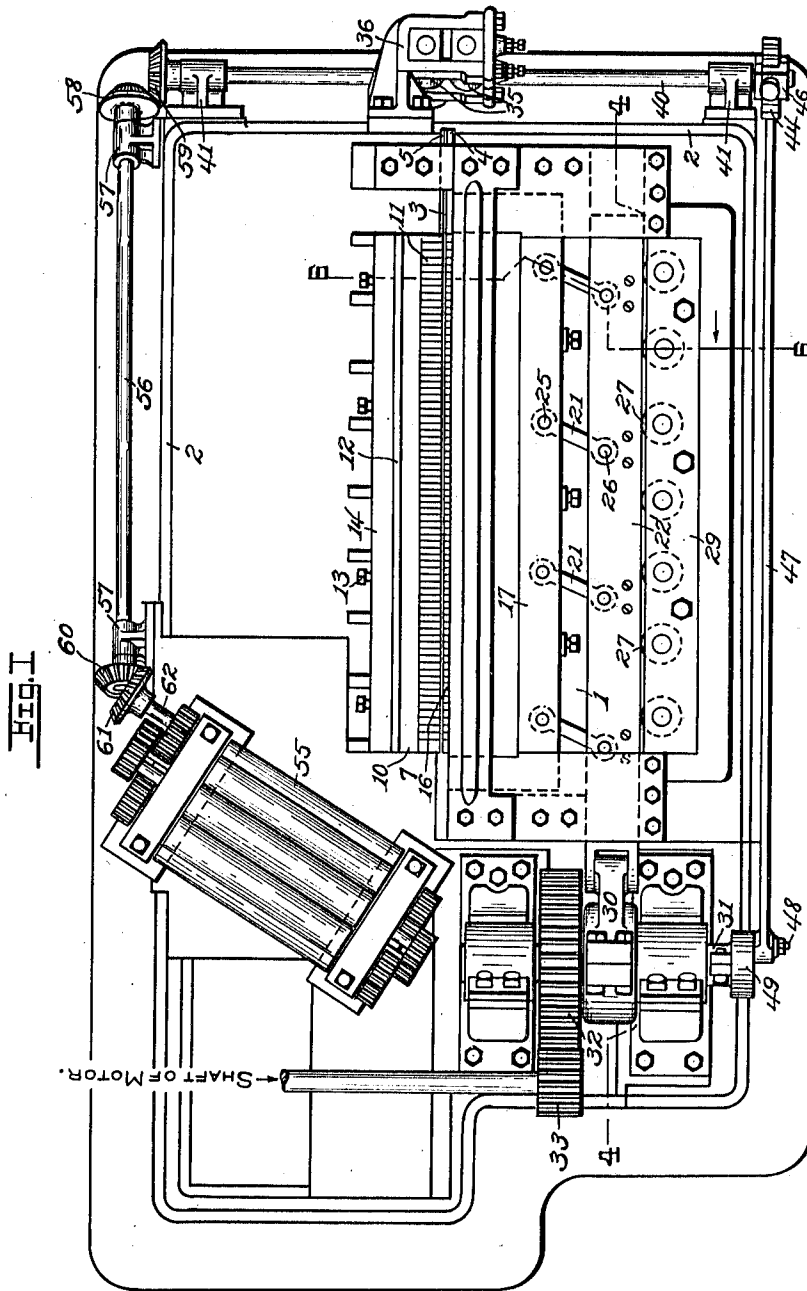


F. M. WHETSTONE.
EXPANDED METAL MACHINE.
APPLICATION FILED JAN. 31, 1912.

1,048,617.

Patented Dec. 31, 1912.

6 SHEETS—SHEET 1.



WITNESSES:
J. E. Arthur,
Bruce Morris.

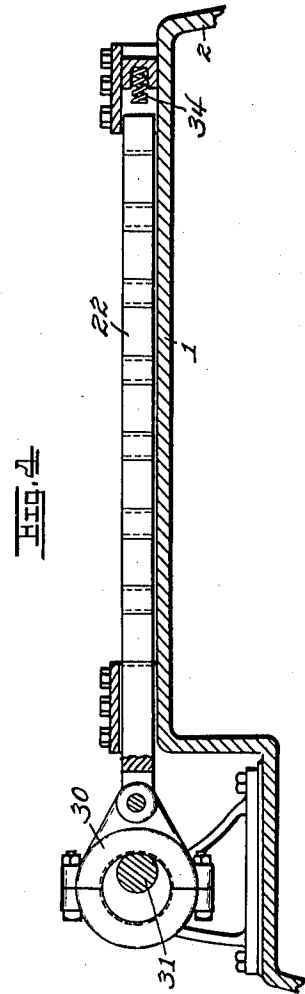
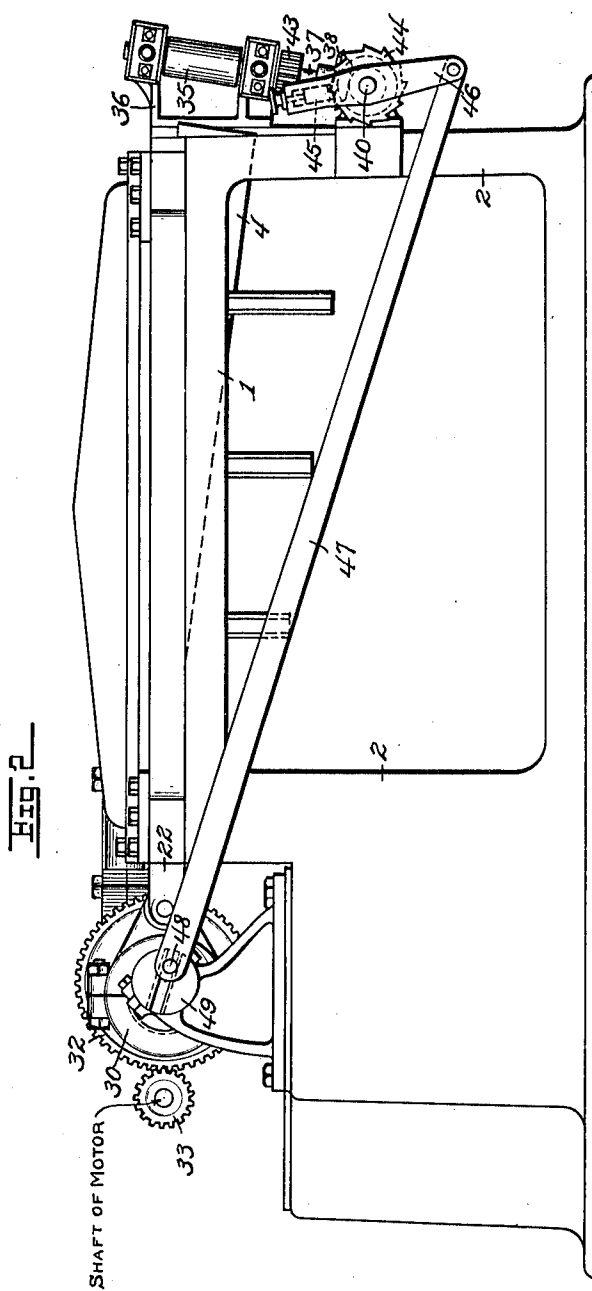
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6 SHEETS—SHEET 2.



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Fig. 3

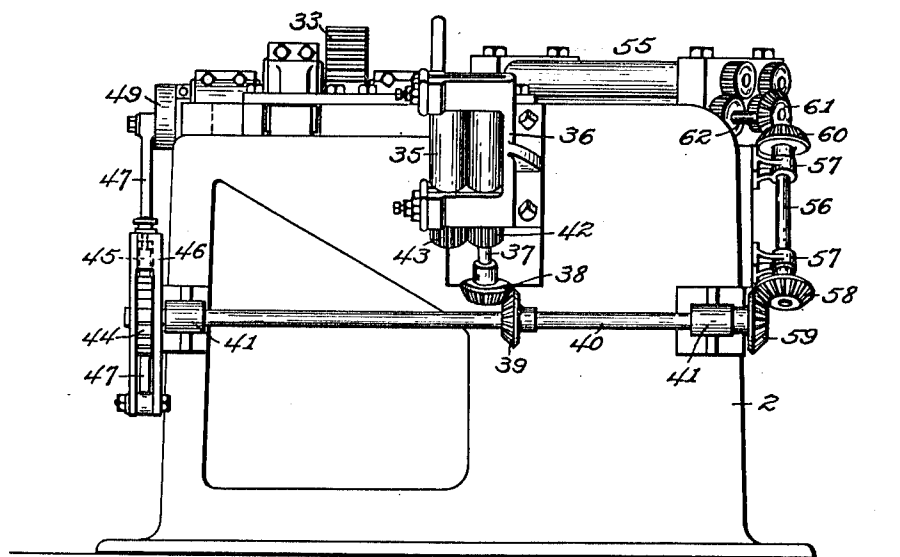


Fig. 11

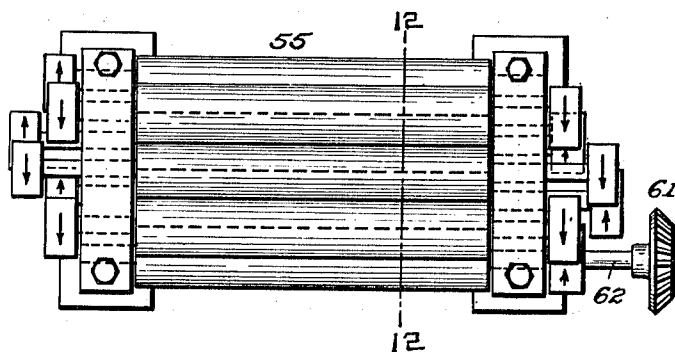
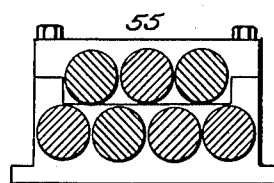


Fig. 12



WITNESSES:
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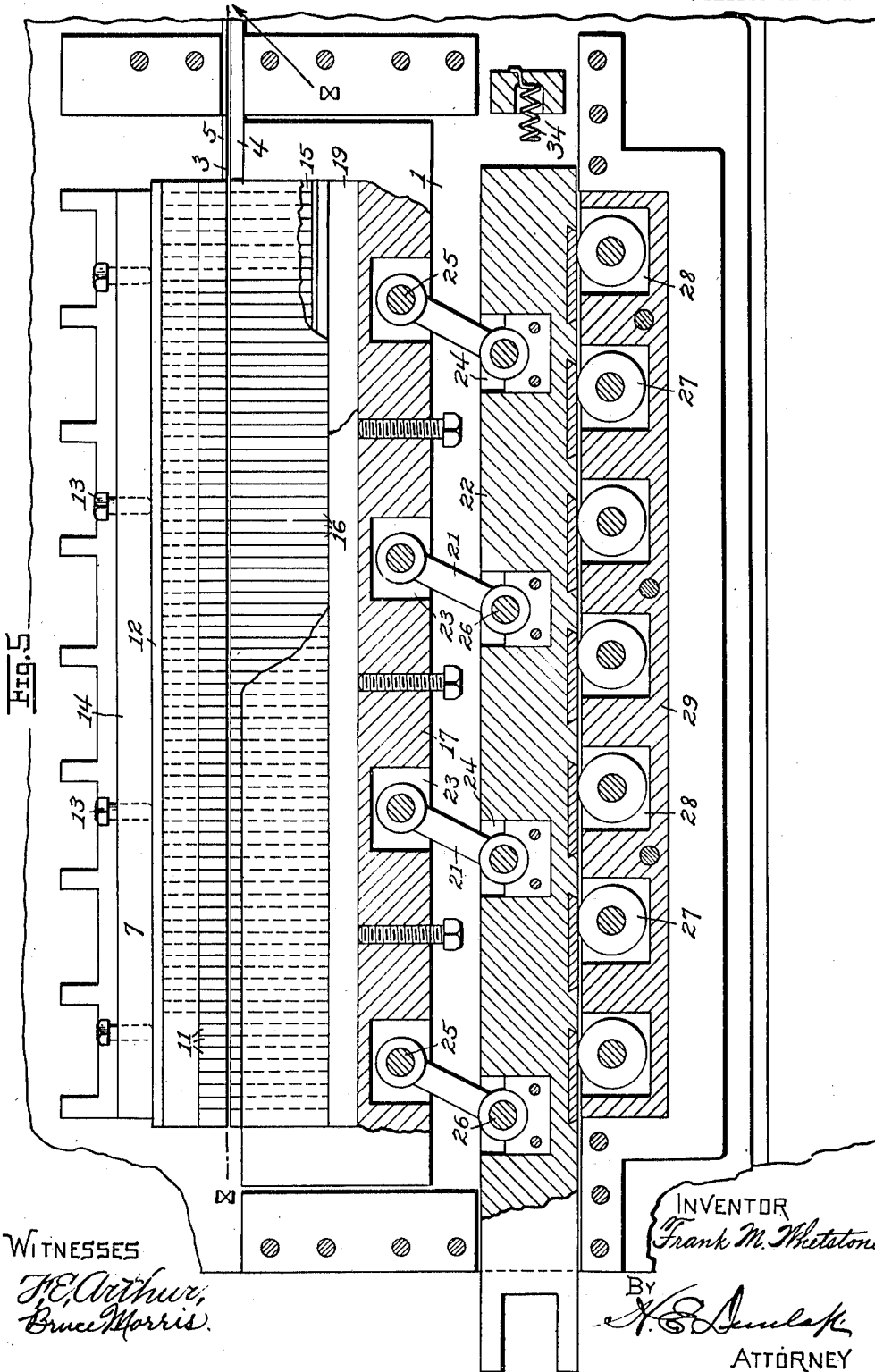
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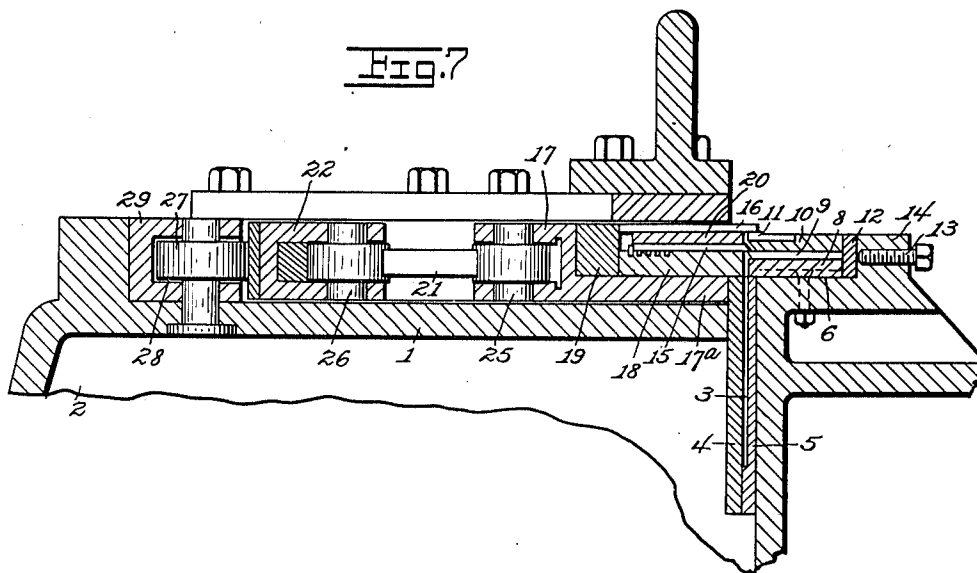
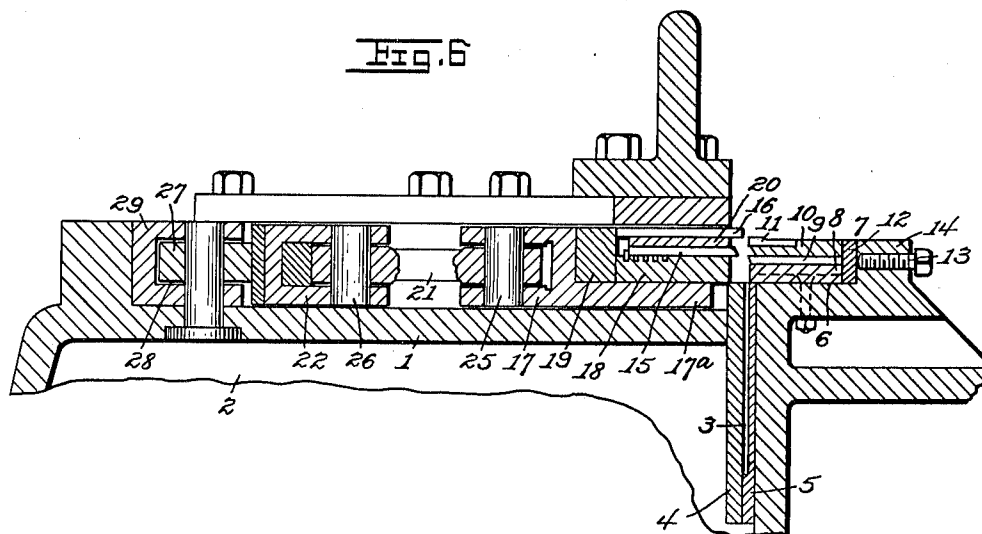
6 SHEETS—SHEET 4.



1,048,617.

F. M. WHETSTONE.
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APPLICATION FILED JAN. 31, 1912.

Patented Dec. 31, 1912.
6 SHEETS—SHEET 5.



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APPLICATION FILED JAN. 31, 1912.

1,048,617.

Patented Dec. 31, 1912.

6 SHEETS—SHEET 6.

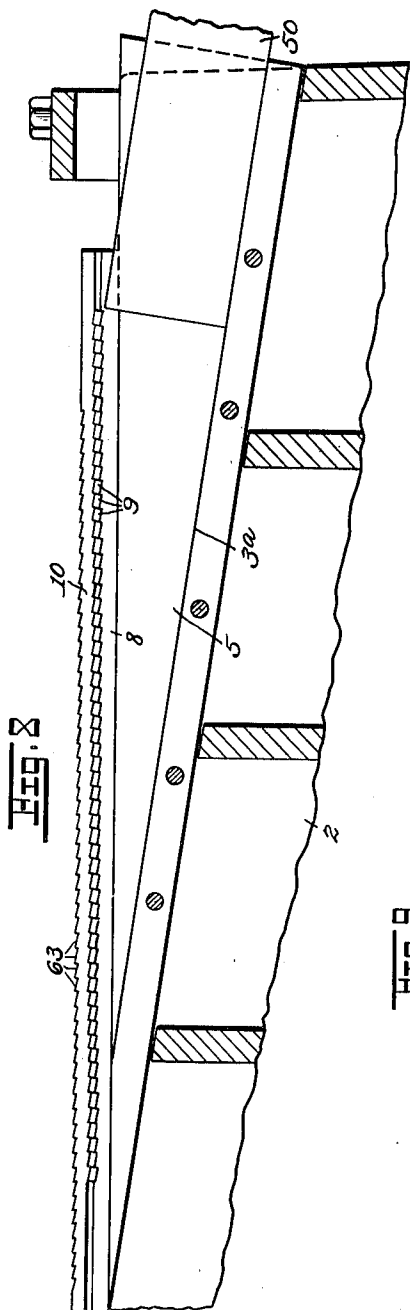


Fig. 8

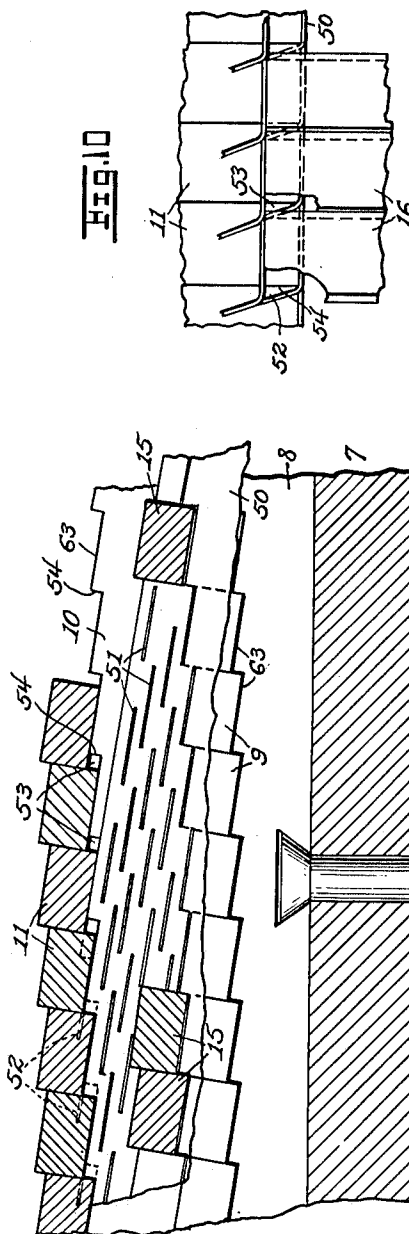


Fig. 10

Fig. 9

WITNESSES:

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UNITED STATES PATENT OFFICE.

FRANK MURRAY WHETSTONE, OF CHICAGO, ILLINOIS.

EXPANDED-METAL MACHINE.

1,048,617.

Specification of Letters Patent. Patented Dec. 31, 1912.

Application filed January 31, 1912. Serial No. 674,490.

To all whom it may concern:

Be it known that I, FRANK MURRAY WHETSTONE, a citizen of the United States of America, and resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Expanded-Metal Machines, of which the following is a specification.

This invention relates to expanded metal machines, and more particularly to an automatic machine for the manufacture of expanded metal or metal lathing.

The primary object of the invention is to provide a strong and durable machine whereby a series of unconnected cuts or incisions are made in a blank sheet of metal in such relation to each other as to break joints, and whereby the metal so cut is stretched or distended to form a series of open diamond-shaped meshes in the sheet.

The method ordinarily employed in the production of expanded metal consists in producing in a blank sheet a plurality of parallel lines of alined cuts, slits, or incisions, each parallel to the lateral edges of the sheet and at equal distances apart, the series of slits in each line being staggered with respect to those in the lines next adjacent thereto, or arranged in such relation as to break joints; after which the metal is opened or stretched to present the usual open or diamond-shaped mesh. In simultaneously cutting and expanding the metal by means of the machines in common use it is necessary that the sheet be first advanced a definite distance, then, after the formation of a series of slits, shifted back slightly, or a distance less than that of the advance movement, and then given another advance movement, in order to prevent the making of a continuous cut or incision in the sheet—that is, in order to leave bonds or unsevered portions between the slits, whereby the strands between parallel slits are united for forming an integral or one-piece structure at the completion of the cutting and expanding operations. Further, in such machines the slitting and expanding operations are commonly performed simultaneously in rows or lines of slits which are immediately adjacent. This process is objectionable for the reason that the return shifting of the sheets renders comparatively slow the advance of the sheet through the machine, and also for the reason that the expanding of the metal

at points closely adjacent to the cuts being produced simultaneously therewith acts to distort or stretch the metal at the last mentioned cuts, resulting in said cuts not being properly positioned for the expanding devices to act thereon after the next advance of the sheet. In order that the metal may be readily expanded, the slits of adjacent rows must be in close proximity for forming intervening strands of narrow width; and, in those machines wherein the cutters and expanders simultaneously act upon next adjacent rows, the size and strength of the cutters is necessarily limited according to the width of the strands, resulting in more or less frequent breakage of cutters and confining the said machines to use upon relatively light gages of metal sheets.

It is a purpose of the present invention to obviate the recited objections, and this I accomplish by producing a machine which admits of the employment of relatively strong and massive cutters; a machine wherein the metal sheet is advanced by intermittent regular steps and without return shifting; a machine wherein the slits are produced by two separate pairs of cutters and at two separate and distinct operations; and a machine whereby incomplete slits are primarily produced in a sheet in a line removed a plurality of strands from the line in which they are completed and wherein the expanding means acts upon the metal at a line of slits remote from the line in which the primary cutters simultaneously produce incomplete slits. And a further object within the contemplation of the invention is to provide a device wherein a positive intermittently actuated feed for the metal blank is provided and embodying mechanism whereby the blank is advanced in a direction oblique to the plane of the cutters which act thereon, as distinguished from a feed in a direction at a right angle to the plane of the cutters, resulting in the attainment of advantages readily understood by those skilled in the art.

With these and other important objects in view, the invention resides in the features of construction, arrangement of parts and combinations of elements which will hereinafter be exemplified, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a top plan view of the inven-

tion; Fig. 2 is a rear side elevation of the same; Fig. 3 is an end elevation of the same; Fig. 4 is a longitudinal section on the line 4—4, Fig. 1; Fig. 5 is an enlarged horizontal section illustrating the mechanism for operating the movable cutter head; Fig. 6 is a cross section on the line 6—6, Fig. 1, showing the movable cutter head in retracted position; Fig. 7 is a similar section showing said cutter head in advanced reciprocating relation to the stationary cutter head; Fig. 8 is an enlarged vertical longitudinal section taken on the line 8—8, Fig. 5, showing the stationary cutter head with the upper cutters thereof removed. Fig. 9 is a detail sectional view taken on substantially the same line and enlarged to substantially full size, illustrating the application of the invention; Fig. 10 is a fragmentary top plan view illustrating the manner of expanding the metal of a blank; Fig. 11 is a top plan view of the leveling rolls; and Fig. 12 is a cross section of the same on the line 12—12, Fig. 11.

Referring to said drawings, in which like designating characters distinguish like parts throughout the several views—1 indicates the horizontal bed of a table, said bed being sustained at a proper height by a suitable supporting frame 2. Located in said table at a suitable point is a vertical slot-like feed passage or runway 3 through which the blank sheet of metal to be acted upon is directed in a manner which will hereinafter be described, said passage being adapted for receiving and maintaining the sheet in vertical, or edgewise, position as distinguished from a horizontal, or flatwise, position. The bottom 3^a of said passage is inclined upward from the outer, or sheet-receiving, end thereof, as is clearly shown in Fig. 8. While said passage, which is in the form of a sawkerf, may be formed by the provision of a groove or channel in a single solid plate or bar, it is preferably formed between two vertically disposed rigidly connected plates 4 and 5, as shown in Figs. 6, 7 and 8, said plates having their upper edges flush with the top surface 6 of a stationary cutter head 7, said surface being elevated slightly above the level of the table-bed 1. On said surface 6 is a longitudinal base member 8 on which is mounted a plurality of cutters 9 upon which is seated a filler plate 10; and a plurality of cutters 11 is rigidly mounted on said filler plate. The outer edges of the member 8 and plate 10 and the outer ends of the lower cutters 9 abut against the face of a gib 12, the position of which may be adjusted by means of set screws 13 projected through a flange 14 on the outer edge of the cutter head 7. The rows of cutters 9 and 11 have their inner ends projected inward beyond the corresponding edges of the member 8 and plate 10 so as to lie close to the

path of travel of a sheet of metal directed through the passage 3, as shown in Figs. 6 and 7.

Located parallel to the stationary cutter head described, and adapted to cooperate with said cutters 9 and 11 on the opposite side of the path of travel of the sheet are two rows of cutters 15 and 16 carried by a reciprocating cutter head. The last mentioned cutter head comprises a longitudinal bar 17 having a forwardly directed extension 17^a, resting upon the table-bed 1. A plate 18 is mounted on said extension with its rear edge abutting against a gib 19, and mounted on said plate are the lower cutters 15 whose front ends are adapted to coact with the lower cutters 9 of the stationary head 7. Overlying said cutters 15 is a filler plate 20 which has mounted thereon the upper cutters 16 adapted for coacting with the upper cutters 11 of said stationary head. Said reciprocating head is actuated by a plurality of toggles 21 interposed between it and a longitudinally movable bar 22 located on the table-bed in the rear thereof, said toggles being connected to said bars 17 and 22 in any appropriate manner, but preferably having their opposite ends received in recesses 23 and 24 respectively formed in the adjacent faces of said bars and mounted on pins 25 and 26. The said longitudinally movable bar 22 operates with its rear edge or face in engagement with the peripheries of a plurality of anti-friction rollers 27 rotatably mounted within recesses 28 provided therefor in a stationary bar 29 carried upon the table-bed, as shown.

The bar 22 is reciprocated in a lengthwise direction by means of an eccentric 30 which is mounted upon a shaft 31 geared, as by a gear 32 and pinion 33, to a source of motive power, as the drive-shaft of a motor (the latter not shown). For reducing the shocks incident to reciprocation of said bar, a suitable yieldable buffer, as a coil spring 34, is preferably provided against which the outer end of said bar may strike prior to its reaching the limit of its thrust or outward stroke.

Appropriate mechanism is provided for intermittently feeding sheets of metal, as 50 in Fig. 8, into and through the feed passage or runway 3, said mechanism comprising in the present instance a set of feed rolls 35 disposed in front of the mouth of said passage. Said rolls are arranged to feed the sheets lengthwise and edgewise into said passage, being journaled in bearings provided in a suitable support or housing, as the arms of a bracket 36 carried by the machine frame or housing 2. For feeding the sheets in a slightly inclined direction corresponding to the inclination of the bottom 3^a of the feed passage, the feed rolls 35 are supported in inclined relation to the

frame, or at substantially a right angle to the said bottom 3^a.

One of the rolls 35 has an extended neck 37 with a bevel gear 38 thereon in mesh with a bevel gear 39 carried by a shaft 40 which is disposed horizontally across the end of the frame and has its ends journaled in suitable bearings provided in supporting brackets 41 carried by said frame. Motion communicated from said shaft 40 to the one roll is imparted to the other through intermeshing gears 42 and 43 carried by said rolls.

One end of the shaft 40 extends outward beyond the rear side of the frame or housing 2 and has rigidly mounted thereon a ratchet 44 adapted to be engaged by a suitable pawl or detent 45 carried by a yoke-like oscillatory lever 46 which is loosely mounted on said shaft in straddling relation to said ratchet, whereby oscillatory or rocking movement imparted to said lever acts to intermittently impart a partial rotation to said shaft. The lower end of said lever 46 has pivotal connection with one end of a pitman 47 whose opposite end is eccentrically connected to the shaft 31 hereinbefore mentioned, as by a crank or wrist-pin 48 adjustably mounted on the face of a disk 49 carried by and concentric with said shaft, as shown in Figs. 1, 2, and 3.

From the foregoing it will be understood that rotation of the motor drive shaft communicates to the rolls 35 an intermittent forward rotation which acts to advance a sheet of metal received between said rolls at regularly timed intervals and in regular steps, the length of the steps being regulated by the number of teeth on the periphery of the ratchet 44 and the length of the thrust of the pitman 47, the latter being regulated by adjustment of the crank or wrist-pin 48 with respect to the axis of the shaft 31.

The movements of the bar 22 and pitman 47 are so timed relatively that each is thrust forward, or makes its forward stroke, during the interval in which the other is making its return stroke. Consequently, the movable cutter head is actuated to move forward during the interval in which the metal sheet remains at rest, and the sheet is advanced during the interval in which the movable cutter head is operating in a position wherein the cutters carried thereby are withdrawn from the path of movement of the sheet. Thus, the operation of advancing the sheet does not interfere with that of reciprocating the cutters with respect to the sheet, and vice versa.

As is clearly shown in Figs. 1, 5, 8 and 9, the cutters of each row are disposed in a horizontal plane; however, said cutters are mounted in individual seats 63 provided therefor in their respective mountings,

which seats have an inclination in cross section parallel to the bottom 3^a of the passage 3 through which the metal sheet is advanced. Thus, the cutters of each row, which are substantially rectangular in cross section, are located in echelon, or have staggered relation to each other, and each has its cutting end lying directly parallel to the path of travel of the sheets advanced through said passage.

When a sheet, as 50, is directed by the rolls 35 into said passage 3, as shown in Fig. 8, the upper corner of its foremost end first becomes elevated to a point where it will be engaged by the cooperating lower cutters 9 and 15 as the latter are carried forward by the reciprocating cutter head. With such reciprocation a single short incision parallel to the longitudinal edges of the sheet is made in said corner of the sheet. At the next advance movement of the sheet, the said corner is elevated a distance which is determined by the inclination of the bottom 3^a of the passage 3 and by the distance through which the sheet is advanced in such movement. And here it may be explained that the width of the cutters to be employed and the distance to be traversed by the sheet in each advance movement thereof is preliminarily determined by the length of the slits or incisions which it is desired to form in the sheet. Further, the distance traversed with each advance movement of the sheet is determined by the length desired for the slits or incisions and the length desired for the unsevered portions which intervene between such incisions. In the present case, as depicted, the distance traversed by the sheet is substantially one and three fourths times the width of the cutters employed.

Each successive series of slits or incisions formed in the sheet after the first incision produced in the foremost upper corner, as aforesaid, lies in a direction oblique, or diagonal, to the center line of the sheet, and the slits of said series, being parallel to said center line, are located in echelon, or in staggered relation.

The incisions, as shown at 51 in Fig. 9, formed by the lower cutters 9 and 15 acting upon the sheet after each advance movement of the latter are obviously of equal length with the width of the cutters by which they are made. A plurality of advance movements must be made by the sheet before a staggered line or series of incisions produced by the lower cutters with one of the reciprocations of the movable cutter head is elevated to a point where the upper cutters act in said line. When such point is reached, however, said upper cutters act to lengthen the slits or incisions produced by the lower cutters, which latter are made of insufficient width to cut slits of full, or requisite, length in order that the produc-

tion thereby of a continuous slit throughout the length of the sheet may be prevented. When a line of slits produced by the lower cutters is elevated into the line of action of the upper cutters 11 and 16, the slits have their front ends extended beyond the front lateral edges of the cutters 16, as shown at 52 in Figs. 9 and 10, so that each of the cutters 11 and 16 acting on the sheet will, when the movable cutter head is advanced, act to produce a second cut which merges at its front end with the previously produced cut or slit in the sheet, lengthening the cut in a rearward direction.

At the same time that the incisions are completed by the upper cutters, as above described, the strands severed thereby are forced laterally over the upper surfaces of the cutters 11, or at substantially a right angle to the plane of the sheet, by the ends of the cutters 16, as is clearly illustrated in Fig. 10, the said cutters 16 thus also acting as expanders whereby the strands are pushed or stretched apart to form the diamond-shaped open mesh of the ordinary commercial expanded metal. Each of said expanders engage the strand, as its severance is completed, near the front end of the slit and force the same back over the top surfaces of the cutters 11 of the stationary cutter head, as shown in Fig. 10, drawing that portion of the rear end of the strand just severed back through an open channel 53 located between the rear lateral edge of the cutter 11 and the substantially upright shoulder 54 defining the rear edge of the cutter seats 63 in the filler plate 10, the channels 53 being formed by the arrangement of the cutters 11 in a position wherein the rear lateral edges thereof do not seat against said shoulders, as shown in said figure.

The two pairs of cutters being spaced apart a distance more or less remote, or equal to the combined widths of several strands, it is apparent that the cutters employed may be made of a considerable thickness and, therefore, of practically any strength desired, adapting them for use on heavy gages of metal and for forming rows of slits separated by extremely narrow strands.

As is obvious, the expanded plate is discharged from the feed passage in a flat or horizontal position, and it advances in a direction diagonal to the center line of the machine. Prior to the complete discharge of the sheet from between the cutter heads, the front end of the sheet is grasped by a set of leveler rolls 55 arranged in suitable diagonal position, whereby the expanded sheet is flattened or smoothed out for removing any unevenness due to buckling or the like. Said rolls 55 have an intermittent drive timed in accord with the intermittent

advance movements of the sheet. The driving mechanism preferably comprises a shaft 56 located parallel to the front side of the machine and journaled in suitable bearing brackets 57 carried by the frame 2, having on one end a bevel gear 58 in mesh with a similar gear 59 carried by an end of the shaft 40, and having on its opposite end a bevel gear 60 in mesh with a similar gear 61 carried by an extended neck 62 of one of the rolls of the set 55. Suitable gearing is carried by the rolls of said set whereby they are all driven in proper directions for advancing the expanded sheet therethrough.

From the foregoing it will be seen that I provide a strong, durable and efficient machine of the character described which has various special advantages. It will be obvious that various changes in the structural form and arrangement of some of the parts may be resorted to without departing from the general spirit or scope of the invention as defined in the appended claims. Hence I am not to be understood as limiting myself to the precise construction and arrangement herein shown and described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. A machine for producing reticulated metal work, comprising cutter heads, two distinct pairs of complementary cutters carried by said heads, a feed passage having an inclined bottom in which a metal sheet is supported in vertical edgewise position, means for advancing a metal sheet along said passage, means for reciprocating one of said heads with respect to the other across the path of movement of the sheet, one of said pairs of cutters coordinating with the other at remotely separated reciprocations for forming incisions of requisite length in said sheet, one complement of one of said pairs of cutters acting also to expand the metal.

2. A machine for producing reticulated metal work, comprising cutter heads, two distinct pairs of complementary cutters carried by said heads, means for advancing a metal sheet between said heads in constantly advancing steps of uniform length, means for reciprocating one of said heads with respect to the other, one of said pairs of cutters coordinating with the other for forming incisions of requisite length in said sheet at operations separated by a plurality of reciprocations, one complement of the last acting pair serving as expanders.

3. A machine for producing reticulated metal work, comprising cutter heads, two distinct pairs of complementary cutters carried by said heads, an inclined feed passage in which a metal sheet has a vertical disposition, means for advancing a metal sheet along said passage and between said heads

in constantly advancing steps of uniform length, means for reciprocating one of said heads horizontally with respect to the other, one of said pairs of cutters coördinating with the other for forming incisions of requisite length in said sheet at separate operations, one complement of one of said pairs of cutters serving as expanders.

4. A machine for producing reticulated metal work, comprising cutter heads, two distinct pairs of complemental cutters carried by said heads, means for advancing a metal sheet between said heads in constantly advancing steps of uniform length, means for reciprocating one of said heads with respect to the other, one of said pairs of cutters coördinating with the other for forming incisions of requisite length in said sheet at separate operations, and means whereby the sheet is guided in a direction oblique to the plane of said heads, one of said pairs of cutters being adapted to produce in said sheet a line of incisions in advance of the action of the other pair in such line, one complement of one of said pairs serving to expand the slitted metal.

5. A machine for producing reticulated metal work, comprising cutter heads, two distinct pairs of complemental cutters carried by said heads, means for advancing a metal sheet between said heads in constantly advancing steps of uniform length, means for reciprocating one of said heads with respect to the other, one of said pairs of cutters coördinating with the other for forming incisions of requisite length in said sheet at separate operations, said pairs being operated in unison and acting in lines separated from each other the width of a plurality of strands.

6. A machine for producing reticulated metal work, comprising cutter heads, two distinct pairs of complemental cutters carried by said heads, means for advancing a metal sheet between said heads in constantly advancing steps of uniform length, means for reciprocating one of said heads with respect to the other, one of said pairs of cutters coördinating with the other for forming incisions of requisite length in said sheet, one of said pairs producing incomplete incisions and the other completing said incisions at an operation a plurality of reciprocations subsequent to the production of said incomplete incisions.

7. A machine for producing reticulated metal work, comprising a pair of cutter heads, means for reciprocating one of said heads with respect to the other, a vertical feed passage having an inclined bottom, means for advancing metal sheets in a vertical edgewise position along said passage and between said heads by intermittent steps, two separated rows of cutters carried by each head, said rows being arranged in

oppositely disposed pairs and having the cutters thereof arranged in staggered relation whereby lines of incisions having staggered relation are produced in an interposed sheet with the reciprocations of said head, one pair of said cutters being adapted to produce incisions of inadequate length and the other being adapted to complete said incisions, one row of cutters of the last mentioned pair being also adapted to effect the opening of the strands simultaneously with the production of the completed incisions.

8. A machine for producing reticulated metal work, comprising a pair of cutter heads, means for reciprocating one of said heads with respect to the other, means for advancing metal sheets between said heads by intermittent steps, two separated rows of cutters carried by each head, said rows being arranged in oppositely disposed pairs and having the cutters thereof arranged in staggered relation whereby lines of incisions having staggered relation are produced in an interposed sheet with the reciprocations of said head, one pair of said cutters being adapted to produce incisions of inadequate length and the other being adapted to complete said incisions, one row of cutters of the last mentioned pair being also adapted to effect the opening of the strands simultaneously with the production of the completed incisions, said pairs of cutters being simultaneously actuated and operating on the sheet at a distance the width of a plurality of strands apart.

9. A machine for producing reticulated metal work, comprising a pair of cutter heads, means for reciprocating one of said heads with respect to the other, means for advancing metal sheets between said heads by intermittent steps, two separated rows of cutters carried by each head, said rows being arranged in oppositely disposed pairs and having the cutters thereof arranged in staggered relation whereby lines of incisions having staggered relation are produced in an interposed sheet with the reciprocations of said head, one pair of said cutters being adapted to produce incisions of inadequate length and the other being adapted to complete said incisions at a reciprocation subsequent by a plurality of reciprocations to that at which the incomplete incision was formed, one row of cutters of the last mentioned pair being also adapted to effect the opening of the strands simultaneously with the production of the completed incisions.

10. A machine for producing reticulated metal work, comprising a pair of cutter heads, means for reciprocating one of said heads with respect to the other, means for advancing metal sheets between said heads by intermittent steps of uniform length, two separated rows of cutters carried by each head, said rows being arranged in oppositely

disposed pairs and having the cutters thereof arranged in a common plane wherein each is in staggered relation to the others whereby lines of incisions having staggered
 5 relation are produced in an interposed sheet with the reciprocation of said head, a guide-way through which said sheet is directed obliquely to the plane of said rows of cutters and parallel to the planes of the indi-
 10 vidual cutters, said pairs of cutters being adapted to coördinate at remotely separated reciprocations for forming incisions of requisite length in the sheet, and one of the rows of the last acting pair being adapted
 15 to open the severed strands simultaneously with the completion of their severance.

11. A machine for producing reticulated metal work, comprising a pair of cutter heads, means for reciprocating one of said
 20 heads with respect to the other, means for advancing metal sheets between said heads by intermittent steps of uniform length, two separated rows of cutters carried by each head, said rows being arranged in oppo-
 25 sitely disposed pairs and having the cutters thereof arranged in a common plane wherein each is in staggered relation to the others whereby line of incisions having stag-
 30 gered relation are produced in an interposed sheet with the reciprocation of said head, a guide-way through which said sheet is directed obliquely to the plane of said rows of cutters and parallel to the planes
 35 of the individual cutters, one pair of said cutters being adapted to produce incisions of inadequate length and the other being adapted to complete said incisions at a reciprocation subsequent by a plurality of reciprocations to that at which the inadequate
 40 incisions were produced, and one of the rows of the last mentioned pairs of cutters operating to open the severed strands simultaneously with the completion of their severance.

45 12. A machine for producing reticulated metal work, comprising a pair of cutter heads, means for reciprocating one of said heads with respect to the other, means for advancing metal sheets between said heads
 50 by intermittent steps of uniform length, two separated rows of cutters carried by each head, said rows being arranged in oppositely disposed pairs and having the cutters thereof arranged in a common plane wherein

each is in staggered relation to the others 55 whereby lines of incisions having staggered relation are produced in an interposed sheet with the reciprocation of said head, a guide-way through which said sheet is directed obliquely to the plane of said rows of cut- 60
 ters and parallel to the planes of the individual cutters, one pair of said cutters being adapted to produce incisions of inadequate length and the other being adapted to complete said incisions at a reciprocation 65
 subsequent by a plurality of reciprocations to that at which the inadequate incisions were produced, and one of the rows of the last mentioned pairs of cutters operating to open the severed strands simultaneously with the 70
 completion of their severance, and means for leveling the expanded sheet.

13. A machine for producing reticulated metal work, comprising a pair of cutter holding elements, two distinct pairs of com- 75
 plemental cutters carried by said elements, means for advancing a metal sheet between said elements, said pairs of cutters acting simultaneously on said sheet in lines separated from each other the width of a plu- 80
 rality of strands, the first of said pairs of cutters acting to produce a line of incomplete incisions in said sheet, and the other pair acting to complete the incisions of said line. 85

14. A machine for producing reticulated metal work, comprising a pair of cutter holding elements, two distinct pairs of com-
 90 plemental cutters carried by said elements, means for advancing a metal sheet between said elements, said pairs of cutters acting simultaneously on said sheet, the first of said pairs of cutters acting to produce a line of incomplete incisions in said sheet, and the other pair acting to complete said line 95
 of incisions when the sheet has advanced a distance removing said line a plurality of strands from the line in which the first pair of cutters simultaneously acts to produce incomplete incisions. 100

In testimony whereof I affix my signature in presence of two subscribing witnesses.

FRANK MURRAY WHETSTONE.

Witnesses:

SADIE DEVINE,
 DAVID EICHBERG.