Oct. 4, 1932. D. M. DENTON 1,880,872

MEANS AND METHOD OF FORMING ROOFING TILE

Filed Oct. 13, 1931 3 Sheets-Sheet 1

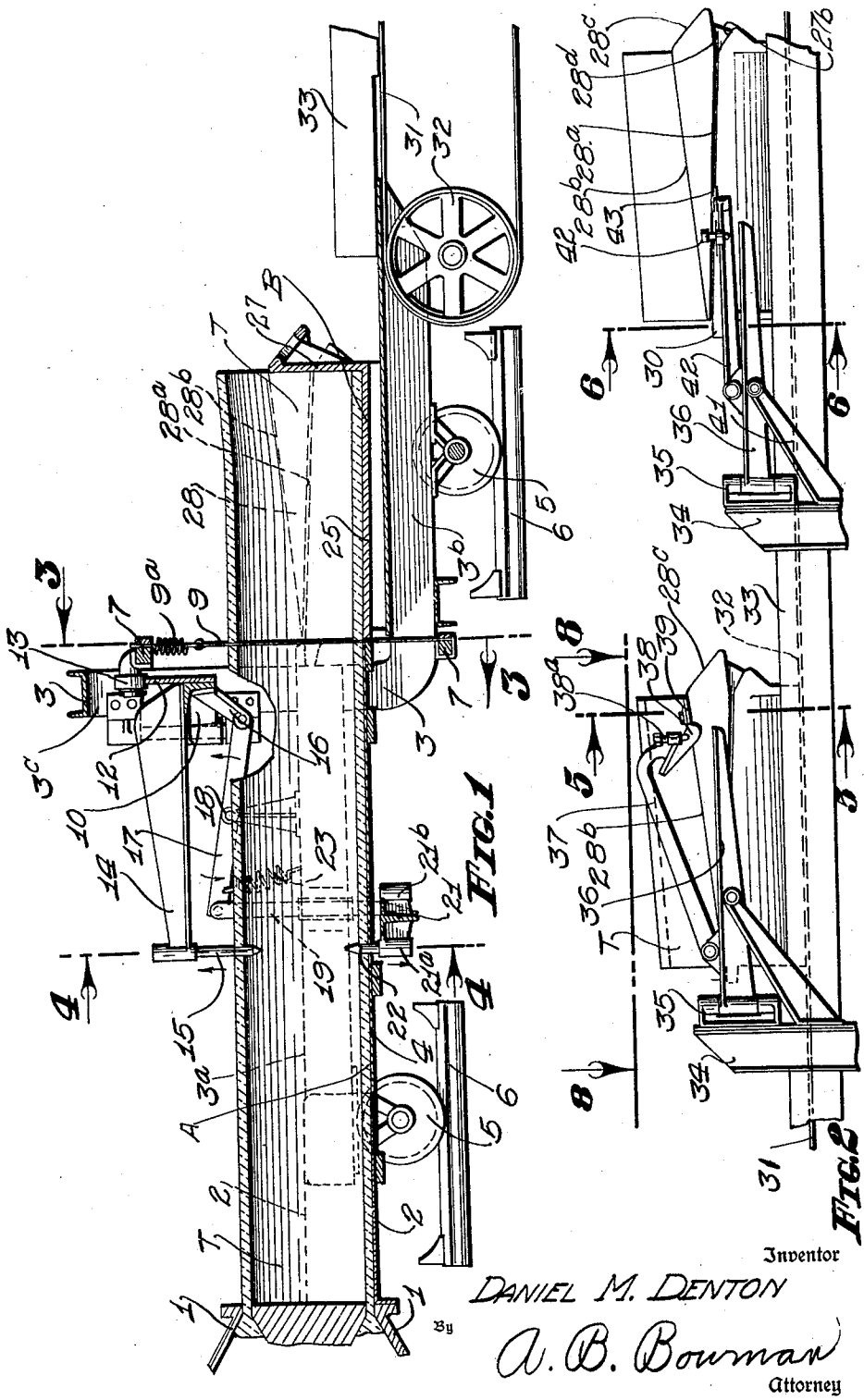


FIG. 1

FIG. 2

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MEANS AND METHOD OF FORMING ROOFING TILE

Filed Oct. 13, 1931 3 Sheets-Sheet 2

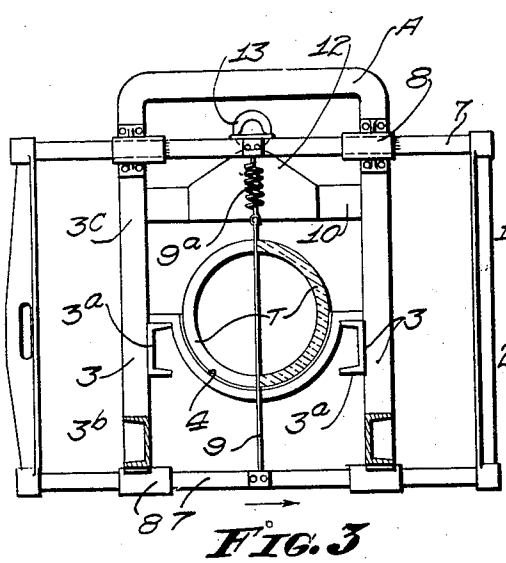


FIG. 3

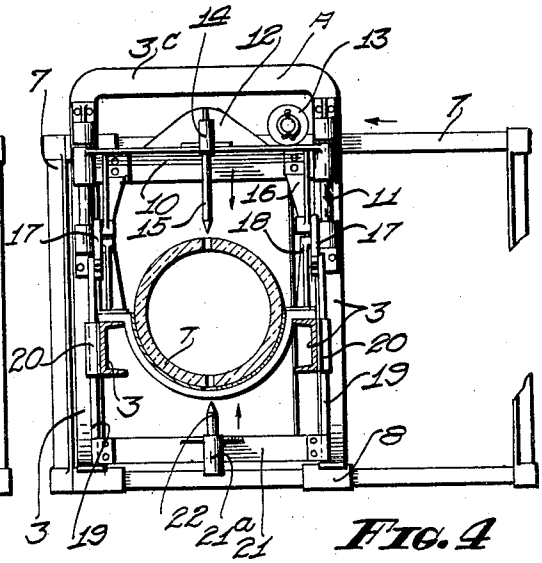


FIG. 4

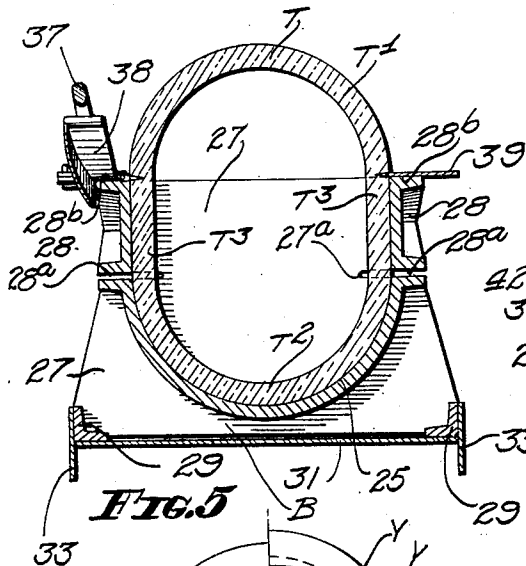


FIG. 5

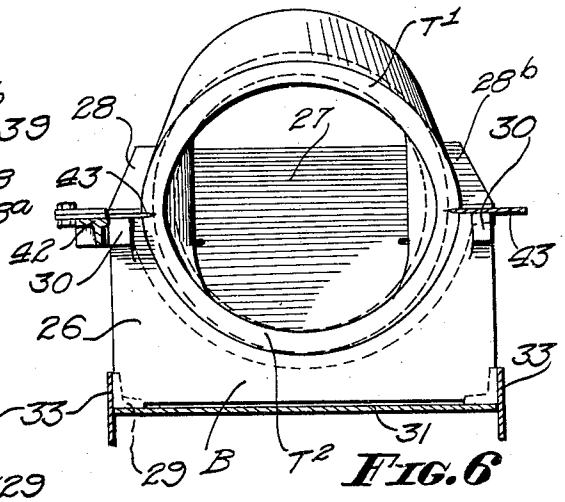


FIG. 6

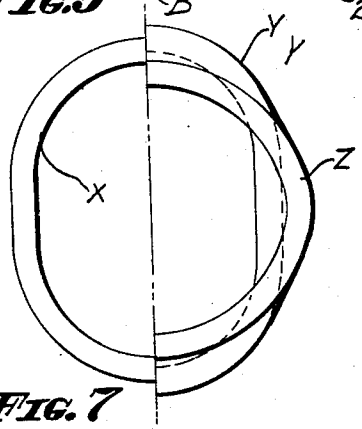


FIG. 7

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MEANS AND METHOD OF FORMING ROOFING TILE

Filed Oct. 13, 1931 3 Sheets-Sheet 3

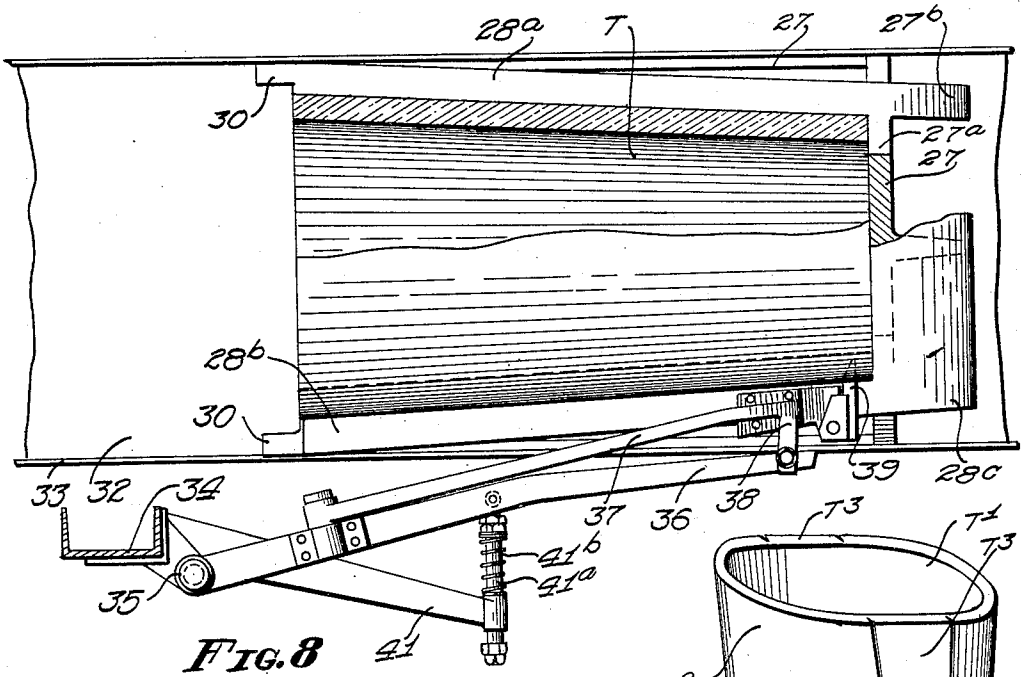


FIG. 8

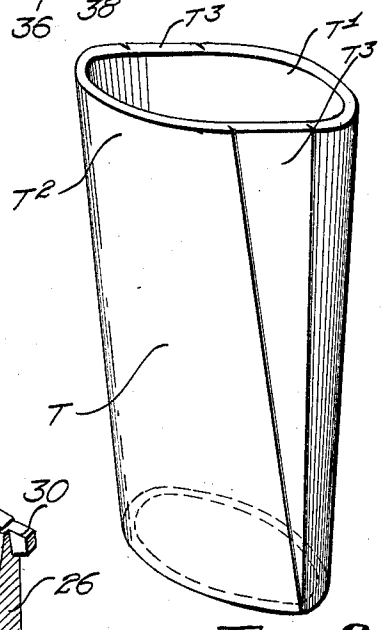


FIG. 9

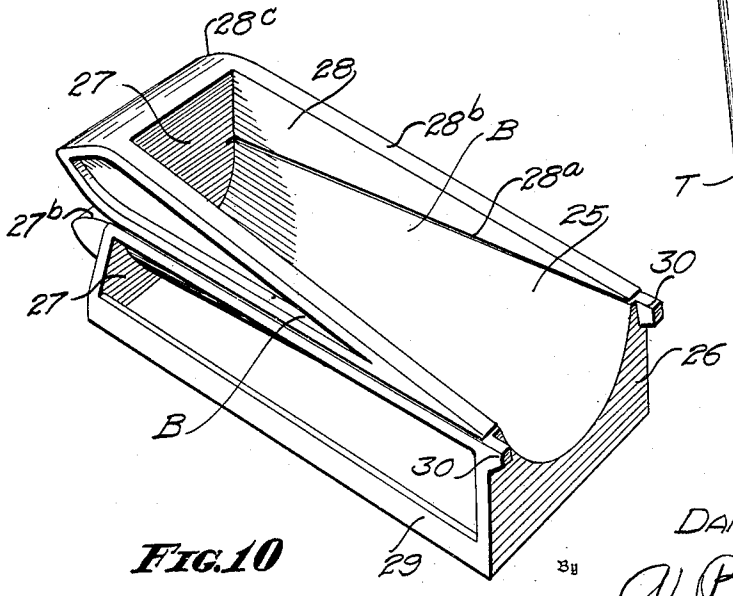


FIG. 10

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UNITED STATES PATENT OFFICE

DANIEL M. DENTON, OF SAN DIEGO, CALIFORNIA

MEANS AND METHOD OF FORMING ROOFING TILE

Application filed October 13, 1931. Serial No. 568,539.

My invention relates to a means and method of forming roofing tiles, and the objects of my invention are:

First, to provide a method of forming tile and of carrying out the method, wherein the tile may be quickly and economically manufactured.

Second, to provide a means of this class which operates in conjunction with other equipment now employed in the manufacture of other clay or plastic material products, such as brick, building tile, clay pipes or the like.

Third, to provide a method of this class which produces two roofing tiles with each operation.

Fourth, to provide a means and method of this class wherein the pair of tiles formed thereby is in the form of a cylinder, which though distorted to form a pair of tiles, readily supports itself upon an end, thus facilitating uniform drying.

Fifth, to provide a novel means of shaping the tiles, which presses parts of the tiles to the desired form and permits other portions of the tiles to settle to the desired form relying on the plastic condition of the material.

Sixth, to provide a means for shaping or forming tiles, in which the strain imposed upon the plastic mass during the shaping operation is reduced to a minimum, thereby correspondingly reducing spoilage, due to the material cracking or breaking while being formed; and

Seventh, to provide on the whole a novelly arranged means of forming roofing tiles and a novel method particularly suited to said means, which is simple of construction and easily and quickly performed and in which said means does not deteriorate or get out of order.

With these and other objects in view as will appear hereinafter, my invention consists of certain novel features of construction, combination and arrangement of parts and portions, and a particular manner of operation thereof, as will be hereinafter described in detail, and particularly set forth in the appended claims, reference being had to the accompanying drawings and to the characters of reference thereon which form a part of this application, in which:

Figure 1 is a fragmentary longitudinal view of the feeding carriage and shaper with parts and portions shown in elevation to facilitate the illustration; Fig. 2 is a fragmentary side elevational view of the scoring mechanisms shown in association with a pair of the shapers; Fig. 3 is a transverse sectional view of the feeding carriage taken through 3—3 of Fig. 1, with the various parts and portions shown in the positions assumed when the cutting operation is partly completed; Fig. 4 is another transverse sectional view of the feeding carriage taken through 4—4 of Fig. 1, with the various parts in the positions assumed at the beginning or end of the cutting operation; Fig. 5 is an enlarged sectional view through 5—5 of Fig. 2 showing the upper scoring mechanism fragmentarily; Fig. 6 is a sectional view through 6—6 of Fig. 2 with the shaper shown in elevation and the lower scoring mechanism shown fragmentarily; Fig. 7 is a diagrammatical view illustrating a modified cross section of the plastic cylinder from which the tile is formed; Fig. 8 is an enlarged fragmentary elevational view taken from 8—8 of Fig. 2 with parts and portions broken away and in section to facilitate the illustration; Fig. 9 is a perspective view of the tile unit after the forming operation and removal of the shaper, the unit being shown in the position assumed during the drying operation; and Fig. 10 is a perspective view of one of the shapers.

Similar characters of reference refer to similar parts and portions throughout the several views of the drawings.

The principal parts and portions of my means for forming roofing tiles are as follows: Die 1, guide trough 2, feeding carriage mechanism A including a feeding carriage frame 3, guide trough 4, wheels 5, tracks 6, cutting wire frame 7, sleeves 8, cutting wire 9, cross member 10, guide rods 11, cam 12, cam roller 13, upper punch arm 14, upper punch 15, brackets 16, levers 17, supports 18, connecting rods 19, guides 20, cross

member 21, lower punch 22, springs 23, and table 24; a shaper B including a trough 25, receiving end plate 26, rear end plate 27, side members 28, frame members 29, and spacing lugs 30; a conveyor mechanism including a belt 31, pulley 32, and guide members 33; and scoring mechanisims including posts 34, hinges 35, booms 36, arms 37, guide feet 38, upper scoring blades 39, brackets 40, tension means 41, arms 42 and lowering scoring blades 43.

The die 1 is shown fragmentarily in Fig. 1. The die may be constructed similarly to the conventional die used in the formation of clay pipes, and is adapted to form an annular cylinder T of clay or other suitable material as it is forced out through said die by any suitable means not shown. The tube of clay formed by the die passes on through a guide trough 2 which is semi-cylindrical and extends axially from the guide as shown in Fig. 1. The clay tubes passes from the trough 2 onto a feeding carriage mechanism A.

The feeding mechanism A includes a frame 3. The frame 3 is provided with a pair of parallel disposed, horizontally arranged side members 3*a*. These members support therebetween a guide trough 4, which is semi-cylindrical and is adapted to telescope with the guide trough 2. Each side member is secured at one end to an L-shaped frame including horizontally disposed legs 3*b*, and vertically disposed portions 3*c*. The horizontally disposed legs 3*b* and side members 3*a* support wheels 5 which are adapted to travel upon tracks 6.

A cutting wire frame 7 is provided which is in the form of a rectangular loop, the horizontal side of which extends across the two upright or vertically disposed portions 3*c* of the carriage frame. These portions of the cutting wire frame are slidably mounted in sleeves 8 which are secured to said upright members 3*c*. A cutting wire 9 extends between the horizontally disposed portions of the cutting wire frame 7, said wire is connected through a suitable spring 9*a* to one side of said frame so as to provide the proper tension upon the cutting wire.

The upright members 3*c* support a pair of vertically disposed guide rods 11. A cross member 10 extends between the upright members 3*c* and its ends are slidably mounted upon the guide rods 11. The cross member is provided with a cam 12 extending upwardly therefrom. The cam is high opposite the central portion of the cross member and slopes downwardly therefrom toward the extremities of said cross member. A cam roller 13 is supported from the uppermost horizontal member of the cutting wire frame 7. This arrangement causes a vertical shifting of the cross member 10 with each stroke of the cutting wire frame 7. The cross member 10 supports an upper punch arm 14 which extends horizontally over the trough 4. The extended end of the punch arm 14 supports a downwardly extending upper punch 15.

The cross member 10 is provided with a bracket 16 near each end, each of which is adapted to engage one extremity of a lever 17. Each lever 17 is fulcrumed intermediate its end upon a support 18. The other end of each lever joins a vertically disposed connecting rod 19, supported from the side members 3*a* by means of guides 20. The lower ends of the two connecting rods 19 are joined by a cross member 21. An upwardly extending lower punch 22 is removably supported intermediate the ends of the cross member 21 in a bracket 22*a*.

Springs 23 are provided which are arranged to yieldably hold the cross member 10 in its raised position so that the upper and lower punches 15 and 22 normally clear the tube of plastic material carried by the guide trough 4. When the roller 13 depresses the cross member 10, the punches 15 and 22 are forced into the tube of plastic material as shown in Fig. 1, so as to form nail holes therein. The cross member 21 is provided with a second bracket 21*b* which is positioned toward the cutter from the bracket 21*a*, and is also adapted to receive the punch 22. When the bracket 21*b* is used, the punch 22 forms holes located adjacent the larger end of the subsequently formed tile.

The horizontal legs 3*b* of the carriage frame 3 support therebetween a flat table 24. The table 24 forms a support whereby a shaper B may be supported contiguous to the discharge end of the guide trough 4. The shaper B in addition to shaping the tube into tile units forms a carriage for transporting the freshly formed units to a point where they may be removed from the shaper and placed on suitable drying racks.

The shaper B includes a trough 25. At its forward or receiving end, the trough is slightly less than a semi-circle in cross section. The trough decreases gradually in diameter from this end and gradually increases the extent of its curvature, so that at its other, or rear end, the trough is approximately a half-circle but somewhat smaller in diameter than said forward end. A receiving end plate 26 supports the forward end of the trough and is cut away so that this end of the trough is open. The rear end of the trough 25 is supported by a rear end plate 27. This plate closes the corresponding end of the trough and projects considerably above said trough. The side margins of the upwardly projecting portions of the rear end plate 27 support a pair of side members 28. Each side member 28 tapers gradually towards the receiving end of the trough. The lower margin of each side member 28 is disposed in slightly spaced

parallel relation with the corresponding upper side margin of the trough 25, so as to form therewith a slit 28*a*, extending the length of the trough. A slot 27*a* is cut into the side of each rear end plate 27 in alinement with the slots 28*a*. The upper surface designated 28*b* of each side member 28 forms a guide. The slots 28*a* also form guides. The side members 28 extend rearwardly of the rear end plate 27 and taper to a blunt point forming at their upper and lower margins directing surfaces 28*c* and 28*d*, which direct cutting or scoring knives, to be described hereinafter, onto the guides 28*b* and guide slots 28*a* respectively. The rear end plate 27 is provided with rearwardly directed lugs, the upper surfaces of which form directing means 27*b* similar to the directing surfaces 28*d* and 28*c*. The end plates 26 and 27 are connected by their lower outer corners to frame member 29 which are arranged in parallel disposed relation to each other and enable the shaper B to be readily positioned upon a suitable conveyor, to be described hereinafter. The forward or receiving end of the shaper is provided with forwardly extending spacing lugs 30, arranged adjacent the upper margins of the receiving plate 26, and spaced radially outwardly from the margins of the trough 25, as shown best in Fig. 6.

The shaper B is adapted to be positioned adjacent the discharge end of the trough 4, in such a manner that the cutting wire may pass across the receiving end of the trough 25, contiguous to the receiving end plate 26, the movement of the cutting wire being confined to the distance between the spacing lugs 30. The bottom of the trough 25 is approximately flush with the bottom of the guide trough 4, however, the radius of the trough at the receiving end is greater than the radius of the plastic tube which is moved onto the shaper. In fact, the diameter of the tube T is approximately equal to the diameter of the trough 25, half way between the receiving and rear end thereof.

Operation of the feeding carriage and shaper is as follows:

The tube of plastic material T moves continuously from the die 1. For this reason, during the cutting operation, the carriage moves at the same speed as the tube, thus both the carriage and the shaper at such time are fixed with respect to the end of the tube. As soon as the cutting operation is completed, and a fresh or empty shaper is positioned, the carriage and shaper are moved forwardly toward the die causing the end of the clay tube to be forced onto the shaper. As the tube approaches the rear end of the shaper, the sides thereof are pressed inwardly so that the tube is elongated along its vertical diameter until it assumes the position shown in Fig. 5. At the receiving end of the shaper, however, the sides of the tube are spaced inwardly therefrom as indicated by the dotted lines in Fig. 6. Immediately after the cutting operation, this portion of the tube begins to settle by its own weight to the position shown in Fig. 6.

The shape of the trough 25 is so proportioned that it corresponds to the form which the plastic tube of clay would normally assume were the opposite sides thereof pressed so as to uniformly converge. The trough prevents the plastic tube from settling beyond this state. No means is required to retain the upper half of the tube in the required shape, for the arch formed by this portion of the tube has sufficient inherent strength whereby this portion maintains its form. This arrangement enables two tiles to be formed in one operation. The guide surfaces 28*b* and guide slots 28*a* delineate the margins of the two tiles, designated T1 and T2, formed by the shaper. Means are provided for scoring the tiles along the margins of the side members 28, so that the triangular material, designated T3, may be removed or broken away from the two tiles. This is done after the drying or baking operation.

A conveyor is provided which includes a belt 31 adapted to pass around a pulley 32, located contiguous to the table 24. The belt 31 is bounded by guide members 33. When the shapers B are positioned upon the belt, the frame members 29 are contiguous to the guide members 33, so that said shapers are properly centered upon the belt. The shapers are carried by the belt past scoring mechanisms which travel along the guide surfaces 28*b* and slots 28*a* of the shaper. The first, or upper scoring mechanism, includes a pair of posts 34 extending upwardly along either side of the conveyor belt. Hinges 35 are provided on the rear side of each post, which are adapted to support booms 36. The booms are rotatable in a horizontal plane. Hinged to each boom 36 is a vertically rotated arm 37, at the end of which is provided a guide foot 38. The guide foot 38 supports a scoring blade 39. The posts 34 also support brackets 40, which in turn support tension means 41. Each tension means includes a rod 41*a* and a spring 41*b* which yieldably holds the corresponding boom over the conveyor belt. The rods 41*a* are adjustable. Suitable stops 38*a* are provided on the guide feet 38 and arranged to engage the extended ends of the booms 36. The tension means 41 and stops 38*a* permit adjustment of the guide feet 38 and upper scoring blades 39, so that they are normally disposed in position for engagement by the directing portions 38*d*. The feet are guided thereby to the upper margins of the guide members 28, whereupon the knives 39 score the sides of the upper tile T1.

After passing the upper tile scoring mecha-

nism, each shaper passes the lower tile scoring mechanism, which is similar to the above-described structure, in that it includes a pair of posts 34, arranged on either side of the conveyor, a pair of hinges 35, and supporting booms 36. Each boom supports an arm 42 to the end of which is secured a lower scoring blade 43. The lower scoring mechanism also includes tension means 41. These means, together with set screws 42*a*, or the like, provided on the arms 42, position the lowering scoring blades 43 so as to enter the slots 28*a*. After passing the scoring mechanisms, the shapers are stood upon the spacing lugs 30, which enables the tile units therein to settle downwardly, so as to rest in the position shown in Fig. 9. The tile unit is then removed to the drying room and dried in this position.

As shown in Fig. 7, the die 1 may be arranged so that the tube when extruded therefrom is oval in shape as indicated by X. This form is particularly desirable, when the clay is relatively poor in quality and is unable to stand much distortion without breaking. It can be seen from an examination of Fig. 7, that relatively little distortion of the tube is required in order to form the smaller end of the tile, designated Y. As the settling of the tile, which forms the larger end thereof, is due to the inherent plasticity of the clay tube, a relatively great distortion may take place at this end without causing the tube to crack, although the quality of the clay be poor, thus the end, designated Z, may vary considerably from the original contour of the tube.

Though I have shown and described a particular construction, combination and arrangement of parts and portions, and have set forth a particular method of forming roofing tiles, I do not wish to be limited to this particular construction, combination and arrangement, nor to the method, but desire to include in the scope of my invention, the construction, combination and arrangement, and method, as set forth in the following claims.

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

1. In a means for shaping roofing tile, a former including a pair of converging wall members arranged to engage opposite sides of a plastic tube.

2. In a means for shaping roofing tile, a former including a pair of converging wall members arranged to engage opposite sides of a plastic tube, and a trough associated with said wall members, said trough shaped to conform to the normal contour of said plastic tube when the opposite sides of said tube conform to said wall members.

3. In a means for shaping roofing tile, an open longitudinally tapered trough, arranged to act upon a plastic tube, the smaller end of said trough being of less lateral dimension than said tube, and the large end being of greater lateral dimension than said tube.

4. In a means for shaping roofing tile, an open longitudinally tapered trough arranged to receive plastic material in the form of a tube of normally constant cross section equal to the cross section of said trough intermediate its ends.

5. In a means for shaping roofing tile, a former including converging side members arranged to engage opposite lateral sides a horizontally disposed plastic tube, and a trough shaped to conform to the normal contour of said plastic tube when the opposite sides of said tube conform to said side members, said trough forming a support for the underside of said plastic tube.

6. In a means for shaping roofing tile arranged to act upon a plastic tube having normally a constant cross section, a forming trough including converging side walls, and a bottom portion conforming to the normal contour of the underside of said plastic tube when said tube is tapered to correspond to said side walls, the upper side of said trough being open, whereby the upper portion of said plastic tube is free to form a tapering arch corresponding to the convergence of said side walls.

7. In a means for shaping roofing tile, a former including a pair of converging wall members arranged to engage opposite sides of a plastic tube, a trough associated with said wall members, said trough shaped to conform to the normal contour of said plastic tube when the opposite sides of said tube conform to said wall members, and scoring knife guide means delineating the margins of tiles formed by said former.

8. In a means for shaping roofing tile, a former including converging side members arranged to engage opposite lateral sides of a horizontally disposed plastic tube, a trough shaped to conform to the normal contour of said plastic tube when the opposite sides of said tube conform to said side members, said trough forming a support for the underside of said plastic tube, and scoring knife guide means delineating the margins of tiles formed by said former.

9. In a means for shaping roofing tile arranged to act upon a plastic tube having normally a constant cross section, a forming trough including converging side walls, a bottom portion conforming to the normal contour of the underside of said plastic tube when said tube is tapered to correspond to said side walls, the upper side of said trough being open, whereby the upper portion of said plastic tube is free to form a tapering arch corresponding to the convergence of said side walls and scoring knife guide means

delineating the margins of tiles formed by said forming trough.

10. In a means for shaping roofing tile arranged to act upon a plastic tube having normally a constant cross section, a shaper including converging forming means arranged to engage opposite lateral sides of said tube, whereby the upper and lower portions of said tube form a tapered arch and channel respectively, said arch and channel being similar in form and constituting a pair of tiles, and a supporting means for said channel.

11. In a means for shaping roofing tile arranged to act upon a plastic tube having normally a constant cross section, a shaper including converging forming means arranged to engage opposite lateral sides of said tube, whereby the upper and lower portions of said tube form a tapered arch and channel respectively, said arch and channel being similar in form and constituting a pair of tiles, a supporting means for said channel, and scoring knife guide means delineating the margins of said tiles.

12. A method of forming roofing tile consisting in, forming a tube of plastic material, then converging the lateral sides of said tube towards one end thereof, whereby the upper and lower sides thereof diverge toward said end and form tapered tile portions, and then scoring said tube so as to delineate the margins of said tile portions.

13. A method of forming roofing tile consisting in, forming a continuous tube of plastic material having a constant diameter, then directing the end of said tube longitudinally, then contracting the lateral dimension and expanding the vertical dimension of said end, then severing said tube inwardly from said end, and then laterally expanding and vertically contracting the lastly formed end of said severed tube.

14. A method of forming roofing tile consisting in, forming a continuous tube of plastic material having a constant diameter, then directing the end of said tube longitudinally, then contracting the lateral dimension and expanding the vertical dimension of said end, then severing said tube inwardly from said end, then laterally expanding and vertically contracting the lastly formed end of said severed tube, whereby the upper and lower portions of said tube form tiles, and then scoring said severed tube so as to delineate the longitudinal margins of said tiles.

15. A method of forming roofing tile consisting in, forming a tube of moist, plastic material, then converging the lateral sides of said tube toward one end thereof, whereby the upper and lower sides thereof diverge toward said end and form tapered tile portions, then scoring said tube so as to delineate the margins of said tile portions, and then standing said tube on end and drying said tube while so positioned.

16. A method of forming roofing tile consisting in, forming a continuous tube of moist, plastic material having a constant diameter, then directing the end of said tube longitudinally, then contracting the lateral dimension and expanding the vertical dimension of said end, then severing said tube inwardly from said end, then laterally expanding and vertically contracting the lastly formed end of said severed tube, whereby the upper and lower portions of said tube form tiles, and then scoring said severed tube so as to delineate the longitudinal margins of said tiles, then standing said severed tube on said lastly formed end and then drying said severed tube while so positioned.

17. A method of forming roofing tile consisting in, forming a tube of plastic material with an initially constant cross section, then diminishing the lateral dimension and increasing the vertical dimension of one end, and expanding the lateral dimension and reducing the vertical dimension of the other end, whereby said lateral sides and said upper and lower sides of said tube converge in opposite directions, and then scoring said tube so as to delineate arcuate sections thereof.

18. A method of forming roofing tile consisting in, forming a tube of plastic material with an initially constant cross section, then tapering the lateral sides of said tube allowing the upper and lower sides thereof to expand in accordance with the taper of said lateral sides, and then scoring said tube so as to delineate arcuate sections of said upper and lower sides.

19. A method of forming roofing tile consisting in, forming a tube of plastic material with an initially constant cross section, then tapering the lateral sides and vertical sides of said tube in opposite directions, and then scoring said tube so as to delineate arcuate sections thereof.

In testimony whereof, I have hereunto set my hand at San Diego, California, this 25th day of September, 1931.

DANIEL M. DENTON.