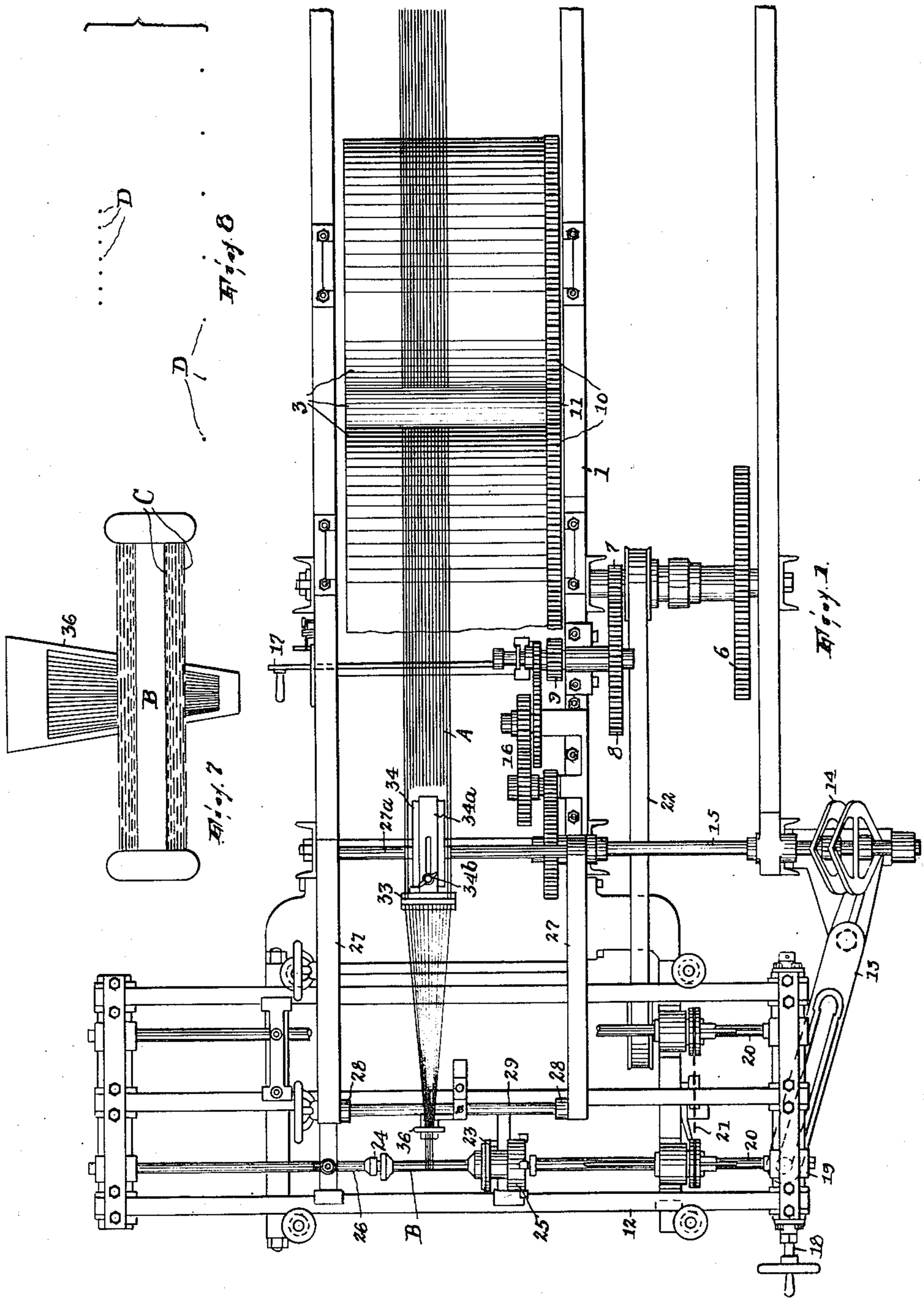
Aug. 20, 1935. A. J. HARRIS 2,011,632

ART OF WARP SIZING

Filed July 8, 1932 2 Sheets-Sheet 1



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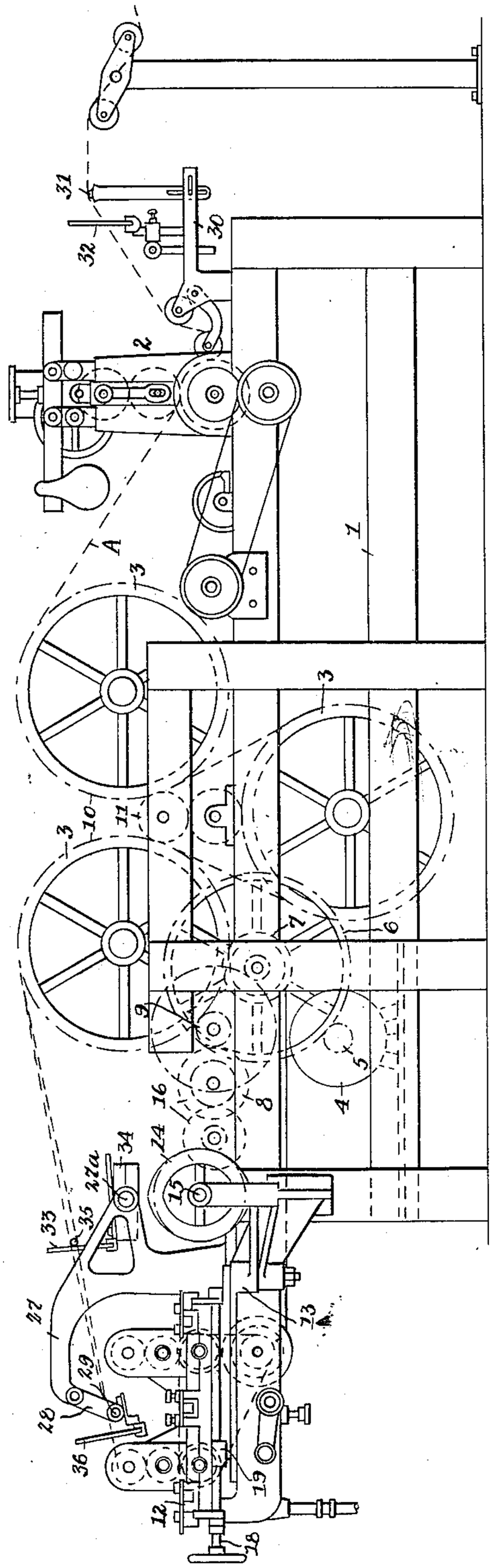

Fig. 1.

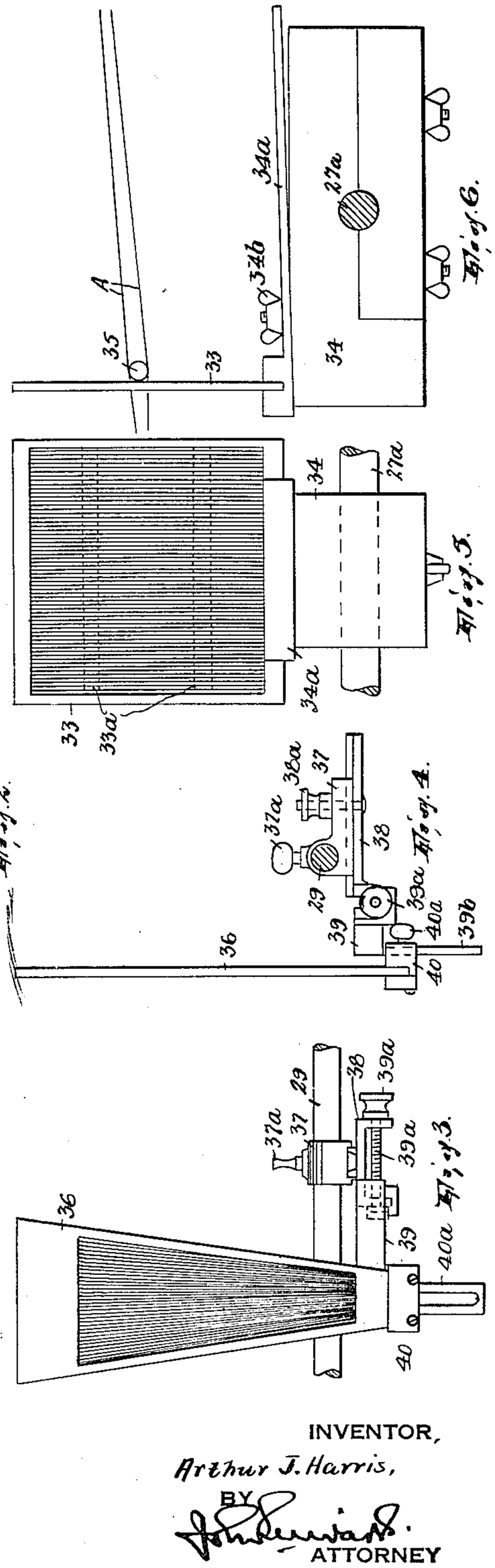

Fig. 2.

Fig. 5.

Fig. 4.

Fig. 3.

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Patented Aug. 20, 1935 2,011,632

UNITED STATES PATENT OFFICE

2,011,632

ART OF WARP SIZING

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Application July 8, 1932, Serial No. 621,440

8 Claims. (Cl. 28—28)

This invention relates to the winding of warps by machines of the type of that disclosed in the Johnson Patent No. 1,788,196, in which a warp (or it may be several warps) is sized by passing it through a sizing means and then around a drying means, as heated drums revolving with the moving warp, and finally is wound on a spool which is suitably rotated and is also reciprocated so as to effect the winding thereon traverse fashion.

In the use of these machines, and especially if there is traverse of the spool, which tends to and usually does cause a rolling of the threads on the drums into contact with and frequently over each other, the size, drying, causes dried size-connections to form between the threads, so that when the warp is put into use in a loom such connections cause breakage of the threads and other trouble in their effort to pass through the harness eyes.

Therefore I form in that part of the warp which is the nearest in the length thereof to the drying surface afforded by the nearest drum a shed which reaches close to said surface so that the ensuing gradual separation of the threads of the two shed-banks causes a breaking down of the connections that may have formed and prevents the forming of those that might otherwise form after leaving such surface.

Preferably said shed extends also to the surface of the core which results further in the band of warp being laid on the wound mass in perfectly flat form, without ridges and with all the threads beside each other and none overlapping, since the threads in the top bank of the shed and those (alternating therewith) in the bottom bank approach the periphery of the wound mass in two distinct (converging) planes; in this connection I preferably use means, as a reed, not only to break down connections between threads which perchance escape breakage due to the shed (as where the middle thread of three is broken away from the other two in the opposite bank of the shed but the latter remain connected) but to keep the threads laterally separated from each other before they reach the wound mass.

Further, in effecting the winding on the spool I employ a reed having converging dents and resort to traverse. A traverse-wind is of course necessary where the warp is narrower than the spool is long, not only in order to fill the spool from end to end but, by the crossing of the successive convolutions, to prevent threads of any convolution cutting into the preceding windings. My object in using a reed of the kind indicated in connection with a traversing spool is further to insure against this latter condition and to produce a wound package which shall be more firm and compact than those heretofore possible by resort to the traverse method of winding. That is to say, according to my invention, due to the convergence of the reed dents and to the growth in diameter of the package there is a difference in the spacing of the threads at the start and at the finish of the winding, in the present case herein disclosed the spacing being greater at the finish than at the start.

Other matters concerning my present invention will be pointed out hereinafter.

In the accompanying drawings,

Fig. 1 is a fragmentary plan of a warp-sizing machine embodying the invention;

Fig. 2 is a side elevation thereof;

Figs. 3 and 4 are a front and side elevation of the converging reed and its supporting means;

Figs. 5 and 6 are a front and a side elevation of another reed and its supporting means;

Fig. 7 is a diagram illustrating the traverse-wind according to this invention;

Fig. 8 is another diagram illustrating the arrangement of the threads of the warp at different periods in the winding.

The frame 1; the quetch 2 by which the size is applied to the warp; the heated drums 3 around which the threads of the warp A then pass; the motor or other driving means 4; the gearing 5—6—7—8—9 by which the drums, intergeared at 10—11, are driven from the means 4; the carriage 12 arranged to reciprocate transversely of and in the frame; the means to reciprocate the carriage comprising a lever 13 connected to the carriage and fulcrumed in the frame and engaged with a cam 14 on a shaft 15 which is driven from the shaft of gears 8—9 by gearing 16 (Fig. 2) comprising a clutch for making or breaking this transmission train and thus start or arrest the traverse motion upon shifting the handle 17 controlling such clutch; the hand-screw 18 journaled in the carriage and having a nut 19 engaged with a slot in the lever whereby to vary the extent of the carriage traverse; the splined shafts 20 journaled in the carriage and connected to rotate together by a sprocket-and-chain means 21, one such shaft being driven by a belt-and-pulley drive 22 from the shaft of the gears 6—7; 23 and 24 the live and dead spindles for supporting a spool B and respectively journaled in the head-stock 25 and tail-stock 26 adjustable on the carriage and transversely of the frame 1, the head-stock being a housing and containing means (not shown, but clearly disclosed in said Johnson patent) to drive the live spindle and hence the spool, are or may be all the same as in said Johnson patent, to the ends that when the motor is running and the clutch closed the drums and spool will be driven so that on size being applied to the warp A by the quetch it will be dried by the drums and the warp wound on the spool, which is simultaneously traversed with the carriage so that the warp, which is narrower than the spool is

long will be wound spirally back and forth thereon.

The frame may carry a pair of supports 27 in which are revoluble a pair of cranks 28 forming with a guide-rod 29 a structure rotatively adjustable to bring the guide-bar, over which the warp extends, to any desired elevation.

In a suitable support 30 is arranged a guide 31 over which and through a reed 32 the warp extends, the dents of the reed of course separating the threads of the warp from each other; the reed is preferably of the cross-reed type, or like that 33 now to be referred to.

Cross-reed 33 is mounted in a support 34 which may be attached to a bar 27*a* of support 27. For adjustment of this reed lengthwise of the warp it may be carried by a slotted bracket 34*a* which is attached to the support 34 by a clamp screw 34*b* penetrating its slot. When a shed has been formed in the warp, as by pressing the warp up or down so that the blocks 33*a* in the alternate spaces between the dents of the reed resist displacement of the threads in such spaces, a rod 35 to maintain the shed is introduced thereinto, the same being unsupported except by the shed and hence leaving the latter free to change its plane as the mass being wound increases in diameter.

Forward of reed 33 is the condensing reed 36 having its dents preferably arranged to converge, in this case downwardly, so that upon displacement of the warp up or down the spacing of the threads thereof, which occupy its spaces, and consequently the width of the warp, will be varied. This reed is supported by a bracket described as follows: One part 37 of the bracket may be affixed to guide-bar 29, so as to be adjustable along the same, by a set-screw 37*a*; another part 38 is adjustable on part 37 lengthwise of the warp upon releasing a screw 38*a* for clamping them together; another part 39 is adjustable transversely of the warp on part 38 by manipulating a screw 39*a* with whose threading it is engaged and which is swivelled in part 38; and a fourth part 40 forms a clamp for the reed and may be set at any desired elevation on a leg 39*b* of part 39 by a clamping screw 40*a*.

The adjustability of the bracket along the bar is necessary to bring the reed opposite the spool to whatever position transversely of the machine it may be with the head-stock and tail-stock; the adjustability of part 38 is for the purpose of centralizing the reed with respect to the spool on shifting the reed one way or the other so that the ends of the wound mass being formed shall be formed properly, or with proper packing with respect to the adjoining head of the spool; and the vertical adjustability of part 39 is to permit the spool to be brought to the proper elevation according to the diameter of the barrel of the spool and the spacing of the threads of the warp at the outset of the winding.

The barrel of the spool, which is cylindrical, of course presents a longitudinally straight winding surface, and the surface of the drying means (to wit, the peripheries of the drums) is of course parallel therewith, as shown.

If, when the warp leaves the drying means 3 and as an incident of the traverse, any dried size-connections exist between the threads thereof, they immediately undergo stress due to the shed formed by the bar 35 and if they are not broken down before they reach the bar they will be when they reach it and in any event all the connections will be broken down by the time the reed 33 is passed.

It is very essential that the warp should be wound as a perfectly flat band on the wound mass on the core—that is, with all the threads side by side and none overlapping as an incident of the traverse. This I accomplish by maintaining the shed in the warp by the bar 35 or equivalent, that is, by causing the threads to approach the periphery of the mass in two distinct converging planes whose apex of convergence is at the periphery of the core, those of each bank of course alternating with those of the other, this of itself being the factor primarily responsible for obtaining the desired result although it is usually better to employ the reed or equivalent means 33 to maintain the threads laterally separated from each other and so definitely spaced as they approach the periphery of said mass.

The convergence of the reed 36, taken with the growth in diameter of the wound mass on the core, results in the conditions illustrated by Figs. 7 and 8, that is to say, as the band of warp changes in width as the mass increases in diameter so the spacing of the threads changes. In Figure 7 each convolution of the mass is represented by a series of dash lines C and the change in width of the band (here increase) is shown by forming the dash lines gradually longer in the succeeding convolutions formed. In Fig. 8 the dots D represent the threads of a band, those in the upper row being taken as close to the core and those in the lower row as more or less remote from the core. The compactness and stability of the windings depends fundamentally on the mere fact of a progressive change in the spacing of the thread-convolutions of the successive layers wound on. However, I prefer that the change shall be an increase in the spacing mainly because then in the growth of the mass the incidental increase in width of the successive layers, where the spool has end heads as shown, results in the mass being developed at its ends against said heads or without circumferential crevices between said ends and heads and consequent possibility of the end convolutions spilling into the crevices; wherefore the convergence of the reed should be in a direction from the tangent plane in which the warp approaches the core toward a plane parallel therewith and coincident with the core's axis.

Having thus fully described my invention what I claim is:

1. The method of treating a warp which consists in winding the same on a revolving core having a substantially longitudinally straight winding surface and thereby drawing the warp lengthwise, applying a viscous size substance to the moving warp in advance of the winding, passing the warp between the core and the point of application of said substance thereto in contact with a heating surface extending substantially parallel with the winding surface of the core, and maintaining in the part of the warp which is nearest in the length thereof to said heating surface a shed which reaches substantially to said heating surface.

2. The method of treating a warp which consists in winding the same on a revolving core having a substantially longitudinally straight winding surface and thereby drawing the warp lengthwise, applying a viscous size substance to the moving warp in advance of the winding, passing the warp between the core and the point of application of the substance thereto in contact with a heating surface extending substantially parallel

with the winding surface of the core, and maintaining a shed in the whole length of the warp which extends substantially from said heating surface substantially to the periphery of the core.

3. The method of forming a wound mass which consists in rotating a cylindrical core for the wound mass and simultaneously winding a band of unconnected strands thereon while gradually increasing the spacing of the strands and preserving the strands of the band all equally spaced from each other on approach to the part of the mass already wound.

4. The method of forming a wound mass which consists in rotating a cylindrical core for the wound mass and simultaneously winding a band of unconnected strands thereon and effecting a traverse as between such band and the core, one relatively to the other, lengthwise of the axis of the core, while gradually increasing the spacing of the strands and preserving the strands of the band all equally spaced from each other on approach to the part of the mass already wound.

5. The method of treating a warp which consists in winding the same on a revolving and longitudinally moving core having a substantially longitudinally straight winding surface and thereby drawing the warp lengthwise, applying a viscous size substance to the moving warp in advance of the winding, passing the warp between the core and the point of application of said substance thereto in contact with a heating surface extending substantially parallel with the winding surface of the core, and maintaining a shed in the warp reaching substantially to said heating surface.

6. The method of treating a warp which consists in winding the same on a revolving and longitudinally reciprocating core and thereby drawing the warp lengthwise, applying a viscous substance to the moving warp in advance of the winding, passing the warp between the core and the point of application of said substance thereto in contact with a heating surface, and positively holding the respective threads of the warp side by side and also positively separated from each other in close proximity to where they begin to wind on the core.

7. The method of treating a warp which consists in moving the same lengthwise in contact with, and transversely of the axis of, a substantially cylindrical heating surface and so that alternating threads of the warp extend directly from said surface relatively posterior thereto in two distinct tangential planes and while the warp is moving applying a viscous size substance to the warp before the threads thereof depart from said surface in such planes.

8. A warp-sizing machine including, with a frame, a revoluble core journaled therein and on which to wind the warp being treated, means to apply size to the warp anterior to the core, a cylindrical drying surface between the core and said means and in contact with which the warp constantly remains during winding thereof on the core, and a warp-shedding means carried by and free to move with the part of the warp between said core and surface.

ARTHUR J. HARRIS.