June 16, 1936. H. J. MURPHY 2,044,440

LOOM FOR WEAVING CRINKLE CLOTH

Filed Nov. 20, 1933 4 Sheets-Sheet 1

Fig. 1.

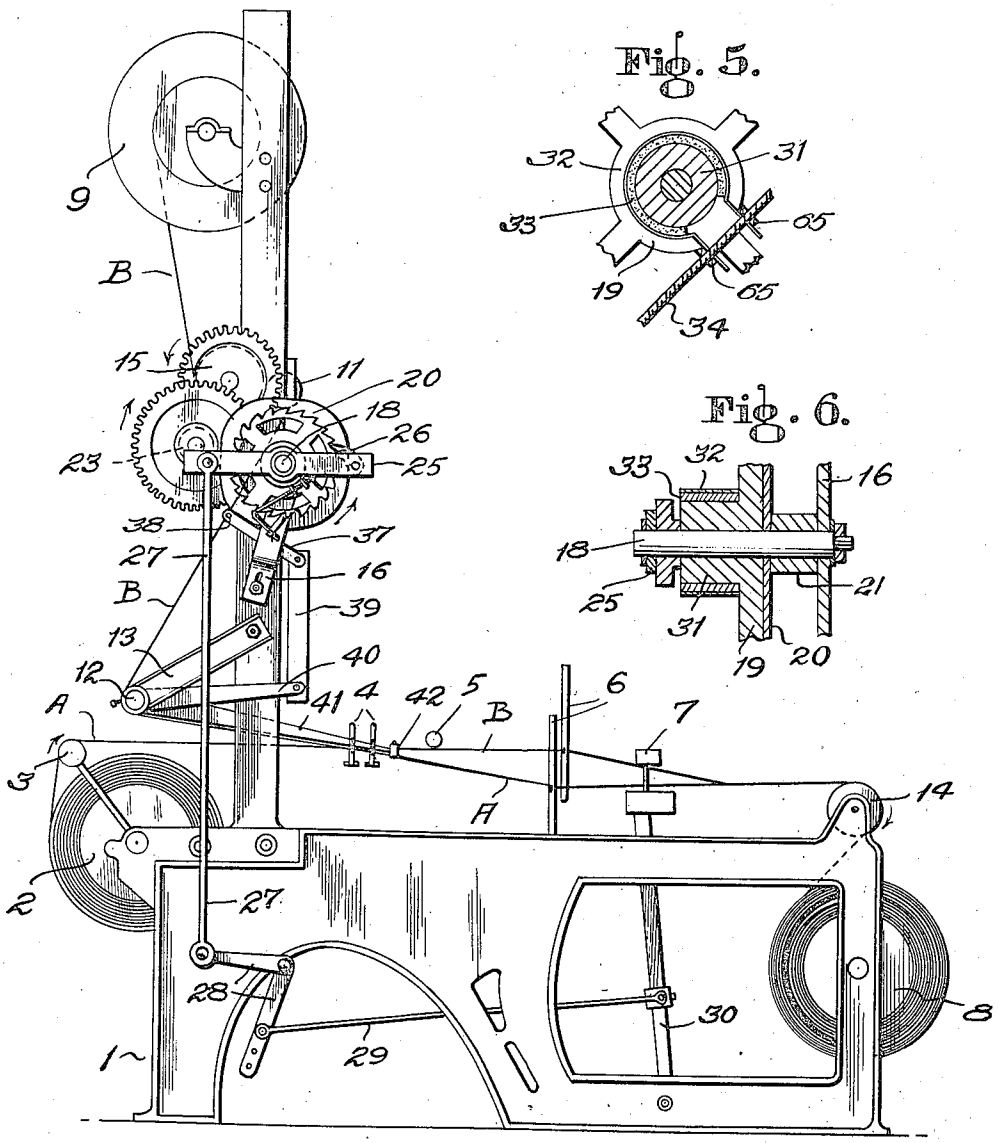


Fig. 5.

Fig. 6.

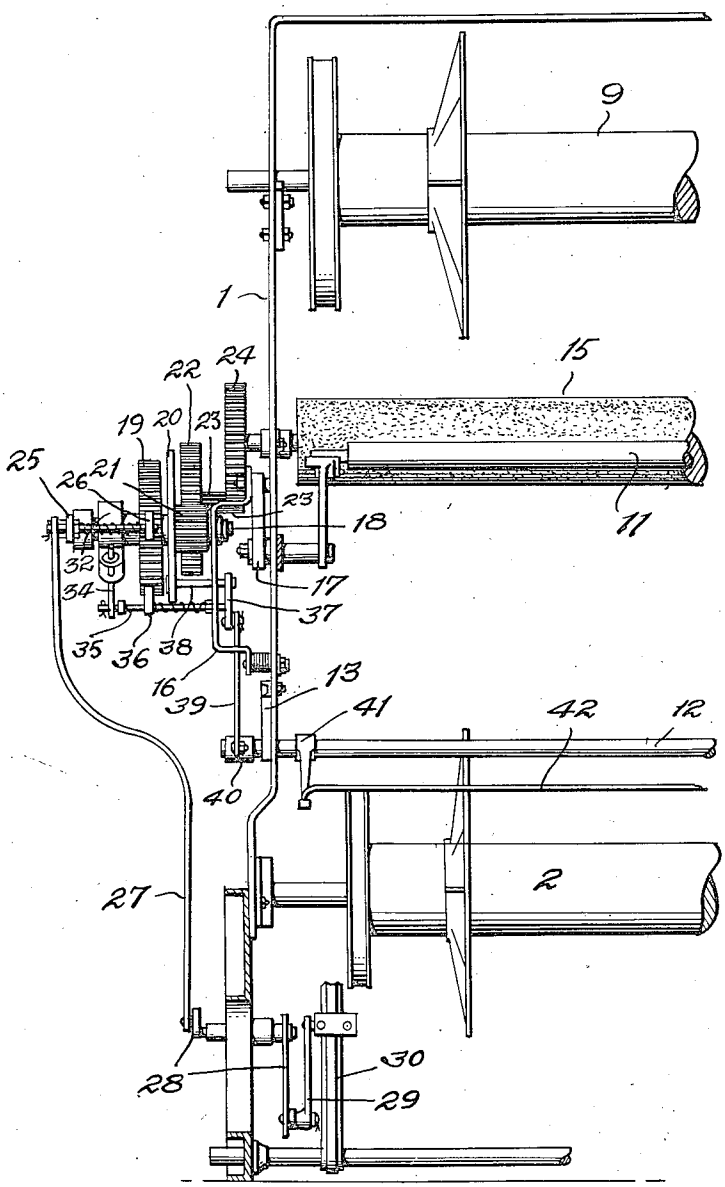
INVENTOR.
Henry J. Murphy
BY J. T. Newton
ATTORNEYS.

June 16, 1936. H. J. MURPHY 2,044,440

LOOM FOR WEAVING CRINKLE CLOTH

Filed Nov. 20, 1933 4 Sheets-Sheet 2

Fig. 2.



INVENTOR:
Henry J. Murphy
BY: J. T. Newton
ATTORNEYS.

June 16, 1936. H. J. MURPHY 2,044,440

LOOM FOR WEAVING CRINKLE CLOTH

Filed Nov. 20, 1933 4 Sheets-Sheet 3

Fig. 3.

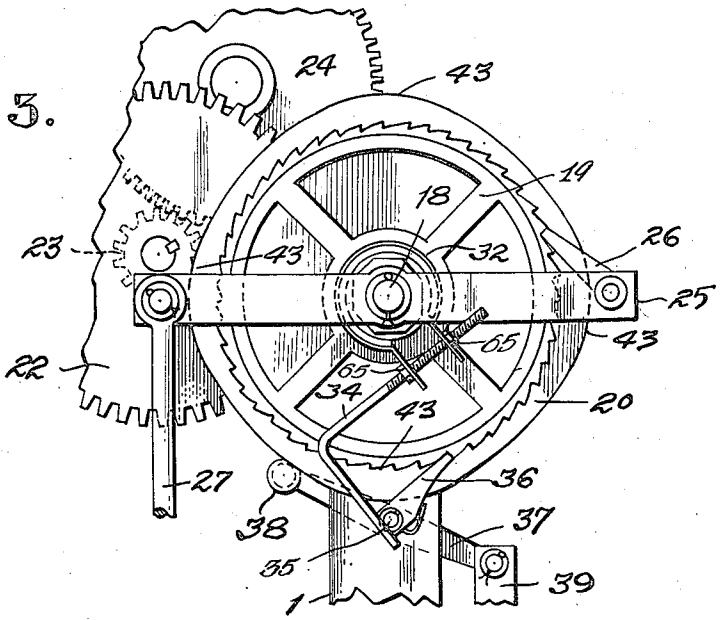
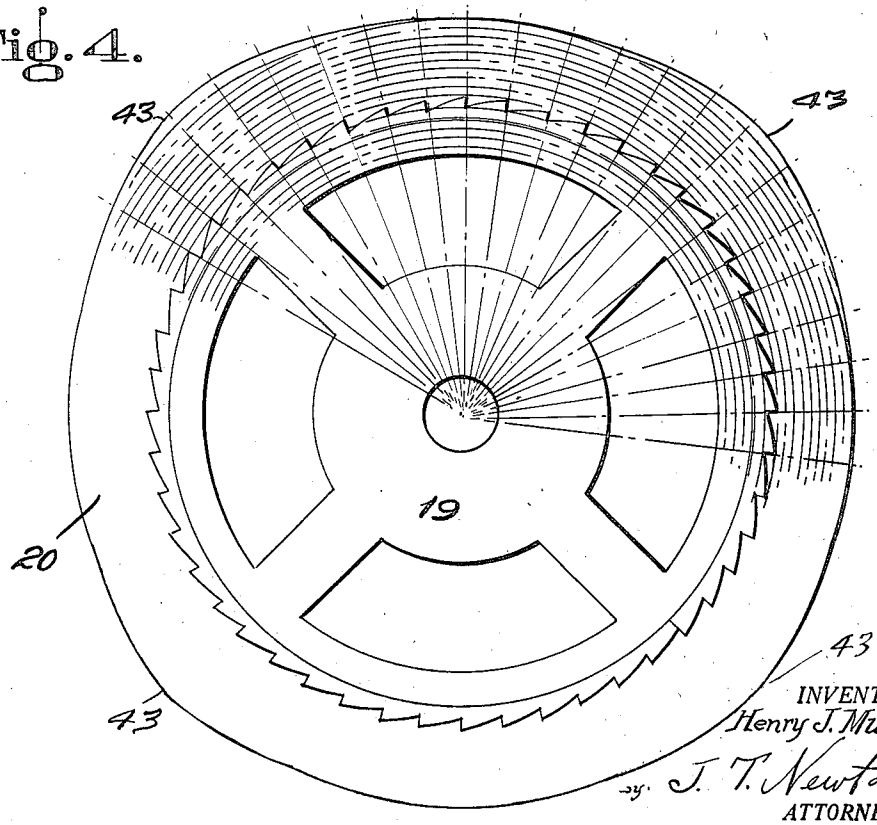


Fig. 4.



INVENTOR.
Henry J. Murphy
By J. T. Newton
ATTORNEYS.

June 16, 1936. H. J. MURPHY 2,044,440

LOOM FOR WEAVING CRINKLE CLOTH

Filed Nov. 20, 1933 4 Sheets-Sheet 4

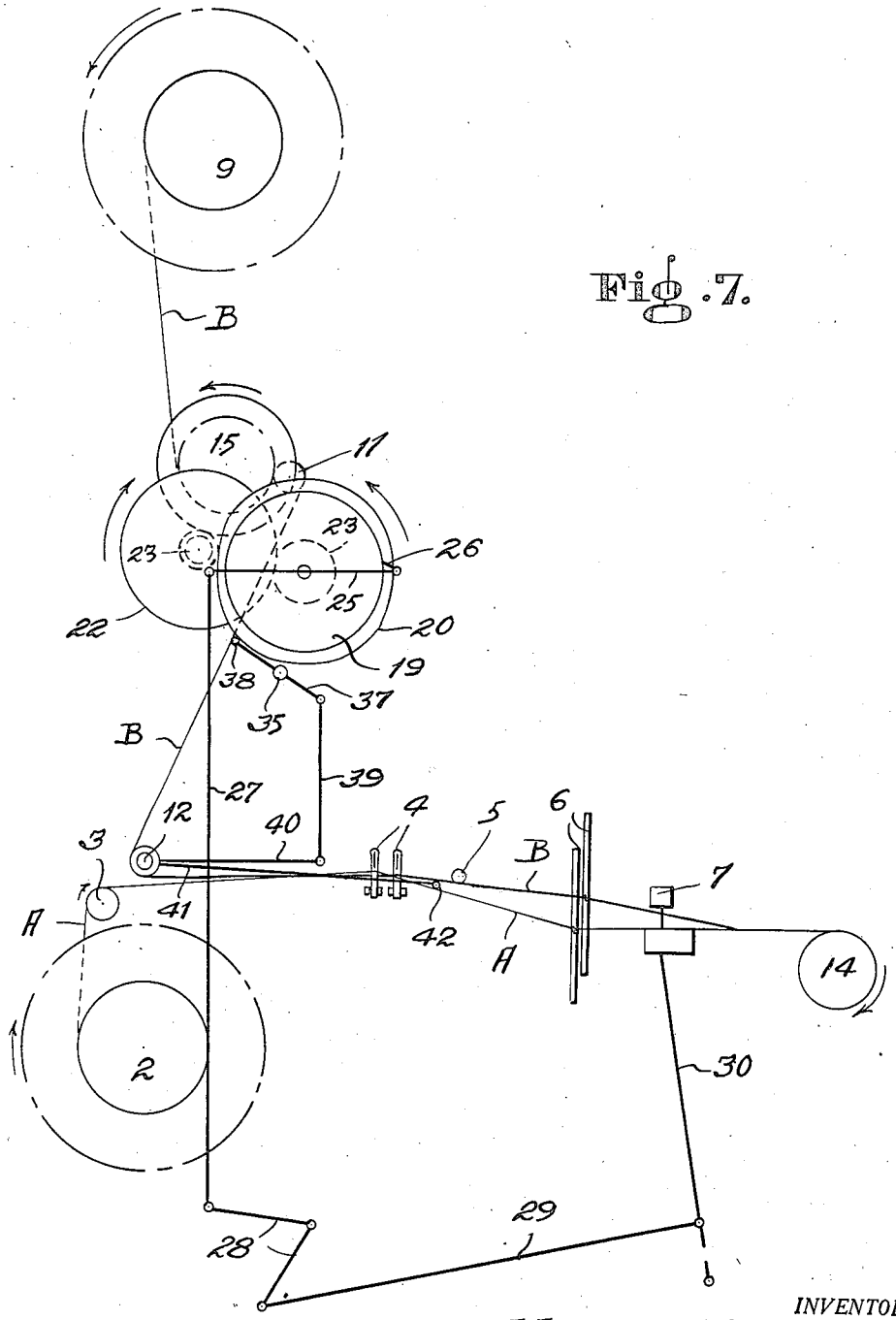


Fig. 7.

INVENTOR.
Henry J. Murphy
BY J. T. Newton
ATTORNEYS.

Patented June 16, 1936 2,044,440

UNITED STATES PATENT OFFICE

2,044,440

LOOM FOR WEAVING CRINKLE CLOTH

Henry James Murphy, Macon, Ga., assignor to Bibb Manufacturing Company, Macon, Ga., a corporation of Georgia

Application November 20, 1933, Serial No. 698,898

3 Claims. (Cl. 139—24)

This invention relates to improvements in looms for weaving crinkle cloth, such as seersucker and the like. In looms of this type the warp is carried by two beams, from one of which the ground warp is drawn under a regular tension and from the other beam the warp is drawn at short and regular intervals in excess of the ground warp. These successive waves of excess warp, woven into the fabric, produce the crinkle effect. In ordinary practice the ground warp is let-off at a regular uniform travel and an intermittent let-off is employed to provide an intermittent travel of the crinkle warp. In former let-off mechanisms for the crinkle warp much trouble has been experienced in regulating the length of the excess waves in the crinkle warp; it frequently happens that the excess waves are too long and the resulting fabric has a coarse rough appearance; then again, the excess waves are too short and the crinkle effect appears to be lacking in patches on the fabric.

In my copending application, filed July 13, 1932, Ser. No. 622,284, now Patent #1,940,366, Dec. 19, 1933, a let-off mechanism is disclosed that avoids the former difficulties to a considerable extent. In that device the let-off includes a ratchet-wheel and pawl mechanism for intermittently driving the sand-roll to feed forward the crinkle warp in excess of the ground warp; the intermittent drive of the sand-roll effects the wave-like movement of the excess to the shedding mechanism. In practicing the device of the copending application it has been found that the waves of excess warp tend to merge as the warp travels from the sand-roll to the shedding mechanism, resulting in an irregular slack condition of the crinkle warp as it is engaged by the shedding mechanism, thereby imparting a rough appearance to the woven fabric.

The present invention has for its object the provision of a let-off mechanism that intermittently rotates the sand-roll to draw the crinkle warp from its beam in successive lengths in excess of the ground warp, as in the device of the copending application, to provide the additional warp required for the crinkle effect. The crinkle warp is drawn from the beam by the sand roll at a uniform rate, but intermittently, so that at the required intervals the excess of warp is provided for the production of the wave effects. The drive of the sand roll is such that excess of slack in the warp does not exceed the requirements for the crinkle weaving. The present invention has for a further object the provision of means for controlling the slack lengths in the crinkle warp so that each length is alternately tightened and loosened as it enters the shedding mechanism, to be alternately woven into flat and crimped rows in the fabric. The slack controlling mechanism operates in timed relation to the sand-roll so that the slack is taken up sufficiently to tension the crinkle warp to correspond with the tension of the ground warp during the plain weaving and also operates in timed relation to release the slack during the crinkle weaving, while the sand-roll operates to let off the crinkle warp sufficiently in excess of the ground warp for the weaving of the crimped fabric.

The mechanism for carrying out the invention is described in detail hereinafter, pointed out in the appended claims and illustrated by the accompanying drawings.

In the accompanying drawings, in which similar reference characters designate corresponding parts.

Figure 1 is a side elevation of a loom with the novel let-off for the crinkle warp mounted thereon, only so much of the loom is shown as is necessary to illustrate the invention.

Figure 2 is a transverse section of the loom, showing the let-off in front elevation.

Figure 3 is an enlarged detail view, showing a side view of the ratchet-wheel and the coacting cam-wheel for actuating the sand roll and controlling the let-off.

Figure 4 is an enlarged detail view of the ratchet-wheel and cam-wheel, showing the relation between the ratchet teeth and the cam-lobes.

Figures 5 and 6 are detail sectional views of the hub parts of the ratchet and cam-wheels.

Figure 7 is a diagrammatic view of the let-off mechanism and associated loom parts, showing the relation of these parts.

Referring to the drawings in detail, 1 designates a part of the frame of a loom on which are mounted the several operative parts of the device. Extending transversely of the lower part of the frame is the beam 2 carrying the ground warp threads A, which lead from the beam over the idler roll 3, through the detectors 4, beneath the transverse fixed bar 5, through the harness 6 and the lay 7 to the cloth beam 8. Mounted in the upper part of the frame, to extend across the same, is the beam 9 carrying the crinkle warp threads B. The latter lead from the beam 9, partly around the sand-roll 15 and over the guide rod 11 to the guide formed by the shaft 12 journaled at its ends in the brackets 13 (but one is shown) secured to the loom frame. The shaft 12 is rotatable for a purpose to be explained further

on. After passing around the shaft 12 the threads B lead through the detectors 4, beneath the fixed transverse bar 5, through the harness 6 and the lay 7 to the cloth beam 8. The foregoing parts and their operation are well known in the weaving art and need not be described in detail. During the weaving the warp threads A and B are drawn forward by the pull exerted by the beat-up action of the lay, and the finished cloth passes over the roll 14 to be wound on the take-up roll 8 in the usual manner.

A let-off mechanism is provided to regulate the feed of the warp B from the beam 9 to produce the crinkle effect in the weave. This mechanism operates to feed forward the crinkle warp B in excess of the ground warp A, the excess warp being fed forward intermittently and uniformly to meet the requirements for the crinkle weave. This is effected by let-off mechanism actuated by the lay of the loom to rotate intermittently the sand-roll 15 to forward the excess of crinkle warp B in successive lengths of slack warps. Associated with the actuating means of the sand-roll is a take-up mechanism for alternately taking up and releasing the slack in the successive lengths in the crinkle warp in its travel from the detectors to the heddles. This take-up mechanism is actuated in timed relation to the intermittent feed of the let-off mechanism.

The let-off mechanism for actuating the sand-roll 15 is partly mounted on a bracket 16, bolted at its lower end to the frame 1 and at its upper end to the upper end of the brace 17, which is bolted at its lower end to the frame 1. A horizontal stub-shaft 18 is fixed at one end in the bracket 16. Journaled on the stub-shaft are the ratchet-wheel 19, the multiple cam-wheel 20 and the pinion 21; these three members are compounded to rotate as a unit on the stub-shaft. The pinion 21 is included in a gear-train comprising said pinion, gear 22, pinion 23 and gear 24 fast on the shaft of the sand-roll 15. As the ratchet-wheel 19 is intermittently rotated, through the intervening mechanism, a like motion is imparted to the sand-roll.

Journaled on the outer end of the stub-shaft 18 is the lever 25, carrying at one end the pawl 26 adapted to engage the ratchet-wheel 19. The other end of the lever is connected by the rod 27 with one of the arms of the bell-crank lever 28, the other arm of the bell-crank lever is adjustably connected by the rod 29 with the lay sword 30. The oscillation of the sword is transmitted through the intervening mechanism to the lever 25, which imparts through the pawl 26 a step-by-step rotation of the ratchet-wheel 19. This intermittent rotation of the ratchet-wheel is transmitted by the gearing 21—24 to the sand-roll 15, which operates to draw the crinkle warp threads B from the beam 9. The crinkle warp threads are held by the guide rod 11 in frictional contact with the sand-roll. By this action of the sand-roll the crinkle warp is fed in successive lengths of slack warps to the weaving mechanism. The length of the individual slack lengths depends on the throw of the lever 25, which is regulated by adjusting the connection between the rod 29 and the bell-crank lever 28. Under ordinary conditions the lever 25 is operated to turn the ratchet-wheel 19 a distance equal to one of its teeth for each complete oscillation of the lay sword. But, by adjusting the connection between the rod 29 and the bell-crank lever 28, the throw of the latter can be increased to amplify the oscillation of the lever 25 so that the pawl 26 may turn the ratchet-wheel 19 through a greater arc, according to the adjustment. This turning of the ratchet-wheel through a greater arc would correspondingly increase the turning movement of the sand-roll, resulting in an increase in the extent of thread waves in the crinkle warp as the latter is fed by the sand-roll and with relation to the oscillations of the lay sword.

A braking mechanism is provided to prevent over-running of the ratchet-wheel 19 and the mechanism controlled by it. Projecting from the outer side of the ratchet-wheel is the hub extension 31, forming a drum engaged by the metal strap 32, Fig. 6, and the interposed friction lining 33. Through the ends of the metal strap extends the threaded rod 34, Fig. 5. By means of nuts 65 turned onto the rod the frictional engagement of the braking strap with the hub 31 can be regulated. The rod 34 is clamped to the supporting arm 35 attached to and projecting horizontally from the outer side of the bracket 16. Pivoted on the arm 35 is the pawl 36 normally pressed into engagement with the ratchet-wheel 19 to prevent backward turning of the wheel.

As the crinkle warp B is intermittently drawn from its beam in excess of the ground warp A drawn from its beam, if no provision was made to prevent it, there would be considerable slack or looseness unevenly distributed in the crinkle warp between the sand-roll and the heddles, which would result in a rough and uneven weaving of the crinkle cloth. To prevent this, auxiliary means are provided for alternately tightening and loosening the slack in each crinkle warp length just before it passes to the heddles. This means acts in timed relation to the operation of the sand-roll, so that the slack is taken up simultaneously with the operation of the sand-roll in feeding forward an excess of warp sufficient to form a transverse crimp or wave in the cloth. It may be stated here that during a complete rotation of the ratchet-wheel 19 the sand-roll is operated to draw from its beam sufficient crinkle warp to form four rows of crimped fabric. While the slack remains in the excess length, the pick of the lay acting on the loose threads of the warp forms a comparatively loose line of threads across the warp to form the crinkle effect in the fabric.

The auxiliary mechanism for regulating the slack in the crinkle warp lengths comprises a lever 37 pivoted on the supporting arm 35. In one end of this lever is journalled the roller 38 bearing against the periphery of the cam-wheel 20. At its other end the lever is connected by the link 39 with the outer end of the lever 40 fixed at its inner end on the rock shaft 12. As previously pointed out, this rock shaft also acts as a guide for the crinkle warp. Extending from the rock shaft are the arms 41 (only one is shown) carrying at their free ends the bar 42 extending between the warps in a position between the detectors 4 and the transverse fixed guide bar 5. As the shaft 12 is rocked the bar 42 is oscillated and on its upstroke, between the detectors and the fixed bar, takes up the slack in crinkle warp. On the down stroke of the bar the accumulated slack is released to be carried along by the following beat-up actions of the lay, resulting in a row of crimped threads extending across the woven fabric. During the upstroke of the bar 42 the slack is taken up and the tension in the crinkle warp will be increased to accord with the tension in the ground warp,

resulting in a plain weaving of the fabric during the upstroke of the bar. The weaving of the fabric with the crinkle fabric alternately slack and under tension results in alternate rows of plain and crimped fabric, in which the crinkle parts are uniform throughout.

The auxiliary mechanism for regulating the slack in each of the crinkle warp lengths intermittently fed forward by the sand roll is controlled by the multiple cam-wheel **20**. The contour of the periphery of the cam-wheel is such as to provide four cam lobes **43** spaced equal distances apart around the periphery of the cam-wheel. As the cam-wheel rotates the cam lobes successively engage the roller **38** on lever **37** and the latter is oscillated to reciprocate the bar **42** controlling the slack in the crinkle warp. As previously described, the cam-wheel is compounded with the ratchet-wheel **19**, so that the step-by-step rotation of the latter is imparted to the cam-wheel. The cam lobes **43** merge gradually into each other and each has only a slight radial extension as but a slight movement of the lever **37** is required.

In actual practice a cam-wheel of the pattern indicated has been compounded with a ratchet-wheel **19** having 48 teeth projecting from its periphery, as illustrated by Figure 4. As the cam-wheel rotates the roller **38** of the lever **37** rides on the nose of each cam lobe **43** through an arc equal to a turning movement imparted to the ratchet-wheel **19** by two successive strokes of the lever **25** actuated by the lay sword **30** through the intervening mechanism. During the two successive strokes of the lever the pawl **26** of the lever successively engages two teeth of the ratchet-wheel and the latter is turned to an extent corresponding to the turning of the cam-wheel. While the roller **38** dwells on the nose of the cam lobe the end of the lever **37** carrying the roller is depressed and through the intervening mechanism the bar **42** is held in a raised position, thereby taking up the slack in the length of crinkle warp. While the crinkle warp is so held a plain weaving of the fabric is effected.

As the cam-wheel **20** continues to turn, through the drive imparted by the ratchet-wheel **19**, the roller **38** leaves the nose of the cam lobe and rides into the following depression in the cam-wheel periphery. The extent of the fall of the roller into the depression is measured by an arc corresponding to four teeth of the ratchet-wheel, there is a dwell of the roller in the bottom of the depression equal to two teeth, and then a rise equal to four teeth as the roller moves to the nose of the next cam lobe. When the roller **38** moves to the bottom of the cam depression through the linkage connection, the slack control bar **42** is moved to is lower-most limit, and while the roller is moving to this position the successive length is fed forward into the crinkle warp by the sand-roll. At this stage the forward beat of the lay pulls or pushes the released slack forward to be woven into a crimped row extending transversely across the fabric. As the cam-wheel continues to rotate the roller **38** rides to the nose or crown of the succeeding cam lobe. As the roller rises, through the connecting linkage the control bar **42** is raised and takes up the slack in the crinkle warp and tensions the same to correspond with the tension of the ground warp. This tension of the crinkle warp is maintained while the roller **38** travels over the nose of the engaged cam lobe; that is, during two beats of the lay. As the tension of the crinkle and ground warps is the same during these two beats of the lay, the resulting weaving will be a plain or flat row of fabric extending across the cloth. As the cam-wheel continues to rotate there will be woven into the cloth alternating rows of crimped and plain fabric, thereby producing the crinkle effect. Owing to the shallow depressions and the gradual slopes to the noses of the cam lobes, there will be a gradual merging of the crinkle and plain rows of fabric to produce the desired wavy effect.

What I claim is:—

1. In a loom for weaving crinkle cloth having a beam for the crinkle warp, a harness, a lay and a sand-roll around which pass the threads from the crinkle warp beam to the harness, in combination with a let-off for the crinkle warp comprising a stub-shaft, a compounded ratchet-wheel and cam journaled on the stub-shaft, means actuated by the lay for intermittently rotating the compounded ratchet-wheel and cam, a gear-train for transmitting the intermittent drive of the compounded ratchet-wheel and cam to the sand-roll to effect intermittent forward feed of the crinkle warp from the beam to the harness, and means actuated by the cam to take up and release alternately the slack in the crinkle warp fed to the harness to produce alternate rows of plain and crinkle weaving in the fabric.

2. In a loom for weaving crinkle cloth having a beam for the crinkle warp, a harness, a lay and a sand-roll around which pass the threads from the crinkle warp beam to the harness, in combination with a let-off for the crinkle warp comprising a stub-shaft, a compounded ratchet-wheel and cam journaled on the stub-shaft, means actuated by the lay for intermittently rotating the compounded ratchet-wheel and cam, a gear train for transmitting the intermittent drive of the compounded ratchet-wheel and cam to the sand-roll to effect intermittent forward feed of the crinkle warp from the beam to the harness, a rock shaft having arms extending therefrom carrying a rod extending across the travel of the crinkle warp before the latter enters the harness, a lever actuated by the cam and connected by a linkage with the rock shaft to actuate said shaft to oscillate the rod to take up and release the slack in the crinkle warp fed to the harness to produce alternate rows of plain and crinkle weaving in the fabric.

3. In a loom for weaving crinkle cloth having a beam for the crinkle warp, a harness, a lay and a sand-roll around which pass the threads from the crinkle warp beam to the harness, in combination with a let-off for the crinkle warp comprising a stub-shaft, a compounded ratchet-wheel and cam journaled on the stub-shaft, means actuated by the lay for intermittently rotating the compounded ratchet-wheel and cam, a gear-train for transmitting the intermittent drive of the compounded ratchet-wheel and cam to the sand-roll to effect intermittent forward feed of the crinkle warp from the beam to the harness, a hub on the ratchet-wheel, a friction strap engaging said hub to prevent over-running of the compounded ratchet-wheel and cam, and means actuated by the cam to take up and release alternately the slack in the crinkle warp fed to the harness to produce alternate rows of plain and crinkle weaving in the fabric.

HENRY JAMES MURPHY.