

Aug. 23, 1949.

G. WALKER

2,480,064

REVETMENT FABRICATING MACHINE

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2 Sheets-Sheet 1

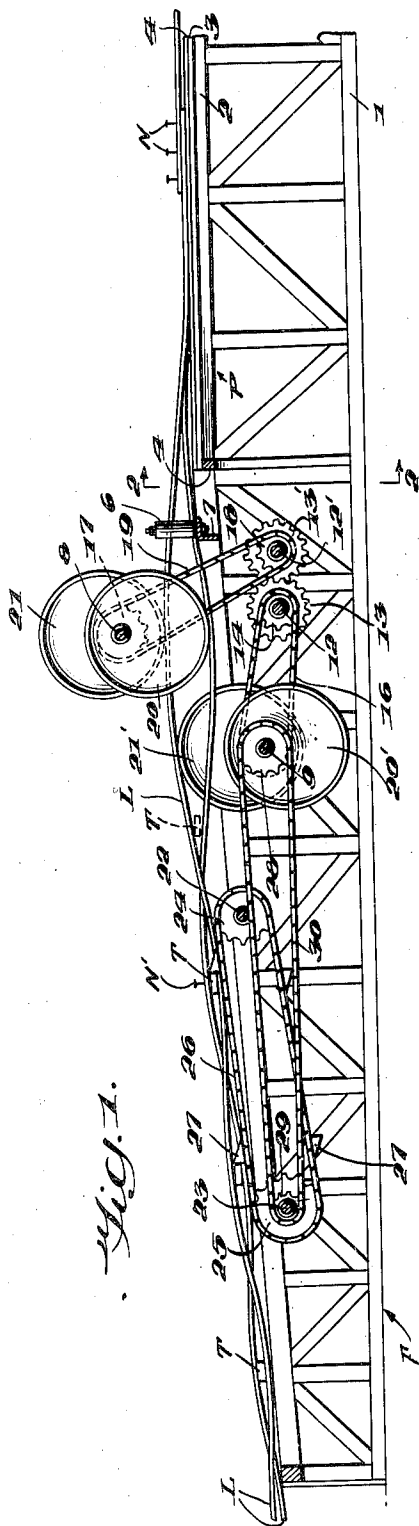


Fig. 3.

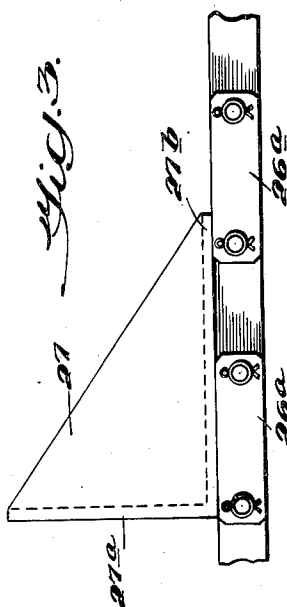


Fig. 2.

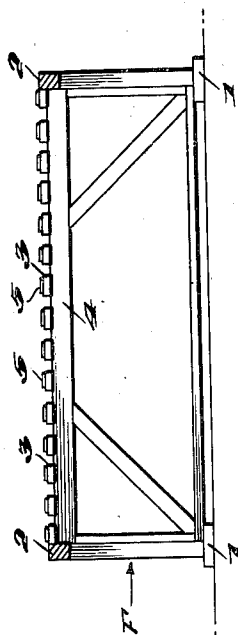
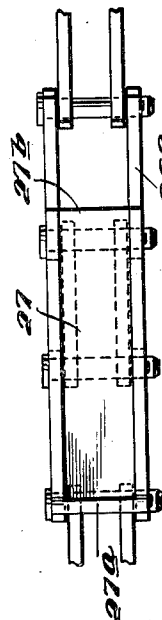


Fig. 4.



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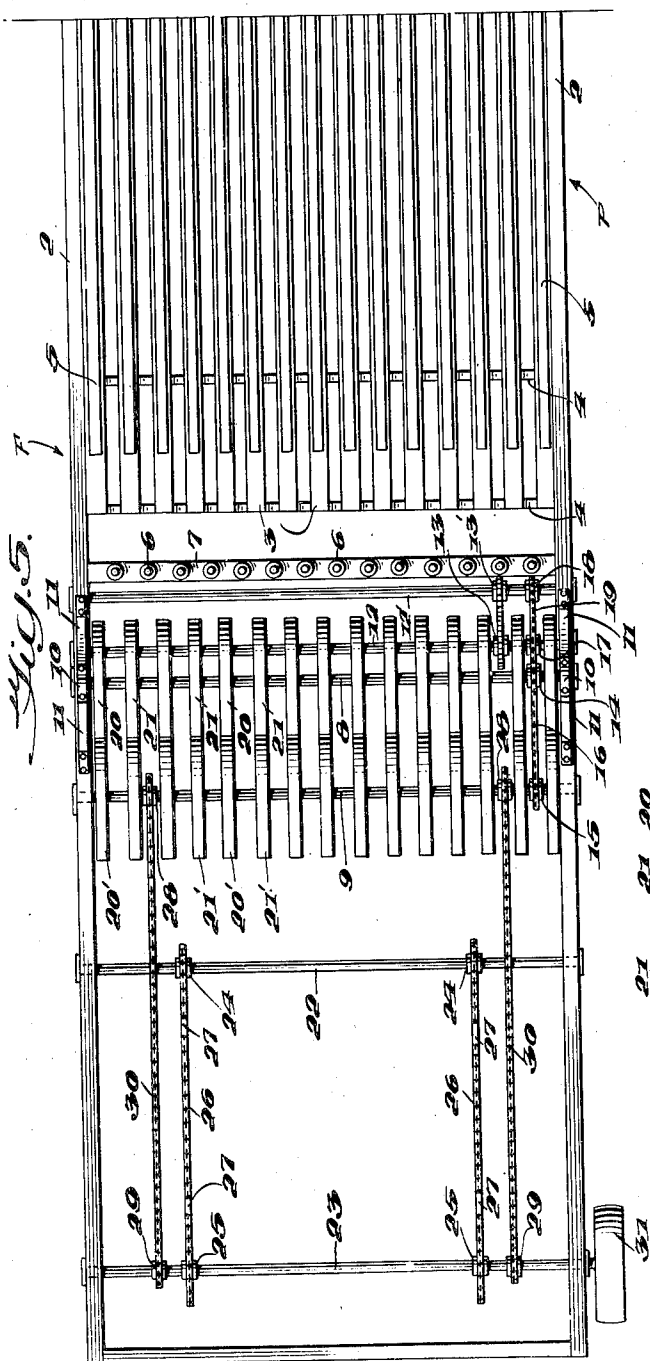
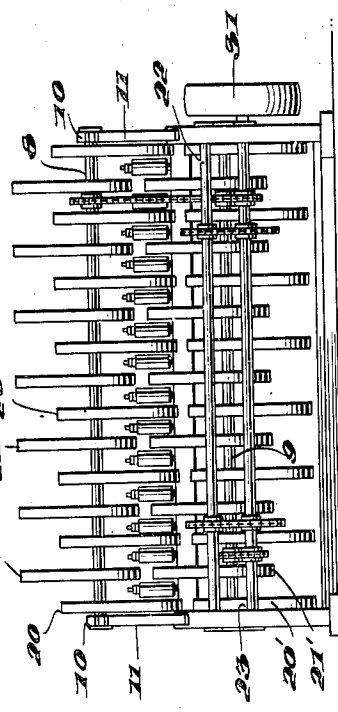
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REVETMENT FABRICATING MACHINE

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2 Sheets-Sheet 2



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REKETMENT FABRICATING MACHINE

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7 Claims. (Cl. 139—11)

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This invention relates to machines for forming revetments or mats by interweaving planks or other relatively stiff, heavy members.

The primary object of the invention is to provide such a machine or apparatus utilizing relatively stiff and extremely heavy material, such as boards, to fabricate mats or revetments which are adapted for use to support river banks or channels, or which may advantageously be used in the forming of emergency landing strips, in building roads over soft or swampy ground, and for other analogous purposes.

The invention employs a machine having a platform associated therewith for supporting a plurality of longitudinal or warp members for longitudinal movement, the frame or platform being arranged in such manner as to permit the assembling and nailing together of boards thereon in end to end relation to form longitudinal or warp members of any desired length.

The invention further provides warp spreading mechanism arranged to reciprocate or deflect portions of different sets of said members in opposite vertical directions to periodically form spaces between said members into which cross members or weft members may be transversely inserted. Preferably said warp spreading mechanism also serves to urge the warp members in a longitudinal direction through the machine.

Further, there is provided weft feeding and manipulating mechanism operating in timed or synchronized relation to said warp spreading mechanism to receive and position successive weft members relative to said warp members and to each other, while urging said weft members in a longitudinal direction.

The foregoing objects and advantages are attained by the preferred embodiment of the invention illustrated in the accompanying drawings, in which:

Figure 1 represents a side elevation of the complete machine showing the work operatively positioned therein, one side of the frame being removed to permit a better view of the operative parts;

Figure 2, a cross-section on the line 2—2 of Figure 1, looking in the direction of the arrows;

Figure 3, an enlarged detail fragmentary side elevation showing the preferred manner of mounting the weft pushers on the sprocket chains of the weft manipulating mechanism;

Figure 4, an enlarged fragmentary plan view of the portion of the invention shown in Figure 3;

Figure 5, a plan view of the preferred embodiment of the invention shown in Figure 1, the work being omitted therefrom; and,

Figure 6, a front elevation of the preferred embodiment of the invention.

Referring now in detail to the accompanying drawings, the frame of the machine, generally

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designated F, is formed from suitable rigid members and preferably comprises the longitudinally extending base members 1 and the upper side frame longitudinally extending members 2 respectively supported thereabove by any suitable arrangement such as the vertical supports and diagonal braces shown.

Occupying the rear portion of the frame F is a platform P adapted to support a plurality of longitudinally extending warp members L, as shown in Figure 1, during longitudinal movement. The upper surface of the supporting platform P extends across the frame between the transversely spaced frame members 2, and said platform may conveniently be composed of a series of longitudinal preferably wooden members 3 supported by cross-bars 4 extending between and secured to the frame members 2.

The upper surfaces of the platform members 3 are preferably formed of metal strips 5 to present hard surfaces serving to clinch nails N as same are driven through the overlapping ends of boards which may be successively placed on the platform and nailed to the preceding boards of their respective warp members to form composite warp members L of any desired length, all as shown in Figure 1. The smooth surfaces presented by the metal strips 5 also serve to minimize the friction between the warp members L and platform P as the former move in a longitudinal direction.

Suitable guide means are associated with the frame F and platform P to maintain the warp members L in predetermined relatively transversely spaced positions during their longitudinal movement. The preferred form of said guide means comprises a series of vertically projecting rollers 6 which are carried by a transverse frame member 7 for rotation about vertical axes. However it is of course not essential that said guides be in the form of rollers.

Mounted on the frame F forward of the platform P to receive warp members L from said platform and reciprocate different sets of said warp members in opposite vertical directions is the warp spreading mechanism of the invention. Such reciprocation or deflection of the members or portions thereof, serves to periodically form spaces between said sets of warp members into which weft members may be successively inserted in a transverse direction, and in longitudinally spaced relationship to each other.

In the preferred embodiment of the invention said mechanism comprises upper and lower transverse shafts or cam shafts 8 and 9 respectively journaled above and below the surface of the platform P adjacent the forward end thereof. The bearings 10 for the upper shaft 8 may be supported above the frame on suitable di-

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agonal supporting members 11 mounted on the frame members 2.

Any of various mechanical expedients may be utilized to cause simultaneous rotation of the two shafts 8 and 9 at equal speeds and preferably in opposite directions.

One suitable arrangement for attaining this end employs a pair of transverse shafts 12 and 12' journaled across the frame F for rotation. Keyed on said shafts for rotation therewith are gears 13, 13' respectively, said gears being in mesh with each other to cause rotation of their respective shafts in opposite directions and at the same speed. The shaft 12 and lower cam shaft 9 are each provided with sprocket wheels 14 and 15 respectively keyed thereon and a sprocket chain 16 is operatively disposed around and between said sprockets 14 and 15 to cause simultaneous rotation of said shafts 9 and 12. The upper cam shaft 8 is similarly connected for simultaneous rotation with the shaft 12' by means of the sprockets 17 and 18 mounted on said respective shafts and having the sprocket chain 19 passing therearound.

The sprocket chain 19 and its cooperating sprockets 17 and 18 are so located transversely of the machine as to have said chain in longitudinal alignment with one of the guides 6 and thus disposed to extend between and out of alignment with the warp members L to avoid interference with same during operation of the machine.

Rotary movement may be imparted to the shafts 8 and 9 by suitable means, a specific embodiment of which is described hereinafter.

Mounted on the shafts 8 and 9 for rotation therewith are a plurality of pairs 20, 20' and 21, 21' of cooperating eccentric rotary members which may advantageously take the form of cam discs. Each said pair comprises upper and lower members or discs 20, 20' respectively, or 21, 21' respectively, the discs of each pair being mounted in corresponding positions of rotation on their respective shafts for rotation therewith in phase with each other, though preferably in opposite directions.

Alternate pairs of said discs or members 21, 21' are mounted on their respective shafts in different positions of rotation than, and preferably at one hundred and eighty degrees to, their respective adjacent pairs of discs 20, 20' to rotate in different, preferably opposite, phase to their said adjacent pairs of discs.

Thus it will be seen that warp members L passing between the peripheries of each pair of discs will be raised or lowered in opposition to the movement of their relatively adjacent members.

Mounted on the frame F forwardly of the warp manipulating mechanism above described is the weft manipulating mechanism of the invention which operates in synchronism with the warp manipulating mechanism to receive and properly position successive weft members relative to each other and to the warp members, after said weft members are inserted transversely between said relatively spaced sets of warp members.

Said weft manipulating mechanism preferably comprises a pair of longitudinally relatively spaced shafts 22 and 23 respectively rotatably journaled transversely across the frame F. Relatively transversely spaced pairs of longitudinally aligned sprockets 24, 25 are mounted on the respective shafts 22 and 23 for rotation therewith. Chains 26 pass around and in operative engagement with the sprockets 24 and 25 of each

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said pair, the upper portions or segments of said chains 26 being disposed for longitudinal movement substantially parallel to the movement of the warp members L.

Carried by said chains 26 for movement therewith are a series of weft pushers 27, the weft pushers of each chain being relatively uniformly spaced and arranged thereon in relative transverse alignment with the weft pushers of said other chain.

The weft pushers 27 may be of any suitable type, such as shown in enlarged detail views in Figures 3 and 4, wherein each is formed with suitable means such as the forwardly disposed shoulder 27a projecting perpendicularly from the chain to engage the weft members T. The shoulder 27a is adapted to abut against said weft members and urge same through the machine in a longitudinal direction when said weft pusher is moved forwardly with its respective chain between the sprockets 24 and 25; it being noted that the sprockets 24 and 25 are rotated in such a direction that the upper sections of the chains 26 move forwardly from the sprockets 24 to the sprockets 25. The weft pushers are of course inoperative during their rearward or return movement with the lower segments of their respective chains from sprockets 25 to sprockets 24.

In the preferred form of weft pusher illustrated in Figures 3 and 4, each said weft pusher 27 is secured at its forward portion to one of the links 26a of its respective chain, preferably by welding, and formed with a free rearwardly projecting tail portion 27b adapted to abut against adjacent relatively rearwardly disposed links when said links are disposed in relatively linear or aligned relation, as in passing between the respective sprockets 24 and 25. This arrangement serves to maintain the shoulder 27a of each said weft pusher perpendicular relative to its sprocket chain 26 during its operative engagement with the weft members T. Further, when the weft pushers 27 pass around either of the sprockets 24 or 25, thus having the adjacent links of their respective chains disposed at an angle to each other, the rearwardly projecting tail portion 27b of each said weft pusher is free to move radially outwardly relative to said sprockets and out of engagement with its respective rearwardly disposed cooperating link 26a, thus permitting the necessary flexibility of the chains as they pass around the sprockets 24 and 25.

The chains 26 are so located transversely of the machine that the weft pushers 27 will project upwardly and move longitudinally between adjacent transversely spaced warp members L in engagement with the weft members T, the relatively transversely aligned weft pushers 27 of the chains 26 serving to accurately position the weft members transversely to the warp members.

It will be seen that the respective successive weft members are thus accurately transversely positioned relative to the longitudinally extending warp members L and are accurately spaced relative to each other in accordance with the longitudinal distance between the respective weft pushers 27.

The warp spreading mechanism and weft manipulating mechanism of the invention are connected for operation in timed or synchronized relation so that the weft manipulating mechanism and the weft pushers 27 thereof will be in proper operative position to engage a weft member after same is inserted transversely between the relatively spread sets of warp members for

wardly of the warp manipulating mechanism, each time the warp members or portions thereof are reciprocated, or in other words each time the different sets of warp members are spread apart by the action of the warp spreading mechanism.

Obviously the means for connecting said two mechanisms for synchronized operation could assume any of a variety of forms. The means shown in the accompanying drawings for the purpose of illustration comprises sprocket wheels or sprockets 28 and 29 fixedly secured to the respective shafts 9 and 23 of the warp spreading and weft manipulating mechanisms, and sprocket chains 30 operatively associated with said respective pairs of sprockets in accordance with usual practice, to cause simultaneous rotation of the said shafts 9 and 23 of the two mechanisms.

Since all of the rotating shafts of the machine are interconnected for simultaneous rotation, obviously operative power may be supplied to the machine through any one of said shafts. In the accompanying drawings, in order to receive operating power, the shaft 23 is provided with a driven sheave 31 fixedly secured thereto for rotation therewith. Said sheave may be driven by a belt from any usual suitable source of power, or any other suitable arrangement may be made for supplying power to the machine. However the source of power is not illustrated in the accompanying drawings, as it constitutes no part of the present invention.

In the operation of the machine, which is believed to be apparent from the accompanying drawings and detailed description, the boards constituting the warp members L are longitudinally disposed on the warp supporting platform P, preferably one warp member being placed on each platform member 3, the widths of the warp members L and their relative arrangement being such that they will pass between and be maintained in proper spaced relation by the guides 6, which serve to guide them between the opposed peripheries of the respective pairs of discs or members 20, 20', 21, 21'.

Successive additional boards may be added to the rear end of each warp member L as same is fed longitudinally through the machine, by placing said added boards on the platform P in longitudinal alignment with the warp members L into which they are to be incorporated, with their forward ends slightly overlapping the rear ends of the preceding boards of their respective warp members. The said overlapping ends may be secured together by nails N driven therethrough, all as shown in Figure 1 of the drawings, without interrupting the longitudinal passage of the warp members L through the machine. The pointed ends of the nails N will be bent over or clinched by engagement with the metal plates 5. Thus it will be seen that sufficient boards or lengths of other material may be added together during the operation of the machine to form the warp members and the resulting mat or revetment of any desired length.

As the warp members pass longitudinally through the machine, each will pass between the opposed peripheries of one of the pairs 20, 20' or 21, 21' of rotary cam members or discs which, due to their eccentric arrangement on their respective shafts will move or deflect the warp members or portions thereof vertically. Due to the aforementioned relative arrangements of the rotary discs or members 20, 20', 21 and 21' of the warp spreading mechanism, it will be seen that alternate warp members L will thus be recipro-

cated or deflected in different, preferably opposite phase to their respective adjacent members. Thus the warp members L will be divided into two sets reciprocating in opposite vertical directions to periodically provide spaces extending transversely therebetween into which successive weft members T may be inserted.

Each time the respective sets of warp members L are vertically spaced, a rigid preferably wooden weft member T is inserted, manually or otherwise, therebetween at a point just forward of the warp spreading mechanism, as at T' in Figure 1.

As the said weft member T is moved longitudinally forward with the warp members, after having thus been inserted, it is engaged by a pair of transversely aligned weft pushers 27, 27' of the weft manipulating mechanism. Said weft pushers serve to accurately transversely position said member and to space it from its preceding member by a distance equal to the longitudinal distances between the weft pushers 27.

If desired, the weft members T may be fixedly secured in place relative to their cooperating warp members by nailing said respective members together during their passage through or over the weft manipulating mechanism, as at N'.

It will be seen that the weft manipulating mechanism, due to the positive engagement of the weft pushers 27 with the weft members T, serves as the primary means for urging both the warp and weft members L and T respectively through the machine. However in the preferred embodiment of the machine wherein the shafts of the warp spreading mechanism are rotated in opposite directions so that the respective opposed peripheries of the discs or members 20, 20', 21 and 21' are all rotating or moving forwardly, it will be apparent that the warp spreading mechanism also assists in feeding the work longitudinally.

In the preferred use of the machine, it is contemplated that the machine will be mounted adjacent a body of water or on a barge floating therein so that the completed mats or revetments formed by the machine will be discharged from the forward end thereof into the water to float in and be supported thereby, thus enabling the production of mats or revetments of almost unlimited continuous lengths. However, the invention is not limited to such arrangement, it being obvious that the completed revetment formed thereby could be supported in various ways, or cut into relatively short lengths as formed, for easy handling.

In this application I have shown and described only the preferred embodiment of my invention, simply by way of illustration of the practice thereof, as by law required. However I recognize that my invention is capable of other and different embodiments and that the various details thereof may be modified in various ways, all without departing from my said invention; therefore the drawings and description herein are to be considered as merely illustrative and not as exclusive.

I claim:

1. A revetment fabricating machine comprising, an elongated frame, a platform mounted on the rear thereof to support a plurality of warp members for longitudinal movement, guides associated with said platform to relatively transversely space said warp members, and warp spreading mechanism mounted on said frame to receive warp members from said platform comprising, transverse cam shafts rotatably journaled adjacent the forward end of said platform, means con-

necting said shafts for rotation in opposite directions, and a plurality of pairs of respectively peripherally opposed cooperating cams mounted on said shafts, the cams of each said pair being mounted on their respective shafts for rotation therewith in phase with each other to alternately raise and lower a warp member moving between their respective peripheries, some of said pairs of cams being mounted on their respective shafts for operation in substantially opposite phase to the remainder thereof, so that the warp members engaged thereby will be raised and lowered in opposition to the movement of other warp members; in combination with weft manipulating mechanism comprising longitudinally spaced sprockets rotatably mounted on said frame forward of said warp spreading mechanism, chains passing around said sprockets in operative engagement therewith, relatively longitudinally spaced weft pusher members carried by said chains to engage and urge successive weft members in a longitudinal direction while relatively fixedly spacing same, and mechanical means at all times connecting said warp spreading mechanism and said weft manipulating mechanism for simultaneous operation in synchronized relationship whereby said weft manipulating mechanism will be positioned to receive a weft member during each movement of said warp members, and the woven material will pass continuously through the machine.

2. A revetment fabricating machine comprising, an elongated frame, a platform mounted on the rear thereof to support a plurality of warp members for longitudinal movement, means associated with said frame for maintaining said warp members in relatively transversely spaced relationship during their longitudinal movement, and warp spreading mechanism mounted on said frame to receive warp members from said platform comprising, a plurality of relatively transversely spaced pairs of respectively peripherally spaced opposed upper and lower eccentric cam discs, the discs of each said pair being mounted for rotation in opposite directions in phase with each other and in opposite phase relative to adjacent pairs thereof so that adjacent warp members engaged by adjacent pairs of said eccentric cam discs will be raised and lowered in opposition to each other, in combination with weft manipulating mechanism comprising longitudinally spaced sprockets rotatably mounted on said frame forward of said warp spreading mechanism, a chain passing around said sprockets in operative engagement therewith, relatively longitudinally spaced weft pusher members carried by said chain to engage and urge successive weft members in a longitudinal direction while relatively spacing same, and mechanical means at all times connecting said warp spreading mechanism and said weft manipulating mechanism for simultaneous operation in synchronized relationship, whereby the material being fabricated will pass continuously through the machine.

3. A revetment fabricating machine comprising, an elongated frame, a platform mounted thereon to support a plurality of warp members for longitudinal movement, means for guiding said warp members in their longitudinal movement, and warp spreading mechanism mounted on said frame to receive warp members from said platform comprising, a plurality of relatively transversely spaced pairs of respectively peripherally spaced opposed upper and lower eccentric cam discs, the discs of each said pair being

mounted for rotation in opposite directions in phase with each other to periodically raise and lower a warp member passing therebetween while urging same in a longitudinal direction, adjacent pairs of said discs being arranged for operation in different phase so that adjacent warp members will be raised and lowered in substantial opposition to each other, in combination with weft manipulating mechanism comprising, a plurality of relatively longitudinally spaced weft pushers, means supporting said pushers for movement in a longitudinal direction, means for causing such movement, and mechanical means at all times connecting said warp spreading mechanism and said weft manipulating mechanism for simultaneous operation in synchronized relationship, whereby the material being fabricated will pass continuously through the machine.

4. A revetment fabricating machine comprising, an elongated frame, a platform mounted thereon to support a plurality of warp members for longitudinal movement, means associated with said frame for guiding said warp members in their longitudinal movement, and warp spreading mechanism mounted on said frame to receive warp members from said platform comprising, a plurality of relatively transversely disposed pairs of respectively peripherally spaced upper and lower eccentric cam discs, the discs of each said pair being mounted for rotation in phase with each other, and adjacent pairs of said discs being arranged for operation in different phase, in combination with weft manipulating mechanism comprising a plurality of relatively longitudinally spaced weft pushers, means supporting said pushers in their longitudinally spaced relationship for movement in a longitudinal direction to engage successive weft members, means for causing such movement, and mechanical means at all times connecting said warp spreading mechanism and said weft manipulating mechanism for simultaneous operation in synchronized relationship, whereby the material being fabricated will pass continuously through the machine.

5. A revetment fabricating machine comprising, an elongated frame, a platform mounted thereon to support a plurality of warp members for longitudinal movement, and warp spreading mechanism mounted on said frame to receive warp members from said platform comprising, a plurality of relatively transversely disposed pairs of respectively cooperating upper and lower cams, the cams of each said pair being mounted for simultaneous rotation in phase with each other, and adjacent pairs thereof being arranged for rotation in different phase, in combination with weft manipulating mechanism comprising a plurality of relatively longitudinally spaced weft pushers, means supporting said pushers in their relatively longitudinally spaced relationship for movement in a longitudinal direction in engagement with successive weft members, and mechanical means at all times connecting said warp spreading mechanism and said weft manipulating mechanism for simultaneous operation in synchronized relationship, whereby the material being fabricated will pass continuously through the machine.

6. A revetment fabricating machine comprising, a platform arranged to support a plurality of warp members for longitudinal movement, and warp spreading mechanism associated with said platform to receive warp members therefrom comprising, a plurality of relatively trans-

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versely disposed pairs of eccentrically mounted relatively axially spaced rotary members, the members of each said pair being mounted for simultaneous rotation in phase with each other to engage opposite sides of one of said warp members, and adjacent pairs thereof being arranged for rotation in different phase, in combination with weft manipulating mechanism operating in synchronism with said warp spreading mechanism comprising, a plurality of relatively longitudinally spaced weft pushers, means supporting said pushers in their relatively longitudinally spaced relationship for movement in a longitudinal direction in engagement with successive weft members, and mechanical means at all times connecting said warp spreading mechanism and said weft manipulating mechanism for simultaneous operation.

7. A revetment fabricating machine comprising, a longitudinally extending frame, a warp supporting platform associated therewith to support a plurality of warp members during longitudinal movement thereof, warp spreading cam mechanism mounted on said frame adjacent said platform to receive warp members therefrom and reciprocate different sets of said warp members in opposite vertical directions relative to each

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other to periodically form spaces between said respective sets of members into which weft members may be periodically transversely inserted, weft manipulating mechanism for receiving and properly positioning successive weft members relative to said warp members and to each other as same are inserted between said sets of warp members, while urging said weft members in a longitudinal direction, and mechanical means at all times connecting said warp spreading mechanism and said weft manipulating mechanism for simultaneous operation in synchronized relationship, whereby the material being fabricated will pass continuously through the machine.

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