E. E. TROWBRIDGE.

PROCESS OF MANUFACTURING BRICKS.

APPLICATION FILED APR. 1, 1915.

1,154,741.

Patented Sept. 28, 1915.

2 SHEETS—SHEET 1.

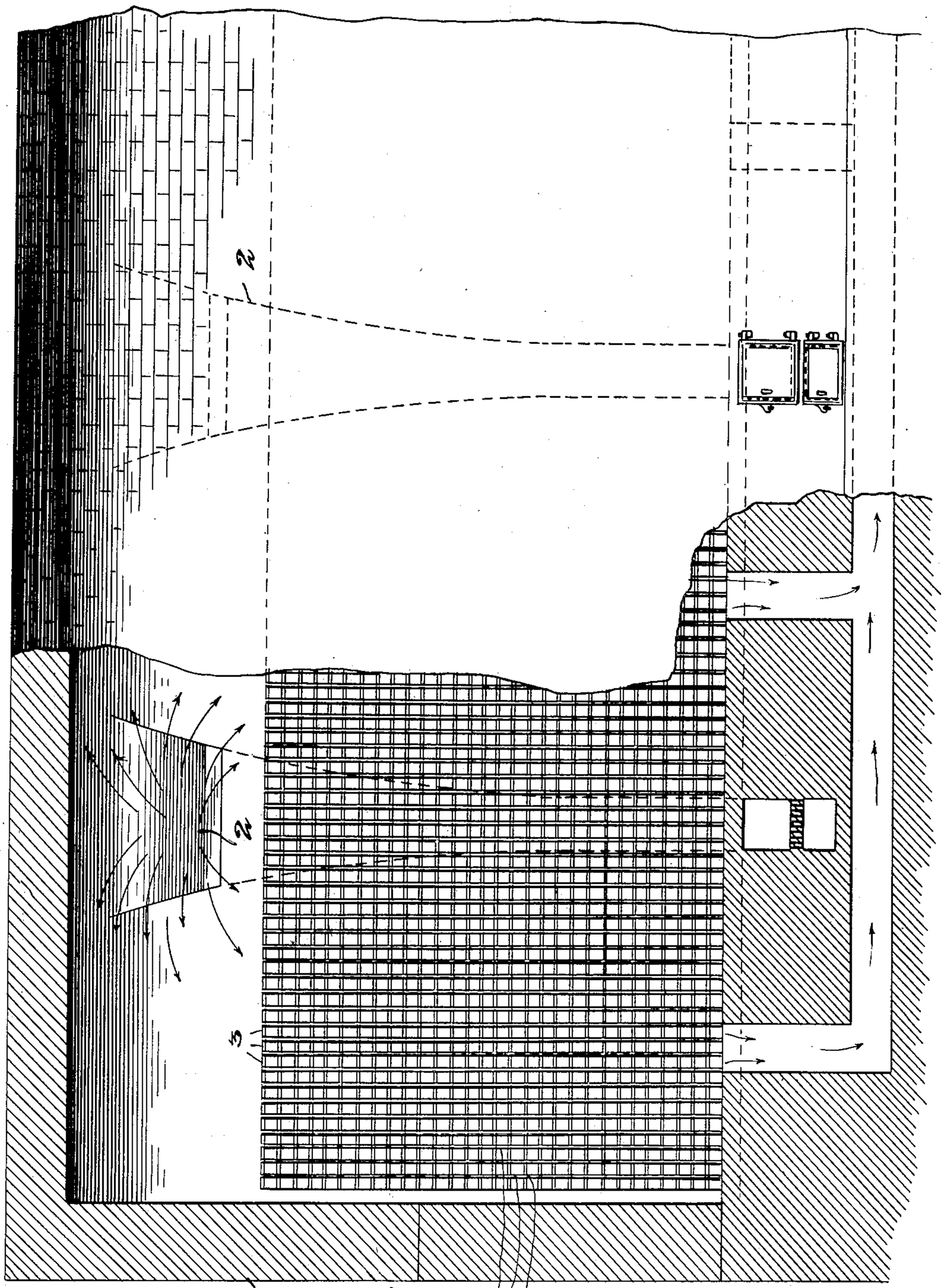

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 4.

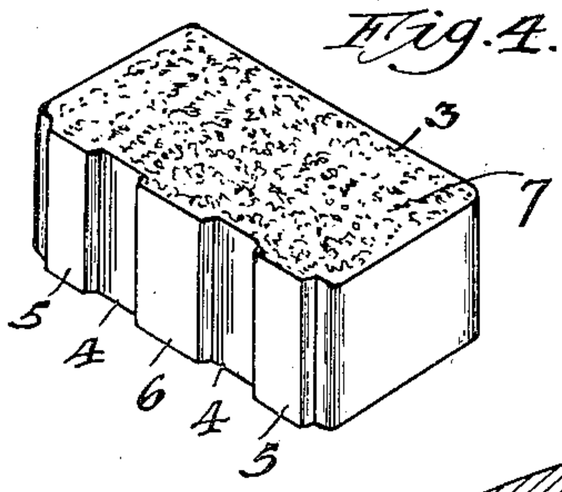


Fig. 3.

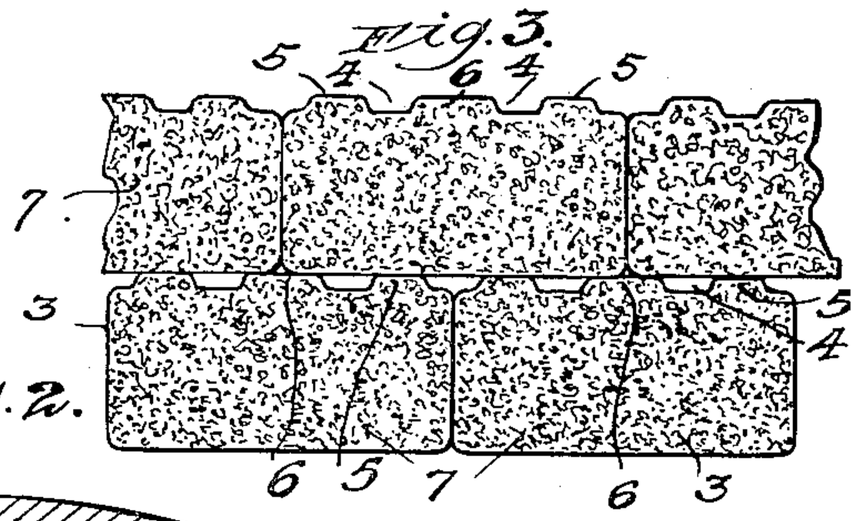
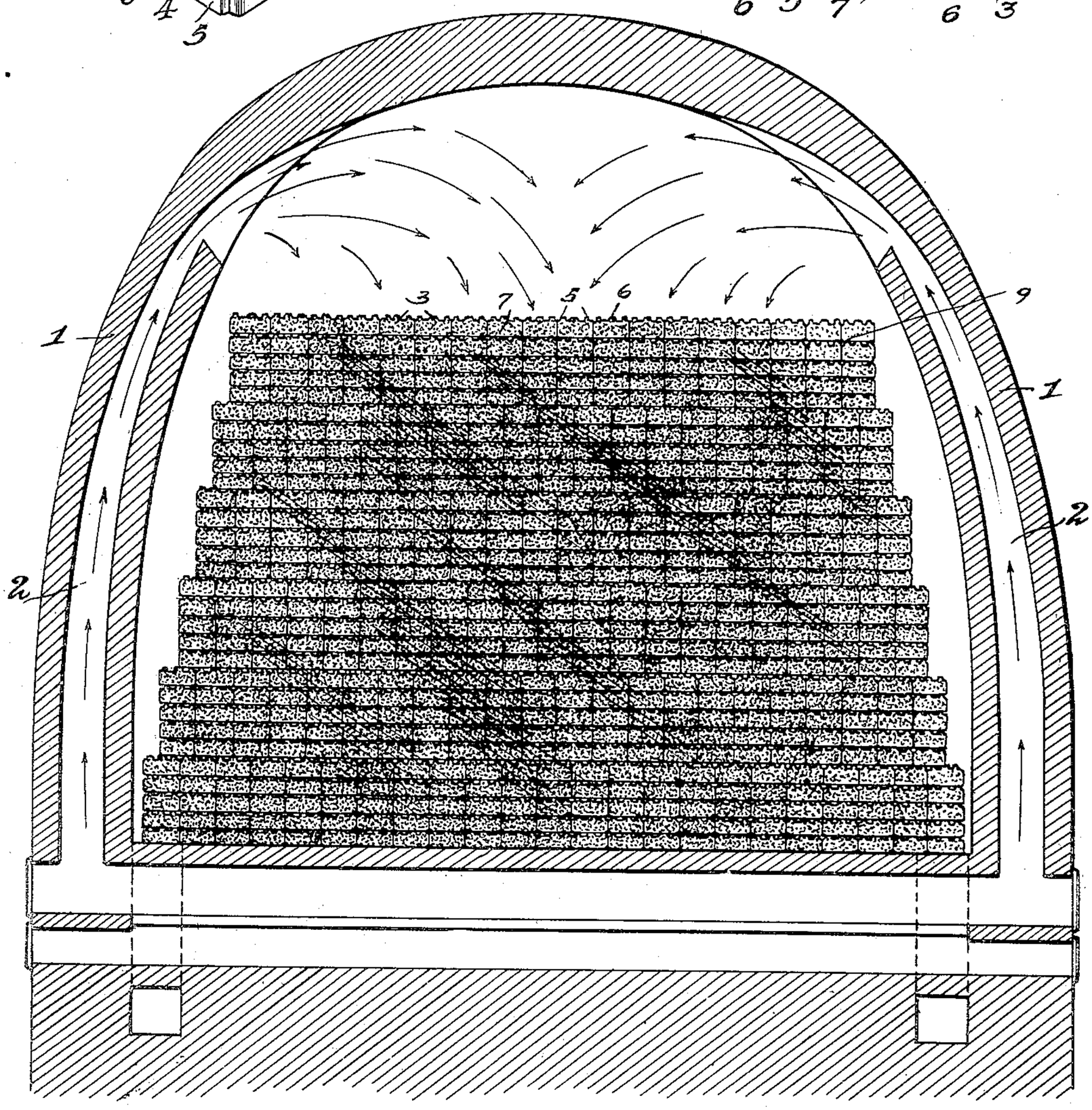


Fig. 2.



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UNITED STATES PATENT OFFICE.

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PROCESS OF MANUFACTURING BRICKS.

1,154,741. Specification of Letters Patent. Patented Sept. 28, 1915.

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To all whom it may concern:

Be it known that I, EMORY E. TROWBRIDGE, a citizen of the United States, and a resident of the city of Kansas City, in the county of Wyandotte, State of Kansas, have invented certain new and useful Improvements in Processes of Manufacturing Bricks, of which the following is a specification.

This invention relates to improvements in processes of manufacturing brick and refers more particularly to a novel form of manufacturing vertical fiber brick. Vertical fiber brick is a relatively new kind of brick in which the fibers run vertically or parallel with the sides of the brick when the same are laid in pavements or used for other purposes. It will thus be seen that the strain of the traffic to which pavements are subjected, is received across the grain of the brick instead of parallel with it. The vertical brick itself which is manufactured by my process forms the subject of a separate application. Briefly, however, the new brick which is manufactured by this process, is provided on one of its sides parallel with the vertical fiber, a plurality of grooves located between relatively broad ribs. When bricks of this type are used in pavements the grooves serve as spaces for receiving an asphaltic or other binder. More particularly, in the present invention, these grooves serve as horizontal heat passages as will be hereinafter more particularly described.

I am of course familiar with the well known form of brick kilns and the processes used therein. One of the difficulties heretofore experienced in the manufacture of brick, is to get a uniform heating of the entire brick. This simple object is not always so easy of attainment in the commercial manufacture of brick. In the ordinary way in which bricks are piled in a kiln, the meeting surfaces of the superimposed bricks are obviously not subject to as direct an application of heat as are the sides of the brick. Moreover, if the vertical rows closely abut against each other the bricks at the end of the pile are subject to more intense heat than are the bricks inclosed within the center of the pile. Various expedients well known in the art, have been attempted to overcome this difficulty but have failed. My new and improved process of manufacturing bricks obviates these difficulties in a simple and efficient manner.

Among the objects of the present invention are to provide a process in which the bricks in the kiln are so arranged as to provide a plurality of heat passages whereby the products of combustion can pass by and come in direct contact with both sides of each vertical row of brick and can also pass between the superimposed rows of horizontal bricks, thus insuring a uniform heating of each individual brick; to provide a process in which the green bricks before being placed in the kiln are formed with a plurality of grooves extending parallel with the vertical fiber of the brick, these grooves serving as horizontal heat passages between the superimposed rows of brick; to provide a process in which the green bricks are so formed prior to being set in the kiln that the horizontal rows of brick can be readily "tied" together without interfering with the even distribution of gases passing through the bricks, in the manner heretofore referred to; to provide a process in which the bricks are so formed that the same novel features of the brick itself, which serve to permit of the binding of the bricks together in the pavement, serve during the manufacture of the brick, to form heat passages to insure more uniform burning of the brick, and also to permit of the rows of brick being tied together as above stated; and in general to provide an improved process of the character referred to.

An illustration of the manner in which the bricks are formed and arranged in the kiln is shown in the accompanying drawings, in which—

Figure 1 is a fragmentary side elevation of the kiln with parts broken away and shown in section; Fig. 2 is a vertical sectional view of the same and showing clearly the manner of setting the green bricks to be burned; Fig. 3 is a view on an enlarged scale showing the manner of tying together the rows of bricks; Fig. 4 is a perspective view of the finished brick.

In the drawings—1 designates as a whole the kiln of well known construction, provided with a series of vertically extending flues 2 arranged to burn with a down-draft as shown by the arrows. Within the kiln are set the bricks designated 3. Each brick has formed on its sides two parallel grooves 4 formed between the outer ribs 5 and an inner rib 6. These ribs are arranged to extend parallel with the vertical fiber 7. It will be noted that the ribs and

grooves are each relatively wide, the rib 6 being as wide or wider than the ribs 5 for a purpose hereinafter mentioned. It will also be noted that the ribs 5 are slightly inset from the edges of the brick. The bricks are laid in the kiln so that the grooves are on the upper faces of the bricks as shown clearly in Figs. 2 and 3.

The vertical rows of brick as shown in Fig. 2, are formed by superimposing each brick so that the plain face of the brick rests upon the ribs and above the grooves, thus forming between each pair of superimposed bricks two horizontal extending open-ended passages through which the gases of combustion can pass. In order to make the vertical rows more secure, it is preferable at intervals to tie the bricks together. This is accomplished in the manner shown more clearly in Fig. 3, *i. e.*, by staggering the horizontal rows so that the ends of the brick rest on the central rib 6. The advantage of having these ribs 6 relatively wide is shown clearly also in Fig. 3, as the meeting ends of the two bricks must be supported by the single central rib. In Fig. 2 I have shown five horizontal rows of superimposed bricks directly above each other, and next five rows staggered and so on up. The particular manner of tying these horizontal rows can of course be varied. Inasmuch as the vertical rows are spaced slightly apart as shown at 8, a relatively large number of vertical heat passages are provided and both sides of each row of bricks comes into direct contact with the gases of combustion. The grooves 4 of each horizontal row of bricks form heat passages 9, so that the upper and lower faces of the bricks as they lie in the kiln are likewise exposed to the heat of the gases of combustion.

Describing now more particularly, the process of manufacturing these bricks, a suitable clay is disintegrated by crusher, edge rollers, roller mills or the like. The clay or shale is then put through a pug mill and ground up and made into stiff mud. It is then put into the brick machine and forced through the die in the form of a rectangular bar by means of an auger screw run in a cylinder as is known in the art. The brick columns as they come from the molding machine are provided with grooves heretofore referred to, these grooves being parallel with the vertical fiber of the brick. This column is then cut with an automatic cutter into brick size. The green bricks are then dried either by sun-drying or in a drying tunnel or rooms, which are heated for that purpose. After the bricks have been thoroughly dried they are taken to the kiln where they are set in the manner heretofore described and shown in the drawings. After the bricks are set in the kiln they are subjected to the step known as "water smoking." This step consists in heating the bricks by means of a slow fire from 400 to 500° Fahrenheit until the moisture has all been driven from the bricks. This water smoking process generally takes from three to four days, although the temperature and time used vary considerably with conditions. Care must be taken during this water smoking period to avoid subjecting the green bricks to too intense heat as this would cause the green bricks to shrink too fast or unevenly and might result in warping or cracking the bricks. In this step uniformity of heat is essential in order to obtain the best results. By arranging the kiln and the bricks in the manner heretofore described, it will be seen that the gases of combustion are brought into substantially direct contact with the entire surface of each brick (except the small ends). This is accomplished both by the vertical and by the horizontal heat passages referred to heretofore. After the water smoking period the bricks are then burnt by heating them from 2200 to 2300° Fahrenheit, depending upon conditions. This takes from approximately six to seven days. In this step uniform heating is also very desirable, and is accomplished in the same way during the water smoking period. The bricks are now finished and ready for use in pavements or for whatever purpose they may be desired.

The necessity of uniform heating of the bricks cannot be too strongly emphasized. This process obviates any necessity of repressing the bricks and the bricks can be thoroughly burnt in a considerably shorter time and with less heat than in the processes heretofore used. It is a particularly advantageous feature of my process that the very grooves and ribs which are necessary in the use of bricks in pavements serve to provide and easy and simple manner of obtaining uniform heating of the bricks during their manufacture. It has been demonstrated that the process in its commercial application is relatively economical and produces bricks which will withstand the heaviest traffic.

The invention is not limited to the details hereinbefore described except as set forth in the appended claims.

I claim as my invention:

1. A process of manufacturing bricks which consists in forming the green bricks having one or more grooves upon one lateral face of each brick, drying the green bricks, setting them in a kiln in a plurality of vertical slightly spaced apart rows, the superimposed horizontal rows of bricks setting over the grooves of the row beneath whereby heat passages are formed between the vertical and horizontal rows, heating the kiln and causing the gases of combustion to travel through said passages both vertically and

horizontally to obtain a uniform heating of the brick.

2. A process of manufacturing bricks which consists in forming the green bricks with a plurality of grooves upon one lateral face of each brick, drying the green bricks, setting them in a kiln in a plurality of vertical slightly spaced apart rows, the superimposed horizontal rows of bricks setting over the grooves of the row beneath whereby heat passages are formed between the vertical and horizontal rows, the bricks of the horizontal rows being offset to overlap the rows beneath to more effectively tie the bricks together, heating the kiln and causing the gases of combustion to travel through said passages both vertically and horizontally to obtain a uniform heating of the brick.

3. A process of manufacturing brick which consists in forming a groove on a face of each green brick, drying the green bricks, setting them in a kiln with the grooved face uppermost, and forming vertical and horizontal rows of bricks, the grooved portions serving as horizontal heat passages between the superimposed bricks, and then water-smoking and burning the bricks while so positioned in said kiln.

EMORY E. TROWBRIDGE.