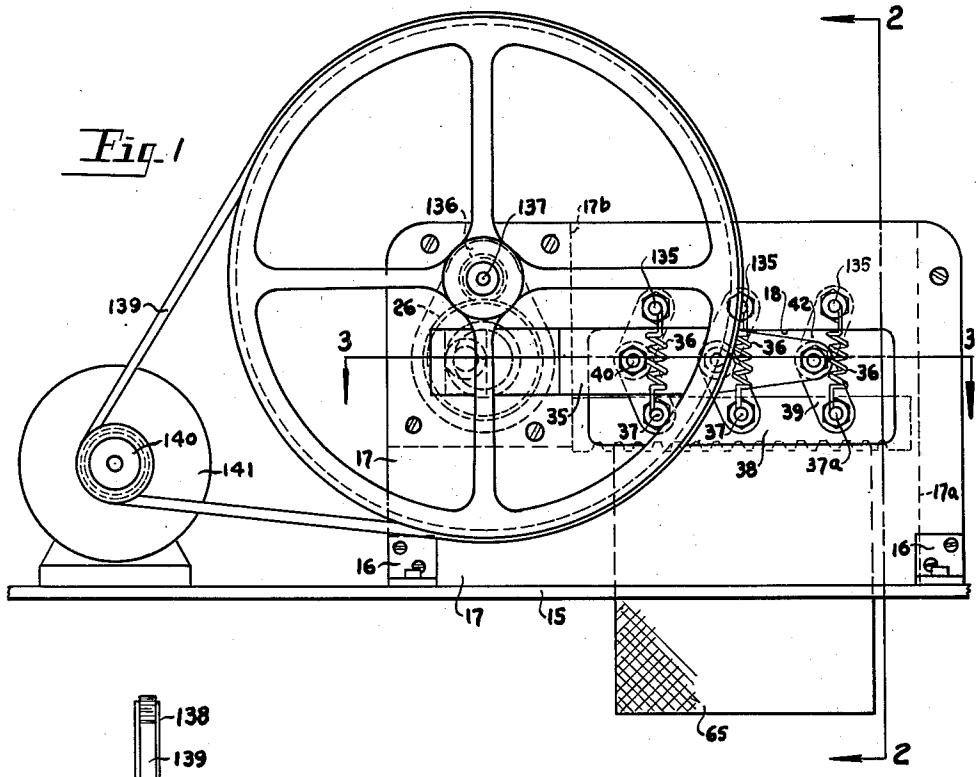
June 27, 1950 O. S. KOSKINEN 2,512,802

MESH FORMING MACHINE

Filed May 20, 1949 4 Sheets-Sheet 1

Fig. 1



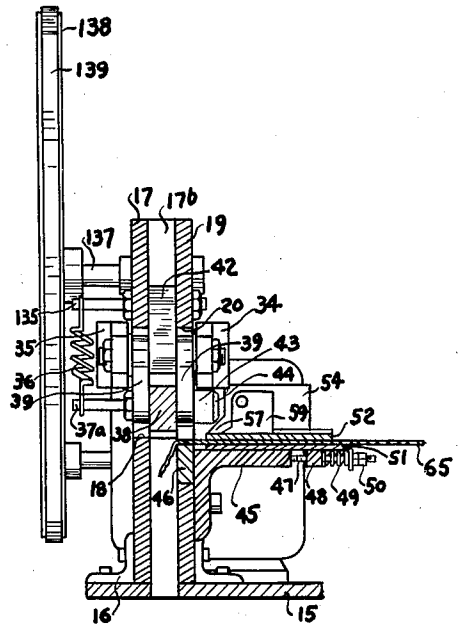


Fig. 2

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MESH FORMING MACHINE

Filed May 20, 1949 4 Sheets-Sheet 2

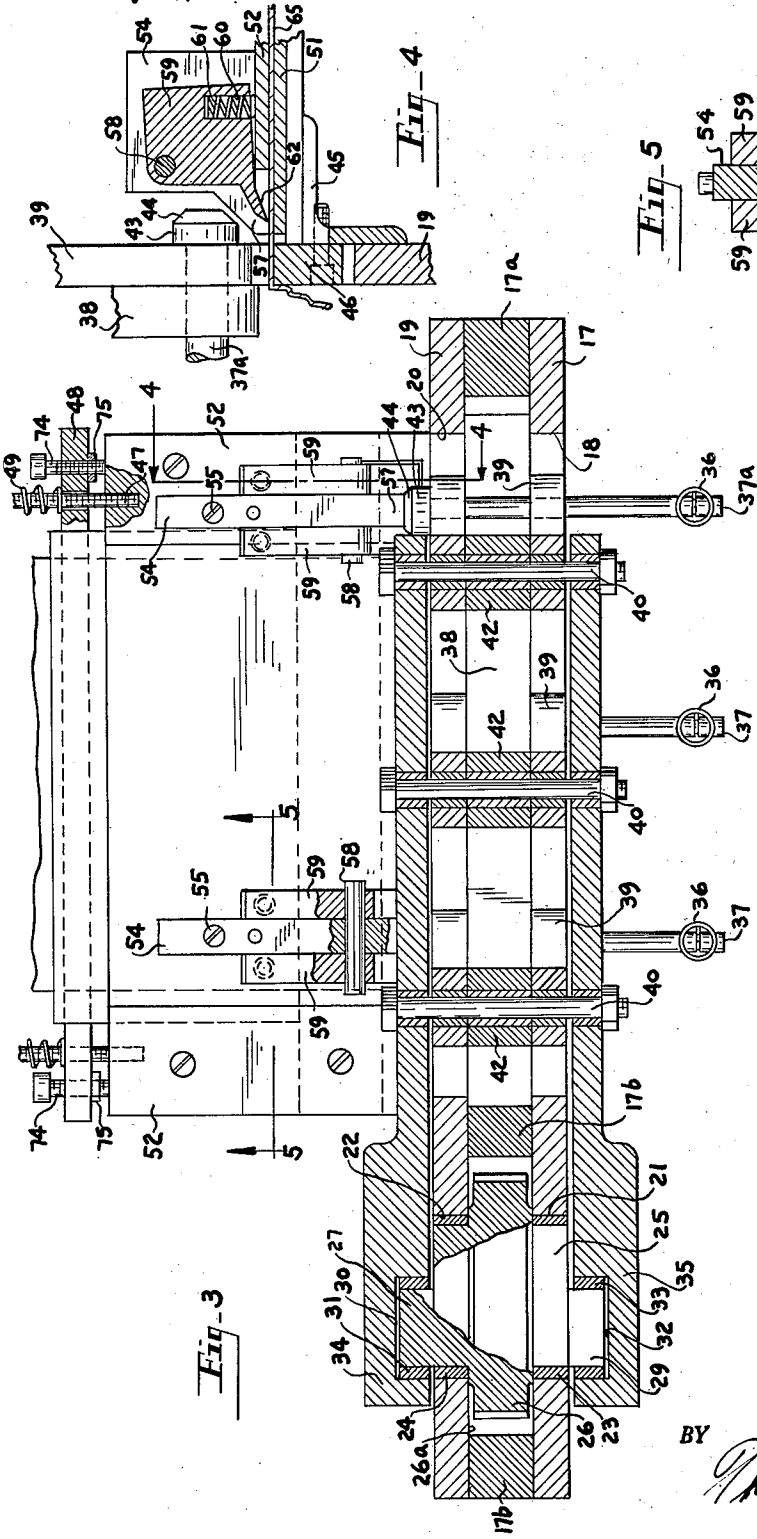


Fig. 3

Fig. 4

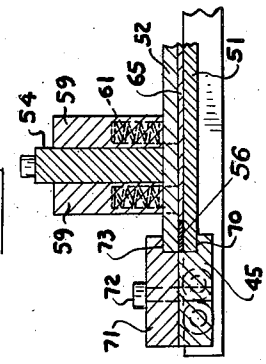


Fig. 5

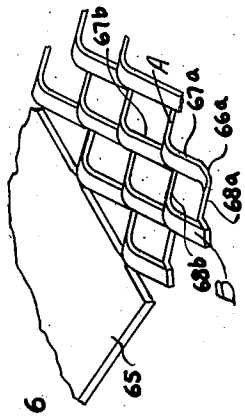


Fig. 6

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MESH FORMING MACHINE

Filed May 20, 1949 4 Sheets-Sheet 3

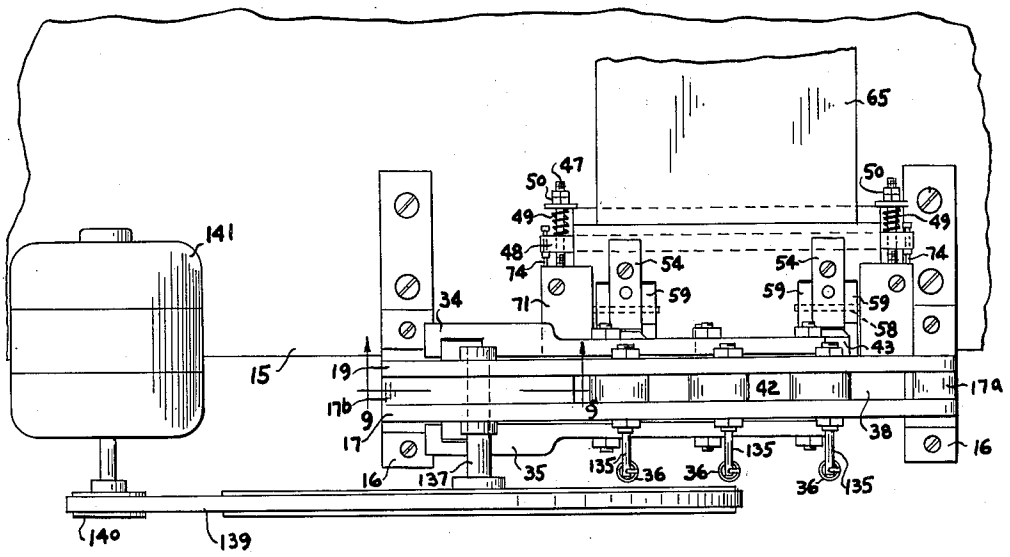


Fig. 7

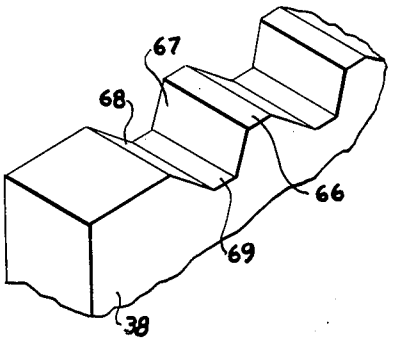


Fig. 8

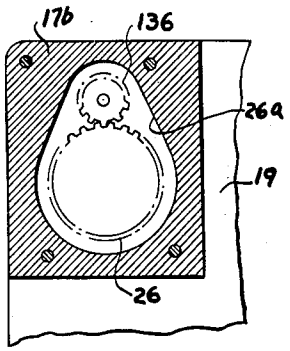


Fig. 9

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MESH FORMING MACHINE

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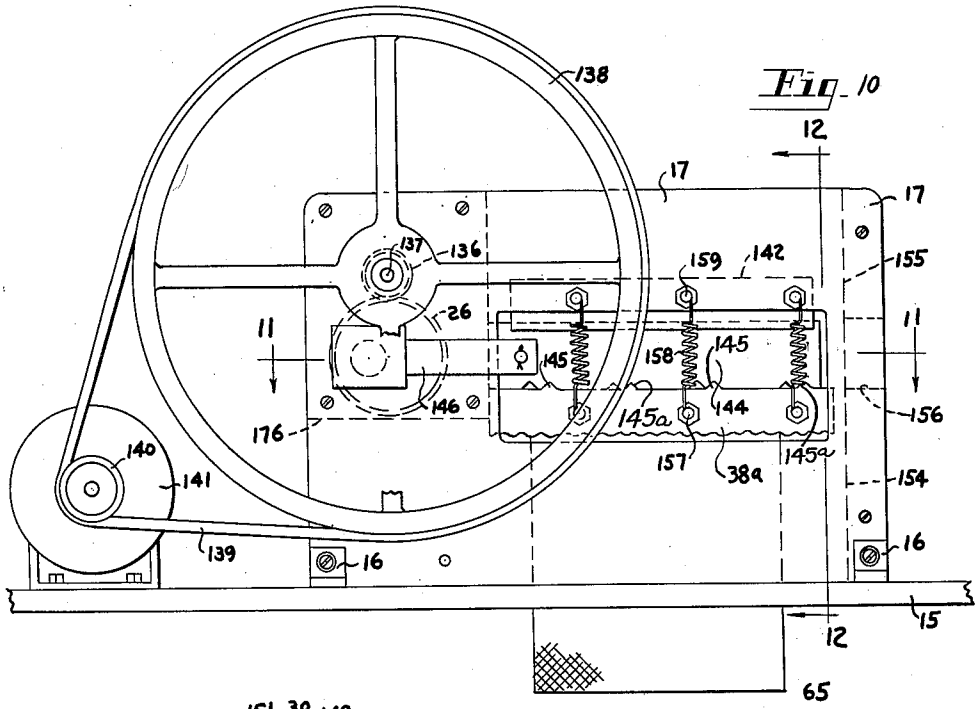


Fig. 10

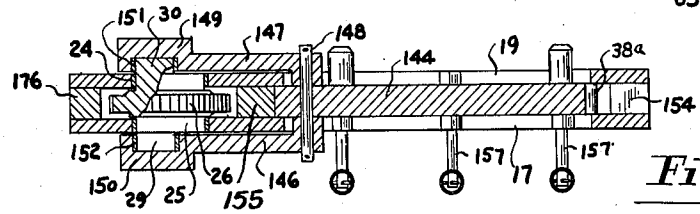


Fig. 11

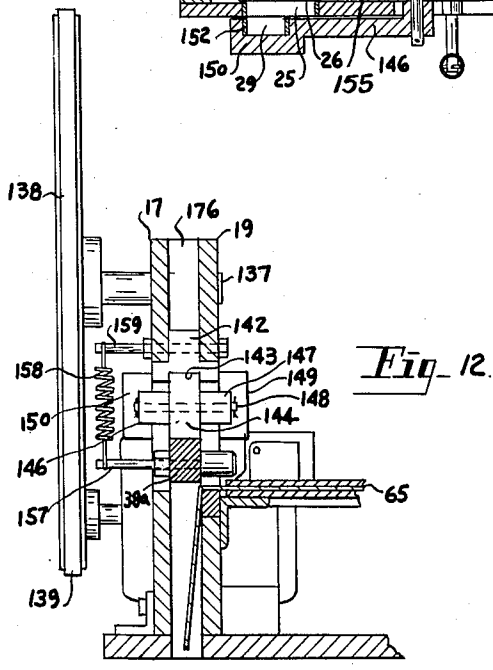


Fig. 12

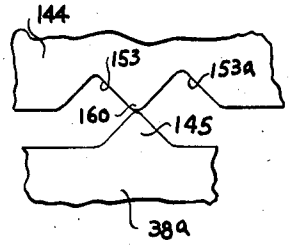


Fig. 13

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UNITED STATES PATENT OFFICE

2,512,802

MESH FORMING MACHINE

Onni S. Koskinen, Birmingham, Mich.

Application May 20, 1949, Serial No. 94,410

10 Claims. (Cl. 164—6.5)

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My invention relates to a new and useful improvement in a mesh forming machine adapted for forming sheet metal into a sheet of mesh bearing material, and it is an object of the present invention to provide a machine so constructed and arranged that in forming the sheet metal into mesh material, the length of the sheet is considerably increased.

Another object of the invention is the provision of a machine of this type which will be simple in structure, economical of manufacture, durable, highly efficient in use, rapid in operation, and easily and quickly operated.

Another object of the invention is the provision of a machine of this class which will shear at spaced apart parts a sheet of material and bend the sheared strips so as to produce mesh formations.

Other objects will appear hereinafter.

It is recognized that various modifications and changes may be made in the detail of structure illustrated, and it is understood that the machine illustrated herein is but one embodiment of the invention.

Forming a part of this specification are drawings in which:

Fig. 1 is a side elevational view of the invention,

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1,

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1,

Fig. 4 is a fragmentary sectional view taken on line 4—4 of Fig. 3,

Fig. 5 is a fragmentary sectional view taken on line 5—5 of Fig. 3,

Fig. 6 is a fragmentary perspective view of a sheet of material, showing it before and after being operated upon,

Fig. 7 is a top plan view of the invention,

Fig. 8 is a fragmentary perspective view of the forming bar,

Fig. 9 is a fragmentary sectional view taken on line 9—9 of Fig. 7,

Fig. 10 is a side elevational view of the invention, showing a slight modification,

Fig. 11 is a sectional view taken on line 11—11 of Fig. 10, with parts removed,

Fig. 12 is a sectional view taken on line 12—12 of Fig. 10, with parts broken away,

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Fig. 13 is a fragmentary side elevational view of the actuating bar and forming bar, with parts broken away.

As shown in the drawings, the invention comprises a bed or table 15. Secured to the bed or table 15 by means of the clips 16 at their bottom edges are the plates 17 and 19, which are spaced apart. Formed in the plate 17 is an opening 18 registering with an opening 20 formed in the plate 19. These plates are spaced apart adjacent one of their ends by the spacing blocks 17*a*, and adjacent their other ends by the spacing block 17*b*, these plates 17 and 19 being held in clamping relation to the spacing blocks by suitable bolts therethrough.

As shown in Fig. 3, there is an opening 21 formed in the plate 17 registering with an opening 22 formed in the plate 19. Positioned in the opening 21 is a bushing 23, and a similar bushing 24 is positioned in the opening 22 to form a bearing for the shaft or axle 25, on which is formed a gear 26, the gear 26 being positioned in the cavity 26*a* formed in the spacing block 17*b*.

The gear 26 meshes with a gear 136, fixedly mounted on the shaft 137, on which is fixedly mounted a flywheel 138 driven by the belt 139, which passes around the pulley 140 of the electric motor 141.

Formed integral with the member 25 and projecting outwardly from opposite faces thereof, eccentrically thereof, are trunnions 27 and 29, which engage in the pockets 30 and 32 respectively formed in the reciprocating members or arms 34 and 35 respectively. Positioned in the pocket 30 is an annular bushing 31, and a similar bushing 33 is positioned in the pocket 32 to form bearing for the trunnions. Pivotally connected, at one of their ends, to these arms 34 and 35 and positioned between the plates 17 and 19 by means of the pivot pins 40, are the links 39 and 42. The opposite ends of the link 42 are pivotally connected by means of the bolt 135 to the plates 17 and 19. The opposite end of the links 39 are pivotally connected by means of the bolts 37 and 37*a* to the forming bar 38. These links thus form a toggle, and the center of the toggle is connected to the arms 34 and 35. Each of the bolts 135 has the outwardly projecting stem to which one end of the spring 36 is connected, the opposite end of the spring 36 being

connected to a similar stem projecting outwardly from the bolt 37 or the bolt 37*a*. Formed on the opposite end of these bolts 37 or 37*a* (I have indicated the formation on the bolt 37*a*), is a head 43 having a tapered surface 44.

Mounted on the plate 19 and projecting outwardly therefrom is a supporting bracket 45, to which is rigidly attached the cutter bar 46, as clearly shown in Fig. 4. This may be referred to as a lower cutter bar in contradistinction to the forming bar or cutter bar 38.

Secured to and projecting outwardly from the bracket 45 is the threaded stud 47, which extends slidably through a plate 48. Embracing this stud 47 is a coil spring 49, one end of which bears against the bar 48 and the other end of which is held in position by means of the nuts 50 threaded on the stud 47. This bar 48 is attached to the plate 51, over which is positioned the plate 52 in spaced relation therefrom, so that the strip 65 of material to be worked upon may be passed between these plates. This plate 52 is provided with a block 54 secured by the bolt 55 to the plate 52. The block 54 has a nose 57 at one end which is adapted to be engaged by the beveled face 44 of the head 43. Extending through this block 54 is a pin or rod 58, on which is pivotally mounted a feeding plate 59, in which is formed a recess 60 in which is positioned a spring 61 so as to normally maintain the plate 59 tilted so that the feeding finger 62 will engage the strip 65 of material to be worked upon. The construction is such that when the head 43 moves downwardly so that the inclined face 44 engages the nose 57, the block 54 will be pushed against the compression of the spring 49 a predetermined distance, this distance depending upon the location of the block 54 on the plate 52. When the face 44 again disengages with the nose 57, the spring 49 will move the block 54 and the attached parts so as to feed the strip of material 65 a predetermined distance forward into the path of the forming bar 38. When in this position, the material would of course overhang the lower cutter bar 46, so that when the forming bar 38 moves downwardly, the material would be pressed over the edge of the lower cutter bar 46 and sheared and shaped to form.

As shown in Fig. 5, the plates 51 and 52 slide in channels at their opposite edges, these plates being spaced apart by spacers 56. The member 45 is cut away as at 70 and mounted on the member 45 is the plate 71 secured thereto by the bolt 72, and cut away as at 73 to provide the channel receiving the side edges of the plates 51 and 52. It is obvious from an examination of Fig. 4 that as the beveled face 44 engages the nose 57 and forces the block 54 to the right, the plate 65 of material to be worked upon will be held in position because of its downturned portion.

In operation, after the sheet of material 65 has been placed in position at slits to the left of the plates 51 and 52, sliding therebetween, the proper distance, the machine would be set in operation. In Fig. 1 the forming bar 38 is retracted to the left to its full position, and as the rotation of the member 25 is effected, the trunnions 29 and 27, which operate as cams, so as to force the members 34 and 35 to the right until the end of the forming bar 38 will engage the members 17*a* as an abutment, so that it can no longer move to the right. However, the movement of the arms 34 and 35 will continue so that the toggles will move to center, and in this movement the forming bar 38 will be forced downwardly to shear and form the material, while at the same time the toggles will break to the right, which is the opposite position from that shown in Fig. 1, in which they are shown broken to the left. As the toggles break to the right, the forming bar 38 will move upwardly, the springs 36 functioning to assist this movement. The eccentric will then pass center in the opposite direction to retract the arms 34 and 35, carrying with them the connected parts, so that the forming bar 38 will travel to the left of Fig. 1. As this movement continues, the left end of the presser bar 38 strikes an abutment such as the face of the block 17*b*, whereupon the movement of the forming bar 38 to the left will stop and the members 34 and 35 will continue to move to the left so as to bring the toggle links on center, thus forcing the forming bar downwardly to again shear and form. This movement of the members 34 and 35 to the left will continue until the position of the various parts shown in Fig. 1 is reached, whereupon the action is repeated.

The face of the forming bar 38 which contacts the work material is provided with spaced apart teeth, and as shown in Fig. 8 in this enlarged view, the teeth comprise the flat leading face 66, and the opposite sides of the teeth are provided with the inclined sides 67 and 68 leading down into the recess or channel 69. It is obvious that these teeth may be made of various sizes and shapes so that mesh of different sizes and formation may be formed, and the spacing of the teeth may be varied.

As shown in Fig. 6, on the first movement down, the strip A would be formed, the face 66 of the teeth engaging the material at 66*a*, the sides 67 and 68 forming the parts 67*a* and 68*a* respectively. As the forming bar 38 comes down to make this formation, the block 54 will be moved to the right of Fig. 4 and the feeding finger 62 will be in engagement with the strip of material 65 so that when the toggle links break to the other side and the forming bar moves upwardly, the block 54 will move to the left of Fig. 4 in response to the pressure of the springs 49, so that the feeding fingers will feed the strip of material 65 to a predetermined distance. The movement to the right of Fig. 4 is limited by the head of the screw 74, which passes through the bar 48 so that the bar 48 may slide on the screw 74, this screw 74 being secured to the bracket 45 and projecting outwardly therefrom and being provided with a lock nut 75 so that the return movement is also limited and thus the amount of feeding is limited. It is obvious that by making the necessary adjustment of this abutting nut 75, the degree of feeding may be varied, as may likewise the opposite movement upon backing out of the screw 74. On the next movement, the strip B would be formed so that the portion 67*b* and the portion 68*b* are offset relatively to the portions 67*a* and 68*a*, to which they correspond. It is obvious that this offsetting may be varied depending upon the amount of movement on the forming bar 38 to the right and left, and this may be regulated by adjusting the distances between the opposed faces of the abutment blocks which engage the opposite ends of the forming bar 38. As the forming bar comes down, not only does it shear at the proper places and form the strip, but the strip is also stretched so that when a sheet of material of a determined length is used, the sheet of mesh formed from that sheet of mate-

rial will be considerably longer than the sheet of material itself. In this operation no metal, of course, is removed. This will become plain by examining Fig. 6 and Fig. 8 together when the teeth of the forming bar move downwardly the face 66 will effect a shearing as will likewise face 67 and 68; however, the forming movement does not continue far enough to have the face 69 engage and shear the material, consequently the forming block 38 stops the forming movement while there is still space between the face of the material 65 and the face 69.

In Figs. 10 to 13 inclusive, I have shown a slight modification of the invention. This modification relates primarily to the construction of the forming bar 38*a* and particularly the means for reciprocating and operating this forming bar 38*a*.

Secured between the plates 17 and 19 is a T-bar 142 having a channel 143 formed in its lower face, in which slidably engages an actuating or moving bar 144, which is pivotally connected adjacent one end by means of the pin 148 to the links 146 and 147, each of these links having on their free end the cups 149 and 150 respectively. Pressed into the cup 149 is the bushing 151, which embraces the trunnion 30, and the bushing 152 pressed into the cup 150 embraces the trunnion 29, so that as the gear 26 rotates, the links 146 and 147 will cause a reciprocation of the actuating bar 144.

Formed on the upper face of the forming bar 38*a*, at spaced apart intervals, are pairs of bosses 145 and 145*a*, adapted to seat in the recesses 153 and 153*a* formed on the lower face of the actuating bar 144. Positioned between the plates 17 and 19 are the spacing blocks 154 and 155 having the space 156 positioned therebetween, the block 154 being in the path of movement of the forming bar 38*a* and serving as an abutment therefor.

Projecting outwardly from the face of the forming bar 38*a* are pins or studs 157 to which the lower ends of the springs 158 are attached, the upper ends of these springs 158 being secured to pins or studs 159 projecting outwardly from the face of the plate 17.

The operation of the modified form is substantially the same as the operation of the preferred form. When the shaft 25 is rotated, the links 146 and 147 will cause a reciprocation of the actuating bar 144. As the actuating bar moves to the right of Fig. 10, it will carry with it the forming bar 38*a* until the forming bar 38*a* meets an abutment, which is the block 154, so that the forming bar 38*a* can move no farther. The actuating bar 144, however, will continue to move to the right, the pockets 153 and 153*a* riding over the boss 145. The boss 145 will be positioned in the pocket or recess 153 and, riding out of this, will then engage the lower planar face 160 of the actuating bar 144 until the boss 145 comes into registration with the recess 153*a*, whereupon it will ride into this recess. As the boss 145 rides onto the planar face 160, the forming bar 38 will moved downwardly, and when this boss 145 rides into the recess 153*a*, the forming bar 38 will move upwardly in response to the tension of the springs 158. On the reverse movement, therefore, the forming bar 38*a* will be carried to the left because of the engagement of its bosses 145 in the recesses 153*a*. This movement to the left will continue until the left end of the forming bar 38*a* reaches its abutment, which is the block 155, whereupon its movement to the left will stop and again the boss 145 will ride out of the recess 153*a* and move toward registration with the recess 153, and in this movement ride over the planar face 160 to repeat the operation.

What I claim as new is:

1. In a mesh-forming machine of the class described, a forming bar having spaced apart projections on one face adapted for engaging a sheet of material and shearing the same; a longitudinally movable arm for moving said forming bar longitudinally in unison therewith and, upon movement of said forming bar a predetermined distance in either direction, movable relatively thereto in the same direction; and means for exerting a thrust on said forming bar upon the relative movement of said arm relatively thereto for forcing said projections on said forming bar to shear and form the sheet of material.

2. In a mesh-forming machine of the class described, adapted for forming a sheet of material into a mesh, a movable forming bar; a plurality of spaced apart projections on one face of said forming bar adapted for engaging and shearing the sheet of material; means for moving said forming bar a predetermined distance in one direction and a predetermined distance in the opposite direction, the distance of movement between said directions being a distance equal to one half the spacing between said projections; and means for exerting a thrust on said forming bar upon movement of said forming bar to each of said predetermined distances.

3. In a mesh-forming machine of the class described, adapted for forming a sheet of material into a mesh, a movable forming bar; a plurality of spaced apart projections on one face of said forming bar adapted for engaging and shearing and forming the sheet of material; means for moving said forming bar a predetermined distance in one direction and a predetermined distance in the opposite direction, the distance of movement between said directions being a distance equal to one half the spacing between said projections; and means for exerting a thrust on said forming bar upon movement of said forming bar to each of said predetermined distances; and means for feeding said sheet of material a predetermined distance during the movement of said forming bar from one of said predetermined positions to the other of said predetermined positions.

4. In a mesh-forming machine of the class described, adapted for forming a sheet of material into mesh construction, a forming bar; a plurality of spaced apart projections on one face of said forming bar adapted for engaging and shearing and forming the sheet of material; a reciprocating arm; interengaging means for engaging said arm and said forming bar for moving the same in unison; means for reciprocating said arm and said forming bar; an abutment member for engaging said forming bar upon movement of the same to a predetermined distance in either direction of longitudinal movement, said arm being movable relatively to said forming bar upon engagement of said forming bar with said abutment, and said interengaging means, upon relative movement of said forming bar and said arm, delivering a thrust to said forming bar at an angle to the direction of longitudinal movement for forcing the same into engagement and into shearing relation with the sheet of material.

5. In a mesh-forming machine of the class described, adapted for forming a sheet of ma-

terial into mesh construction, a forming bar; a plurality of spaced apart projections on one face of said forming bar adapted for engaging and shearing and forming the sheet of material; a reciprocating arm; interengaging means for engaging said arm and said forming bar for moving the same in unison; means for reciprocating said arm and said forming bar; an abutment member for engaging said forming bar upon movement of the same to a predetermined distance in either direction of longitudinal movement, said arm being movable relatively to said forming bar upon engagement of said forming bar with said abutment, and said interengaging means, upon relative movement of said forming bar and said presser bar, delivering a thrust to said forming bar at an angle to the direction of longitudinal movement for forcing the same into engagement and into shearing and forming relation with the sheet of material; and resilient means for normally retaining said forming bar out of engagement with the sheet of material upon cessation of the delivery of said thrust.

6. In a mesh-forming machine of the class described, adapted for forming a sheet of material into mesh construction, a forming bar; a plurality of spaced apart projections on one face of said forming bar adapted for engaging and shearing and forming the sheet of material; a reciprocating arm; interengaging means for engaging said arm and said forming bar for moving the same in unison; means for reciprocating said arm and said forming bar; an abutment member for engaging said forming bar upon movement of the same to a predetermined distance in either direction of longitudinal movement, said arm being movable relatively to said forming bar upon engagement of said forming bar with said abutment, and said interengaging means, upon relative movement of said forming bar and said arm, delivering a thrust to said forming bar at an angle to the direction of longitudinal movement for forcing the same into engagement and into shearing relation with the sheet of material; means for normally retaining said forming bar out of engagement with the sheet of material upon cessation of the delivery of said thrust; and means for feeding the sheet of material a pre-determined distance upon movement of said forming bar out of engagement with the sheet of material.

7. In a mesh-forming machine of the class described, adapted for operating upon a sheet of material and forming a mesh of the same, a forming bar; a plurality of spaced apart projections on one face of said forming bar for engaging the sheet of material and shearing and forming the same, said forming bar being movable into and out of engagement with the sheet of material and being longitudinally movable at right angles to the direction of movement when moving into and out of engagement with the sheet of material; a reciprocating arm; means for reciprocating said arm; means interengaging said arm and said forming bar for moving said forming bar in unison with said arm; an abutment member for engaging said forming bar and limiting its movement in one direction beyond a predetermined distance, said arm, upon engagement of said forming bar with said abutment, being movable in the same direction relatively to said forming bar and said engaging means, upon relative movement of said forming bar and said arm, delivering a thrust to said forming bar for forcing the same into engaging relation with the sheet of material for shearing and forming the same; an abutment

member for engaging said forming bar upon movement of the same in the opposite direction a predetermined distance, and said arm being movable in the same direction relatively to said forming bar upon engagement of said forming bar with said last named abutment, and said interengaging means effecting a thrust to said forming bar for forcing the same into shearing relation with the sheet of material.

8. In a mesh-forming machine of the class described, adapted for forming a sheet of material into mesh, a forming bar; a plurality of spaced apart projections on one face of said forming bar adapted for engaging and shearing and forming a sheet of material; a reciprocating arm; means for reciprocating said arm longitudinally of said forming bar; a plurality of toggle links connecting said arm with said forming bar and adapted, upon moving toward center, for forcing said forming bar into shearing relation with the sheet of material; an abutment member for engaging said forming bar upon movement of the same in one direction a predetermined distance, said arm being movable in the same direction, subsequent to the engagement of said forming bar with said abutment, a distance sufficient for moving said toggle links onto center and breaking them across center; an abutment member for engaging said forming bar upon movement of the same in the opposite direction a predetermined distance, and said arm being movable in the same direction, subsequent to the engagement of said forming bar with said last named abutment, for moving said toggle links onto center and past center.

9. In a mesh-forming machine of the class described, adapted for operating upon a sheet of material for reducing the same to mesh condition, a forming bar; a plurality of spaced apart projections on one face of said forming bar adapted for engaging and shearing and forming the sheet of material; a reciprocating arm movable longitudinally of said forming bar; means for reciprocating said arm; a plurality of spaced apart projections on the opposite face of said forming bar, said arm having pairs of recesses arranged at each of said last-named projections, each of said recesses being adapted for reception of one of said projections, said projections engaging in said recesses; an abutment at each end of said forming bar and adapted for engaging the same upon movement of the same in one direction a predetermined distance, said arm being longitudinally movable of said forming bar subsequent to the engagement of the same with an abutment, and said projections riding out of said recesses upon longitudinal movement of said arm relatively to said forming bar subsequent to the engagement of said forming bar with the abutment for delivering a thrust for forcing said forming bar into shearing engagement with the sheet of material.

10. In a mesh-forming machine of the class described, adapted for operating upon a sheet of material for reducing the same to mesh condition, a forming bar; a plurality of spaced apart projections on one face of said forming bar adapted for engaging and shearing and forming the sheet of material; a reciprocating arm movable longitudinally of said forming bar; means for reciprocating said arm; a plurality of spaced apart projections on the opposite face of said forming bar, said arm having pairs of recesses arranged at each of said last-named projections, each of said recesses being adapted for reception of one of said projections, said projections engaging in said recesses; an abutment at each end of said forming

bar and adapted for engaging the same upon movement of the same in one direction a predetermined distance, said arm being longitudinally movable of said forming bar subsequent to the engagement of the same with an abutment, and said projections riding out of said recesses upon longitudinal movement of said arm relatively to said forming bar subsequent to the engagement of said forming bar with the abutment for delivering a thrust for forcing said forming bar into shearing engagement with the sheet of material; and means for feeding said sheet of material past said

forming bar upon the movement of said forming bar out of engagement with the sheet of material.

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