April 8, 1924. 1,489,890

S. M. LANGSTON

SHEET SLOTTING APPARATUS

Filed May 5, 1923 2 Sheets-Sheet 1

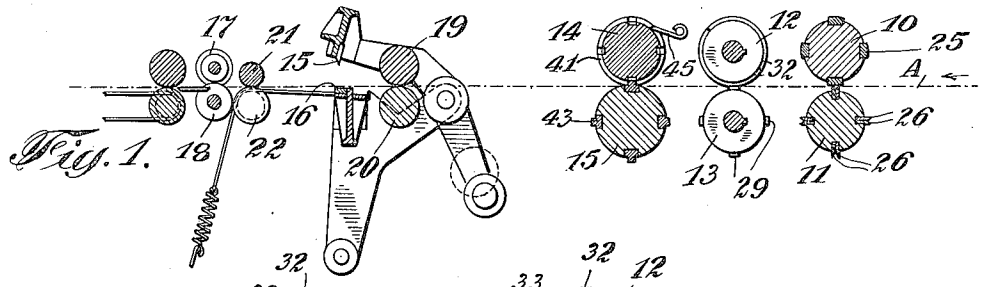

Fig. 1.

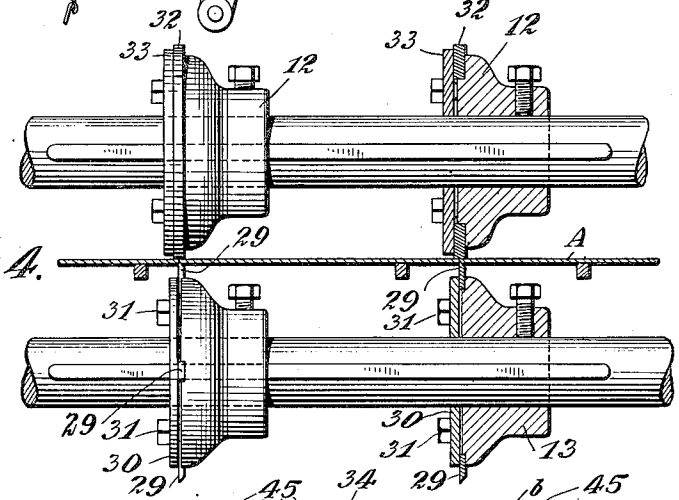

Fig. 4.

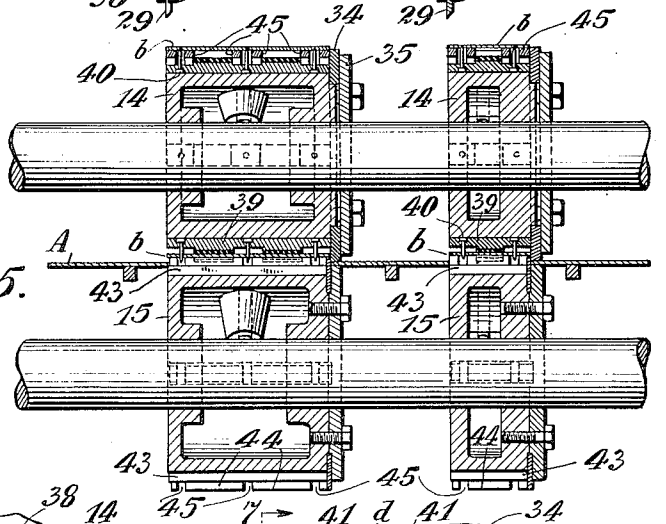

Fig. 5.

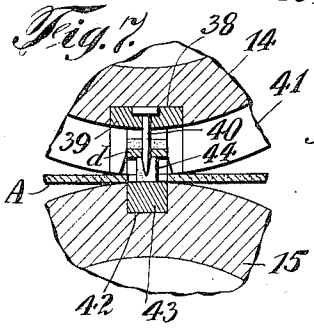

Fig. 7.

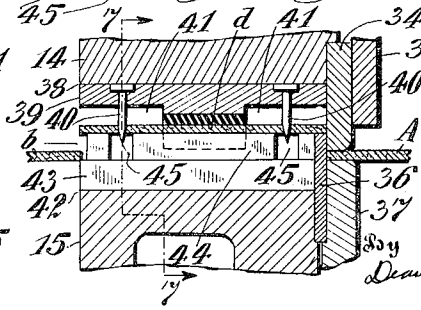

Fig. 6.

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SHEET SLOTTING APPARATUS

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Fig. 2.

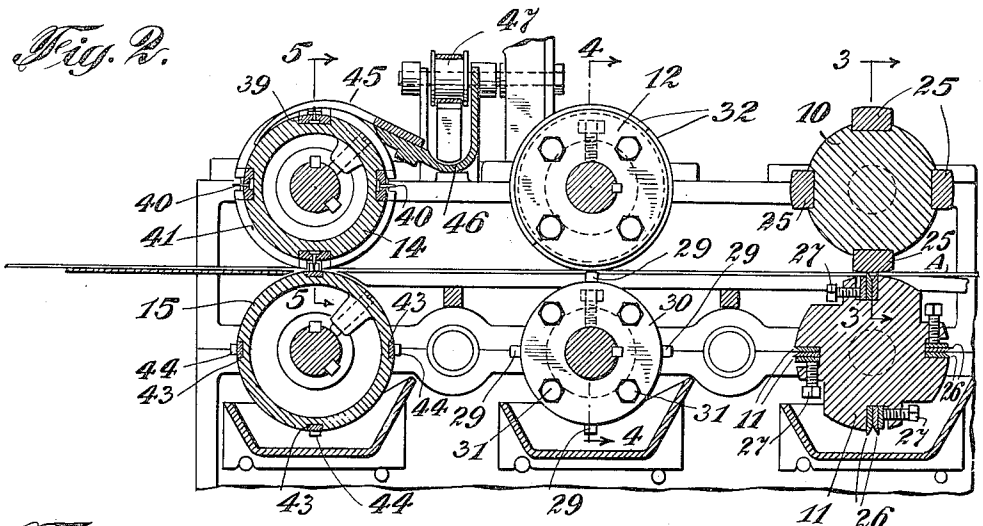


Fig. 3.

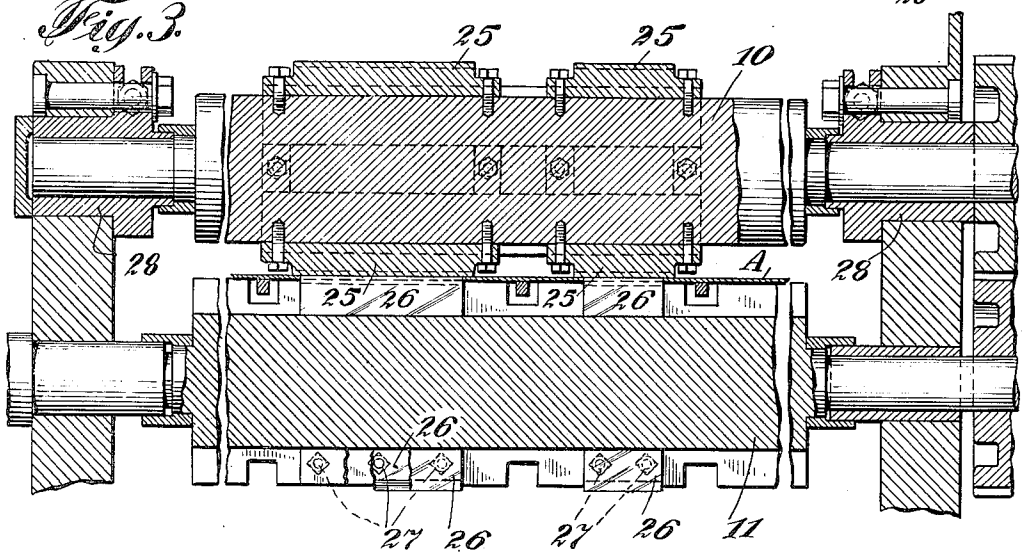
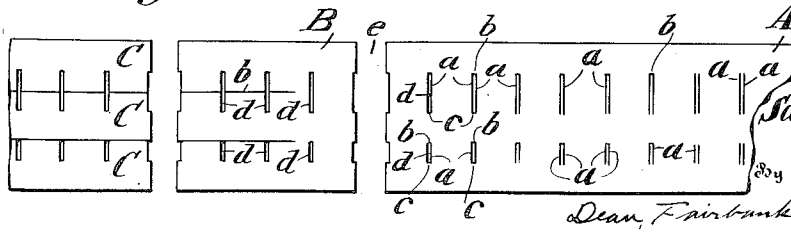


Fig. 8.



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UNITED STATES PATENT OFFICE.

SAMUEL M. LANGSTON, OF WENONAH, NEW JERSEY.

SHEET-SLOTTING APPARATUS.

Application filed May 5, 1923. Serial No. 636,838.

To all whom it may concern:

Be it known that I, SAMUEL M. LANGSTON, a citizen of the United States, and resident of Wenonah, in the county of Gloucester and State of New Jersey, have invented certain new and useful Improvements in Sheet-Slotting Apparatus, of which the following is a specification.

This invention is an improvement in machines for slotting sheet material, the slotting mechanism being so designed and the parts being so positioned as to cut one or more rows of slots preferably substantially rectangular in form, lengthwise of the sheet and between the side edges of the latter as the sheet is fed through the machine.

Although the sheet material may vary in character and the slotted product may be made for a wide variety of uses, I have particularly in mind the forming of appropriate slots as a part of a process for, or in an apparatus for manufacturing shingle strips. The material commonly used for this purpose is a heavy paper, asbestos, felt or fibre sheet, saturated or coated with a waterproofing material and coated with crushed slate or other fireproof and protecting layer.

The specific form of apparatus shown in the accompanying drawings and embodying my present invention may be used in carrying out the process disclosed and claimed in my Patent No. 1,441,359, issued January 9, 1923, and is an improvement on the apparatus diagrammatically shown in said patent and disclosed in detail and claimed in my Patent 1,462,138, issued July 17, 1923.

In the specific machine illustrated in the last mentioned patent, one pair of cooperating rotary members acts to cut a series of pairs of slits arranged in a row lengthwise of the sheet, the two slits of each pair being spaced to only a short distance apart to define the opposite sides of the final slots. A second pair of cooperating rotary members act to cut a second series of pairs of slits shorter than the first mentioned slits and connecting the latter at their ends to complete the formation of the slots. In forming this second series of slots the cut out material is forced out of the plane of the sheet and between two pairs of knives which simultaneously form or aid in forming the slits at the opposite ends of each slot.

In carrying out my present invention I cut the ends of the slot by separate operations and by separate mechanisms whereby certain important advantages are secured. The knives for cutting the pairs of longer slits may be readily replaced by longer or shorter ones, and the two separate mechanisms one for cutting the short slits at one end of the first mentioned slits and the other for cutting the short slits at the other end of the first mentioned slits, may be readily adjusted in respect to each other so as to vary the length of the slots without varying the width thereof. This is important as shingle strips have acquired substantially standard dimensions particularly so far as the width of the slots is concerned, but different shingle manufacturers or different users desire a different degree of overlap of the shingle strips in forming the courses, and by means of my improved construction the length of the slots may be readily varied so as to provide any desired length of tab or exposed shingle simulating portion.

As a further advantage of my present construction the apparatus which serves to extract or bodily remove the cut out pieces is carried by the rotary members which cut only one end of the slot, the other end having been previously formed. Therefore the forcing of the pieces out of the sheet does not force them between two spaced parallel rigidly connected knives as in the apparatus disclosed in my last mentioned patent. This is of special importance where the sheet material is comparatively thick and still warm and soft and sticky from the coating or saturating compound which was applied just previous to cutting up the sheet to make shingle strips.

Although I have illustrated a form of my invention involving certain details of construction the same as or similar to those disclosed in other copending applications, I wish it understood that I am not to be limited to such details except as hereinafter claimed, and that my present invention may be embodied in various specific forms.

In the accompanying drawings:

Fig. 1 is a vertical longitudinal section showing diagrammatically an apparatus for forming shingle strips, and embodying my present invention.

Fig. 2 is a section similar to a portion of Fig. 1, but on a larger scale.

Figs. 3, 4 and 5 are transverse sections on the lines 3—3, 4—4, and 5—5 respectively of Fig. 2,

Fig. 6 is a section similar to a portion of Fig. 5, but on a larger scale,

Fig. 7 is a section on the line 7—7 of Fig. 6, and

Fig. 8 is a plan view of a sheet, successive portions from the right hand end toward the left hand end showing the action of successive parts of the apparatus.

The apparatus as diagrammatically illustrated in Fig. 1 includes a pair of rotary coacting members 10 and 11 which act to cut one or more rows of pairs of transversely extending slits *a* in a sheet A which is fed through the machine, the two slits of each pair being spaced apart to a distance equal to the width of the desired slot. Beyond the rotary members are a pair of rotary coacting members 12 and 13 for forming short slits *b* connecting together the two slits *a* of each pair at one end thereof. Beyond these members are a pair of rotary coacting members 14 and 15 for forming slits *c* which connect together the two slits of each pair at the other end to define the slot, and these members also act to remove the small pieces *d* from the sheet.

The manner in which the sheet is thereafter treated is not essential to my present invention, although preferably I employ the method claimed in my prior Patent 1,441,359. A pair of transverse cutters 15 and 16 which are movable toward and from each other and back and forth in the plane of the sheet, act to subdivide the sheet into sections B along the lines *e*, and coacting slitters 17 and 18 cut each section along lines *f* to form the complete shingle strips C. The continuous feeding of the sheet is accomplished by feed rollers 19 and 20 in advance of the cut-off, and feed rolls 21 and 22 beyond the cut-off and in advance of the slitters. Preferably the feed rollers 21 and 22 act at a higher surface speed than that of the body of the sheet so as to take out slack in the portion on which the cut-off acts, and to advance the sections at higher speed through the slitters and to the conveying mechanism.

The apparatus illustrated for forming pairs of transverse slits *a* is substantially identical with that illustrated and claimed in my Patent 1,462,138. The upper member 10 has a series of platens 25 and the lower member 11 has a series of longitudinal grooves in which are placed the two oppositely bevelled knives 26 which act against the hardened surface of the platens 25 to form the pairs of parallel slits. The knives are held in place by clamping screws 27 and are readily removable. Preferably the grooves extend the full length of the roller 11 so that knives of any desired length may be employed, and these may be positioned at any desired point along the length of the roller 11 in accordance with the desired length and position of the slits. The two members are adjustable toward and from each other by means of eccentric sleeves 28 and preferably one roller may be rotatably adjusted in respect to the other so as to distribute the wear on the surface of the platen.

The parts for cutting the first pair of short slits extending lengthwise of the sheet and connecting the two transversely extending slits of each pair at one end only are shown, particularly in Figs. 2 and 4, as including the pair of coacting members 12 and 13 previously referred to. The lower member 13 is shown as having a plurality of radially extending knives 29 with their cutting edges disposed in the same plane and at a uniform distance from the axis of the member. These knives or blades are shown as set set in grooves in an end face of the body of the member, and clamped in position by an annular plate 30 held to the body of the member in any suitable manner, as for instance by screws 31. By making the grooves of the same width as the blades, but of less depth than the thickness of the blades, the single plate serves to hold all of the blades in proper position. The upper member 12 is shown as having an annular part 32 presenting a hardened peripheral surface against which the edges of the blades 29 may act in cutting the slits. This annular platen 32 is held in place by a clamping plate 33, and may be adjusted circumferentially of the body portion of the member to bring different parts of its peripheral surface into operative relationship to the blades 29. The annular platens 32 are preferably made of sections so that they may be easily removed and replaced by new ones as occasion may demand. The pair of members 10 and 11, and the pair of members 12 and 13 are so positioned in respect to each other, or the members of one pair are adjusted about and along their axes so as to bring the cut *b* made by the knives 29 at one end of each pair of cuts *a* made by the blades 26. To permit of the use of blades 26 of different lengths and different positions transversely of the sheet, the members 12 and 13 are mounted for adjustment axially of their respective shafts.

It will be noted that the apparatus above described cuts the slits *b* by what is commonly known as a score cut, that is by the action of a blade against an anvil or platen. This does not displace any portion of the material at the edge of the sheet out of the plane of the sheet. Although this is preferable, it will be obvious that the members 12 might be adjusted axially to a short distance from that shown in Fig. 4 and that longer blades 29 might be used which would overlap the annular member 32 and coact

with the end face and edge of the latter to sever the material by what is commonly known as a shear cut. This does not involve any change in the construction of the parts illustrated, except for the use of slightly longer knives.

As the important feature of my present invention I provide means for cutting a second row of slits *c* similar to the slits *b* but positioned at the opposite end of each pair of slits *a*, said means being adjustable in respect to the means for cutting the slits *b* so that these slits *b* and *c* may be at any desired distance apart in accordance with the length of the knives 26. Thus the tab or shingle simulating portion of the strip and the slots therebetween may be made of standard width but of any desired length in accordance with the amount of overlap which the user desires to employ in laying the shingle strips. Means for cutting the slits c and for removing from the sheet the cut out pieces are shown particularly in Figs. 2, 5, 6 and 7. Each upper member 14 includes a substantially drum shaped body portion having an annular shear blade 34 similar to the annular platen or anvil 32 above referred to, and similarly held in place by a clamping plate 35. The lower member 15 is also of substantially drum shape, and has a series of blades 36 similar to the blades 29 above referred to, and held in place by a clamping plate 37. These coacting members 34 and 36 are preferably arranged to make a shear cut rather than a score cut. The upper member 14 has a plurality of longitudinally extending grooves 38 in its outer surface extending to the blade 34, and within each groove is an insert 39 presenting a plurality of pins 40. The body portion of the member has circumferential grooves 41 so positioned that the pins 40 come at the intersection of the two sets of grooves. The lower member 15 has longitudinally extending grooves 42 in which are mounted inserts 43 presenting flanges 44 each extending beyond the periphery of the body portion of the drum and into the corresponding groove of the upper member. Each flange 44 has recesses 45 for registering with the pins 40. As the sheet A passes between the two members the blades 36 cooperate with the annular blade 34 to cut the slits *c*, while the flanges 44 force the cut out piece *d* into the groove of the insert 39 and on to the pins 40. Thus as the members continue to rotate and the sheet passes through between them, the piece *d* will be retained on the pins and carried away by the upper member 14. Any suitable stripping mechanism may be employed for removing the cut out piece *d* from these pins. I have shown bifurcated stripping fingers 45 lying in the grooves 44 on opposite sides of each pin and disposed at the upper side of the member 14. The pieces *d* which are removed from the pins by these stripping fingers may slide down into a transversely extending trough 46 and be carried away by conveyor mechanism substantially as more fully illustrated in my Patent 1,462,138. Furthermore the mechanism for adjusting the members 10, 11, 12, 13, 14 and 15 in the direction of their respective axes and for adjusting them circumferentially in pairs and individually, may also be constructed substantially as illustrated in said last mentioned patent, and I reserve the right to add illustration of such adjusting means to the drawings in this case if it appears advisable or necessary.

The members 10, 11, 12 and 13 cooperate to form a row of substantially U-shaped cuts and define tongues facing transversely of the sheet, that is, substantially at right angles to the direction of feeding movement of the sheet. The said members may be duplicated to form as many rows of the apertures as desired, the rows extending lengthwise of the sheet. Where there are a plurality of such rows, the apertures will also form rows transversely of the sheet. The length of the apertures may equal the length of a slot which is to be formed in the final shingle strip as indicated at the lower portion of Fig. 8, or may be of double such length, as indicated at the upper portion of said figure. In assembling the parts of the machine the pair of members 12, 13, may be placed in advance of the pair of members 10, 11, so that one longitudinal cut will be formed before the forming of the two transverse cuts. By using the score cutters the blades are preferably on the side of the sheet opposite to that bearing the crushed slate or other coating material, and may be so adjusted in respect to the opposing platen faces that the blades cut through the fibre of the sheet without cutting through the crushed slate coating. Such score cutters do not force any portion of the sheet out of its plane at the cuts so that the tongues remain in the plane of the sheet during the advancement of the sheet to the members 14, 15. In forming the final cut *c* defining the aperture, the severed piece does not bind or wedge against the side of the blade, as is the case where it is forced out between two rigidly connected parallel knives operating to cut both ends of the aperture at the same time. The severed piece, having been previously cut at one end, is free to move or be crowded slightly in an endwise direction as will be apparent from Fig. 6. The cut off mechanism operates to make transverse cuts which are spaced apart to a distance equal to a multiple of the distance between adjacent apertures, and registers with only certain of said apertures. The slitting mechanism operates

to intersect every row of apertures either at one end or intermediate of the ends thereof, so as to form the complete shingle strips.

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

1. A machine of the class described, including means for feeding a sheet of material endwise, means for cutting lengthwise thereof a row of U-shaped slits to form tongues projecting transversely of the sheet in the plane thereof, and a pair of rotary coacting members for forming cuts lengthwise of the sheet to sever said tongues at their base ends and thereby form a series of apertures.

2. A machine of the class described, including means for feeding a sheet of material endwise, two pairs of rotary coacting members, one pair acting to cut a row of pairs of transverse slits and the other acting to cut a row of longitudinal slits connecting the slits of the first mentioned pairs at one end, and another pair of rotary coacting members to cut another row of longitudinal slits connecting said first mentioned pairs of slits at the other end and thereby form apertures.

3. A machine of the character defined in claim 2, in which the last mentioned pair of members has means for removing the severed piece from the sheet.

4. A machine of the character defined in claim 2, in which the first mentioned pair of members has means for supporting knives of various lengths, and the second mentioned pair and the last mentioned pair are axially adjustable in respect to each other, whereby the length of the apertures transversely of the sheet may be varied at will.

5. A machine of the class described, including three pairs of rotary coacting members arranged to act in succession upon a sheet fed between the two members of each pair, one member of one pair having a pair of parallel knives extending lengthwise thereof to form a row of pairs of transversely extending slits, one member of another pair having a knife for cutting a row of slits lengthwise of the sheet to connect said pairs of slits and form transversely extending tongues, and one member of the third pair having a knife for cutting a row of slits lengthwise of the sheet to sever said tongues.

6. A machine of the class defined in claim 5 in which one member of the last mentioned pair has means for receiving and removing from the sheet the severed piece.

7. A machine of the class described, including means for feeding a sheet of material endwise, means for cutting lengthwise thereof a row of U-shaped slits to form tongues projecting transversely of the sheet in the plane thereof, a pair of rotary coacting members for forming cuts lengthwise of the sheet to sever said tongues at their base ends and thereby form a series of apertures, cut off mechanism for severing the sheet transversely along lines intersecting certain of the apertures, and slitting means for cutting the sheet longitudinally along a line intersecting all of the apertures of the row.

8. A machine of the character defined in claim 7 in which the slitting mechanism is arranged beyond the cut off mechanism and operates on sections of the sheet after they have been severed from the body of the sheet by the cut off mechanism.

9. A machine of the class described, including means for feeding a sheet of material endwise, means for cutting lengthwise thereof a row of U-shaped slots to form tongues projecting transversely of the sheet, intermediate of the side edges of the latter, and a pair of rotary coacting members for forming cuts lengthwise of the sheet to sever said tongues at their base ends and thereby form a series of apertures, one of said rotary members having a plurality of longitudinally extending grooves and a plurality of circumferentially extending grooves in the periphery thereof, and the other of said rotary members having means for forcing the severed strips into the longitudinally extending grooves.

10. A machine of the character defined in claim 9 in which there is provided means operating in said circumferentially extending grooves for removing the severed pieces from the longitudinally extending grooves.

11. A machine of the class described, including means for feeding a sheet of material endwise, means for cutting lengthwise thereof a row of U-shaped slits to form tongues projecting transversely of the sheet in the plane thereof, a pair of rotary coacting members for forming cuts lengthwise of the sheet to sever said tongues at their base ends and thereby form a series of apertures, one of said rotary members having an annular knife at one end thereof and a plurality of longitudinally extending grooves in the periphery terminating at said knife, and the other of said members having spaced knives for cooperating with said annular knife and adapted to register with the ends of said grooves, and means for forcing the severed strips into said grooves.

Signed at Camden, in the county of Camden and State of New Jersey, this 3 day of May A. D. 1923.

SAMUEL M. LANGSTON.