Jan. 11, 1938. H. L. THOMPSON 2,105,102

WARP FEED FOR WIRE WEAVING LOOMS

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Fig. 1.

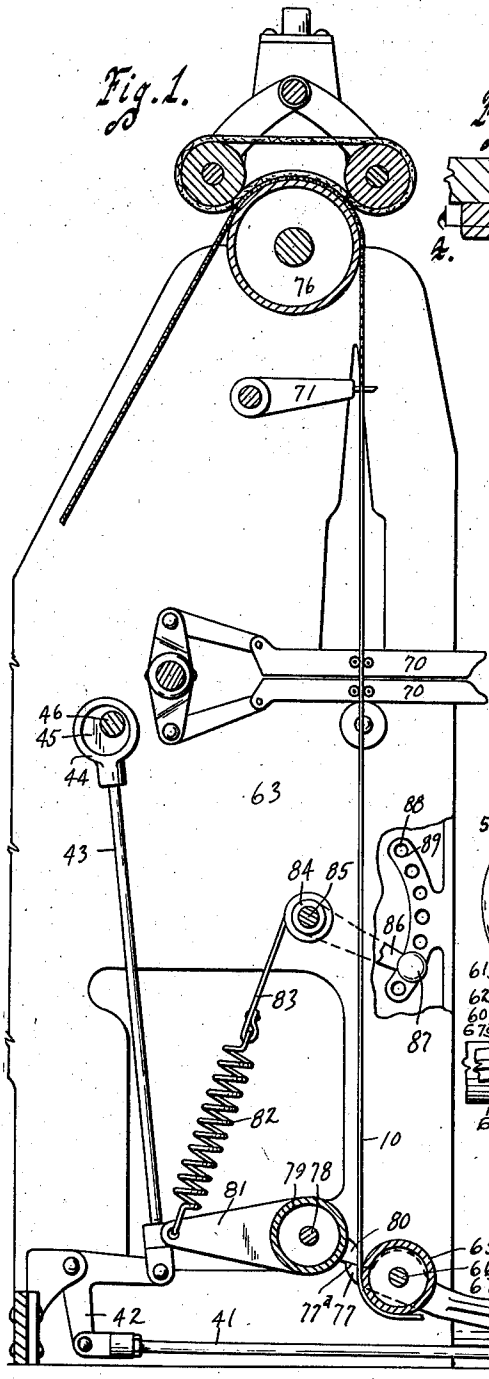


Fig. 3.

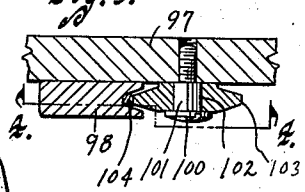


Fig. 4.

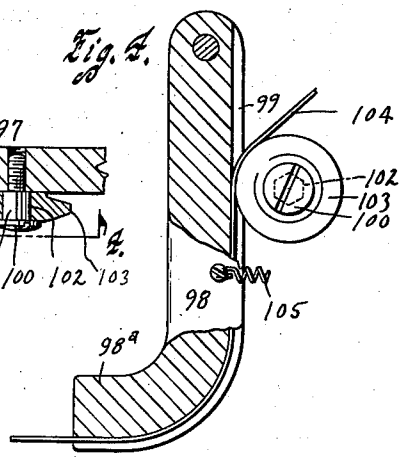


Fig. 2.

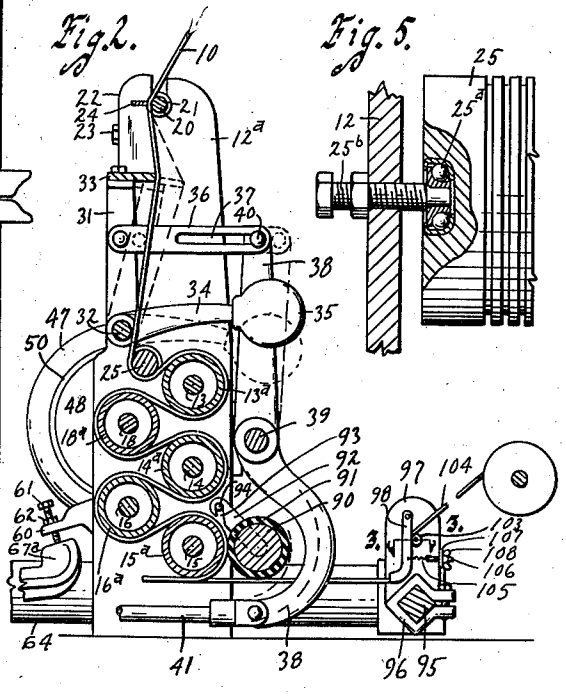


Fig. 5.

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Fig. 8.

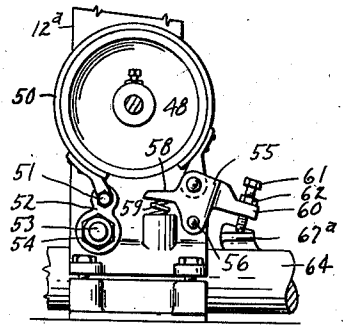
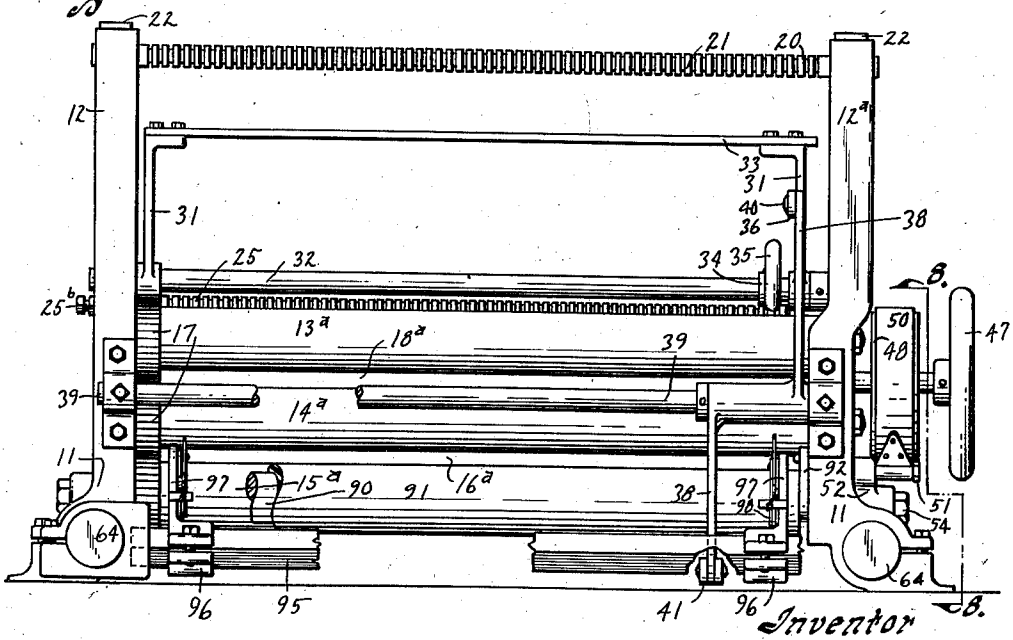


Fig. 6.

Fig. 7.



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UNITED STATES PATENT OFFICE

2,105,102

WARP FEED FOR WIRE WEAVING LOOMS

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Application October 8, 1935, Serial No. 44,021

4 Claims. (Cl. 139—100)

The object of my present invention is to provide a warp feed for a wire weaving loom, such for instance as is disclosed in my Patent No. 2,022,225.

It is particularly my object to provide an improvement in warp wire feeding mechanism and tension control means.

It is a further object to provide a warp feed mechanism, by which warp wires can be supplied in identical lengths to the loom for weaving purposes.

Another purpose is to provide a mechanism which will afford the proper tension upon the warp wires during the weaving operations.

Another object is to provide means for holding the warp wires in place for convenience in splicing a broken wire.

Still a further object is to provide means for imposing proper tension on the selvage wires.

Except as to the last two features, this application is a division from my foregoing identified application.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my warp feed for wire weaving looms, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a vertical, sectional view of the front portion of a wire weaving loom of which my present warp feed is a part.

Figure 2 is a similar section of the rear part thereof.

Figure 3 is a horizontal, sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a vertical, sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a detail, sectional view taken on the line 5—5 of Figure 6.

Figure 6 is a side elevation of the rear portion of the loom.

Figure 7 is a rear elevation of that portion of the loom shown in Figure 6.

Figure 8 is a vertical section taken on the line 8—8 of Figure 7 of part of the brake structure.

In the wire weaving loom, of which my warp feed is a part, the warp wires are fed from suitable sources of supply, for instance from spools, not shown, rotatably supported on racks adjacent the rear of the machine.

From the spools, the warp wires are fed to the warp feed, which constitutes my present invention, and from thence they are carried forwardly, and in the present machine, then upwardly, to the weaving mechanism proper.

It is difficult to produce wire cloth which will lie flat and straight as it comes from the loom. This is due in part to difficulties encountered in supplying the warp wires in exactly equal lengths and with proper tension. Where the wires are alike and there is variation in the tension on the incoming warp wires, it frequently occurs that wires having the least tension are crimped more easily in the weaving operation than the wires under greater tension, which imposes strains on the cloth and results in the production of an uneven cloth having waves.

In ideal wire cloth, the crimp of warp and weft wires is equal, except at the selvage so that the cloth will have just the thickness of two wires.

If one wire crimps so easily that it does not deflect the wire against which it is crimping, the cloth will have spots, where it will be more than two wires thick. Such spots are easily seen and are injurious to the appearance of wire cloth.

Furthermore, if a cloth having uneven crimp is passed over rolls under tension or even on to a tightly rolled roll of cloth, the wire crimps will be pressed down, causing loose spots in the finished cloth.

It is obvious that where tensile strain is imposed on the finished cloth, a loose wire does not receive its share of the pull. This explains the "pulled" or distorted cloth sometimes seen.

My present apparatus is intended to eliminate the undesirable results just described.

In the drawings herewith, starting at the rear of the machine, I have provided laterally spaced base elements 11 from which members 12 and 12*a* extend upwardly. These upright members support the rolls which guide and help to tension the warp wires. Journaled in the frame members 12 and 12*a* are vertically spaced horizontal shafts 13, 14, and 15, on which are rolls 13*a*, 14*a*, and 15*a*, preferably of metal.

Spaced forwardly from the shafts 14 and 15 and staggered with relation to them is a horizontal shaft 16, journaled in the uprights 12 and 12*a*. On the shaft 16 is a roll 16*a*. Spaced forwardly from the shafts 13 and 14 and staggered with relation thereto, the shaft 18 is journaled in the frame members 12 and 12*a*. On the shaft 18 is a roll 18*a*. These rolls are all of the same diameter and they are caused to rotate by frictional contact with the moving warp wires as these wires are fed into the loom. Suitable meshing gears 17, on the rolls, insure that the rolls rotate in unison and at the same speed.

At the upper ends of the frame members 12 and 12a, a spacer rod shaft 21 is detachably secured in place by means of clamps 22 and screw bolts 23, which extend through the clamps 22 and are threaded into the frame members. The spacer shaft 21 is provided with equally spaced circumferential grooves 20, as shown in Figure 7.

A horizontal bar 24 is supported by the clamps 22 in position to hold the warp wires 10 in the grooves 20.

The spacer rod or shaft 21 may be easily removed and replaced with another having differently spaced grooves for making cloth with different spaces between the successive warp wires.

Substantially below the spacer rod 21 and arranged forwardly in the machine from the roll 13a, and with its lower part below the level of the upper part of the roll 13a, is a second spacer rod or shaft 25 journaled to rotate freely in the frame members.

The spacer 25 is grooved similarly to the rod 21. It must also be removable so that it may be replaced with another spacer with differently spaced grooves. For this reason, bearings 25a are set in the ends of the spacer rod 25 and studs 25b are adjustably mounted in the frame members 12 and 12a to cooperate with the bearings 25a by projecting into the sockets thereof, demountably journaling the spacer 25 on the frame members.

The spacer shaft 25 is located nearly in contact with the roll 13a, so that even very hard wire, which has a tendency to retain any original crookedness can be fed onto the surface of the roll 13a in straight circumferential lines, which is desirable for the best performance of the wire in feeding equal lengths of warp wires to the weaving mechanism proper.

The warp wires 10 except the selvage wires come from the spools, which are usually located above and rearwardly with relation to the machine and are threaded around the forward face of the spacer rod 21 from above and then around the spacer rod 25 with a rather sharp bend, and then rearwardly over and around the roll 13a and thence successively around the rolls 18a, 14a, 16a and 15a.

It will be noted that the staggered arrangement of the rolls is such that the wires are threaded, so that they embrace the larger part of the circumference of each of the smooth rolls.

This provides for frictional contact between the warp wires and the roll surfaces for effectually preventing slippage of the wires upon the rolls at any pull to which the wire is subjected in the machine.

Since the warp wires are always under tension, which is necessary in weaving wire cloth, the friction between the surfaces of the rolls and the warp wires, and the fact that the rolls are geared together to travel at uniform speeds, insures precise duplication of the lengths of the warp wires, leaving the roll 15a.

In order to further assure even initial tension on the warp wires as they start their travel through the rolls, I provide means for providing slack in the warp wires just before they reach the spacer 25.

Laterally spaced rocker arms 31 are fixed to a rock shaft 32 journaled in the frame members 12 and 12a. The arms 31 extend upwardly and are connected at their upper ends by a rocker bar 33. On the shaft 32 is fixed an arm 34 carrying a weight 35, best shown in Figure 2, for normally holding the rocker bar 33 against the warp wires 10 between the spacer bars 21 and 25, and thus holding these wires out of the direct path between the spacer bars.

Pivoted to one rocker arm 31 is a link 36 extending rearwardly in the machine, and having an elongated slot 37, which receives a headed pin 40 projecting from the lever 38.

The lever 38 is pivoted at 39 between its ends on the frame member 12a. The lower end of the lever 38 is pivoted to a link 41 extending forwardly in the machine. The link 41 is pivoted at its forward end to a bell crank lever 42, shown in Figure 1, which bell crank is in turn pivoted to an upwardly extending link 43. The link 43 at its upper end carries the collar 44, which embraces the eccentric disc or cam 45 on the shaft 46. Rotation of the shaft 46 actuates the parts just described for imparting an oscillating movement through a short arc to the rocker bar 33 for intermittently putting slack in the incoming warp wires 10. It will, of course, be understood that this operation is synchronized with the other operations of the loom.

The operation of the rocker bar insures a uniform initial tension of the warp wires when they are drawn onto the rolls by drawing slack from the supply spools for each warp feed movement.

It is sometimes necessary to reverse the direction of the movement of the incoming warp wires for a short distance to correct a bad piece of weaving or to make a "set" in starting a new shuttle of weft wire.

For this purpose, there is provided on one end of the shaft 18, a hand wheel 47 (Figure 7). When it is desired to reverse the movement of the warp wires, the feed pawl hereinafter referred to is moved out of operating position and a hand wheel is operated for reversing the normal movement of the tension rolls.

The operator ordinarily performs this operation with the hand wheel 47 when the rocker bar 33 is at the forward limit of its movement. Thereupon when the rolls are given reverse motion, the rocker bar 33 swings rearwardly and maintains slight tension in the slack wire above the rolls, though not enough tension to strip wire from the supply spools.

This arrangement affords an automatic control for the slack wire to avoid accumulation of too much slack above the rolls in case of reverse movement.

It is however a safeguard only within the limits of travel of the rocker bar, but I find this to be sufficient for normal requirements.

The structure heretofore described serves to assure that the warp wires will be furnished to the machine in identical lengths and also functions in connection with certain additional parts now to be described, to provide proper general tension upon the warp wires during the weaving operation.

Assuming that the warp feed is definite and for all purposes practically irresistible, it follows that the load applied against the rotation of the rolls of the mechanism, shown for instance in Figure 2, will increase the tension of the warp wires between these rolls and the machine feed mechanism.

I have provided means for automatically establishing a tension producing friction load in a controlled degree. The amount of friction to be applied must be regulated by the actual tension of the warp itself, so that increasing tension produces a decrease in friction, and a decreasing

tension produces an increasing friction. In this way, the tension will be self-regulated and automatically constant.

On the shaft 18 between the hand wheel 47 and the frame member 12a is fixed a brake drum 48 (Figures 2, 6, 7, and 8). On the drum is a brake band 50, one end of which is anchored to the frame 12a by means of a pin 51 and ordinary parts, including a short arm 52, a post 53, and a lock nut 54. The other end of the brake band is pivoted between the ears of a lever 55 pivoted to rock on the frame 12a by means of a pin 56. The lever 55 has an arm 58 acting against a spring 59, which serves to normally hold the brake out of contact with the drum.

The lever 55 also has a forwardly extending arm 60 through which is threaded a screw bolt 61 on which is a lock nut 62.

When the brake band is thus inoperative, the tension on the warp wires required to pull them forwardly through the machine is only that tension which is necessary to revolve the warp wire rolls and to overcome the friction of the wires on the spacer shafts and the rocker bar and the selvage tensioning devices hereinafter described.

I shall now describe the mechanism for regulating the brake friction.

When the warp wires leave the roll 15a, shown in Figure 2, they travel forwardly in the machine toward the weaving mechanism supported upon the main side frame members 63. The main side frame members 63 are rigidly connected with the frame members 12 and 12a by means of strong rigid frame members 64.

The warp wires pass under and then upwardly from a whip roll 65 carried on the shaft 66. The shaft 66 is journaled in the forward ends of the arms or levers 67. The whip roll is at the forward part of the machine, and the arms 67 extend rearwardly on opposite sides of the machine, and are fixed between their ends on a shaft 68, journaled in bearings 69 supported by the frame members 64 (Figure 1). One arm 67 has a rearward extension 67a (Figures 1 and 2) projecting to position just below the forwardly extending arm 60 on the lever 55 and below the stop screw 61 adjustably mounted in that arm. The screw 61 serves to vary the effective distance between the arm 60 of the lever 55 and the extension 67a of the arm or lever 67.

Upward movement of the rearward end of the extension 67a of the lever 67 moves the screw 61 and arm 60 upwardly for tilting the lever 55, for thus tightening the brake band 50 around the drum 48 against the tension of the spring 59 for providing resistance against rotation of the warp rolls at the rearward end of the machine. This results in resistance to the forward feed of the warp wires.

The warp wires are drawn upwardly through the heddles 70 and past the beater 71 by means of the breast roll 76 and associated mechanism not here particularly described. This breast roll and associated mechanism is all clearly shown and described in my Patent No. 2,022,225.

It will be understood that the breast roll is operated to draw the warp wires intermittently through the machine in synchronism with the operation of the other parts of the loom.

As the warp wires are drawn around the whip roll 65 and upwardly through the weaving mechanism by the breast roll and its associated mechanism, the wires exert an upward pull on the whip roll, which merely lies upon them.

If the warp wires were given slack, the whip roll would have no support and would drop to the floor, if it were not for the engagement of the extension 67a with the adjustable stop screw 61. This engagement, of course, limits the downward movement of the whip roll. The whip roll and the arms 67 are heavy enough so that they tend to raise the extension 67a and thus cause the brake band 50 to tighten and to effect resistance to the rotation of the warp wire rolls. There is thus provided a means for establishing tension on the warp wires between the warp wire rolls and the breast roll 76.

The warp wires can not pass through the warp rolls until there is sufficient pull or tension upon them to lift the whip roll a certain distance. This distance can be regulated by means of the adjustment of the screw 61.

It will be observed, however, that the adjustment of this screw only determines the height at which the whip roll causes the brake to be released.

In order to change the tension on the warp, it is necessary to change the downward pressure exerted on the warp wires by the whip roll.

I will now describe the mechanism for regulating this downward tension of the whip roll on the warp wires.

The arms 67 have forward extensions 77 projecting forwardly beyond the whip roll with flat faces 77a machined in a plane radial with relation to the axis of the shaft 66. Just forwardly of the whip roll 65 is a transverse shaft 78, which is preferably rigidly supported between the machine side frames 63. On the shaft 78 is a rotatable sleeve 79, preferably on suitable anti-friction bearings not here shown.

At the ends of the sleeve 79, it is provided with rearwardly extending arms 80, which engage and coact with the arms 77 and have machined faces for engaging the faces 77a.

At about the longitudinal center of the sleeve 79, an arm 81 extends forwardly from the sleeve. A coil spring 82 is connected to the arm 81 at one end and to a flexible member 83 at the other end. The flexible member 83 is wound around a shaft 85, which shaft is suitably journaled on the main frame of the machine.

For winding the flexible member 83 on the sleeve 84, a lever 86 is fixed to the shaft 85 adjacent one of the main frame members. The lever 86 may be locked in various positions of adjustment by means of a movable pin 87, having slidable mounting in the lever 86 and adapted to be projected into any one of the series of holes 88 in a quadrant 89.

Since the warp wire tension is dependent upon the pull required to lift the whip roll 65 high enough to release the brake on the tension rolls, it follows that any downward pressure applied to the whip roll will increase the warp tension just that much, because the brake will not release the tension rolls until this downward pressure has been overcome by the upward pull of the warp itself.

When once the proper adjustment is established, it is substantially permanent except for slight variations due to wear and so forth, although the adjustment is easily altered by varying the tension of the spring 82.

In addition to functioning as a means for alter-

ing the warp tension, the sleeve 79 and its arms 80 serve to keep the whip roll in perfect horizontal position, and thus prevents straining or pulling the whip roll frame out of alignment by any of the warp wires.

In action, the whip roll is constantly rising and falling through a short travel in unison with the heddle movement and the feed of the warp. This does not necessarily involve the warp rolls in a perfectly synchronized feed movement, since the elasticity of the train of members conveying the action as well as that of the wire itself blends this motion into a brake release that is somewhat more constant, but which accurately averages the feed at the particular tension at which the machine is set.

It is thus possible to take up the warp slack, due to heddle movement, and at the same time automatically adjust the tension brake with the same mechanism. This is feasible since the heddle movement is compensated within the range of the elasticity of the parts, while the warp feed by means of the breast roll 76, causes an actual rise of the whip roll, until the lift thereof results in a release of the brake to allow additional warp wires to pass through the warp rolls.

I have provided means for holding the warp wires in place at the bottom of the series of warp tension rolls.

This may be important in case one of the warp wires should break. Just rearwardly of the roll 15*a* (Figure 2) is a contact roll 90, preferably with a rubber covering 91. The contact roll 90 is rotatably supported in easily removable swinging brackets 92, which have slots 93 to receive pins 94 by which the brackets are hung on the frame members 12 and 12*a*.

The brackets 93 are simply hung over the pins or studs 94, which permit easy removal of the roll and at the same time affords enough pressure of the roll 90 against the roll 15*a* on account of the weight of the roll 90.

The rocker bar 38 is curved to clear the roll 90.

In case one of the warp wires should break in its passage through the machine, the incoming member will still be held in position with relation to the other warp wires on the roll 15*a*, so that the splice can be made without having to thread the broken wire carefully around all the warp wire rolls.

Figures 2, 3, 4, 6 and 7 show the selvage wire tensioning means.

If the selvage wires were fed through with the other warp wires, they would soon become loose in the weaving mechanism. Since they are at the edge of the cloth, they are not crimped by the weaving action, since they are only straightened out of a straight course by a slight twist of the selvage loop. What little crimp they normally attain is due to the pressure exerted against the breast roll after the weaving, and it is not sufficient to maintain desirable weaving tension in the selvage wires. In order therefore to afford the selvage wires approximately the same tension as that imposed upon the other warp wires and avoid the looseness which would otherwise occur in the selvage wires, I have mounted at each side of the machine, the devices now to be described.

These devices are mounted just rearwardly of the frame members 12 and 12*a* on the projecting ends of the frame members 64. Supported on the frame members 64 is a transverse shaft 95.

For each selvage wire retainer, I provide a clamp 96 adapted to be adjustably mounted on a squared portion of the shaft 95, so that it can be adjusted for different widths of the wire cloth.

Projecting upwardly from the clamp 96 is a bracket arm 97. Pivoted at its upper end on the bracket arm 97 is a hardened steel finger 98, which has a forward extension 98*a* at its lower end and has a groove 99 in its rear and bottom faces, curved as shown in Figure 4, to deliver a selvage wire to the bottom of the roll 15*a* on a horizontal level with the other warp wires leaving such roll.

A headed screw 100 has an angular portion 101 fitted through a corresponding opening 102 in a hardened disc 103. The screw is mounted in the plate 97 with left-hand threads, so that the selvage wire 104 may be fed between the disc 103 and the steel finger 98 with the disc pressed into the groove 99.

A spring 105 is connected with the finger 98 below the disc 103 and is fastened to one end of a bolt 106, which extends through a lug 107, and has a wing nut 108 threaded on its outer end, for regulating the tension on the spring.

As the loom feeds the wire from the selvage tension devices, the wire is pinched between the snubbing disc 103 and the bottom of the groove 94 in the tension finger.

It will, of course, be understood that the groove is so shaped as to allow contact with the wire between the finger and the disc. Any lengthwise motion of the wire is strongly resisted by the frictional engagement of the finger, the wire and the disc. Pull on the wire through the machine imposes an effort toward swinging the finger 98 away from the snubbing disc 103, and when sufficient pull is applied, the finger will move away from the disc for releasing the snubbed wire.

In this device, I have a means for weighing or regulating the tension. By increasing the tension on the finger 98, it is clear that a correspondingly greater pull is required to move the finger 98 away from the snubbing disc for pulling the selvage wire through the machine. This tension can be adjusted so that it has proper relation to the tension of the other warp wires.

Thus it will be seen that I have provided a warp feed mechanism by which the warp wires, except the selvage wires may be fed in equal lengths through the machine for insuring an even crimp therein during the weaving operation.

The selvage wires are also given a controllable tension adapted to secure the best results in weaving.

All the tension devices are regulatable for enabling the skilled workman to get the best results.

The tension is automatically regulated according to the pull of the warp wires through the weaving mechanism.

Means is provided for maintaining the selvage wires at proper tension with relation to the other wires, even though the crimping of the selvage wires is not the same as the crimping of the other warp wires.

By the construction herein provided, I afford means for producing a smoother, truer wire than would otherwise be possible.

It is my purpose to cover by my claims any details of arrangement or any modifications in the structure of the parts as here shown, which may reasonably come within the scope of my invention and of my claims.

I claim:

1. In a weaving machine, means for feeding warp wires to the machine, a whip roll forwardly in the machine from said means and resting on

the advancing warp wires, means for pivotally mounting the whip roll to swing on an axis between the whip roll and the warp feeding means, a rotary element adjacent the whip roll, means associated with said element for imposing pressure on the whip roll for pressing the whip roll against the warp wires.

2. In a weaving machine, means for feeding warp wires to the machine, a whip roll forwardly in the machine from said means and resting on the advancing warp wires, means for pivotally mounting the whip roll to swing on an axis between the whip roll and the warp feeding means, a rotary element adjacent the whip roll, means associated with said element for imposing pressure on the whip roll for pressing the whip roll against the warp wires, and adjustable means for imposing yielding rotative force on the rotary element for thus regulating such pressure.

3. In a weaving machine, means for feeding warp wires to the machine, a whip roll, arms pivotally mounted forwardly of said means and projecting forwardly and rotatably supporting the whip roll in position for it to rest on the advancing warp wires for pivotal movement, a rotary member arranged adjacent to the whip roll, means associated with said rotary member for engaging said respective arms for pressing the same downwardly and thus pressing the whip roll against the warp wires and to prevent lengthwise rocking of the whip roll.

4. In a weaving machine, means for feeding warp wires to the machine, a whip roll forwardly in the machine from said means and resting on the advancing warp wires, means for pivotally mounting the whip roll to swing on an axis between the whip roll and the warp feeding means, a rotary element adjacent the whip roll, means associated with said element for imposing pressure on the whip roll for pressing the whip roll against the warp wire, means at the front of the machine for drawing the warp wires through the machine, said first means including mechanism for imposing tension on all of the warp wires, except the selvage wire, and separate means for imposing tension on the selvage wires.

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