F. J. WENDELL.

METHOD AND MACHINE FOR STRETCHING SLITTED SHEET METAL.

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900,902.

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Fig. 1.

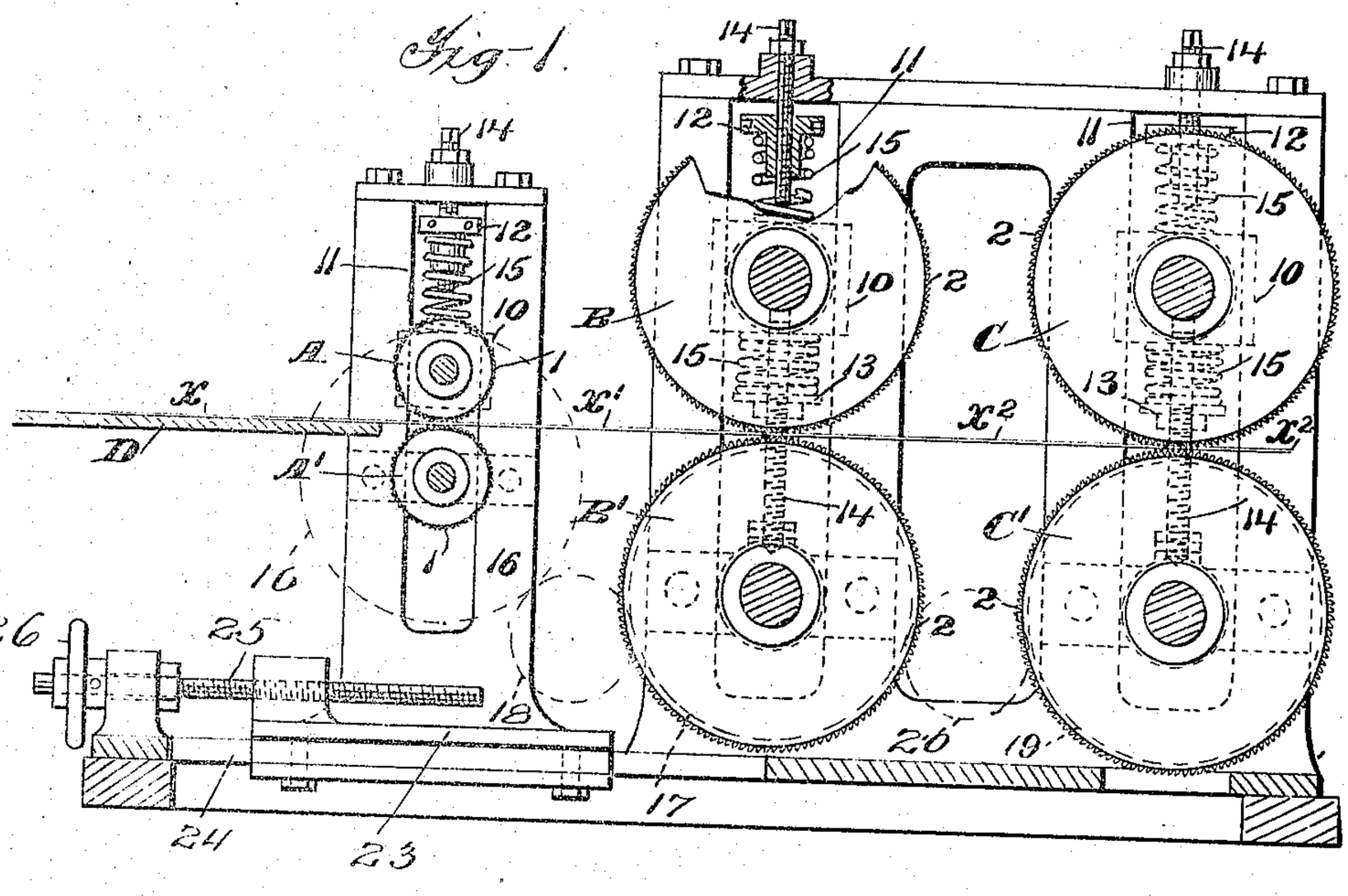


Fig. 2.

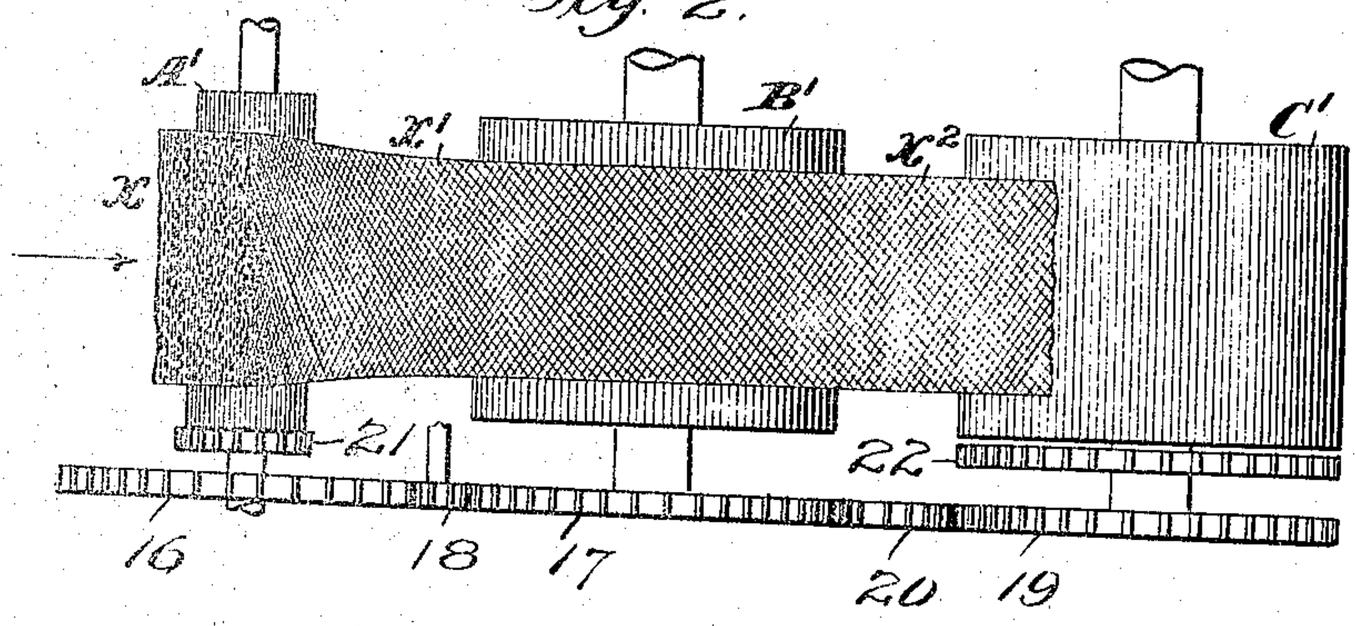


Fig. 4.

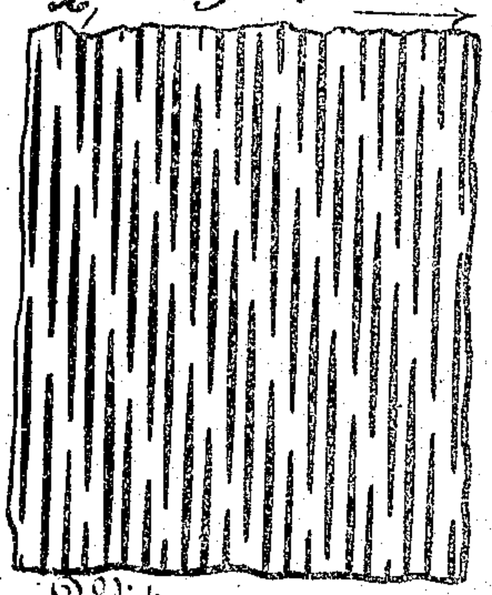


Fig. 5

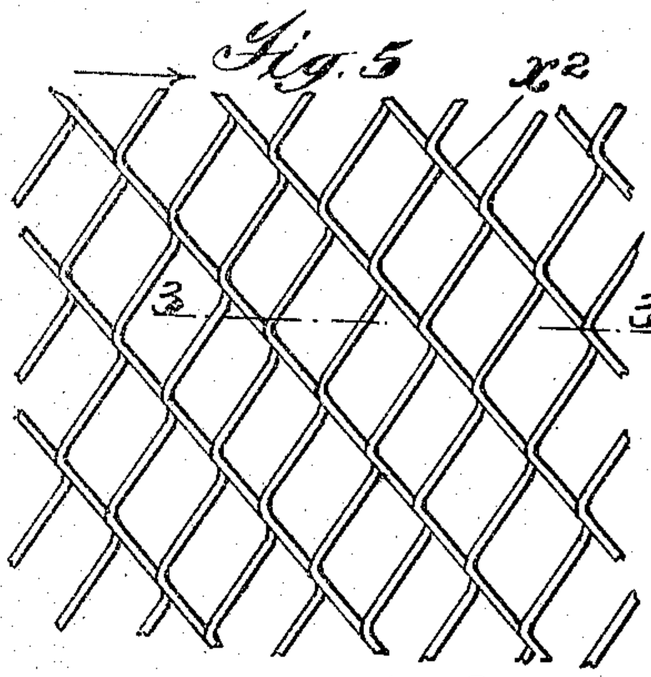
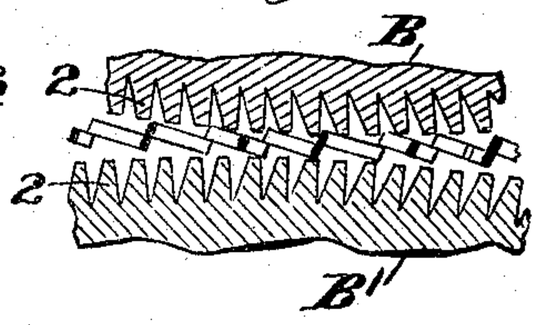


Fig. 3.



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UNITED STATES PATENT OFFICE.

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METHOD AND MACHINE FOR STRETCHING SLITTED SHEET METAL.

No. 900,902. Specification of Letters Patent. Patented Oct. 13, 1908.

Application filed December 27, 1904. Serial No. 238,503.

To all whom it may concern:

Be it known that I, FERDINAND J. WENDELL, a citizen of the United States, residing at New York, county of New York, and State of New York, have invented certain new and useful Improvements in Methods and Machines for Stretching Slitted Sheet Metal, fully described and represented in the following specification, and the accompanying drawings, forming a part of the same.

This invention relates to improvements in methods and machines for stretching or expanding slitted sheet metal, the especial object of the invention being to provide a simple, rapid and efficient machine for producing expanded metal of different classes.

In accordance with the method and machine embodying the present invention in the best form now known to me, the slitted sheet metal is stretched or expanded by continuously drawing the sheet metal forward transversely to the slits against a suitable resistance, so as to open the slits in the line of feed, preferably by feeding the sheet forward by two or more sets or pairs of feeding rolls operating upon the sheet successively and moving at successively higher surface speeds, so that the higher speed rolls act as stretching rolls. Two sets of rolls only may be used, the second set acting as stretching rolls, but with these two sets are preferably used another set of rolls in advance of and moving at a slightly greater surface speed than the first set of stretching rolls, so as to give the metal a slightly further stretch and act as setting rolls, which overcomes any tendency of the stretched metal to change its form as it leaves the first set of stretching rolls and aids in assuring the uniformity and permanency of the mesh. The present invention includes in addition to this preferred method and machine, certain broad features of invention in methods and machines for stretching or expanding slitted sheet metal which may be embodied in different forms.

For a full understanding of the invention, a detailed description of a machine embodying all the features of the same as applied in their preferred form in a machine for producing expanded metal of that class in which the metal strips are turned at an angle to the plane of the sheet, will now be given in connection with the accompanying drawings, and the features forming the invention will then be specifically pointed out in the claims.

In the drawings—Figure 1 is a longitudinal section of the machine partly diagrammatic, and with one of the rolls partly broken away for purpose of illustration, and showing the machine operating on a metal sheet. Fig. 2 is a plan view of the metal and lower rolls of Fig. 1. Fig. 3 is a detail, illustrating the feeding action of the drawing and stretching, and of the setting rolls. Figs. 4 and 5 are details of one form of slit metal and the expanded metal produced therefrom.

The machine in the form shown includes the feeding rolls A, A′ and the two sets of stretching rolls B, B′ and C, C′, the rolls C, C′, forming the final stretching or setting rolls. The rolls B, B′ are driven at a considerably higher speed than the rolls A, A′, this depending somewhat upon the character of the slitted metal and the form of mesh, and the rolls C, C′ are driven at a slightly higher speed than the rolls B, B′. The desired relative speeds of the rolls may be secured by any suitable form of gearing, and the rolls may be of any suitable relative size. In the construction shown all the rolls may be geared together so as to be driven at the same rate of shaft speed, the relative sizes of the rolls A, A′ and B, B′, as shown, being such as to secure the desired stretching action for forming the metal shown in Fig. 5 from the slitted metal of Fig. 4, and the rolls C, C′, as shown, being somewhat larger than rolls B, B′ so as to secure the desired surface speed of these rolls relatively to the rolls B, B′. The gearing between the rolls is shown in Figs. 1 and 2, consisting of the gear 16 on the shaft of roll A′, which drives the shaft of roll B′ through gear 17 on the latter shaft and an intermediate 18, gear 17 in turn driving the shaft of roll C′ through gear 19 on the latter shaft and an intermediate 20, gears 17 and 19 being of the same size. The rolls of each pair are geared together by gears of the same size meshing together, these gears 21, 22 on rolls A′, C′ being shown in Fig. 2, gear 17 on roll B′ acting to drive both roll B and roll C′.

The lower rolls A′, B′, C′ may be stationary and mounted in fixed bearings, as shown, but it is desirable that the upper rolls A, B, C should be spring pressed and adjustable for action on metal which is of

different thicknesses either before or after slitting and stretching. It is desirable, also, in making expanded metal of the class shown, in which the metal strips are turned at an angle to the plane of the sheet, and the portions joining successive slits extend below and above the plane of the sheet, that the rolls B, C should be spring supported to permit an up and down movement of the rolls under the desired pressure, as the metal passes between the rolls. For this purpose, each of the rolls A, B, C, is mounted in a block 10 moving vertically in ways 11 in the machine frame and is pressed downward by nuts 12 on bolts 14 above the blocks, which nuts act upon the block through springs 15, so that the bearing blocks 10 of all the rolls A, B, C are pressed down by springs 15, the tension of which is adjusted by the nuts 12. The rolls B, C, are also supported by springs 15 below the blocks 10, and the tension of these springs made adjustable by nuts 13 on bolts 14, so that, by the spring pressure and adjustment above and below these rolls, the desired position, pressure, and movement of these rolls may be secured.

The feeding rolls A, A′ are ribbed or roughened or formed in any suitable manner so as to secure the desired hold upon the slitted metal, these rolls being shown as provided with small ribs 1 extending throughout the length of the rollers. The rolls B, B′ and C, C′ form feeding devices and are also ribbed or otherwise formed so as to assure the proper hold on the metal for the feeding and stretching action, and, with expanded metal of the form shown, these rolls are preferably provided with feeding teeth or ribs of the form shown in detail in Fig. 3, in which the forward surfaces of the feeding teeth or ribs 2 are substantially at right angles to the plane of the sheet, so as to assure a positive feed of the metal by the engagement of these surfaces with the projecting portions of the metal. As shown in Fig. 3, the teeth on the upper roll B engage the projecting portions above the metal sheet and thus assure its positive feed. If the sheet were turned upside down, the teeth on the roll B′ would secure the same result.

The proper distance between the rolls A, A′ and B, B′ will vary to some extent with the character of the metal, the width of the sheet and the form of the mesh to be produced, and it is desirable that the rolls A, A′ and B, B′ should be relatively adjustable, to secure the best results, and in order that the same machine may be used to produce metal of different mesh. For this purpose, the rolls A, A′ are shown as carried in frame 23 mounted to slide on the base 24 of the machine and adjustable by screws 25 having hand wheels 26.

The metal is shown as drawn by the feeding rolls A, A′ over table D, but it will be understood that the slit metal may be delivered to the rolls A, A′ in any suitable manner.

The operation of the machine will be understood from a brief description in connection with the drawings. As shown clearly in Fig. 2, the sheet of slit metal x is unstretched until it passes the rolls A, A′ and the slits may be opened slightly by the slitting knives, as shown in Fig. 4, or otherwise. As the metal leaves the rolls A, A′ under the stretching action of the rolls B, B′, however, the metal commences to stretch or extend longitudinally and the slits are thus gradually opened and the mesh formed, the width of the metal sheet decreasing correspondingly, until the metal is fully stretched, and the meshes completely formed. The gradual operation of stretching or extending the metal by opening the meshes and narrowing the sheet, is illustrated in Fig. 2, x' showing the portion of the sheet which is undergoing stretching between the rolls A, A′ and B, B′. A machine employing only the feeding rolls A, A′ and the stretching rolls B, B′ may be used, but in the preferred construction shown, the metal x' is stretched slightly between the stretching rolls B, B′ and C, C′, which avoids any tendency of the metal meshes to change form after the metal passes the rolls B, B′, and sets the mesh so as to assure its proper form and permanency. The portion of the metal undergoing this second stretching between the rolls B, B′ and C, C′ is shown at x^2 in Fig. 2, and, as the metal does not substantially change its form after leaving the rolls B, B′, the completed metal of Fig. 5 is similarly lettered.

With the rolls A, A′ and B, B′ relatively adjustable, the machine may be used with metal slit in many different ways, and the product of the machine may be of widely different forms in respect to form and size of mesh and character of the metal sheet. To produce a smaller mesh, or with a narrower sheet of slit metal or thinner sheet metal, the rolls A, A′ and B, B′ will be closer together, while with longer slits for producing a larger mesh, and with a wider sheet or thicker metal, the distance between the rolls A, A′ and B, B′ will be increased. The relative surface speeds of the feeding and stretching rolls will be varied somewhat, also, according to the character of the slitted metal and the product required. In the machine illustrated, which I have used with good results, the diameter of the first set of stretching rolls is about three times that of the feeding rolls, thus giving a relative surface speed of about three to one and, as shown, the diameter and surface speed of the second set of stretching rolls is very little more than of the first set.

It will be understood that the invention is not to be limited to a method and machine for producing metal in which the metal strips

are turned at an angle to the plane of the sheet, but that the invention is applicable to extending slitted sheet metal by opening the slits to produce openwork or meshed metal of other classes.

What I claim is:—

1. The method of stretching or expanding slitted sheet metal, which consists in drawing the slitted sheet forward transversely to the slits, and retarding the sheet against the drawing movement so as to produce the resistance required to open the slits to form the mesh while the portion of the sheet to which the resistance is applied moves forward in the direction in which the sheet is drawn.

2. The method of stretching or expanding slitted sheet metal, which consists in drawing the slitted sheet forward by rotating rolls transversely to the slits and holding the sheet against the drawing movement so as to produce the resistance required to open the slits to form the mesh while the portion held moves forward.

3. The method of stretching or expanding slitted sheet metal, which consists in feeding the slitted sheet forward transversely to the slits by feeding rolls and drawing the sheet from the feeding rolls by stretching rolls rotating at a higher surface speed than the feeding rolls.

4. The method of stretching or expanding slitted sheet metal, which consists in feeding the slitted sheet forward transversely to the slits by feeding rolls, drawing the sheet from the feeding rolls by stretching rolls rotating at a higher surface speed than the feeding rolls, and advancing the stretched sheet from the stretching rolls by rolls rotating at a slightly higher surface speed than the stretching rolls.

5. In a machine for stretching or expanding slitted sheet metal, the combination with means for drawing the slitted sheet forward transversely to the slits, of means for applying to the sheet the resistance to its forward movement required to open the slits to form the mesh while the portion of the sheet to which the resistance is applied moves forward in the direction in which the sheet is drawn.

6. In a machine for stretching or expanding slitted sheet metal, the combination with stretching rolls acting to draw the slitted sheet forward transversely to the slits, of means for applying to the sheet the resistance to its forward movement required to open the slits to form the mesh.

7. In a machine for stretching or expanding slitted sheet metal, the combination with stretching rolls acting to draw the slitted sheet forward transversely to the slits, of means for applying to the sheet the resistance to its forward movement required to open the slits to form the mesh, and feeding devices in advance of the stretching rolls moving at a slightly higher speed than the stretching rolls.

8. In a machine for stretching or expanding slitted sheet metal, the combination with stretching rolls acting to draw the slitted sheet forward transversely to the slits, of means for applying to the sheet the resistance to its forward movement required to open the slits to form the mesh, and a second set of stretching rolls moving at a slightly higher surface speed than the first stretching rolls.

9. In a machine for stretching or expanding slitted sheet metal, the combination with sheet feeding rolls, of stretching rolls rotating at a higher surface speed than the feeding rolls.

10. In a machine for stretching or expanding slitted sheet metal, the combination with sheet feeding rolls, of stretching rolls rotating at a higher surface speed than the feeding rolls, and a second set of stretching rolls rotating at a slightly higher surface speed than the first set of stretching rolls.

11. In a machine for stretching or expanding slitted sheet metal, the combination with sheet feeding rolls for advancing the slit sheet, of spring pressed stretching rolls rotating transversely to the slits at a higher surface speed than the feeding rolls.

12. In a machine for stretching or expanding slitted sheet metal, the combination with sheet feeding rolls for advancing the slit sheet, of spring pressed stretching rolls rotating transversely to the slits at a higher surface speed than the feeding rolls, and means for adjusting the spring pressure.

13. In a machine for stretching or expanding slitted sheet metal, the combination with spring pressed sheet feeding rolls for advancing the slit sheet, of spring pressed stretching rolls rotating transversely to the slits at a higher surface speed than the feeding rolls.

14. In a machine for stretching or expanding slitted sheet metal, the combination with spring pressed sheet feeding rolls for advancing the slit sheet, of spring pressed stretching rolls rotating transversely to the slits at a higher surface speed than the feeding rolls, and means for adjusting the spring pressure on the feeding and stretching rolls.

15. In a machine for stretching or expanding slitted sheet metal, the combination with sheet feeding rolls for advancing the slit sheet, of spring pressed stretching rolls rotating transversely to the slits at a higher surface speed than the feeding rolls, and a second set of spring pressed stretching rolls.

16. In a machine for stretching or expanding slitted sheet metal, the combination with sheet feeding rolls for advancing the slit sheet, of spring pressed stretching rolls rotating transversely to the slits at a higher surface speed than the feeding rolls, a second set of

spring pressed stretching rolls, and means for adjusting the spring pressure.

17. In a machine for stretching or expanding slitted sheet metal, the combination with sheet feeding rolls for advancing the slit sheet, of stretching rolls rotating transversely to the slits at a higher surface speed than the feeding rolls, and means for adjusting the distance between the feeding and stretching rolls.

18. In a machine for stretching or expanding slitted sheet metal, the combination with sheet feeding rolls for advancing the slit sheet, of stretching rolls rotating transversely to the slits at a higher surface speed than the feeding rolls, and means for adjusting the feeding rolls toward and from the stretching rolls.

19. In expanded metal feeding devices, a pair of feeding rolls spring pressed toward and away from each other and provided with metal feeding teeth formed by ribs extending longitudinally of the rolls, in combination with means for adjusting the opposing spring pressures.

20. Expanded metal feeding rolls B, B', on opposite sides of the feeding plane having feeding ribs 2 formed with their forward surfaces at approximately right angles to the plane of the metal.

21. In a machine for stretching or expanding slitted sheet metal the combination with means for feeding the slitted sheet forward transversely to the slits, of means for applying tension to the sheet forward of the feeding means to open the slits to form the mesh.

22. A machine for forming expanded metal, consisting of means for continuously feeding a slitted strip, and means for engaging the surfaces of the strip and continuously operating upon the strip to open the slits in a single plane.

23. A machine for forming expanded metal, including a pair of rolls for engaging the surfaces of a slitted strip and opening the slits laterally in a single plane.

24. A machine for forming expanded metal, including a plurality of pairs of rolls for engaging the surfaces of a slitted strip and opening the slits laterally, one of said pairs of rolls having a different surface speed from the other rolls.

25. In a machine for manufacturing expanded metal, a train of rolls for successively operating upon a slitted strip, and means for giving the rolls differential surface speeds.

26. In a machine for stretching or expanding sheet metal, a pair of rolls for continuously feeding and holding the slitted stock, and a second pair of rolls for continuously operating upon the stock to open the slits.

27. In a machine for forming expanded sheet metal, means for drawing out the strands of a transversely slitted material in the direction of the line of feed.

28. In a machine for stretching or expanding a previously slitted sheet of metal, a plurality of pairs of rolls having differential peripheral speeds for engaging the surfaces of the metal and opening the slits.

29. In a machine for stretching or expanding metal sheets previously slitted transversely, a plurality of pairs of cylindrical rolls for engaging the opposite surfaces of the metal, and means for giving the rolls differential peripheral speeds.

30. The method of manufacturing expanded metal which includes the continuous engagement of the surfaces of a slitted sheet along the lines of the bonds and entirely across the sheet for opening the slits.

31. The method of manufacturing expanded metal which includes the continuous engagement of the surfaces of a slitted sheet along the lines of the bonds and straight across the sheet for opening the slits.

32. A new and improved method of manufacturing expanded metal, which comprises slitting the metal to form strands and then continuously feeding the slitted sheet and opening the slits by drawing out the strands by surface engagement of the metal.

33. The method of manufacturing expanded metal comprising first, slitting the metal to form strands, second, feeding the slitted sheet at right angles to the direction of the slits, and third, engaging the strands parallel to the slits to form openings.

34. The method of manufacturing expanded metal which comprises continuously feeding a slitted sheet at right angles to the direction of the slits, and opening the slits in the direction of the line of feed.

35. The method of manufacturing expanded sheet metal, which consists in forming alternating slits in the metal, feeding the metal in a direction at right angles to the slits and engaging the metal at a plurality of lines substantially at right angles to the direction of feed of the metal to open the slits.

36. In a machine for making expanded metal, a roll rotating transversely to the slits and provided with teeth to engage the bonds and draw out the strands to expand the metal.

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

FERDINAND J. WENDELL.

Witnesses:
L. PIERRE CURTIS,
T. E. KEHOE.