W. H. COOLEY.

METHOD OF FORMING EXPANDED METAL.

APPLICATION FILED JUNE 29, 1908.

909,064. Patented Jan. 5, 1909.

2 SHEETS—SHEET 1.

FIG. 2

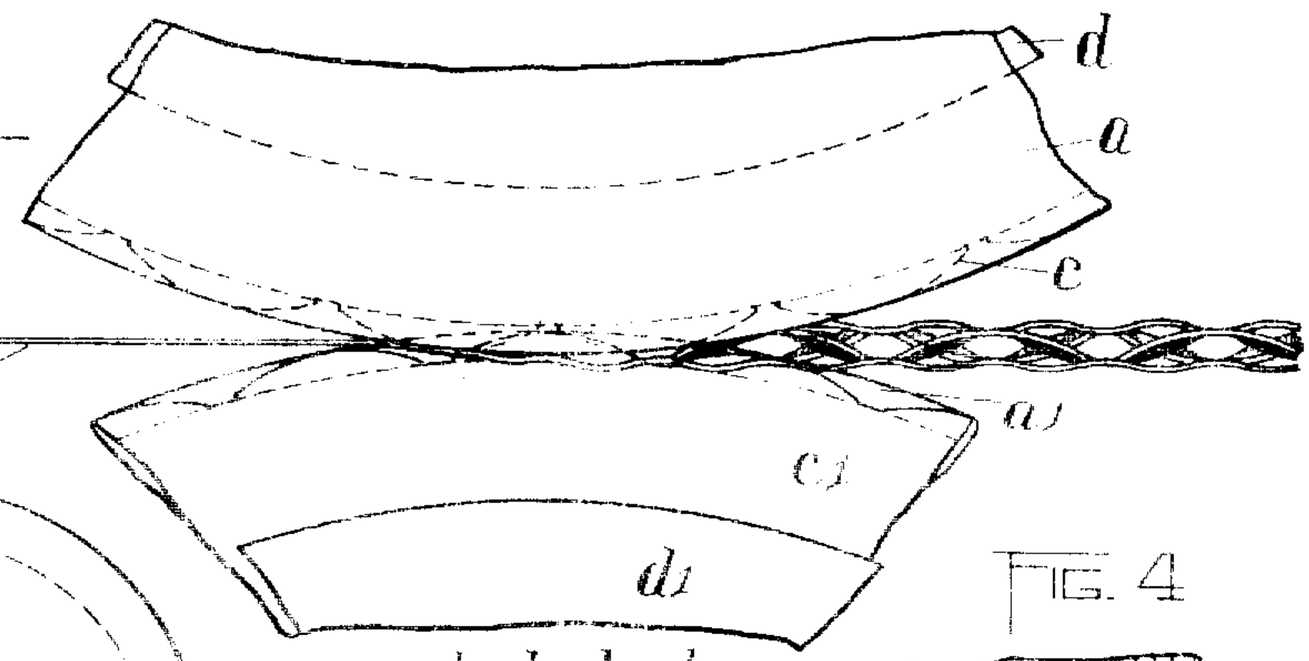


FIG. 1

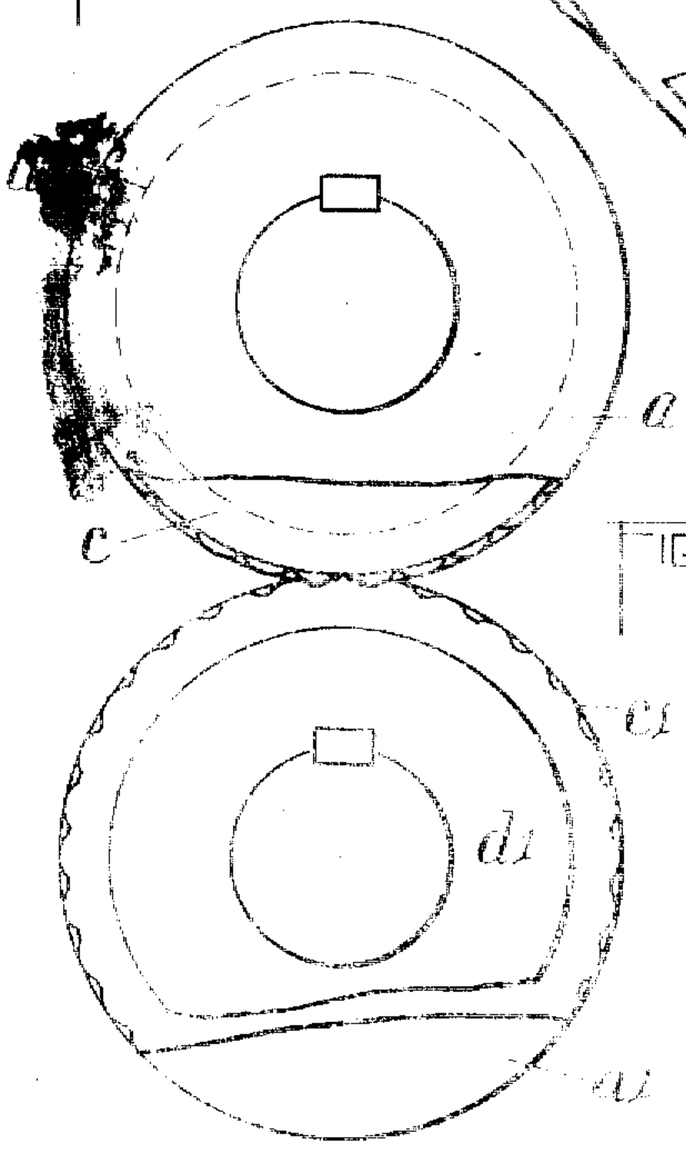


FIG. 3

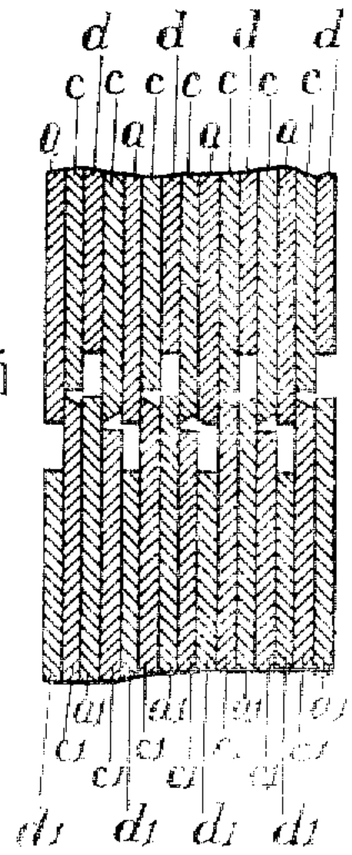


FIG. 4

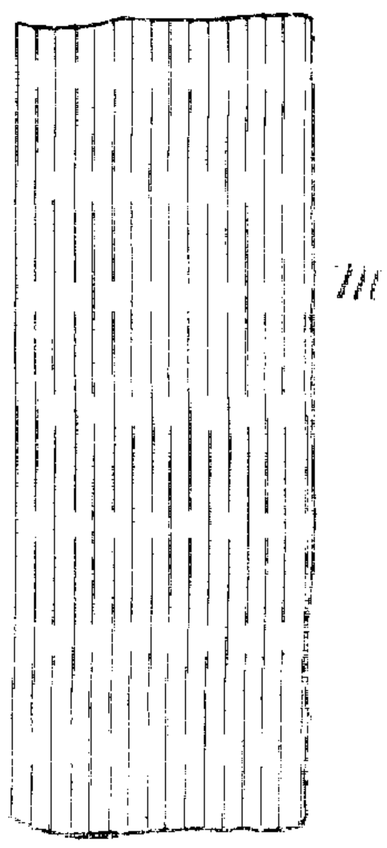
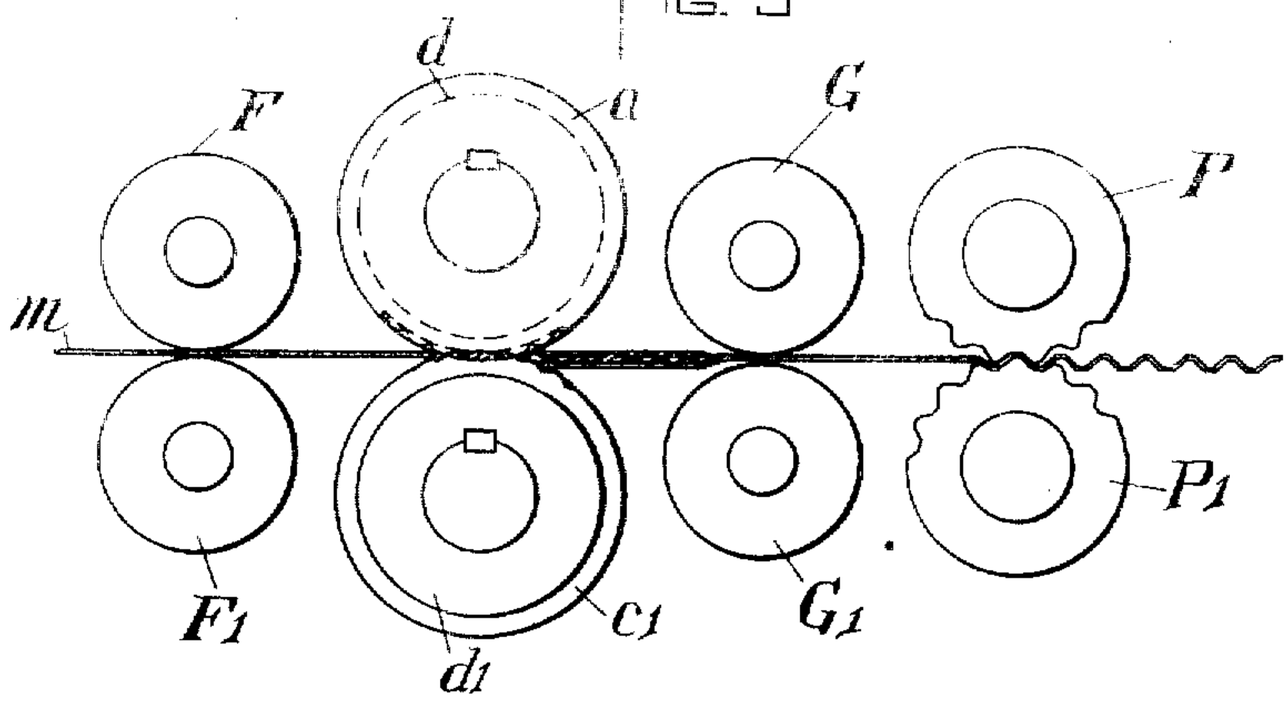


FIG. 5



WITNESSES:
Osborne F. Gurney
Lottie Woodd

INVENTOR:
Wm. H. Cooley.

W. H. COOLEY.

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2 SHEETS—SHEET 2.

FIG. 6

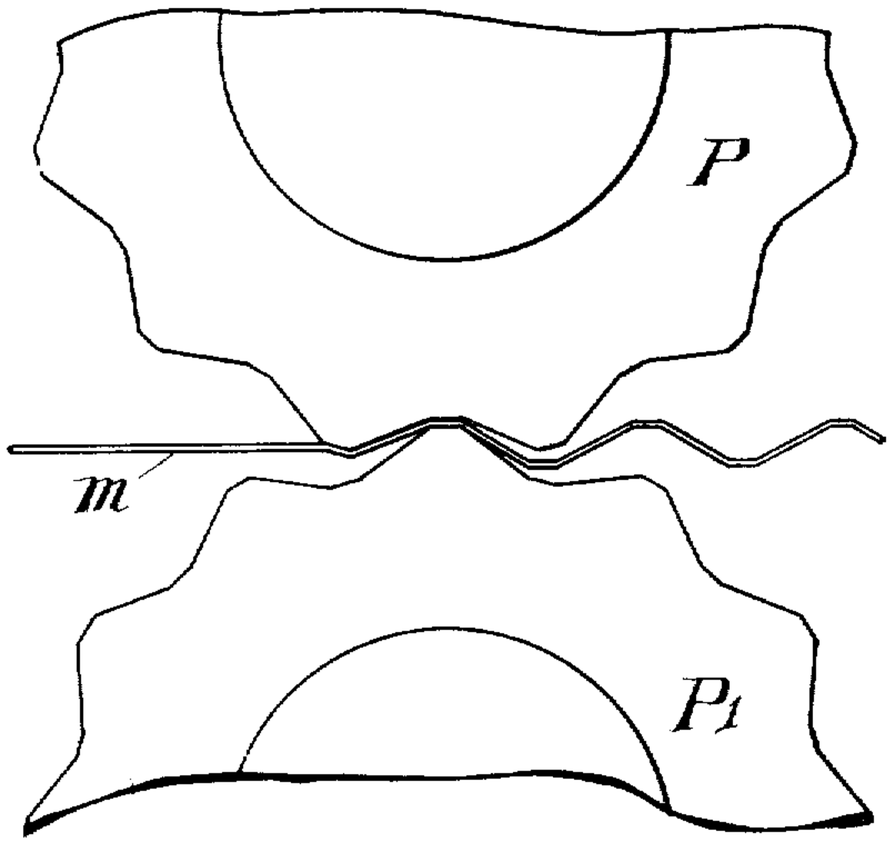


FIG. 7

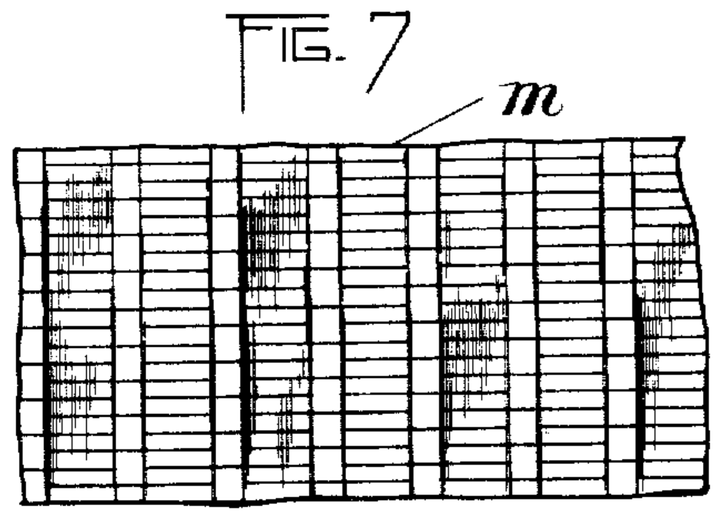


FIG. 9

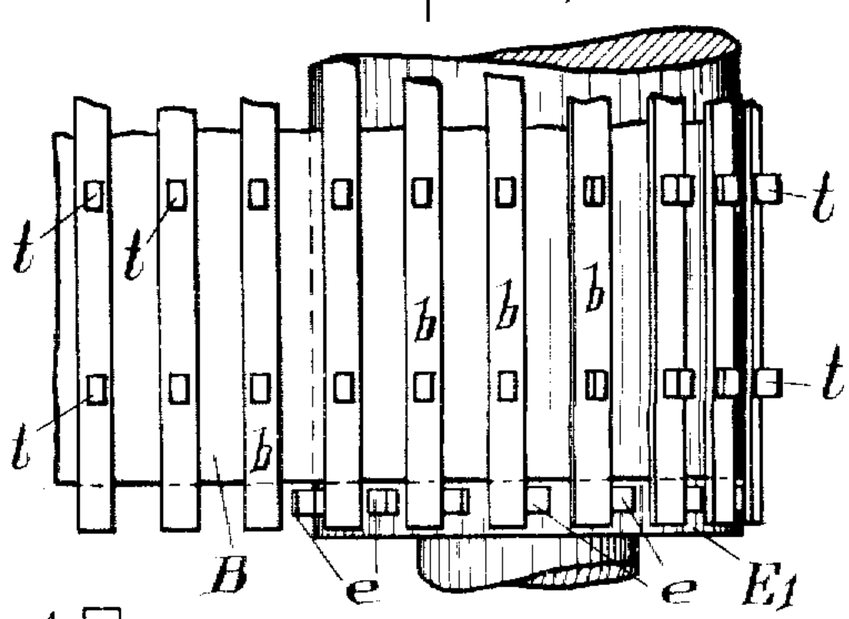


FIG. 8

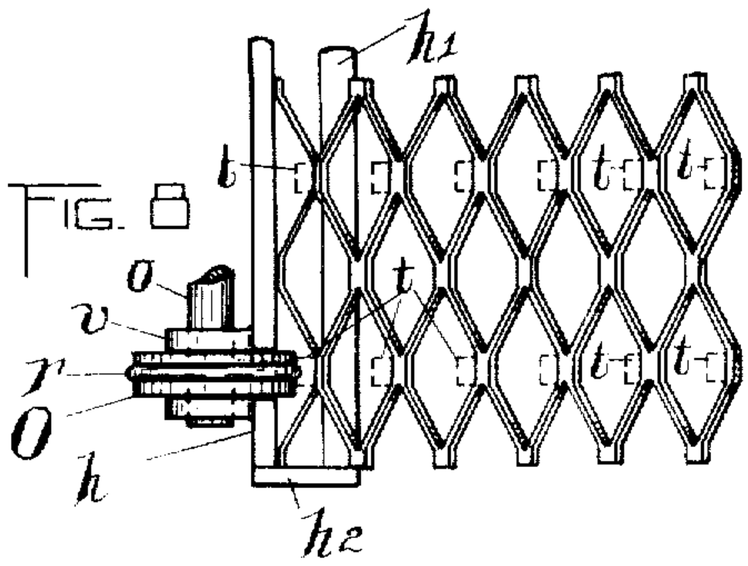


FIG. 10

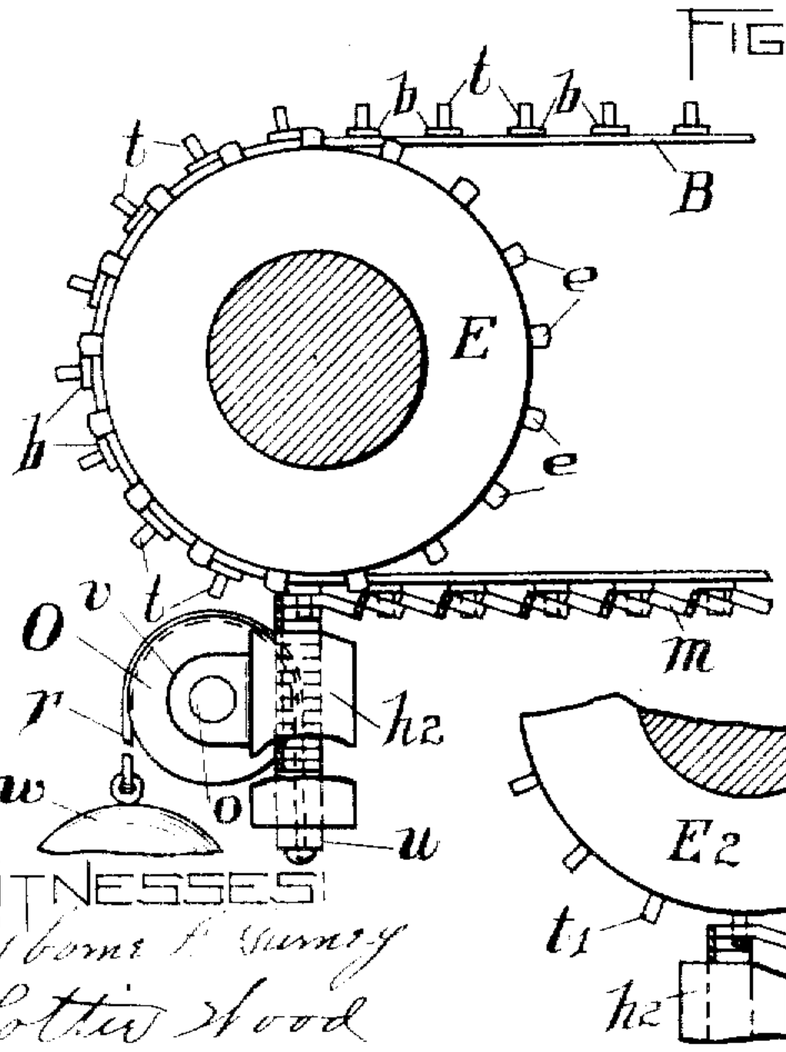
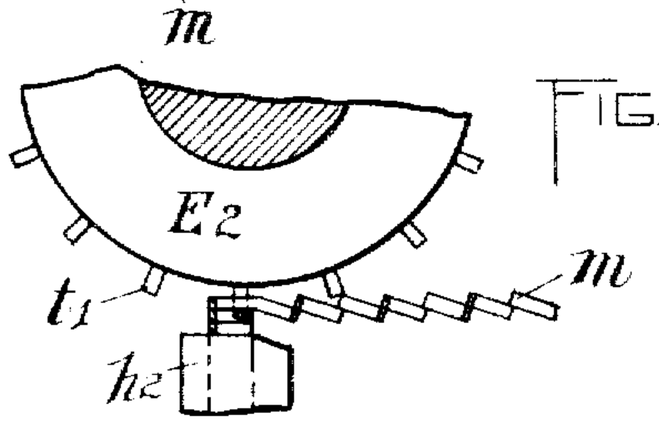


FIG. 11



WITNESSES:

Osborne & Gurney

Lottie Wood

INVENTOR:

Wm. H. Cooley.

UNITED STATES PATENT OFFICE.

WILLIAM H. COOLEY, OF BROCKPORT, NEW YORK.

METHOD OF FORMING EXPANDED METAL.

No. 909,064. Specification of Letters Patent. Patented Jan. 5, 1909.

Application filed June 29, 1908. Serial No. 440,805.

To all whom it may concern:

Be it known that I, WILLIAM H. COOLEY, a citizen of the United States, and a resident of Brockport, in the county of Monroe and State of New York, have invented a new and Improved Method of Forming Expanded Metal, of which the following is a specification.

My present invention relates to an improved method of producing expanded metal such as used in reinforced concrete work and for lathing and other similar purposes.

It has been customary hitherto in the production of expanded metal, when the metal was cut by reciprocating dies, to expand the metal as it is being cut, and when the metal was cut by means of rotary cutters, to expand the metal either while being cut or subsequently to the cutting operation in a separate expanding apparatus or machine, in which latter case it has been usual to expand the entire sheet at one operation. This method has afforded some advantages, in that the entire sheet could be expanded at a single operation and the cutting could be more rapidly done by means of rotary cutters.

Machines for expanding the metal, after it has been cut, at a single and independent operation have usually been of such a size as to be seriously objectionable for the larger size sheets, as such machines had to be adapted to receive the sheet in its full dimensions in one direction before expansion and to expand the metal to its maximum dimension in the transverse direction. In such machines it has been usual to place the entire strain of the expanding operation upon the opposite edges of the sheet and such expansion has sometimes been somewhat irregular, owing to the fact the strain in the expanding operation is put upon strands or side bars of the meshes at the extreme edges of the sheet.

By means of my method I am enabled to greatly reduce the expense of and the space occupied by the expanding apparatus while securing at the same time a nearly perfect regularity in the shape and size of the mesh in the expanded metal.

In carrying out my invention, I first form the cuts in the metal in the desired way by means of, preferably rotary, cutters, although reciprocating cutters may be used, and as the metal leaves the cutters, it is caused to pass through crimping or corrugating mechanism, which may also be preferably of the rotary type, although reciprocating mechanism may be used for this purpose also, which crimps the sheet in such a way that a strip cut from the sheet transversely of the corrugations and of the direction of the feed through the cutters will correspond to the dividing wall or bars between two adjacent and transversely extending series of meshes, so that to produce the expanded metal, it is only necessary to bend every other series of bars, between the cuts, in the opposite direction from that in which they lie in the crimped or corrugated sheet, and in expanding such a sheet it is only necessary to engage the sheet at the keys between the bars and draw such keys in straight lines without stretching the metal.

I desire to call especial attention to the fact that one of the essential features of my present invention consists in so crimping the sheet after it has been cut that the direction of the motion of the expanding members may be in straight lines, on account of which the metal may be expanded without stretching and the expander may be comparatively small and simple in construction,—comprising either a roller having engaging teeth on it or a pair of rollers carrying sprocket chains or other endless bands having engaging teeth thereon, such teeth spaced the same distance each way as the keys in the expanded metal. By this method of expansion, the meshes are all expanded uniformly and each mesh is expanded independently of any other mesh in the sheet.

An important feature of my present invention is the cutting of the metal by rotary cutters, as such cutters may be operated with greater rapidity than reciprocating dies, and for the further reason that such rotary cutters may be advantageously incorporated in the same machine with the crimping or corrugating rollers and the sheet may be delivered from such machine in its cut and corrugated or crimped form.

Another important feature of my invention is the character and method of forming the cuts in the metal, the purpose being to provide a system of cutting in which rotary cutters may be used whose outer peripheries are plain and in no way notched, such cutters operating to displace from the normal initial plane of the sheet longitudinally extending portions whose width is the width of one of the bars inclosing the meshes in the

expanded metal, such longitudinally extending strips located alternately below and above the normal initial plane of the metal and adjacent ones of such alternating strips separated by an intermediate strip of the same width but extending first above and then below the initial plane of the metal and united to such first named strips on each side thereof at points denominated keys in the finished product. In cutting the metal in this way the centrally disposed longitudinally extending strips are connected to alternately positioned keys in rows extending transversely of the metal.

The accompanying drawings illustrate different steps in my process of forming the expanded metal and diagrammatically the apparatus which I may make use of for carrying out this process or method. Such drawings are as follows:—

Figure 1 shows in end view and partially in section a pair of coöperating cutting rollers. Fig. 2 shows an enlarged view of these rollers at the cutting points and with a sheet of metal as passing therethrough and a portion of the sheet of metal as having been cut by the rollers. Fig. 3 is a sectional view of the cutting rollers near their coöperating outer edges. Fig. 4 shows diagrammatically the cuts formed by the rotary cutters. Fig. 5 shows in diagram the cutting rollers and the coöperating feed rollers and additional thereto the crimping or corrugating rollers, while Fig. 6 shows in enlarged view a portion of the corrugating rollers and a part of a sheet of metal being operated on thereby. Fig. 7 shows a plan view of the metal after it has been cut and corrugated. Fig. 8 shows a section of the expanded metal and diagrammatically the positions of the expanding fingers as they expand the metal. Fig. 9 is a top view of a portion of the expanding mechanism, while Fig. 10 is a side view of the expander. Fig. 11 shows a modified form of the expanding mechanism.

Similar letters refer to similar parts throughout the different figures of drawing.

Referring to Figs. 1, 2, 3 and 4,—my rotary cutters consist of a series of plain upper and lower disks a and a^1, the face or thickness of which is the width between the cuts and the width of a bar in the expanded metal. These disks a and a^1 are assembled on suitable shafts and held properly spaced in a way to be explained and the thickness also of a bar apart between a disk a and a disk a^1. These disks a and a^1 overlap each other and by just twice that distance which the longitudinally extending strips are to be displaced from the initial plane of the metal. On each side of each roller a is a cutter c and on each side of each such roller a^1 is a cutter c^1, the extreme outer peripheries of the cutters c and c^1 presenting series of cutting segments so formed that a cutter c^1 cuts against the adjacent side of a disk a, while a cutter c cuts against the adjacent side of a disk a^1, such cutters c and c^1 having their more prominent edges even with the disks a and a^1, respectively. Cutting edges on the rotary cutters c and c^1 are alternately positioned and are adapted to force the metal from the normal initial plane of the sheet first upwardly to a point in alinement with the outer periphery of a disk a^1 and then downwardly to a point in line with the outer periphery of a disk a. The cutters c are separated first by a disk a and then by a spacing disk d and in a similar way the cutters c^1 are separated first by a disk a^1 and a spacing disk d^1. The thickness of these spacing disks it will be noted is of course the same as that of the cutters and other disks. The cutting disks c and c^1 after they have operated on the metal leave cuts and forced from the initial plane of the sheet a series of sections arranged, as indicated clearly in edge view in Fig. 2, the cuts being arranged as indicated in Fig. 4. As seen in Fig. 5, feed rollers F and F^1 and G and G^1 are provided each side of the rotary cutters and the metal is supposed to pass from left to right, in this figure, and as it leaves the roller G it is flattened out again.

After passing through the feed rollers G and G^1, the sheet of metal m is engaged by a coöperating pair of crimping or corrugating rollers P and P^1, the size and rate of rotation of which is such as to substantially take up the travel of the sheet through the preceding rollers and cutters. These rollers P and P^1 form in the sheet transversely arranged corrugations conforming to the contour of the mesh in the expanded metal, in the centers of which are located the keys in transversely extending rows, every other row of keys being forced in one direction and every intermediate row of keys being forced in the opposite direction from the initial plane of the sheet. Such a sheet of metal when thus corrugated is next expanded by being inserted between two guides h and h^1 having connecting end pieces h^2, only one of which is seen, and one, and preferably the right hand, series of keys is engaged by a series of projecting fingers t extending outwardly from each one of a series of bars b secured upon an endless band or carrier B and caused to rotate over the rollers E and E^1. These rollers E and E^1 carry on their ends a series of teeth e adapted to engage the bars b to propel the same in the expanding operation. In the expanding of the metal by this mechanism, the keys in the cut and corrugated metal are drawn in straight lines and the completed mesh, of diagonal form, is produced by drawing the metal at the keys in straight lines and without stretching, as clearly indicated. By reason of the corrugation of the metal, one half of the side walls of each series of transversely arranged meshes in the expanded metal is already formed to

shape, while the connecting bars for the opposite halves of each one of such series of transversely disposed meshes is formed by bending such bars in the opposite direction from that in which they lie in the crimped and corrugated metal between the members h and h^1.

Instead of the form of expander shown in Figs. 9 and 10, I may use the modified form shown in Fig. 11, in which instance, in place of the fingers t I may use similar fingers t^1 projecting directly from the single rotating cylinder E^2.

I desire to call attention to the fact that each mesh is expanded by itself and that the expansion is effected without stretching the metal and is uniform throughout the sheet regardless of any slight irregularities in the spacing of the cuts or in the character of the metal, and also to the fact that in the expansion only every other series of bars is bent in the opposite direction from that in which it lies in the cut and crimped metal, while every intermediate series of bars is simply moved along in its normal shape or condition without bending. On account of the crimping or corrugating of the metal, permitting the expanding fingers t to travel in straight lines, the expanding process may be a continuous and rapid one and effected by the simple mechanism herein shown.

Any suitable feeding mechanism may be used to feed the corrugated sheet into engagement with the expanding mechanism and I have shown only diagrammatically one form of such a feeding mechanism in Figs. 8 and 10. Such a feeding mechanism may comprise a weight w having attached thereto a chain or rope r arranged to pass over a pulley O secured upon a shaft o and revoluble in bearings v and such chain secured at its other end to a plate u engaging under the under edge or end of the corrugated sheet of metal, as indicated. There may be any desired number of such weights and ropes and pulleys, according to the length of the sheet transversely of the corrugations. There should be provided at least two such weights one having its attaching cord secured to each end of the cross bar u.

What I claim is:—

1. The within described method of cutting metal for expansion which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and simultaneously forcing continuously in one direction away from the initial plane of the sheet longitudinally extending strips between the cuts spaced apart by three intermediate strips and forcing the centrally disposed one of each such three intermediate strips continuously in the opposite direction away from the initial plane of the sheet and forcing the adjacent strip on each side of each such centrally disposed intermediate strip obliquely across the initial plane of the sheet between their alternating connections at the keys to strips on each side thereof forced continuously in opposite directions.

2. The within described method of cutting metal for expansion which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and simultaneously forcing continuously in one direction away from the initial plane of the sheet longitudinally extending strips between the cuts spaced apart by three intermediate strips and forcing the centrally disposed one of each such three intermediate strips continuously in the opposite direction away from the initial plane of the sheet and forcing the adjacent strip on each side of each such centrally disposed intermediate strip obliquely across the inital plane of the sheet between their alternating connections at the keys to strips on each side thereof forced continuously in opposite directions, the obliquely extending connecting strips on one side of each such centrally disposed intermediate strip alternating in direction with those on the other side of such centrally disposed intermediate strip.

3. The within described method of forming expanded metal, which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and forcing every other row of keys in one direction away from the normal plane of the metal and every intermediate row of keys in the opposite direction to form in the cut or slashed metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at the keys and drawing the same in substantially parallel and straight lines extending substantially in a plane at an angle to the plane of the corrugated sheet.

4. The within described method of expanding a slashed sheet of metal, which consists in forming in the slashed or cut metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at such keys and drawing the same in substantially parallel and straight lines extending substantially in a plane at an angle to the plane of the corrugated sheet.

5. The within described method of expanding a slashed sheet of metal which consists in first corrugating the sheet to shorten

the sheet in the direction of the cuts to permit the expansion of the sheet by opening the cuts therein by forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart in planes perpendicular to the original direction of the cuts and parallel to each other and then forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart in planes perpendicular to the original direction of the cuts and parallel to each other.

6. The within described method of forming expanded metal, which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and forcing every other row of keys in one direction from the normal plane of the metal and every intermediate row of keys in the opposite direction to form in the cut or slashed metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at the keys and drawing the same in substantially parallel and straight lines to expand the sheet.

7. The within described method of expanding a slashed sheet of metal, which consists in forming in the slashed or cut metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at the keys and drawing the same in substantially parallel and straight lines to expand the sheet.

8. The within described method of expanding a slashed sheet of metal which consists in first corrugating the sheet to shorten the sheet in the direction of the cuts to permit the expansion of the sheet by opening the cuts therein by forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart in substantially straight lines in planes perpendicular to the original direction of the cuts and then forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart in substantially straight lines in planes perpendicular to the original direction of the cuts.

9. The within described method of forming expanded metal, which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and forcing every other row of keys in one direction away from the normal plane of the metal and every intermediate row of keys in the opposite direction to form in the cut or slashed metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at the keys and drawing the same in substantially parallel and straight lines extending substantially in a plane transverse to the plane of the corrugated sheet.

10. The within described method of expanding a slashed sheet of metal which consists in forming in the slashed or cut metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at such keys and drawing the same in substantially parallel and straight lines extending substantially in a plane transverse to the plane of the corrugated sheet.

11. The within described method of expanding a slashed sheet of metal which consists in first corrugating the sheet to shorten the sheet in the direction of the cuts to permit the expansion of the sheet by opening the cuts therein by forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart in substantially straight lines in planes perpendicular to the original direction of the cuts and parallel to each other and then forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart in substantially straight lines in planes perpendicular to the original direction of the cuts and parallel to each other.

12. The within described method of forming expanded metal, which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and forcing every other row of keys in one direction away from the normal plane of the metal and every intermediate row of keys in the opposite direction to form in the cut or slashed metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at the keys and drawing the same substantially without stretching the metal in substantially parallel and straight lines extending substantially in a plane at an angle to the plane of the corrugated sheet.

13. The within described method of expanding a slashed sheet of metal, which consists in forming in the slashed or cut metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal

and engaging the corrugated sheet at such keys and drawing the same substantially without stretching the metal in substantially parallel and straight lines extending substantially in a plane at an angle to the plane of the corrugated sheet.

14. The within described method of expanding a slashed sheet of metal which consists in first corrugating the sheet to shorten the sheet in the direction of the cuts to permit the expansion of the sheet by opening the cuts therein by forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart in planes perpendicular to the original direction of the cuts and parallel to each other and then forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart substantially without stretching the metal in planes perpendicular to the original direction of the cuts and parallel to each other.

15. The within described method of forming expanded metal, which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and forcing every other row of keys in one direction away from the normal plane of the metal and every intermediate row of keys in the opposite direction to form in the cut or slashed metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at the keys and drawing the same substantially without stretching the metal in substantially parallel and straight lines to expand the sheet.

16. The within described method of expanding a slashed sheet of metal which consists in forming in the slashed or cut metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at the keys and drawing the same substantially without stretching the metal in substantially parallel and straight lines to expand the sheet.

17. The within described method of expanding a slashed sheet of metal which consists in first corrugating the sheet to shorten the sheet in the direction of the cuts to permit the expansion of the sheet by opening the cuts therein by forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart in substantially straight lines in planes perpendicular to the original direction of the cuts, and then forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart substantially without stretching the metal in substantially straight lines in planes perpendicular to the original direction of the cuts.

18. The within described method of forming expanded metal, which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and forcing every other row of keys in one direction away from the normal plane of the metal and every intermediate row of keys in the opposite direction to form in the cut or slashed metal corrugations extending transversely of the cuts. the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at the keys and drawing the same substantially without stretching the metal in substantially parallel and straight lines extending substantially in a plane transverse to the plane of the corrugated sheet.

19. The within described method of expanding a slashed sheet of metal which consists in forming in the slashed or cut metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and engaging the corrugated sheet at such keys and drawing the same substantially without stretching the metal in substantially parallel and straight lines extending substantially in a plane transverse to the plane of the corrugated sheet.

20. The within described method of expanding a slashed sheet of metal which consists in first corrugating the sheet to shorten the sheet in the direction of the cuts to permit the expansion of the sheet by opening the cuts therein by forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart in substantially straight lines in planes perpendicular to the original direction of the cuts and parallel to each other and then forcing or drawing points correspondingly located on opposite sides of the cuts relatively apart substantially without stretching the metal in substantially straight lines in planes perpendicular to the original direction of the cuts and parallel to each other.

21. The within described method of forming expanded metal which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and forcing every other row of keys in one direction away from the normal plane of the metal and every intermediate row of keys in the opposite direction to form in the cut or slashed metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the

connecting key between them in the expanded metal and forcing or bending every other transversely extending row of bars in the opposite direction from that in which they lie in the corrugated sheet.

22. The within described method of expanding a slashed sheet of metal which consists in forming in the slashed or cut metal corrugations extending transversely of the cuts the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and forcing or bending every other transversely extending row of bars in the opposite direction from that in which they lie in the corrugated sheet.

23. The within described method of forming expanded metal which consists in forming alternating series of interrupted cuts in the metal to leave alternating keys between the cuts and forcing every other row of keys in one direction away from the normal plane of the metal and every intermediate row of keys in the opposite direction to form in the cut or slashed metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and forcing or bending substantially without stretching the metal every other transversely extending row of bars in the opposite direction from that in which they lie in the corrugated sheet.

24. The within described method of expanding a slashed sheet of metal which consists in forming in the slashed or cut metal corrugations extending transversely of the cuts, the contours of which correspond substantially to the contours of any two bars on the same side of a mesh with the connecting key between them in the expanded metal and forcing or bending substantially without stretching the metal every other transversely extending row of bars in the opposite direction from that in which they lie in the corrugated sheet.

WM. H. COOLEY.

Witnesses:
OSBORNE F. GURNEY,
LOTTIE WOOD.