H. I. MORRIS.

LOOM ELEMENT.

APPLICATION FILED NOV. 18, 1916.

1,358,094.

Patented Nov. 9, 1920.

3 SHEETS—SHEET 1.

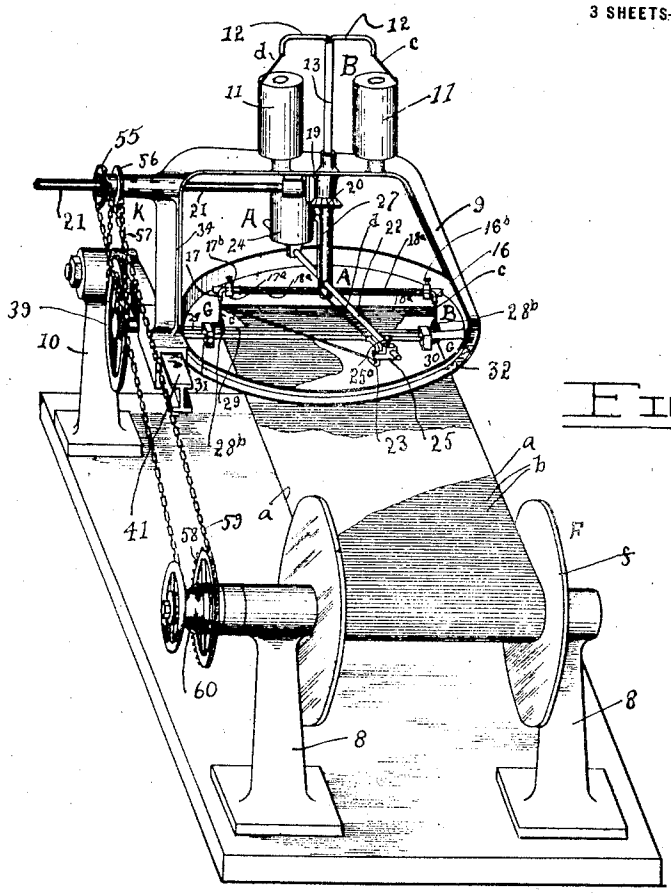


Fig. 1.

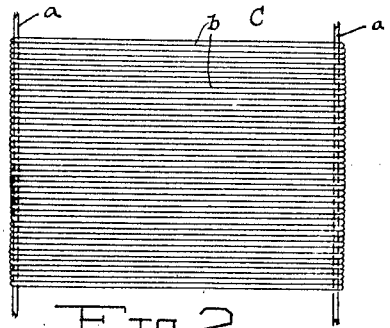


Fig. 2.

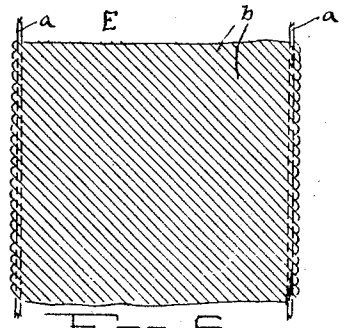


Fig. 6.

Witnesses

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3 SHEETS—SHEET 2.

Fig. 4.

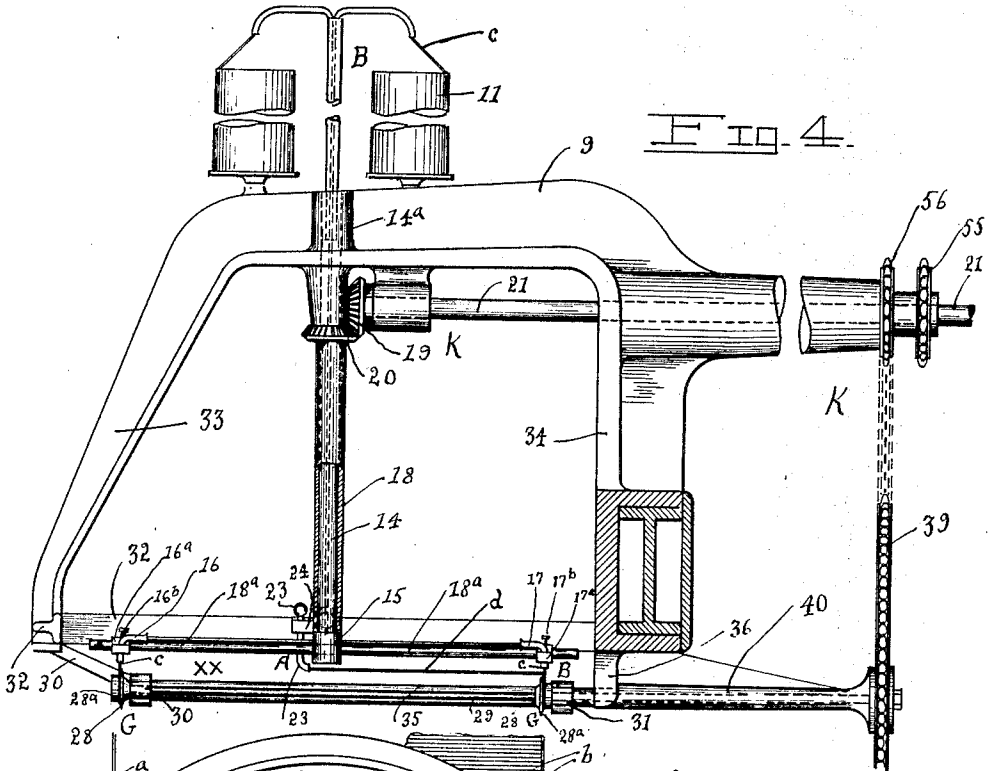
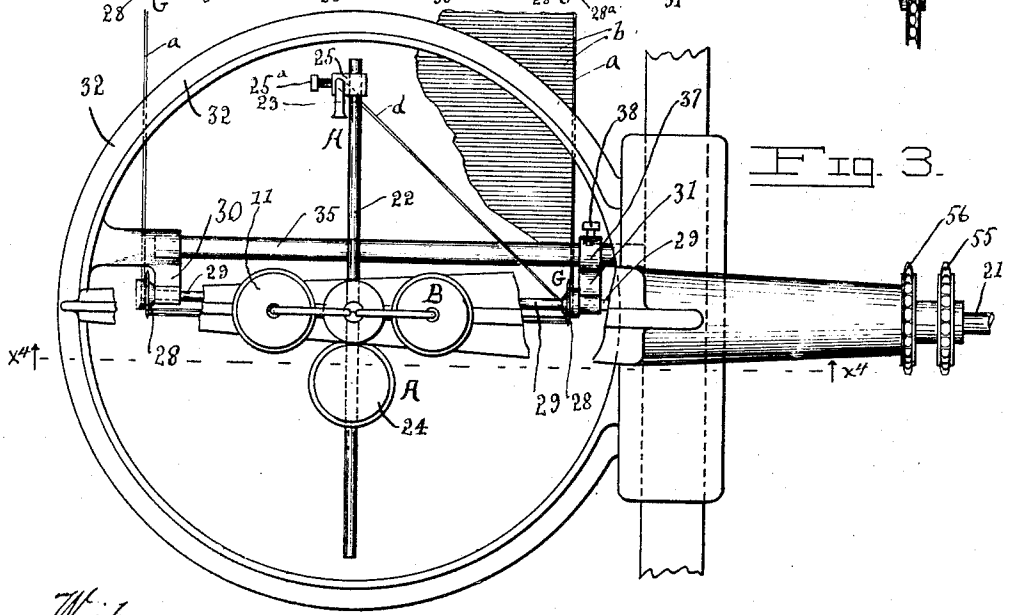


Fig. 3.



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3 SHEETS—SHEET 3.

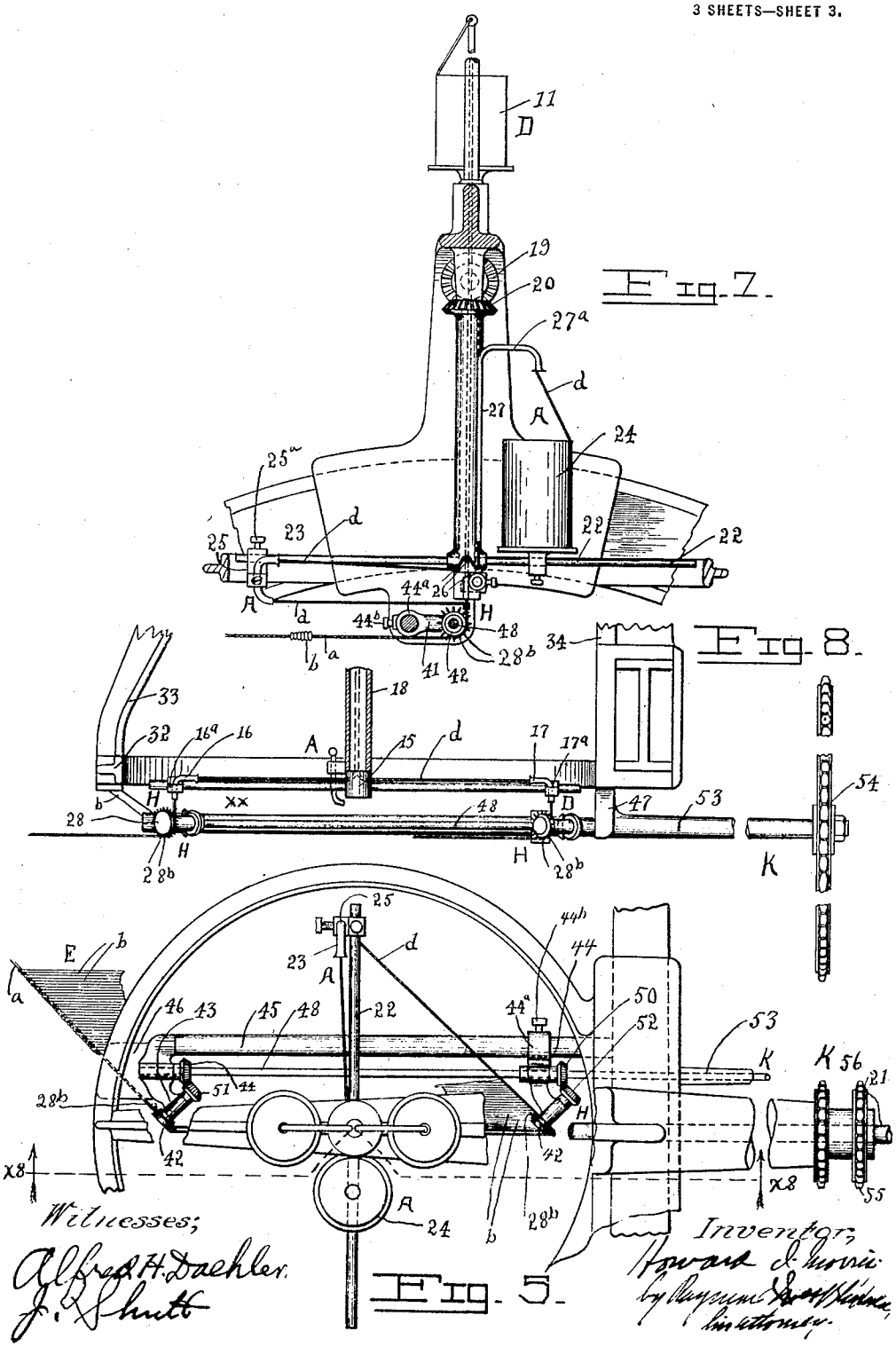


Fig. 7.

Fig. 8.

Fig. 5.

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UNITED STATES PATENT OFFICE.

HOWARD I. MORRIS, OF SAN DIEGO, CALIFORNIA, ASSIGNOR TO THE SAVAGE TIRE COMPANY, OF SAN DIEGO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

LOOM ELEMENT.

1,358,094. Specification of Letters Patent. Patented Nov. 9, 1920.

Application filed November 18, 1916. Serial No. 132,164.

To all whom it may concern:

Be it known that I, HOWARD I. MORRIS, a citizen of the United States, residing at San Diego, in the county of San Diego and State of California, have invented new and useful Improvements in Loom Elements, of which the following is a specification.

This invention relates to loom elements, and more particularly to warp-producing means for looms, or means whereby the warp thread elements are grouped together in a fabric or partially formed fabric, preferably in connection with a selvage element, so that the invention likewise contemplates selvage-producing means. In certain of its aspects the invention likewise pertains to the warp-producing means and selvage-producing means disclosed in an application for U. S. Letters Patent for looms, filed by me September 9, 1916, Serial No. 119,208. The present invention therefore relates to such warp-producing means and selvage-producing means as are treated of in said prior application for Letters Patent and therein claimed in combination and association and inter-relation with other loom features and elements. The present invention relates to said warp-producing means and selvage-producing means separately or independently considered, or considered only as to their own inter-relations and combinations of features and elements. Furthermore, the present invention comtemplates the provision of warp-producing means and selvage-producing means whereby a partially or completely organized fabric may be produced, irrespective of the application to such fabric or the association therewith of weft thread units, which application and association may or may not be made, all in accordance with the nature of the fabric to be produced and the service to which it is to be subjected or adapted. In said prior application the fabric constituting the output of the loom was what I have termed a bias-woven or bias fabric, or a fabric in which the warp thread elements were caused to be related to the longitudinal edge portions or portion of the fabric at an angle of less than 90 degrees; the weft thread elements being likewise so associated with the warp thread elements as to be related to the longitudinal edge or edge portions of the fabric, or the selvage threads or selvage elements thereof, at an angle of less than 90 degrees. In accordance with the present invention, the weft thread elements or the means for producing and associating the same with the warp thread elements are not material to the issue, which only deals with the production of a partially or completely organized fabric which, as stated, only contains the warp thread elements, and selvage elements, and the former may be caused to be related to the longitudinal edge portion or portions of the fabric, or to the selvage element or elements of the same, at an angle of less than 90 degrees, or at an angle of 90 degrees. Such fabrics, namely, fabrics from which weft thread elements are omitted, are of utility, as in the art of vehicle tire manufacture, in which such fabrics are designated as cord fabrics. Thus, the present invention provides means particularly adapted for the production of such cord fabrics to be used in the construction of automobile tires or tire casings, although the invention is not to be understood as limited within its considerations to means for producing a fabric for any such single purpose.

The present invention, in common with the disclosure of said prior application, in providing means for producing a fabric containing both warp thread elements and a selvage element or elements, provides for all of the advantages resulting from so associating a selvage element or elements with the warp thread elements, as set forth in said prior application, including the prevention of longitudinal give or stretch of the fabric prior to the rubberizing or calendering of the same, where such fabric is to be used for tire-making or other certain purposes. This provision of a selvage element or selvage elements in a fabric likewise provides for increased inherent stability which makes the fabric of increased utility and value in a wide range of the arts. While it has been attempted to weave certain open pattern or loosely organized fabrics, with a selvage edge or selvage edge units, with a bias relation between the warp thread elements and the selvage edge portion, and also weave fabrics with such selvage edge elements with a rectangular relation between the warp thread elements and the selvage

elements, I am unaware that means have heretofore been provided for producing either of such fabrics in compact and close weave, in which the warp thread elements are distinct from the selvage elements so that the latter may impart effectively an inherent stability and anti-stretch quality to the fabric. In accordance with the present invention, this superior fabric may be produced, either in bias formation or a formation in which the warp thread elements are related rectangularly to the fabric longitudinal edges or to the selvage elements, having all of the advantages arising from such inherent stability and anti-stretch quality. As disclosed likewise in said prior application, the product of the present invention, if in bias formation, lends itself readily and effectively to the production, in the various arts, of tubular or arched structures, such as tire bodies or casings, hose, electrical conduit covering and the like, in which it is desirable to evenly lay or apply the woven fabric upon or to a core, or over a core, or to associate it with a generally cylindrical or circular surface, to the end that the fabric may be equally and evenly extended in all directions. For such purposes, if woven fabric be used in which the warp threads, or the weft threads if used, be related to the fabric edge rectangularly, great difficulty is met with in truly and properly applying the fabric or the successive courses or layers of the fabric to the core or surface, such as to a tire-forming core. This is due to the fact that such application involves the extension of the fabric in more than one direction of curvature and in the direction of the resultants of such plurality of directions of curvature. Heretofore it has been necessary to provide suitable mechanism for diagonally severing the fabric woven with either the warp or weft threads in rectangular relation to the longitudinal edge, and thereupon to splice or seam together such lengths of such fabrics so severed to produce a bias formation. This diagonal severing and resultant splicing together has been of course rendered necessary by the fact that it is impracticable to weave this fabric of a width beyond certain outside dimensions. This splicing together of such lengths of fabric likewise produce unevenness and lumpiness at the lines of junction and necessarily a weakness at such lines, all of which results in reduction of the inherent strength of the assembled lengths or strips. Likewise, in the article or device built up of such spliced lengths, roughness or unevenness or variation from true dimensions occurs, and these variations from true dimensions tend to disorganization and disruption of such structure. In tire structure such irregularities of organization exert a tendency to produce variation of compression and that of course produces resultantly a buckling of the contiguous portions of the fabric and eventually either a break-down or deterioration or weakening of the same, such as invites blow-out or failure of the tire. Such results cannot be prevented or avoided in the use of such built-up or sectionally jointed, spliced or united lengths of bias-cut fabric. The present invention aims to provide warp-producing means or warp-producing and selvage-producing means for looms by which such bias fabric may readily be formed, or such cord bias fabric, to which of course may be added or with which may be of course associated, by suitable weft-producing means, fabric weft elements. As stated above, such cord fabric, or fabric devoid of weft thread elements, is now extensively used, in tire manufacture, and the present invention therefore, taken by itself, provides warp-producing means or warp-producing and selvage-producing means for looms, capable of turning out bias cord fabric, having all of the advantages and being devoid of all of the objections hereinabove pointed out, as attaching, to the use of fabrics in which the bias formation is not provided. Likewise, the present invention provides warp-producing and selvage-producing means for looms, whereby such cord fabrics may be turned out minus the bias formation or relation of the warp thread units to the longitudinal edges of the fabric. And in accordance with the present invention the fabric may be provided with the stretch-resisting independent selvage elements providing a fabric of increased inherent strength and stability; and such fabrics may, as indicated, be used for a wide range of purposes in a wide range of the arts, and wherever the superior qualities and advantages of such fabrics make their selection and use desirable. As pointed out in said prior application, the selvage thread element or elements may be severed and removed from the fabric after the rubberizing or calendering of the same, which later processes tend to consolidate the fabric firmly and to prevent its stretch or distortion. Or such selvage edge portions may be severed from the remaining portions of the fabric at any point or stage of the working up or alteration of the fabric, or of its application or incorporation in the process of manufacture of the particular device or article in question. Likewise, for many purposes, the selvage edge portions may be permitted to remain associated with the fabric so that the anti-stretch quality and inherent stability afforded by such selvage edge element or elements may be utilized in the final service of the fabric or the article in which it is incorporated.

With the above and other objects in view, the invention consists in the novel and useful provision, construction, formation, com-

bination, association, adaptability, inter-relation and mode of operation of parts, members, elements and features, all as hereinafter described, shown in the drawings and finally pointed out in claims.

In the drawings:

Figure 1 is an isometric view of warp-producing means constructed and organized in accordance with the invention, the same being organized and constructed particularly for the production of fabric or partially-completed fabric comprising selvage edge elements and warp thread elements with the latter elements related at an angle of 90 degrees to the prior elements;

Fig. 2 is a fragmentary face view of a portion of fabric or partially-completed fabric constituting the product of the mechanism disclosed in Fig. 1;

Fig. 3 is an enlarged fragmentary top plan view of the construction in Fig. 1, the parts being given a half turn about;

Fig. 4 is an enlarged fragmentary transverse sectional view taken generally upon the line x^4—x^4, Fig. 3, and looking in the direction of the appended arrows;

Fig. 5 is a view similar to Fig. 3, showing a modified form of construction and organization adapted for producing a fabric or partially-completed fabric in which the warp thread elements are related at an angle of less than 90 degrees to the longitudinal side edge portions or selvage elements, as shown in Fig. 6;

Fig. 6 is a fragmentary facial view of fabric or partially-completed fabric constituting the output of the construction shown in Fig. 5;

Fig. 7 is a detail fragmentary vertical transverse sectional view illustrating a portion of the machine in detail;

Fig. 8 is an enlarged fragmentary vertical sectional view taken in the main upon the line x^8—x^8, Fig. 5, and looking in the direction of the appended arrows.

Corresponding parts in all the figures are designated by the same reference characters.

Referring with particularity to the drawings, A designates warp-forming means and B designates selvage-forming means shown in Figs. 1, 3 and 4, as associated together, for producing the fabric C, shown in Fig. 2; while D designates selvage-producing means as shown in Figs. 5, 7 and 8 as associated with warp-producing means A for producing the fabric E shown in Fig. 6. As shown in Figs. 2 and 6 the fabric is provided with selvage thread elements *a* with which are associated the warp thread elements *b*. In Fig. 2 such warp thread elements are shown as related approximately rectangularly with relation to the selvage thread elements *a*; while in Fig. 6 the warp thread elements *b* are shown as associated at angles of less than 90 degrees with relation to the selvage thread elements *a*. In each instance one such selvage thread element is shown at or adjacent to the longitudinal side edge of the fabric or partially-completed fabric, but it is to be understood that there may be so provided a plurality of such selvage thread elements in each provision of the same. Likewise, each course of warp threads constituting the respective warp thread element is shown as singular, but it is understood that each such warp thread element may comprise a plurality of warp threads for each course, all in accordance with choice or the weave or pattern of fabric or partially-completed fabric which the mechanism is designed to weave.

In the drawings the fabric or partially-completed fabric is shown as constituting the complete output of the mechanism, no indication being given of any association with the warp thread units and the selvage thread units or weft thread units. It is of course to be understood that these weft thread units may be provided as desired, in order to produce a warp-and-weft thread fabric, in any desired or suitable manner, such for example as disclosed in said prior application hereinabove identified. The present invention will, however, be specifically treated as organized to produce a fabric or partially-completed fabric comprising merely the warp thread units and the selvage thread units, or a fabric such as known in the tire-making art as cord fabric. To that end, I have shown in Fig. 1 take-off means F, whereby the product of the mechanism is rolled upon a suitable receiving device or drum *f*, rotatably supported by standards 8 and suitably driven, as hereinafter described, so that the fabric may be progressively wound upon the drum in step with its production by the means A and B. In Fig. 5 the fabric E is shown as extending obliquely from the zone in which the warp and selvage thread elements are associated together, any suitable means being employed to impart such oblique course of movement to the fabric or partially-completed fabric, and whereby, as hereinafter described, the fabric is given a transverse distortion which produces the bias relation as between the selvage thread elements and the warp thread elements. Such means are not concerned in the present invention, and may be provided as expediency or preference may dictate, as for instance is disclosed in said hereinabove identified application.

Apart from the guide means G in Figs. 1, 3 and 4, and the guide means H in Figs. 5, 7 and 8, and the particular means associated with the same for their proper actuation, the general construction, combination, inter-relation, association and mode of operation of parts, elements and features, is without variation throughout the disclosures of the draw-

ings; such guide means and associated means for actuating the same being the only essentially modified features in the construction shown in Figs. 5, 7 and 8, with relation to the construction and organization shown in Figs. 1, 3 and 4; and such modification of such guide means and associated means disclosed in Figs. 5, 7 and 8 is for the purpose of initially or in an auxiliary capacity providing in the fabric or partially-formed fabric the transverse distortion which produces the bias relation as between the warp thread elements and the selvage thread elements as hereinabove set forth.

Coming down now to the general organization of the mechanism shown in the drawings, I provide an upright frame 9 which is supported by a standard 10. Supported upon this frame 9, at the top thereof, are spools or bobbins 11 which supply the thread or cord *c* from which is produced the selvage *a* of the resultant fabric. These separate cords or threads are led to the warp-forming and selvage-forming zone generally designated as XX, being guided from the spools or bobbins 11 upwardly and through separate guide tubes 12 which conduct such cords or threads to a tube 13 secured in upright position in connection with the upper end of a tubular shaft 14 suitably received in fixed position as at 14^a in the frame 9. The threads pass downwardly through this tubular shaft 14 and emerge from the lower end thereof and through a block or head 15 at the lower end thereof which is suitably bored to accommodate such threads. Thence the threads are carried outwardly or radially from such tubular shaft and block and passed through curved tubular guides or eyes 16 and 17 which are respectively and adjustably mounted at the outer ends of radial arms 18^a carried by the block or head 15. Thence the threads depend into the working zone XX where they are associated with the warp thread as hereinafter described.

Surrounding the tubular shaft 14 is a rotatable sleeve 18 which is supported at its lower end upon the block or head 15 and is rotated by suitable members or parts of the operating means K, the general organization of which will be outlined as the description of the mechanism progresses. The particular features which rotate the sleeve 18 comprise inter-meshing miter gears 19 and 20, respectively, upon the upper end of the sleeve 18 and one end of a counter shaft 21. Fixed to and projecting radially from the sleeve 18 in a plane slightly above that of the arms 18^a is an arm 22 carrying at its outer end a curved tubular thread guide or eye 23 to and through which is led the cord or thread *d*, supplied from a suitable bobbin or spool 24 mounted upon the same arm 22 which carries the tubular guide 23. This thread *d* ultimately becomes the warp thread *b*, or the warp structure comprising courses or continuous loopings of such warp thread or thread elements about the selvage thread units *a*, as more clearly shown in Figs. 2, 3, 6 and 8. The tubular guide 23 which if desired may be duplicated together with the extension of the arm 22 radially in diametrically opposed directions, so that one such tubular guide is provided at each end of such arm is, in each instance, mounted upon an adjustable block or carrier 25 which may be manipulated lengthwise of the arm 22 so as to vary the width of the resultant fabric or fabric portion. The width of the fabric is, however, more definitely determined by other features which will be hereinafter treated, the adjustability of the block or blocks 25 being for the purpose of conforming the position or positions of the same to adjustment of other features, and to adapt the path of travel of the block 25 and its curved guide 23 to the other conditions determined by the relation and provision of other features. The cord or thread *d* is led to the respective guide tube 23 around tension pins 26 carried exteriorly upon the rotatable sleeve 18 adjacent to the lower end thereof. Likewise, there is mounted upon such sleeve a longitudinally ranging guide tube 27, the upper end of which is laterally extended and bent outwardly and downwardly as at 27^a, to receive at its mouth or orifice the length of threads *d* supplied by the spool 24.

The lower end of each guide tube 23, of which but one is shown in the drawings, is disposed in the plane of the working zone XX beneath the plane in which the thread *c* escapes from the guide tubes 16 and 17. Such latter guide tubes because of the method of mounting above described are held stationary by the frame 9, and the guide tube 23 is rotated by the arm 22. It results that the thread *d* is wrapped or rove or laid about the two threads *c* which depend from the guide tubes 16 and 17, and produces the selvage elements at the edges of the resultant fabric.

In order to retain the selvage threads *c* in their proper spaced relation during the wrapping or looping or roving upon and about the same of the warp thread *d*, and to guide what may be in one specific structure termed the cord fabric produced by the association of such threads *c* and *d* toward the take-off means F, as shown in Fig. 1, or to assist in guiding such partially-formed fabric obliquely away from the zone XX, in the latter instance to so direct the course and trend of such cord fabric as to produce a transverse distortion thereof and produce a bias relation as between the warp thread elements and the selvage thread elements, the fabric is now conducted to and about the spaced guides G in Figs. 1,

3 and 4 and the spaced guides H in Figs. 5, 7 and 8.

Referring to the guides G, each of the same comprises a rotating roller 28, both being mounted in spaced relation upon a shaft 29 which extends lengthwise of the zone XX and is journaled in brackets 30 and 31, the former of which projects inwardly from an annular frame 32 which substantially surrounds the working zone XX and lies in a plane substantially that of the head or block 15 upon the tubular shaft 14, such annular frame being directly supported by upright members 33 and 34 of the frame 9. The bracket 30 receives and supports one end of a transverse rod 35 the other end of which is supported in a downward extension 36 of the frame 9. Adjacent to such latter point of support, the bracket 31 is adjustably mounted upon such rod 35 by a collar 37 provided with a set screw 38 for fixing such collar and bracket in position of adjustment relative to the bracket 30. By adjusting the bracket 31 lengthwise of the rod 35 the adjacent rotating guide or roller 28, which, as well as the other guide 28 is keyed or splined upon the shaft 29, but which is loosely mounted in connection with the bracket 31, may be adjusted lengthwise of the shaft 29 so as to determine the relative spacing of such rotating guides or rollers 28, thus primarily determining, in connection with the adjustment of the tubular guides 16 and 17, the width of the fabric to be produced by the mechanism. Such guides 16 and 17 are adjustably mounted upon the arms 18^a by means of adjustable blocks 16^a and 17^a respectively which may be fixed in positions of adjustment upon such arms by set screws 16^b and 17^b. The selvage threads *c* depend from the thread guides 16 and 17 to the rollers 28 and engage with such rollers outwardly of flanges 28^a, which serve to hold the edge portions of the fabric which includes such selvage elements *a* produced of the selvage threads *c*. It will be understood that the take-off means F exert a strain or pull upon the fabric as it is produced, firmly and positively engaging such fabric with the rollers 28, so that the fabric as it is formed is drawn down and about and under the rollers 28 and off to the take-off means.

The shaft 29 is properly journaled in the brackets 30 and 31, and is rotated to assist the drawing down and advancing of the forming and formed fabric by a sprocket wheel 39 upon the outer end of the shaft 29, which latter is also journaled in a sleeve 40 carried by the frame 9. Said frame 9 with the annular frame 32 is adjustably mounted upon an I beam arm 41 which at one end is directly carried by the standard 10.

Referring to the provision and construction of the guide means H shown in Figs. 5, 7 and 8, the same comprise rollers 42 which are mounted respectively in brackets 43 and 44, one roller 42 and its bracket 44 being adjustably mounted upon a rod 45 held in position by suitable members or extensions 46 and 47 of the frame 9 or of the annular frame portion 32 thereof. The guides H occupy substantially the same positions with relation to the zone XX that the guides G occupy in the other form of construction. The bracket 44 is provided with a collar 44^a surrounding the rod 45 and having a suitable set screw 44^b whereby such collar and bracket and the roller 42 supported by such bracket may be fixed in position of adjustment lengthwise of the rod 45, thus permitting of variation of the distance between the two rollers 42, which adjustment corresponds to the adjustment of the rollers 28 in the other form of construction, such adjustments in both cases together with the adjustment of the thread guides 16 and 17 by means of the blocks 16^a and 17^a, being the more particular adjustments hereinabove referred to and associated with the adjustment of the block 25 and its fixing in position of adjustment by a set screw 25^a.

A jack shaft or counter shaft 48 is suitably journaled in the bracket 44 and also in the bracket 43, being one member of the operating means K and being provided with miter gears 49 and 50 which respectively mesh with miter gears 51 and 52 upon the rollers 42, thus providing means for supplying power for rotating both such rollers 42 in a corresponding direction whereby the fabric engaged with the rollers is assisted in its drawing down from the zone XX and its direction obliquely away from the said zone. The miter gear 50 is splined upon the jack shaft 48, and is loosely connected with the bracket 44, so that the bracket and such miter gear and the meshing gear 52 may be adjusted lengthwise of the shaft 48 as described. The miter gear 49 is fast upon the shaft 48. The axes of the rollers 42 are substantially parallel, and lie in planes oblique to the plane of the jack shaft 48 and of the zone XX, so that the fabric is given an initial distortion or transverse twist, which actions are supplemented by the drawing off of the fabric from said rollers 42 in a direction oblique to the direction of descent of the selvage cords or threads *c*, in order to produce the bias formation as above set forth. The jack shaft 48 is likewise journaled in a sleeve 53 supported by the frame extension 47 and is provided with a sprocket wheel 54 which enters into the drive means or operating means K. There remains now to be described further and only the complete organization of the drive means or operating means K, and the complete operation of the mechanism.

The shaft 21 may be regarded as the main

drive shaft of the operating means K, in the combination of working features described and disclosed, and the same is provided with two fast sprocket wheels 55 and 56 respectively. About the sprocket wheel 56 and about the sprocket wheel 39 in one case and the sprocket wheel 54 in the other case, is passed a sprocket chain 57, so that the shaft 29 in one case, and the shaft 48 in the other case, is rotated synchronously with the shaft 21. Likewise the shaft of the drum *f* of the take-off means F is provided with a fixed sprocket wheel 58 about which and the sprocket wheel 55 is passed a sprocket chain 59, so that the shaft 21 and the drum *f* are rotated synchronously. Applied to the sprocket wheel 58 and to the shaft of the drum *f*, in a conventional manner, is a friction clutch device 60 whereby the shaft of the drum may slip relative to rotation of the sprocket wheel 58, so that as the roll of fabric taken off upon the drum *f* increases in diameter the drum may rotate relatively slower than the sprocket wheel 58, to accommodate the supply of fabric which is at a constant rate of progress.

As shown in Figs. 1, 5, 7 and 8 the flanges 28^a may be broken up or subdivided to form teeth or pins 28^b which engage with the fabric or partially-formed fabric and the edge portions or selvage elements *a* thereof, between the courses of warp thread elements *b* as more particularly shown, and more particularly for the purposes set forth in said prior application hereinabove identified. The mode of operation of the mechanism in so far as the present invention is concerned is not however varied, due to such substitution in effect of spaced pins or projections for the continuous flange 28^a upon either the rotating guides G or H.

The operation, method of use and advantages of the improved loom elements comprising the invention will be readily understood from the foregoing description taken in connection with the accompanying drawings and the following statement:

As the shaft 21 revolves, the tubular shaft or sleeve 18 is rotated, carrying around with it the arm 22 in a circular path of movement, thread or cord *d* being at all times supplied to the thread guide 23 thereof from the spool 24, and such warp thread or cord is rove about the separate selvage threads or cords *c* continuously supplied from the spools or bobbins 11 through the tubular shaft 14 through the head or block 15 and the thread guides 16 and 17, and which selvage threads or cords *c* are first brought down and passed about and under the rotating guides G or H. The warp thread *d* passes through the thread guide 27^a and about the tension pins 26 in its conduction to the thread guide 23. Suitable adjustments of the rotating guide G or H are made, as described, and correspondingly similar adjustment of the thread guides 16 and 17 and 23, to the end that the desired width of fabric may be produced. As the warp and selvage fabric is produced, it is drawn off under the rotating guides G to the take-off means F, and rolled up upon the same, or is otherwise disposed of; or, where the rotating guides H are employed, the fabric is given a twist or distortion transversely by said rotating guides H, and is led off and away from the zone XX, in a path oblique with respect to the plane of the said zone XX, being so influenced in any suitable and desirable manner.

The operating means K cause the actuation of the take-off means F to roll up the fabric, and likewise cause the shaft 29 of the rotating guides G or the shaft 48 of the rotating guides H to rotate simultaneously with the rotating sleeve 18 which rotates the arm 22 whereby the warp threads or cord is applied to the selvage threads or cords by and through the thread guide 23. This action of the rotating guides serves to draw the associated warp and selvage elements down from the zone XX and influences them to move in the direction of the take-off means F or in a direction consequent upon distortion of the fabric transversely to produce a bias relation as between these elements. The pull upon the fabric or partially-completed fabric draws down the selvage threads or cords *c* in the progressive action of the mechanism, and the laying of course after course of warp thread *d* is accompanied by a continuous feed of such cord as the requirements of the progressive rotation of the arm 22 demand.

It will be manifest that many variations and modifications with respect to the specific construction and combination and inter-relation and association of parts and features heretofore described and disclosed in the drawings may be made, in adapting the invention to varying conditions of use and service, and within the requirements and preferences of design and particulars of practice, all without departing from the true spirit of the invention and a fair interpretation thereof.

Having thus disclosed my invention, I claim and desire to secure by Letters Patent:

1. In mechanism of the character disclosed, means for supplying fabric edge threads, and means for associating therewith warp thread courses; in combination with means for guiding the thus associated fabric elements into an angularly altered path of movement.

2. In mechanism of the character disclosed, means for supplying fabric edge threads, and means for associating therewith independent warp thread courses; in combination with means for guiding the thus associated fabric elements into an angularly al-

tered path of movement; and further means for operating said guide means.

3. In mechanism of the character disclosed, means for supplying fabric edge threads, and means for associating therewith independent warp thread courses; in combination with means for guiding the thus associated fabric elements into an angularly altered path of movement; said guide means being rotatable, and further means being provided for rotating the same.

4. In mechanism of the character disclosed, means for supplying fabric edge elements, and means for associating therewith warp thread courses; in combination with means for guiding the fabric elements so associated into an altered path of movement; said guide means imparting to the fabric elements so associated a transverse distortion.

5. In mechanism of the character disclosed, means for supplying fabric edge elements, and means for associating therewith independent warp thread courses; in combination with means for guiding the fabric elements so associated into an altered path of movement; said guide means imparting to the fabric elements so associated a transverse distortion and comprising a rotatable member.

6. In mechanism of the character disclosed, means for supplying fabric edge elements, and means for associating therewith independent warp thread courses; in combination with means for guiding the fabric elements so associated into an altered path of movement; said guide means imparting to the fabric elements so associated a transverse distortion and comprising a rotatable member; means further being provided for operating said rotatable member.

7. In mechanism of the character disclosed, means for supplying fabric edge elements, and means for looping about said fabric edge elements courses of fabric warp elements; in combination with means for changing the course of the fabric as produced.

8. In mechanism of the character disclosed, means for supplying fabric edge elements, and means for looping about said fabric edge elements courses of fabric warp elements; in combination with means for imparting a transverse distortion to the fabric so produced.

9. A machine for manufacturing cord fabric, including a tubular member, a sleeve rotatable upon the exterior of the tubular member, spaced guide means arranged upon opposite sides of the tubular member at one end thereof, means for supplying a pair of selvage cords to the tubular member from the opposite end thereof, said selvage cords being threaded through the respective guide means and supplied thereby to the fabric in a parallel relation, a rotatable member carried by the sleeve for roving a warp thread around the selvage threads, take off means for the finished fabric, and means for rotating the sleeve and operating the take off means in proper relation to produce a tight cord fabric.

10. In mechanism of the character disclosed, a tubular shaft, a rotating sleeve surrounding said shaft, a radial arm carried by said sleeve, radial arms carried by said tubular shaft, means for supplying thread through said tubular shaft to said radial arms carried thereby, and means for supplying thread to said radial arm carried by said rotating sleeve.

11. In mechanism of the character disclosed, a tubular shaft, a rotating sleeve surrounding said shaft, a radial arm carried by said sleeve, radial arms carried by said tubular shaft, means for supplying thread through said tubular shaft to said radial arms carried thereby, and means for supplying thread to said radial arm carried by said rotating sleeve; said radial arms being all provided with guides for said thread.

12. In mechanism of the character disclosed, a tubular shaft, a rotating sleeve surrounding said shaft, a radial arm carried by said sleeve, radial arms carried by said tubular shaft, means for supplying thread through said tubular shaft to said radial arms carried thereby, and means for supplying thread to said radial arm carried by said rotating sleeve; said radial arms being all provided with guides for said thread; said thread guides being adjustably mounted.

13. In mechanism of the character disclosed, spaced adjustably mounted thread guides, and means for supplying thread thereto; in combination with a tubular support for said guides through which said thread is supplied to said guides.

14. In mechanism of the character disclosed, separate guide means, and means for supplying fabric elements to said guide means, said guide means being relatively adjustable to vary the width of the fabric produced; in combination with means for looping courses of other fabric elements about said first named fabric elements.

15. In mechanism of the character disclosed, separate guide means, and means for supplying fabric elements to said guide means, said guide means being relatively adjustable to vary the width of the fabric produced; in combination with means for looping courses of other fabric elements about said first named fabric elements prior to passage of said first named fabric elements to said guide means.

16. In mechanism of the character disclosed, separate guide means, and means for supplying fabric elements to said guide means, said guide means being relatively adjustable to vary the width of the fabric

produced; in combination with means for looping courses of other fabric elements about said first named fabric elements prior to passage of said first named fabric elements to said guide means, said guide means being rotatable.

17. In mechanism of the character disclosed, separate guide means, and means for supplying fabric elements to said guide means, said guide means being relatively adjustable to vary the width of the fabric produced; in combination with means for looping courses of other fabric elements about said first named fabric elements prior to passage of said first named fabric elements to said guide means, said guide means being rotatable; and means being provided for rotating said guide means.

18. In mechanism of the character disclosed, means for providing independent selvage fabric edge elements, and means for associating courses of fabric warp elements therewith and looped about the same; means likewise being provided for transversely distorting the fabric so produced to provide a bias relation between the selvage fabric edge elements and the fabric warp elements.

19. In mechanism of the character disclosed, means for providing independent selvage fabric edge elements, and means for associating courses of fabric warp elements therewith; means likewise being provided for transversely distoring the fabric so produced to provide a bias relation between the selvage fabric edge elements and the fabric warp elements.

20. In mechanism of the character disclosed, a rotating guide, means for supplying a fabric selvage element to said guide, and means for associating fabric warp elements with said selvage element while the latter is in engagement with said guide; said guide being provided with spaced projections adapted to be engaged with said fabric in alternation with courses of warp elements so associated with said selvage element.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HOWARD I. MORRIS.

Witnesses:
C. P. TURNER,
CLAUS SPRECKELS.