Dec. 26, 1950 D. W. STEWART, JR., ET AL 2,535,241

METHOD AND APPARATUS FOR PRODUCING TILES

Filed Feb. 20, 1950 3 Sheets-Sheet 1

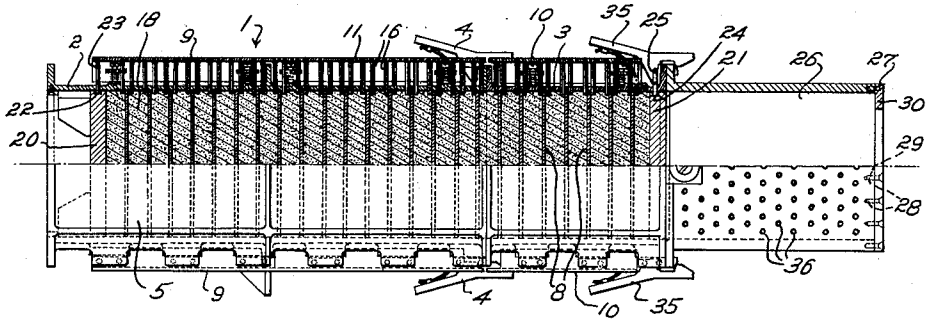


Fig. 1

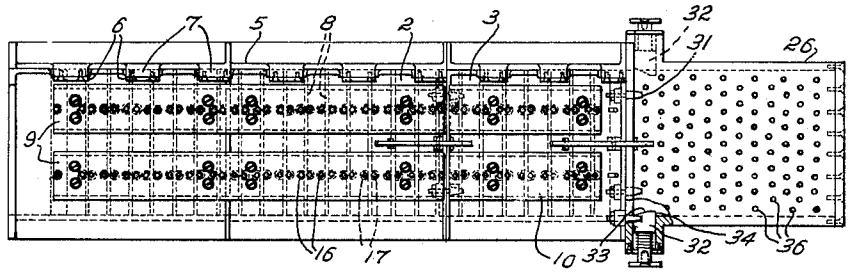


Fig. 2

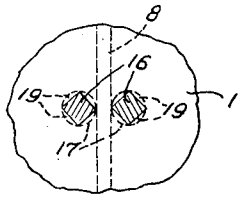


Fig. 4

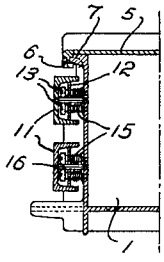


Fig. 3

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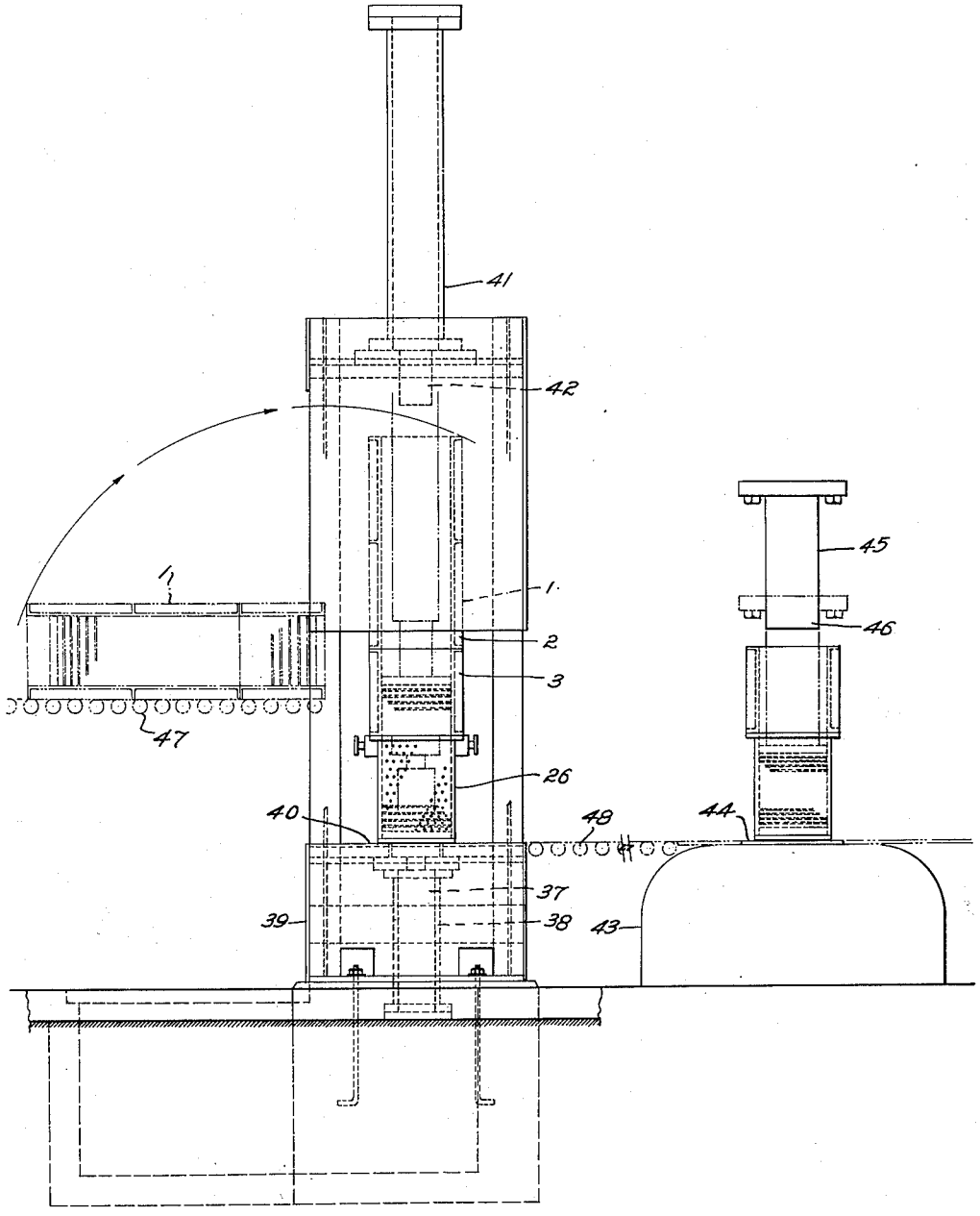


Fig. 5.

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METHOD AND APPARATUS FOR PRODUCING TILES

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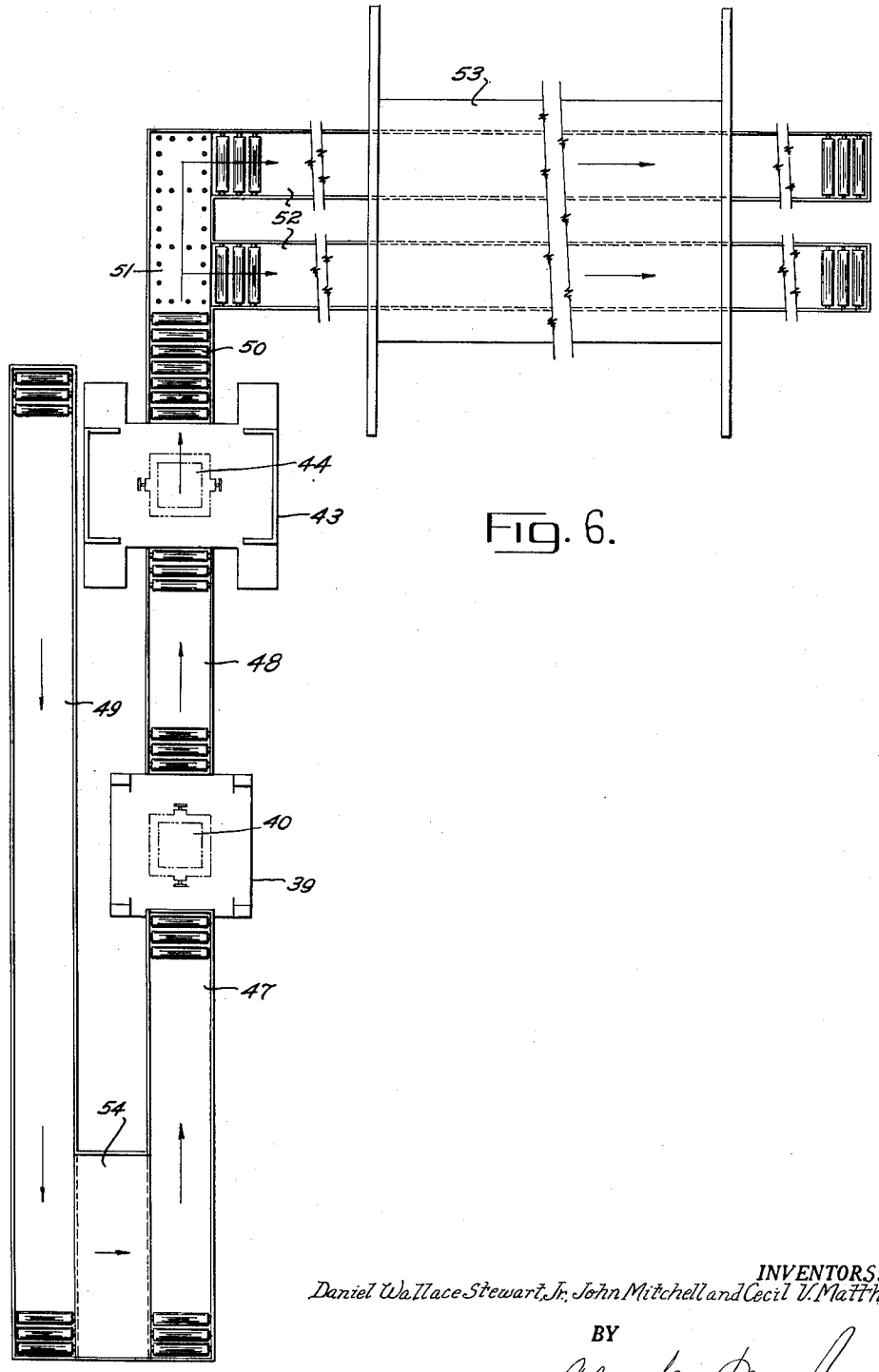


Fig. 6.

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2,535,241

METHOD AND APPARATUS FOR PRODUCING TILES

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Application February 20, 1950, Serial No. 145,152

9 Claims. (Cl. 25—42)

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This invention relates to a method and apparatus for producing composition tiles, such as floor tiles and the like.

It is an object of this invention to provide a simple and efficient method for producing tiles which may be carried out with relatively few steps.

Another object is to provide an apparatus for producing tiles which is effective for convenient and rapid operation and which includes a combined mould and die loader for direct association with a die.

Other objects and details of the invention will be apparent from the following description, with particular reference to the accompanying drawing, in which

Figure 1 is a plan view, partly in section of a combined mould and die loader with associated die,

Figure 2 is a side elevation of the apparatus shown in Figure 1,

Figure 3 is a partial end view in section of the die loader,

Figure 4 is an enlarged side elevation, partly in section, of a portion of the die loader,

Figure 5 is a side elevation of a pressing apparatus, and

Figure 6 is a plan view of a die and tile handling apparatus.

Referring to Figures 1 to 4, 1 is a die loader adapted to receive the material to be formed into tiles and comprising a rectangular container, the internal cross-sectional dimensions of which are equal to those of the tile to be produced. The container 1 is formed in two sections 2 and 3 in end-to-end relation, section 2 being approximately two-thirds and section 3 approximately one-third of the total length of the container. Means for locking the two sections in assembled relation while permitting ready detachment of one section from the other may comprise a plurality of clamps 4 engageable with the abutting flanged ends of the sections.

The container 1 has an open top through which it may be charged with material, the top being provided with a removable closure plate 5 which may be securely fastened thereon by means of a plurality of depending lugs 6 carried by the closure and a plurality of complementary overhanging lugs 7 carried by the lip of the container. It will be apparent that the closure, when placed on the top of the container, is slidable longitudinally into or out of lug-engaging position.

The container 1 is adapted to receive a plu-

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rality of division plates 8 arranged to separate the material in the container into a plurality of equal tile forming masses. In order initially to position the plates 8 in uniformly spaced relation in the container, a pair of plate spacers 9 are mounted on each side of section 2 and a pair of plate spacers 10 on each side of section 3. Each spacer 9 and 10 comprises a longitudinally extending bar 11 of preferably channel shaped cross-section having a strip 12 coextensive in length therewith fitting within the channel and fixed to the flanges of the channel in spaced relation to the web portion thereof. A plurality of pair of pins 13 mounted in fixed relation on the side wall of the container extend through each strip 12 with their heads lying in the space between the strip and channel web to mount the bars 11 on the wall of the container while permitting limited lateral movement inwardly and outwardly with respect to the container wall. A spring 15 carried by each pin normally holds each bar 11 in outwardly disposed relation. Fixed to each bar 11 are a plurality of spaced pairs of inwardly extending pins 16, each pair of pins 16 being spaced from each other a distance approximately equal to the thickness of a spacer plate 8. The pins 16 extend through complementary openings 17 in the container wall. In the normal or outwardly disposed position of the bar 11, the inner ends of pins 16 do not project beyond the inner wall surface of the container. It will be apparent, however, that the bars 11 may be pressed inwardly, against the action of the springs 15, to project the ends of the pins 16 beyond the inner wall surface of the container, as shown in Figure 1, in which position the plates 8 may be inserted between the ends of the respective pairs of pins, which thus hold the plates in uniformly spaced relation. Thereafter, following charging of the material 18 between each pair of plates, the bars 11 are released to retract the pins from plate-holding position. Preferably, the pins 16 are square in cross-section and the openings 17 are circular, thus providing air outlet spaces 19 in the container wall between each pin and surface of its complementary opening 17.

The open ends of container 1 are provided with closure plates 20 and 21 which are slidable on the inner wall surface of the container. Releasable means are provided for holding the plates 20 and 21 in position during the charging of the container. As shown, plate 20 has a recess 22 arranged to receive the end of pins 23 car-

ried by bars 11, and plate 21 has a recess 24 arranged to receive the ends of pins 25 laterally slidable in the walls of the container.

A die 26 adapted to receive the charged material from die loader 1 comprises a rectangular container having its inner cross-sectional area equal to that of the die loader. The ends of the die are open, the outer end being provided with a removable ring 27 having dowels 28 arranged to engage complementary openings 29 in the walls of the die and an inwardly extending annular flange 30. The inner end of the die is adapted to receive dowels 31 carried by the adjacent end of the die loader accurately and securely to position the latter thereon. The inner end of the die is also provided with a plurality of laterally extending spring-pressed latch pins 32 having inclined surfaces 33, permitting entry of the plates 21, 8 and 20, with material therebetween, into the die, and shoulders 34 to retain the same within the die. Means for removably locking the die loader on the die may comprise a plurality of clamps 35. The die is provided with a plurality of air outlet apertures 36 in its side walls.

Referring to Figure 5, 37 is a vertically disposed stripper ram reciprocally mounted in a cylinder 38 carried by a frame 39. The frame has a press bed 40 adapted to receive the die 26 with the die loader 1 in superimposed relation thereon. A precompressing press 41 having a reciprocating ram 42 is mounted in the frame in vertically opposed relation to ram 37. Adjacent frame 39 is a second frame 43 having a press bed 44 to receive the die 26. Associated with press bed 44 is a vertically disposed press 45 having a reciprocating ram 46. Suitable means, not shown, are provided for actuating the rams.

Referring to Figure 6, 47 is a roller conveyor for delivering the die loader to press-bed 40, 48 a roller conveyor for transferring the die with associated loader section to press-bed 44, 49 a roller conveyor in adjacent parallel relation to conveyors 47 and 48 for die loader return, 50 a roller conveyor arranged to receive the press runout, 51 a ball conveyor for transferring the press runout to oven conveyors 52, and 53 an oven through which the press runout is conducted on conveyors 52. A transfer skid plate 54 connects the outer ends of conveyors 49 and 47.

In operation, the spacer plates 8 and closure plates 20 and 21 are positioned in the die loader, as shown in Figure 1, and the die loader charged with a suitable mixture for formation of the tiles. Various mixtures of materials may be employed, one satisfactory mixture comprising a slurry of sawdust, magnesium oxide, epsom salt and water. The cover 5 is then locked in position on the loader, which is conducted on conveyor 47 to press-bed 40 on which is positioned the die 26 and through which the ram 37 has been raised to position its upper surface flush with the top of the die, as shown in dotted lines in Figure 5. The die loader is upended and placed in vertically disposed position on the die 26, to which it is locked in the manner previously described. It should be observed the smaller section 3 of the loader is in lowermost or die-engaging position. With the holding pins 13, 23 and 25 in retracted position, the contents of the loader rest upon and are supported by the upper end of retracted ram 37. The ram 42 is now actuated, under a load of 2–5 tons to apply a pressure of 48–120 pounds per square inch, to carry out its downward stroke. The ram 42 enters the open end of the die load and engages the plate 20 to apply pressure on the contents. At the same time, the ram 37 moves downwardly fully to retracted position at the bottom of the die. The extent of the downward stroke of ram 42 is shown in Figure 5 wherein it will be observed that, at the end of the stroke, the ram has entered the section 3 of the loader within which, and the die, the contents of the loader has been compressed. This pre-compressing operation reduces the thickness of the individual masses of material by about one-third. The initial thickness of each such individual mass may, for example, be 1¼ inches. Air in the masses may escape, during the pre-compressing step, through the spaces 19 in the loader and apertures 36 in the die.

Ram 42 is now retracted and the empty larger section 2 of the die loader is removed from the assembly. The smaller section 3 of the loader with die 26 is transferred on conveyor 48 to the adjacent press-bed 44. Ram 46 is then actuated to carry out its downward stroke under a load of approximately 100 tons to apply a pressure of the order of 2400 pounds per square inch. As shown, such stroke compresses the contents completely within the die 26. The individual tile masses have now been compressed to about ⅕ of their original thickness or, for example, to one-quarter inch. The loader section 3 is then removed from the die, which is conveyed on conveyors 50, 51 and 52 through the oven 53, where the tiles are baked. Such baking may be carried out at 350° C. for three-quarters of an hour. The die is then returned to the press-bed 40, where the stripper ram 37 is actuated to eject the contents through the top of the die. The stripper remains in upwardly extended position within the die for reception of the next die loader.

There has thus been provided a method and apparatus for producing tiles in an efficient, economical and convenient manner and involving a sequence of related operations, each of which contributes to the efficiency of the succeeding operation.

What is claimed is:

1. A method of producing tiles which comprises charging a slurry of tile-forming material into a die loader while separating the material in the loader into a plurality of separate masses, initially compressing under a relatively low pressure the masses and partly ejecting them into a die, subsequently compressing the masses into said die under a relatively high pressure, baking the compressed masses in the die, and finally ejecting the masses from the die.

2. A method as defined in claim 1 wherein said relatively low pressure is of the order of 48–120 pounds per square inch and said relatively high pressure is of the order of 2400 pounds per square inch.

3. A method as defined in claim 1 wherein said masses are initially compressed to a thickness of approximately one-third that of their original thickness, and wherein said masses are finally compressed to a thickness of approximately one-fifth that of their original thickness.

4. Apparatus for producing tiles comprising an open-ended die loader having a major section and a minor section, means detachably securing said sections together, a plurality of spacer plates arranged to separate said loader into a plurality of substantially equal compartments, means for releasably holding said plates in equally spaced relation within the loader, an open-ended die, and means for detachably securing said die to said minor section.

5. Apparatus as defined in claim 4 wherein said plate holding means comprises a plurality of bars extending longitudinally of and mounted externally on the side walls of said loader for lateral movement towards and away from said walls, spring means holding said bars in normal position away from said walls, each said bar having a plurality of pairs of aligned longitudinally spaced pins fixed thereto, said side walls having complementary openings receiving said pins, the ends of said pins lying within said openings in normal position of said bars but projecting within said loader when said bars are pressed inwardly against the action of the springs.

6. Apparatus as defined in claim 5 wherein said pins are substantially square in cross-section and said openings are circular in cross-section.

7. Apparatus for producing tiles comprising an open-ended die loader having a major section and a minor section detachably secured together, an open-ended die, means for detachably securing said die to said minor section in end-to-end relation, a plurality of spacer plates arranged to separate said loader into a plurality of substantially equal compartments, means for releasably holding said plates in equally spaced relation within the loader, a press-bed arranged to support said die and loader in vertically disposed position, a pressing ram arranged to enter the upper open end of the loader, a second press-bed in adjacent relation to the first press-bed and arranged to support said die and minor section of the loader in vertically disposed position, and a second pressing ram arranged to enter the open end of said minor section.

8. Apparatus as defined in claim 7 including a stripper ram mounted within said first press-bed and arranged to enter the lower end of said die.

9. Apparatus as defined in claim 7, including a conveyor for delivering said loader to the first press-bed, a second conveyor for delivering said die and minor section from the first press-bed to the second press-bed, an oven, and a conveyor for delivering said die from the second press-bed to the oven.

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