citizen of Wurttemberg, who have declared my intention of becoming a citizen of the United States, and resident of New York city, county of New York, State of New York, 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 applying reinforcing filaments or threads to webs of paper or like sheet material and more particularly to special mechanism for applying continuously transverse filaments to a paper sheet as it is fed continuously through the machine. The invention is well adapted for applying reinforcing filaments between two sheets of paper that are to be joined together with a pitch or other cementitious binder to form a duplex paper. A principal object of the invention is to provide a cross thread laying means that is continuously operative in synchronism with the paper movement and adapted to lay the threads under tension upon the coated paper just at the instant it is pressed against and united with the other paper sheet. To this end I provide thread tensioning and laying jaws for holding the cross threads that are operative in close proximity to a pair of pressure rollers that press the two sheets of paper together. A further object of the invention is to provide means readily and conveniently adjustable for laying the cross threads at different distances apart as may be required for different uses. A still further object is to provide thread laying mechanism of the kind stated that is readily adaptable and adjustable to different widths of paper. A further object is to provide thread laying instrumentalities that are simple and of few parts, yet capable of operating rapidly and reliably to lay reinforcing threads in the manufacture of duplex paper. 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 the essential parts of an apparatus constructed in ac-

cordance with my invention, portions being broken away and in section;

Fig. 2 is a front view thereof with a portion in section;

Fig. 3 is an end view looking from the right in Fig. 1;

Fig. 4 is an enlarged detail partly in elevation and partly in vertical section showing the mounting and operating means of the thread laying chains;

Fig. 5 is a partial perspective view showing the coöperation of the thread laying instrumentalities with the pressure rollers;

Fig. 6 is an enlarged fragmentary perspective illustrating the operation of the thread gripping jaws;

Fig. 7 is an enlarged detail in vertical section showing the mounting of the thread gripping jaws;

Fig. 8 is a detail partly in elevation and partly in vertical section showing a thread gripping jaw from the front;

Fig. 9 is a detail plan view of a thread gripping jaw;

Fig. 10 is a fragmentary side elevation illustrating a modified means for spacing and separating the cross threads;

Fig. 11 is a diagrammatic plan view of the mechanism shown in Fig. 10; and

Fig. 12 is a fragmentary cross section illustrating the mechanism of Figs. 10 and 11.

Upon a suitable frame work 10 are journaled a pair of free moving pressure rollers 11, 12, the lower one 11 of these being journaled in stationary bearings and the upper one 12 in bearings at the ends of swinging arms 13 pivoted to the frame at 14. The arms 13 are engaged by links 15 connected with lever arms 16 pivoted to the frame at 17 and having mounted thereon adjustable weights 18 adapted thus to act on the roll 12 to press it against the roll 11 with a variable predetermined pressure. Between the presser rolls 11 and 12 are laid a paper web W from above and a second web W' from below, these webs being previously treated with hot pitch or other binding or adhesive substance. A series of filaments F are led upward with the web W', these being guided and spaced by guide thimbles 19 at the base of the apparatus, these spaced threads and the paper web being guided around and over an idle roll 20 also mounted in the base of the apparatus. The filaments F are thus applied to run lengthwise of the paper web in

parallel spaced apart relation. The duplexed paper is engaged after its passage between the rolls 11, 12 by another pair of feeding rolls 21, 22 which are suitably driven, as indicated by a power belt 23; these rolls being mounted in suitable manner (not shown) so as to press the paper between them, are adapted to draw it constantly through the machine for the coöperation of the cross thread laying instrumentalities now to be described. In spaced apart standards 24 of the frame work is journaled a drive shaft 25 equipped with means to receive driving impulse, shown as belt pulleys 26. This shaft has a gear 27 fixed on the inner end thereof engaging a gear 28 fixed on a spool carrier 29 rotatably journaled as seen at 30 on a head 30' of the machine frame. The carrier 29 is equipped with a series of spool holders 31 detachably fitted thereto each bearing a thread spool S from which a thread T is drawn by the thread laying mechanism to be described. The series of threads T are guided through passages in a guide ring 32 mounted on the carrier 29 and held spaced inward therefrom by holding rods 33. From the guide ring 32 the threads are laid through a series of guiding and tensioning passages 34 carried by a sprocket chain 35. The chain 35 is mounted to operate at one side of the paper web and in parallelism therewith, on an inner sprocket wheel 36 and an outer sprocket wheel 37. This sprocket chain is connected to rotate in unison with the spool carrier, and for this purpose the sprocket wheel 37 has rigid therewith a smaller sprocket wheel 38 driven by a sprocket chain 39 from a shaft 40 journaled in the frame work, the outer end of this shaft being connected by gearing 41 with the drive shaft 25. The several thread guiding passages 34 are each equipped with a tension device 34^a, which is adapted to hold the thread passing therethrough under suitable tension which may be varied by adjusting the nut 34^b of such tension device, a thread guiding wire loop 34^c being provided to engage the thread just within said tension device to support the thread end out close to the gripping jaws as now to be explained. The sprocket wheels 37, 38 are fixed on a short shaft 42 which is journaled in a bearing block 43 carried on a plate 44 adjustably clamped to ways 45 for reasons later more fully set forth. The shaft 42 has fixed at the inner end thereof a beveled pinion 46 in driving engagement with a pinion 47 rigid with a sprocket wheel 48 journaled on a post 49 carried by the plate 44. The sprocket wheel 48 has engaged therewith a sprocket chain 50, the links of which are equipped with upwardly and outwardly projecting lugs 51 to which are pivoted at 52 gripper jaws 53 coöperative with gripper blocks 54 carried by the respec-

tive links to grip and clamp between them the end of a filament as it projects from the thread guide 34^c. Each gripper jaw is equipped with a rearwardly extending arm 55 acted on by a spring 55^a tending to swing the same to close the jaw. A stationary curved rail 56 is mounted in position to act on the tail ends of the arms 55 as the jaws 53 come opposite to and adjacent the thread guides 34 on the sprocket wheel 37 and thus the jaws 53 are caused to open to receive the thread ends as best seen in Fig. 6. The rail 56 terminates just beyond this position as seen at 56^a so that before the jaws 53 begin to recede from the sprocket chain 35 they are closed upon and clamping the thread ends to draw them through tension devices 34^a of the guides 34. From the sprocket wheel 48 the sprocket chain 50 extends diagonally forward across the paper web, the inner reach of said chain being mounted on another sprocket wheel 57 pivoted at 58 to a plate 59 fitted for transverse adjustment on ways 60 of the machine frame. As best seen in Figs. 1 and 5 the sprocket wheel 57 is so positioned as to carry the gripper jaws on the chain 50 into close proximity with the receiving mouth between the rolls 11, 12 as said jaws move outward beyond the edge of the sheet and thus it results that the threads carried by said jaws and held under tension by the tension devices 34^a will be laid on to the sheet in a taut condition just as they are caught between the two pressure rolls 11, 12. It will be understood that the jaws 53 are spaced on the chain 50 correspondingly farther apart than the thread guide 34 on the chain 35 so that the threads extending from the respective thread guides to the respective jaws 53 will be held in parallelism and extending straight across the paper web. A suitable tripper rail or member may be provided to release the thread ends from the jaws 53 after the threads are thus held between the paper sheets and a suitable severing device may be mounted to cut off the threads close to the edge of the paper, before the ends are thus released by the jaws. It is also essential that means be provided for severing the threads at the other side of the paper, *i. e.*, just beyond the tension devices 34^b and for this purpose I show in Fig. 1 a rotary power driven cutter 61 connected for operation by an electric motor 62. I preferably however use at both ends of the rolls severing devices of the kind shown in Figs. 10, 11 and 12 which are also constituted to serve as spacing and locating means for the threads. As herein shown the lower roll 11 has fixed to the end thereof at its periphery a ring 63 equipped with pointed curved teeth 64 extending from the circumference of the roll, these teeth being spaced apart a distance corresponding to the required spacing of the

threads *t.* For coöperation with this ring I mount a stationary shear knife 65 carried by a bracket 66 depending from the machine frame, this knife 65 being thus held closely
 5 against the ring 63 as in Figs. 11 and 12. Thus the teeth 64 serve to correct the spacing of the threads and insure the laying thereof in precise alinement while the shear 65 co-
 10 operative therewith cuts off the ends close to the edge of the paper. The present apparatus is designed for coöperation with paper webs of different widths with a mini-
 15 mum of readjustment and for this purpose the rolls 21, 22 are of a length corresponding to the maximum width of the paper that it may be required to handle. The rolls 11
 20 and 12 are selected according to the width of the paper web in hand and it will be noted that the outer one of the arms 13 has its
 25 pivot 14 mounted on the adjustable plate 59 so that the mounting of the roll may thus be adjusted as to width by changing the position of the plate 59. Thus as seen in
 30 dotted lines in Fig. 1 the plate 59 may be adjusted outward so that the sprocket wheel 57 will occupy the dotted line position 57', the
 35 chain 50 being of course correspondingly lengthened with additional thread gripping jaws. In such setting for wider paper the plate 44 is adjusted outward on the ways 45
 40 until the sprocket wheel 48 occupies the position 48'. The shaft 42 has its outer end journaled in a bearing block 67 and since this shaft partakes of the described adjust-
 45 ment the bearing block 67 is adjustably mounted on ways 68 of the frame. It is to be noted that not only is the machine thus
 50 quickly adaptable to handle different widths of paper but the spacing of the threads may be quickly and conveniently varied by either
 55 substituting for the sprocket chains 35—50, other chains having differently spaced guides and grippers, or by using only selective ones of the series of guides and
 60 grippers on said chains, *e. g.*, using only alternate ones thereof and leaving the others blank. Since with the present construction the transverse filaments are applied one by one to the paper directly at, or closely adjacent the receiving mouth between the rolls 11, 12 it is practicable to vary the spacing of these threads by varying the rate of movement of the thread laying means with respect to the rate of paper feed. Thus it will be
 65 noted that as shown the paper feed is driven from a source independent of the thread laying mechanism and for spacing the threads farther apart it is only necessary to retard the rate of movement of the thread laying chains with respect to the rate of paper movement, while by driving the thread laying chains faster than the paper moves the threads will be laid correspondingly closer together,—*i. e.*, closer together than the spacing of the thread gripping jaws themselves.

The present apparatus is adapted to apply either coarse or fine textile threads or wires or other reinforcing filaments and it is also adapted to handle rough papers including
 70 craped papers as well as more smooth surfaced kinds. I am aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in
 75 all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

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

1. Apparatus of the kind described, comprising paper feeding and pressing means, and thread laying means coöperative there-
 85 with consisting in an endless device equipped with thread guides and movable to advance the threads to the paper, and a second endless device equipped with thread gripping jaws and mounted for movement to draw the
 90 thread across the course of the paper and also to advance the same toward the paper.

2. Apparatus of the kind described, comprising a pair of presser rolls adapted to receive between them a paper sheet, a thread
 95 laying chain equipped with thread guides and movable to advance the threads into the mouth between said rolls, and a second thread laying chain equipped with thread grippers and extending diagonally with re-
 100 spect to said rolls and the first named chain, the grippers on said second chain adapted to draw the threads into alinement with said rolls and also to advance the threads into the mouth between said rolls.
 105

3. Apparatus of the kind described, comprising a pair of transfer rolls adapted to receive between them a paper sheet, an endless thread laying device equipped with thread guides extending adjacent one end
 110 of said rolls and in parallelism with the path of the paper sheet, and a second, diagonally disposed endless thread laying device equipped with grippers and arranged to draw the threads through the first mentioned
 115 thread laying device and across the course of the paper sheet.

4. Apparatus of the kind described, comprising a pair of transfer rolls adapted to receive between them a paper sheet, an endless thread laying device equipped with thread guides extending adjacent one end
 120 of said rolls and in parallelism with the path of the paper sheet, a second endless thread laying device equipped with grippers and arranged to draw the threads through the first mentioned thread laying device and across the course of the paper sheet, said two
 125 thread laying devices having a coöperative arrangement and mounting to deliver the
 130

threads directly into the mouth between said rolls.

5. Apparatus of the kind described, comprising paper feeding and pressing means, and thread laying means cooperative therewith consisting in an endless device equipped with thread guides extending in parallelism with the edge of the paper sheet at one side thereof, and a second endless device equipped with thread gripping jaws having a path of movement at one point closely approaching the first named thread laying device, and extending thence diagonally away therefrom and toward said paper feeding and pressing means, and adapted to draw the threads across the course of the paper and apply the same thereto.

6. Apparatus of the kind described, comprising paper feeding and pressing means, thread laying means cooperative therewith consisting in an endless device equipped with thread guides and movable to advance the threads to the paper, a uni-directional carrier for thread spools mounted and connected for movement in unison with said device, and an endless chain equipped with grippers mounted relatively close to said thread laying device at one point and extending thence diagonally away therefrom to a point at the opposite side of the paper sheet and closely adjacent said pressing means for delivering the threads directly to said pressing means.

7. Apparatus of the kind described, comprising a pair of free moving presser rolls adapted to receive between them a paper sheet and having an adjustable mounting at one end thereof, a pair of feed rolls arranged to draw the paper through said presser rolls, and thread laying means constructed and arranged to lay transverse threads in a taut condition directly into the mouth between said rolls, said thread laying means having

a mounting adjustable with said roll mounting to permit setting for paper sheets of different widths.

8. Apparatus of the kind described, comprising a pair of free moving presser rolls adapted to receive between them a paper sheet and having an adjustable mounting at one end thereof, a pair of feed rolls arranged to draw the paper through said presser rolls, and thread laying means constructed and arranged to lay transverse threads in a taut condition and individually directly into the mouth between said rolls, said thread laying means having a mounting adjustable with said roll mounting to permit setting for paper sheets of different widths.

9. Apparatus of the kind described, comprising a pair of presser rolls adapted to receive between them a paper sheet, thread laying means cooperative with said rolls and adapted to lay threads upon paper directly in the mouth between said rolls, and thread spacing means carried by one of said rolls consisting in a plate equipped with a series of pointed teeth spaced apart according to the desired spacing of the threads.

10. Apparatus of the kind described, comprising a pair of presser rolls adapted to receive between them a paper sheet, thread laying means cooperative with said rolls and adapted to lay threads upon paper directly in the mouth between said rolls, and thread spacing means carried by one of said rolls consisting in a plate equipped with a series of pointed teeth spaced apart according to the desired spacing of the threads, said spacing means constituting also a movable shear member and another shear member mounted to cooperate therewith for severing the threads.

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

KURT WANDEL.