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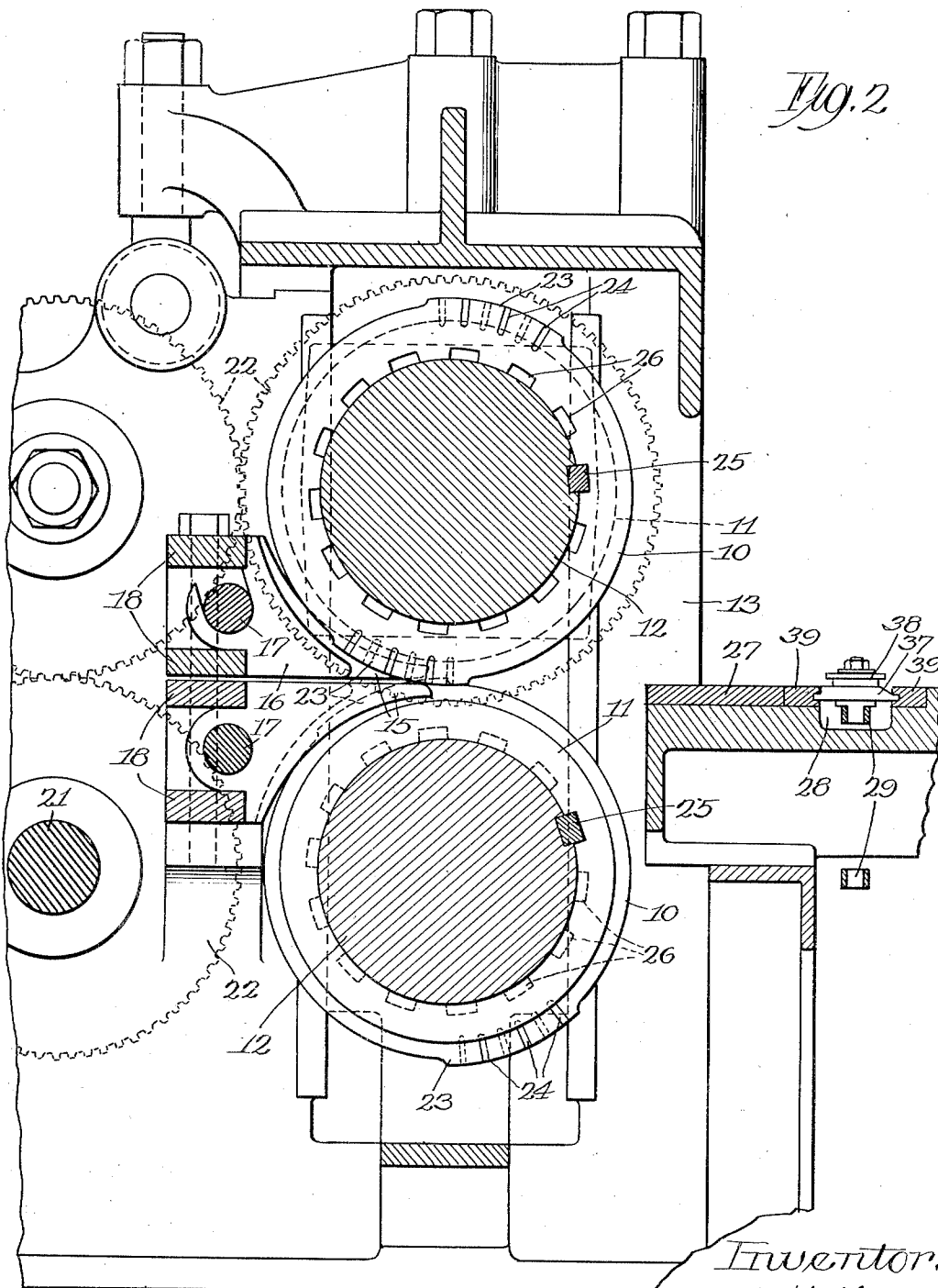
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1,664,247

METHOD AND APPARATUS FOR SLITTING METAL SHEETS

Filed Aug. 14, 1925

4 Sheets-Sheet 2



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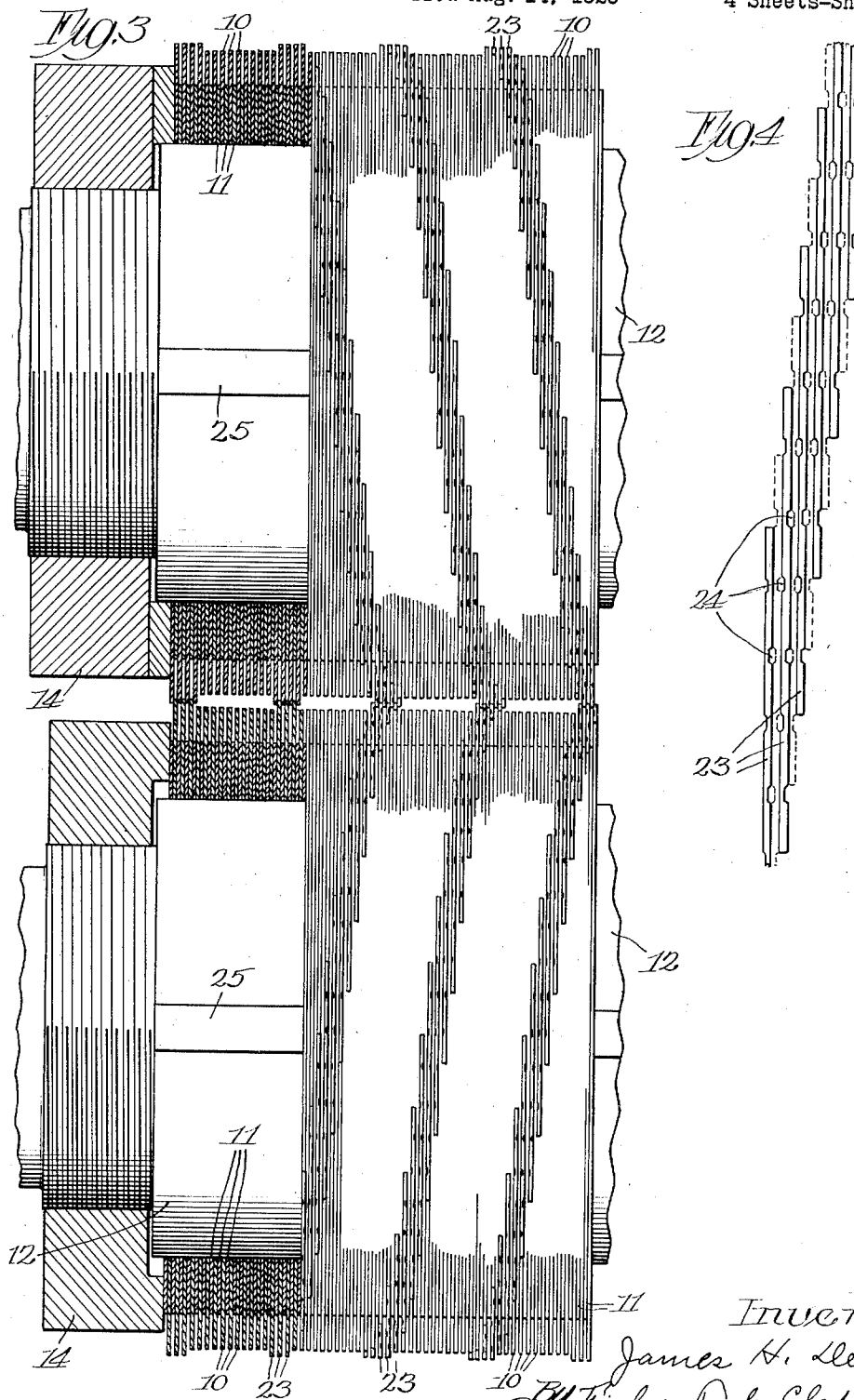
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METHOD AND APPARATUS FOR SLITTING METAL SHEETS

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4 Sheets-Sheet 4

Fig. 7

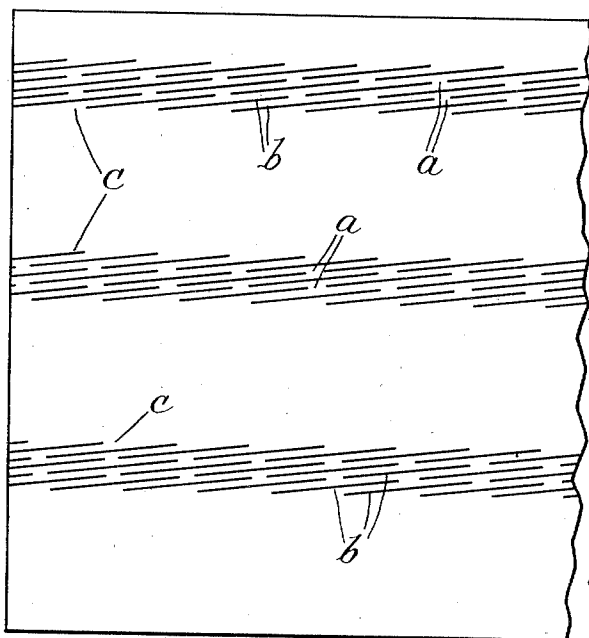


Fig. 9

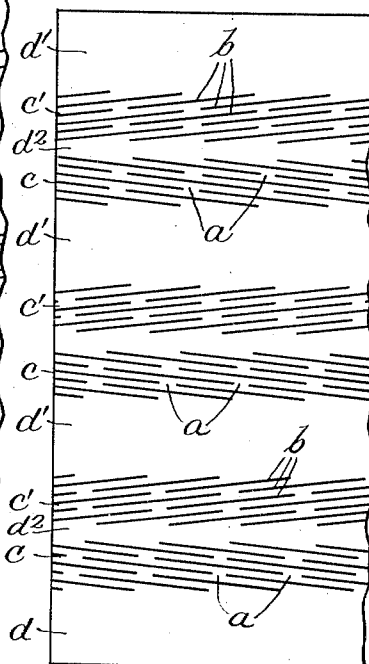
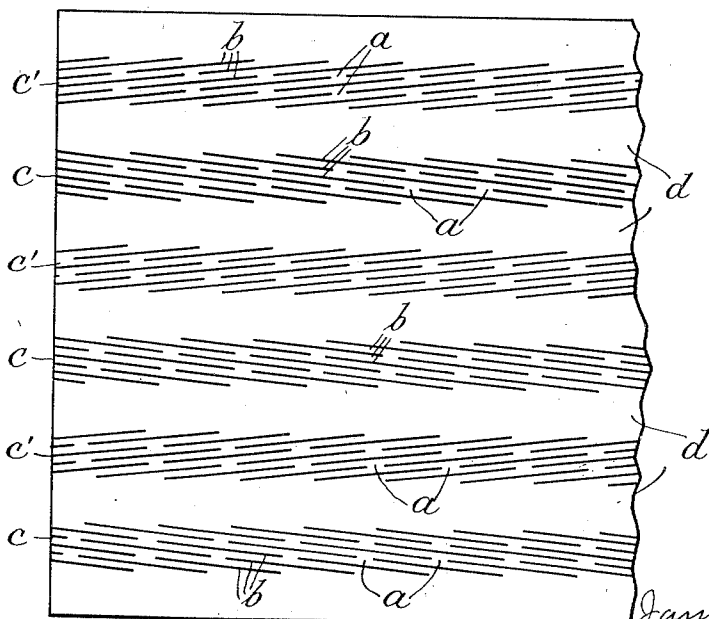


Fig. 8



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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR SLITTING METAL SHEETS.

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The improvement relates to slitting metal sheets in longitudinally extending sections or panels that are spaced from one another and from the margin of the sheets to a greater or less extent by unslitted strips, each panel being formed into strands by parallel rows of slits with bonds between the slits of each row and opposite the slits of adjacent rows. As well understood in the art, metal lath is formed from such sheets by expanding the slitted panels. Usually also the unslitted strips are formed into stiffening ribs. It is also well known that, to permit the expansion without stretching the strands at the margins of the panels, the rows of slits should be inclined to the margins at a slight angle as determined by the relation between the width of the strands and the longitudinal spacing of the bonds. In some cases, the rows of slits in all of the panels of the sheet are inclined in the same direction, but, in the subsequent expansion, the side edges of the sheet are relatively displaced in longitudinal direction to a considerable extent and large triangular pieces must be cut off to square the ends of the finished sheets. Thus, while this method has the advantage that the sheets can be rapidly and economically slitted with roller cutting dies such as shown in the United States Letters Patent No. 1,211,362, F. C. Arey, dated January 2, 1917, there is considerable waste in forming the finished product. Sheets have also been formed with the rows of slits in adjacent panels oppositely inclined at corresponding angles. While waste is avoided by this method of slitting, it has heretofore only been practiced by means of reciprocating dies or punches and this procedure, in comparison with roller process, is slow and uneconomical. The use of slitting rolls having oppositely inclined sets of cutting edges has also been proposed but the construction and maintenance of such rolls would be very expensive and they are believed to be quite impractical if not wholly inoperative.

The present invention seeks to provide an improved method and apparatus for roller slitting metal sheets to form panels with the rows of slits oppositely inclined in ad-

jacent panels. In accordance therewith, sections of the sheet are first slitted to form alternate panels in which the parallel rows of slits are all inclined in the same direction leaving intermediate unslitted zones wider than the panels and then slitting sections of such zones to form the panels having oppositely inclined rows of slits.

This method involves the use of an improved apparatus comprising rolls having cutting edges lying in planes at right angles to the axes of the rolls and arranged in helical bands or zones with relatively wider spaces between the turns of the helical bands. Preferably two pairs of rolls having helical cutting bands or zones oppositely pitched at corresponding angles are provided together with means for maintaining the sheets oppositely inclined to their paths of movement through the respective pairs of rolls and at an angle corresponding to the pitch of the helical cutting zones.

The features of the invention are herein-after more fully set forth and particularly pointed out in the appended claims, the improved apparatus being illustrated in the preferred form in the accompanying drawings.

In the drawings:

Fig. 1 is a plan view of the improved apparatus, parts being broken away to show the slitting rolls.

Fig. 2 is a vertical section of one pair of the slitting rolls.

Fig. 3 is an enlarged detail view partially in elevation and partially in section of the end portions of the rolls.

Fig. 4 is an enlarged detail view of a portion of one of the cutting zones or bands.

Figs. 5 and 6 are detail sections on an enlarged scale and taken on the lines 5—5 and 6—6 respectively of Fig. 1.

Fig. 7 is a plan view of a portion of a sheet after the first slitting operation.

Fig. 8 is a similar view illustrating the sheet after the final slitting operation.

Fig. 9 is a view similar to Fig. 8 illustrating a variation in the manner of slitting the sheet.

The improved apparatus comprises two

pairs of cooperating roller dies A and B. These rolls or dies are each made up of a series of cutting rings or disks 10 mounted together with slightly smaller spacing rings 11 of the same thickness, on heavy cylindrical supports 12 journaled in the frame 13. the cutting and spacing rings of each roll being clamped between collars 14 threaded on the ends of the supports. Cooperating
 10 strippers 15 separated by spacing plates 16 are mounted on rods 17 and held in place by bars 18. A main drive shaft 19 for each pair of rolls is connected by gears 20 to a countershaft 21 and the latter is connected
 15 by gears 22 to the rolls, an idler gear being interposed between the countershaft and the upper roll.

The disks or rings 10 have segmental projecting cutting portions 23 provided with the
 20 usual cutting edges at right angles to the axes of the rolls, such edges being interrupted by radial grooves 24 for forming the bonds *a* between the slits *b* (see Figs. 7, 8 and 9). The segmental cutting portions of each
 25 disk extend through considerably less than one-half of its periphery and preferably through only about one quarter thereof. Preferably also the cutting edge portions
 30 comprise separate sections that are uniformly spaced about its periphery. In the form shown, each disk is provided with two diametrically disposed cutting sections, each extending through about one-eighth of its periphery. The disks of each roll are held
 35 against a relative rotary movement by a key 25, and to permit the arrangement of the disks with their cutting sections in offset relation and also avoid making a large number of different disks, each disk is provided
 40 with a plurality of keyways 26. The disks of each roll are so arranged that the cutting sections 23 thereof are progressively offset, as most clearly shown in Figs. 3 and 4, and form helical cutting bands or zones extending
 45 about the periphery of the roll. The helical cutting bands on the rolls of each pair correspond and, in operation, the projecting cutting portions 23 intermesh.

The width of the cutting disks of course
 50 corresponds to the width of the strands and the spacing of the grooves 24 to that of the bonds, and the cutting sections of adjacent disks are offset to an extent corresponding to the longitudinal spacing of the bonds, as
 55 best shown in Fig. 4, so that the pitch of the helical cutting zones corresponds to the desired angle of inclination of the slits *b* that are formed in the sheet. It is also noted that since the cutting sections 23 of each
 60 disk extend through considerably less than one-half or about only one quarter of its periphery, the helical cutting zones are substantially narrower than the blank spaces between the turns thereof and, in the form
 65 shown, are only about one-third of the width

of the spaces. Also, since each disk has two cutting sections 23, two helical cutting zones are provided on each roller in a manner analogous to a double screw thread. It is further noted that the helical cutting zones
 70 of the two pairs of rolls A and B are pitched or inclined oppositely but at corresponding angles.

In slitting the sheets, each is passed successively through the pairs of rolls A and B.
 75 During each such operation, the sheet is of course advanced in a direction parallel with the cutting edges of the rolls and at right angles to its axis, but it is maintained inclined to such path of movement and at an
 80 angle corresponding to the desired inclination of the slits and to the pitch of the helical cutting zones, so that the slitted panels are parallel to the side edges of the sheets. At the first operation, longitudinal sections
 85 of the sheet are slitted to form panels *c* having rows of slits all inclined in the same direction as shown in Fig. 7, leaving intermediate unslitted zones that are materially
 90 wider than the panels, such panels and zones corresponding in width to the cutting bands and blank spaces of the rolls. At the second
 95 slitting operation, effected by the rolls B, the sheet is reversed in position, that is to say, it is maintained at a corresponding but oppositely inclined angle to its path of movement, and it is also so adjusted that sections
 100 of the zones between the panels *c* are slitted to form the panels *c'* having oppositely inclined rows or slits (see Figs. 8 and 9).

Instead of passing the sheet through a second pair of rolls having oppositely pitched
 105 helical cutting zones, each sheet, after the formation of the panels *c*, could be turned over and again passed through the first pair of rolls to form the panels *c'*. It is also noted that by properly adjusting the sheet
 110 relatively to the slitting rolls, the separately formed series of panels *c* and *c'* can be spaced to leave unslitted strips *d* of substantially uniform width as shown in Fig. 8, or
 115 if desired, can be so spaced as to leave relatively wide and narrow strips *d¹* and *d²*, as shown in Fig. 9. In the finished sheet made from the form shown in Fig. 8, the strips
 120 *d* will usually be provided with shallow stiffening ribs or beads. With the form shown in Fig. 9, the wide strips *d'* can be formed into deep stiffening ribs and the narrow strips *d²* left flat.

Means of guiding the sheets to each pair of rolls comprises a feed table 27 having transverse grooves 28 through which pass the
 125 upper reaches of a series of endless chains 29. The latter pass over driving and idle sprockets 30 and 31 mounted on a common shaft 32 and a series of short shafts 33 respectively, these shafts being carried by
 130 brackets 34 and 35 at opposite sides of the feed table. Each of the chains is provided

with a series of projecting studs 36 on which are mounted blocks 37 and rollers 38. As the blocks move across the feed table, the narrow edges thereof engage grooved guides 39 so that the upper faces of the blocks are held flush with the upper surface of the table with the rollers in engagement with the edges of the sheets, as shown in Fig. 1. To hold the sheets in proper position, the rollers are preferably provided at their upper ends with flanges 40 which overlap the edges of the sheets and to prevent the edges of the sheets catching between the rollers and blocks, the latter are preferably provided with recesses 41 as shown in Fig. 6 into which the lower ends of the rollers extend.

The operating shaft 32 of each set of chains is connected by means of skew gears 42 to a short shaft 43 at right angles thereto and the latter is provided with a sprocket 44 connected by a chain 45 to a sprocket on the countershaft 21. To tighten the chains, the shafts 33 of the idler sprockets 31 (see Fig. 6) are mounted in blocks 46 arranged in guideways in the brackets 35 and adapted to be adjusted by screws 47.

To effect the adjustment of the chains carrying the guiding rollers or abutments 38 relative to one another and to the cutting rolls, the sprockets 30 and 44 are adjustably connected to their respective shafts by cone clutches such as shown in detail in Fig. 5. Each of these sprockets is mounted on a sleeve 48 fixed to its shaft and is provided with a hub 49 having a conical bore which fits a correspondingly shaped flange 50 formed upon the sleeve. Clamping and locking collars 51 and 52 threaded on one end of the sleeve secure the sprocket in adjusted position on its sleeve. A similar collar 53 threaded on the opposite end of the sleeve aids in clamping the sprocket in position and also, when it is desired to change the adjustment, serves to force it from position on the sleeve.

The chains of the two pairs of rolls A and B are driven in opposite direction, as indicated by the arrows in Fig. 1, and, in order that the guiding rollers in engagement with the sheets shall be upon the tight reaches of the chains, the shaft 32 and driving connections therefor are arranged on opposite sides of the feed table as shown. These driving connections of course operate the chains in proper timed relation with the rotary movement of the slitting rolls. The separate chains of each set can be moved relatively to one another to properly engage the rollers thereon with the edges of the inclined sheets by adjusting the sprockets 30. Also the chains of each set can be adjusted as a whole to position the sheet relatively to the slitting rolls by adjusting the sprocket 44. As already stated, such adjustment of

the guiding means can be used to form expansible metal sheets having unslitted strips of the same or different width.

Inasmuch as each set of chains has a number of sets of guiding rollers, it is frequently desirable to relatively adjust the rollers on each chain. For this purpose as shown in Fig. 6, each roller is journaled upon a sleeve 54 which is eccentrically mounted on the stud 36 and is clamped in position thereon by a nut and washer 55. This arrangement permits the independent adjustment of the guide rollers on each chain.

The slitting operation slightly offsets adjacent strands, and to avoid trouble in feeding the sheet for the second slitting operation, the sheet is rolled flat after the first slitting operation. For this purpose, a set of flattening rolls 56 are arranged at the delivery side of the slitting rolls A (see Fig. 1), and are driven from the shaft 19, through chain and sprocket gearing 57.

By the improved method, the slitting of the sheets in panels with the slits in adjacent panels oppositely inclined is effected by the economical roller process and with slitting rolls having cutting edges at right angles to their axes. Obviously, changes may be made from the details set forth without departure from the scope of the invention as defined in the claims.

I claim as my invention:

1. The method of forming expansible metal sheets which consists in slitting sections of the sheet to form parallel rows of slits arranged in panels with alternately disposed unslitted zones wider than the panels and with the rows of slits inclined at an angle to the margins of the panels and then slitting sections of said zones to form slitted panels having oppositely inclined rows of slits, substantially as described.

2. The method of forming expansible metal sheets which consists in slitting sections of the sheet to form parallel rows of slits arranged in panels with alternately disposed unslitted zones wider than the panels and with the rows of slits inclined at an angle to the margins of the panels, flattening the sheet and then slitting sections of said zones to form slitted panels having oppositely inclined rows of slits, substantially as described.

3. The method of slitting metal sheets with roller dies which consists in separately forming two series of oppositely inclined rows of slits arranged respectively in alternate panels with unslitted zones between the panels by passing each sheet successively through the dies, substantially as described.

4. The method of forming expansible metal sheets which consists in roller slitting sections of the sheet to form parallel rows of inclined slits arranged in panels with relatively wider unslitted zones between the

panels and then roller slitting sections of said zones to form panels having parallel rows of oppositely inclined slits, substantially as described.

5 5. The method of forming expandible metal sheets which consists in roller slitting sections of the sheet to form panels having rows of parallel slits inclined at an angle to the margins of the panels, rolling the sheet
10 flat and then roller slitting alternate sections of the sheet to form panels having oppositely inclined rows of slits, substantially as described.

6. The method of forming expandible
15 metal sheets which consists in roller slitting sections of the sheet to form panels having rows of parallel slits inclined at an angle to the margins of the panels, then roller slitting alternate sections of the sheet to form
20 panels having oppositely inclined slits, and adjusting the sheet at the second slitting operation to predetermine the widths of the unslitted strips between the panels, substantially as described.

7. The method of slitting metal sheets with roller dies having helical bands of cutting edges lying in planes at right angles to their axes, which consists in separately
30 forming two series of oppositely inclined slits arranged in alternate panels by passing each sheet successively through the dies and maintaining the same at similar angles to the direction of feed but reversed in position during the successive passes, substantially
35 as described.

8. Apparatus for forming expandible metal sheets having alternate slitted panels and unslitted strips with the slits of adjacent panels oppositely inclined, comprising
40 slitting rolls having cooperating cutting edges in planes at right angles to the axes of the rolls and arranged in helical bands extending around the rolls with spaces substantially wider than the bands between the
45 turns thereof and guiding devices for maintaining the sheets inclined to the direction of feed through the rolls and at an angle corresponding to the pitch of the helical bands thereof, said guiding devices being
50 adjustable to determine the widths of the alternate unslitted strips of the sheets, substantially as described.

9. Apparatus for forming expandible metal sheets having oppositely inclined rows
55 of slits in adjacent panels, comprising slitting rolls formed of spaced disks each of which is provided with a plurality of radially projecting cutting edge portions with intermediate spaces extending through substantially greater angles than the angles
60 subtended by said cutting edge portions, adjacent disks being circumferentially off-set to provide multiple helical bands of cutting edges extending around the rolls with spaces
65 between the bands thereof substantially

wider than the bands, substantially as described.

10. Apparatus for slitting metal sheets in sections or panels, comprising roller dies having helical bands of cutting edges disposed in planes at right angles to the axes of the rolls, and means for maintaining the sheets at a definite angle to their path of movement, comprising a plurality of transverse endless chains, means for driving the
75 same in unison with the rolls, and independently adjustable abutments mounted on said chains for engaging the side edges of the sheets, substantially as described.

11. Apparatus for slitting metal sheets in sections or panels, comprising roller dies having helical bands of cutting edges disposed in planes at right angles to the axes of the rolls, and means for maintaining the sheets at a definite angle to their path of movement, comprising a plurality of transverse endless chains, means for driving the same in unison with the rolls, means for simultaneously and individually adjusting said chains relatively to said rolls, and independently adjustable abutments mounted on said chains for engaging the side edges of the sheets, substantially as described.

12. Apparatus for slitting metal sheets in sections or panels, comprising roller dies having helical bands of cutting edges disposed in planes at right angles to the axes of the rolls, and means for maintaining the sheets at a definite angle to their path of movement, comprising a plurality of transverse endless chains, means for driving the same in unison with the rolls, and abutments mounted on said chains for engaging the side edges of the sheet, common and individual driving sprockets for said chains, and
105 an adjustable cone clutch and clamp for connecting each of said sprockets to its shaft, substantially as described.

13. Apparatus for slitting metal sheets in sections or panels, comprising roller dies having helical bands of cutting edges disposed in planes at right angles to the axes of the rolls, and means for maintaining the sheets at a definite angle to their path of movement, comprising a feed table having transverse passageways thereon, endless chains in said passageways and geared to said rolls, studs on said chains arranged to project above the surface of the feed table, eccentric sleeves adjustably clamped in position on said studs, and rollers journaled on said sleeves for engaging the side edges of the sheet, substantially as described.

14. Apparatus for slitting metal sheets in sections or panels, comprising roller dies having helical bands of cutting edges disposed in planes at right angles to the axes of the rolls, and means for maintaining the sheets at a definite angle to their path of movement, comprising a feed table hav-
135

ing transverse passageways thereon, endless chains in said passageways and geared to said rolls, studs on said chains arranged to project above the surface of the feed table, 5 blocks on said studs, guides on the feed table for engaging said blocks to hold the upper faces thereof substantially flush with the surface of the table, said blocks having recesses in their upper faces, and rollers journaled on said studs with their inner ends 10 bearing on the bottoms of said recesses, substantially as described.

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