Sept. 16, 1930. C. H. REKER 1,775,735

BRICK COLUMN FORMING PROCESS AND APPARATUS

Filed May 17, 1927 3 Sheets-Sheet 1

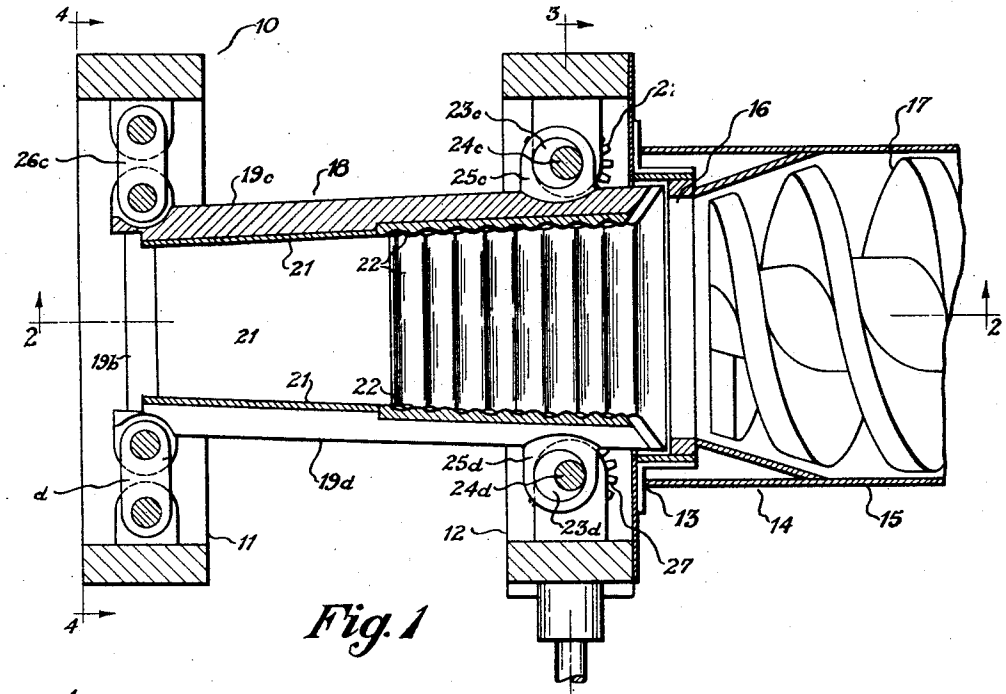


Fig. 1

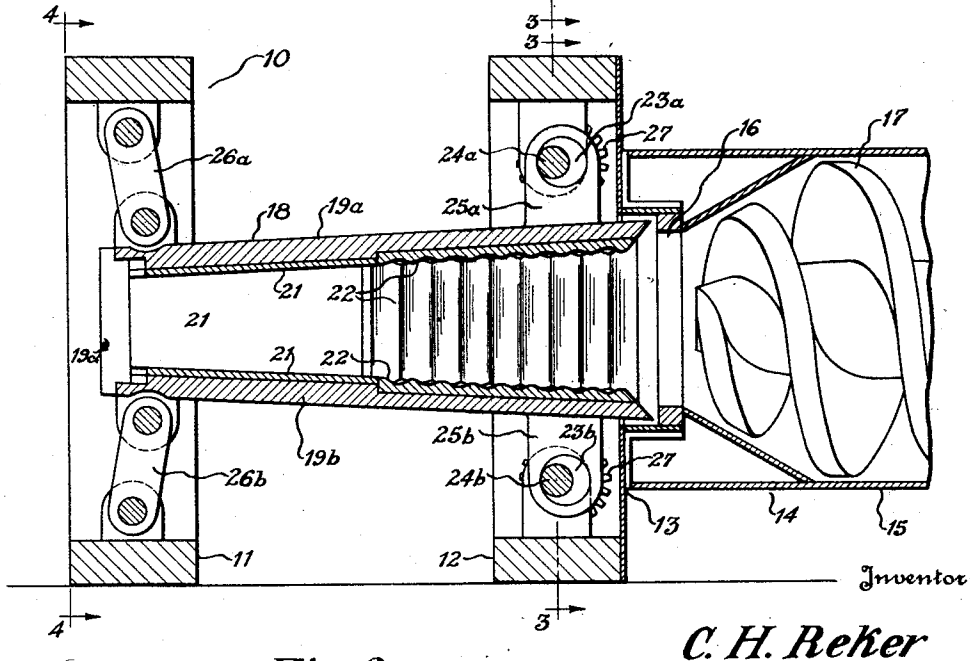


Fig. 2

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BRICK COLUMN FORMING PROCESS AND APPARATUS

Filed May 17, 1927 3 Sheets-Sheet 2

Fig. 3

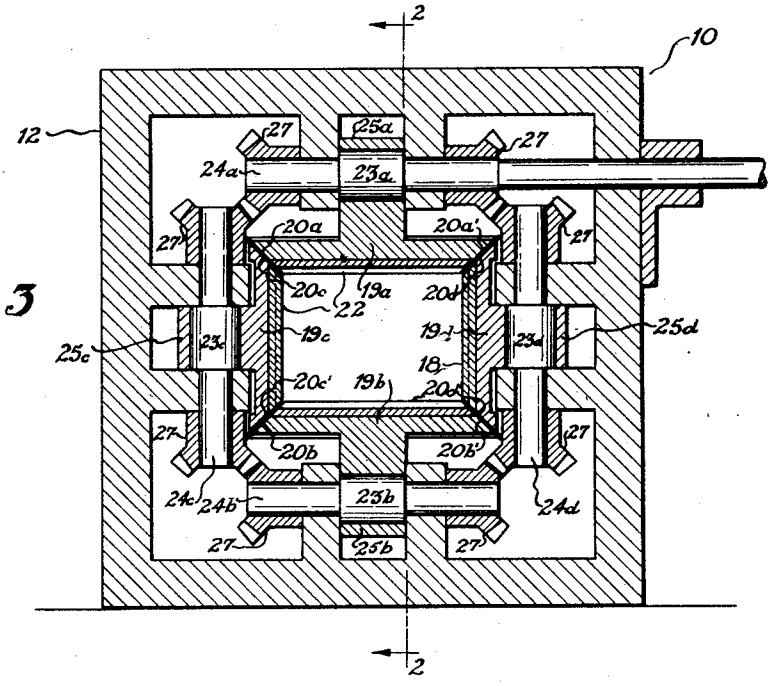
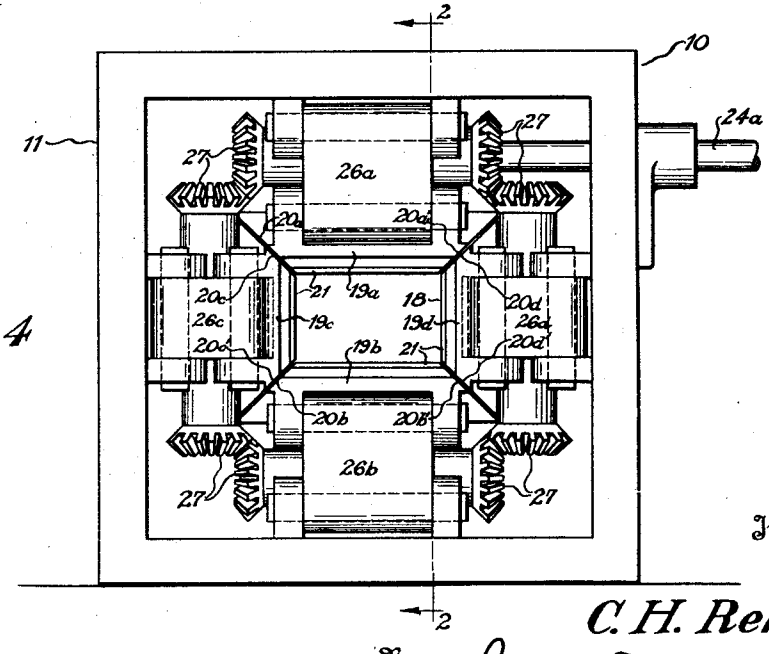


Fig. 4



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Filed May 17, 1927 3 Sheets-Sheet 3

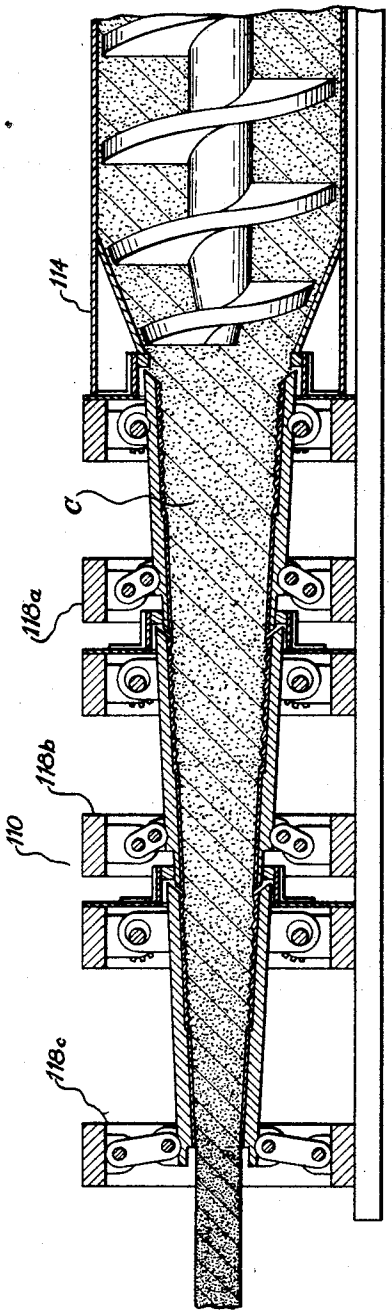


Fig. 5

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UNITED STATES PATENT OFFICE

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BRICK-COLUMN-FORMING PROCESS AND APPARATUS

Application filed May 17, 1927. Serial No. 192,081.

The invention relates to an improved process and to apparatus for carrying out the improved process of forming brick columns from stiff mud.

The stiff mud process as practiced includes preparing clay or shale to the consistency of stiff mud and then forcing the mud through stationary dies.

The usual apparatus for carrying out the process includes a pug mill and a brick machine for preparing the stiff mud from the clay or shale, and mud forcing means which usually consist of a screw conveyor or auger operating in a tubular casing and forcing the clay from one end of the casing into and through a column forming die, and thence through a brick cutting machine.

The column forming die is usually a tapered rectangular box or casing having both opposite ends open. The large end opening of the die receives the clay from the auger, and for standard bricks, the rectangular dimensions of the small end opening of the die may be about 4 x 8½ inches.

As the column flows through the die it may be lubricated by steam or oil.

When the aforesaid usual process is carried out by means of the usual apparatus, due to the friction of the interior surfaces of the die walls against the column flowing therethrough, the central longitudinal portion of the column travels faster than the side portions which must overcome the frictional resistance of the inner surfaces of the die walls.

Accordingly seams and crevices are formed in columns comprising certain clays and shales and in others stratification occurs.

Moreover in the operation of the usual apparatus, air is introduced into the column, preventing a satisfactory bond, and leaving minute void in the finished brick.

Accordingly bricks made by the usual process are not completely homogeneous, and have neither a uniform density, nor a density as great as desirable.

Moreover due to the friction of the die, the over all power required to operate the apparatus is excessive.

The objects of the present invention include the provision of an improved process for producing a more homogeneous and impervious brick, and an improved apparatus for carrying out the process.

Other objects of the invention with respect to the apparatus, include the following:

First, the provision of an improved die in which the friction of the moving column against the die walls shall be reduced to minimum, thereby eliminating differential flow of the column, as well as reducing power requirements.

Second, the provision of an improved die, the operation of which will remove the air from the moving clay column;

Third, the provision of an improved structure and arrangement permitting the use of two or more of the improved dies in tandem for attaining a high density in the resulting brick, and for reducing the pressure required to be applied on the moving column by the auger; and

Fourth, the provision of an improved power driven die which will accelerate the moving column, instead of retarding the same in the manner of the usual stationary die, thereby reducing the over all power requirement of forming and preparing the column, the power consumed by the power driven die being relatively small as compared with the amount of power saved by reducing the required auger pressure.

These and other objects are attained by the present invention as will be described in greater detail hereafter, and claimed.

Preferred embodiments of the improved apparatus for carrying out the improved process are illustrated in the accompanying drawings forming part hereof, in which

Figure 1 is a fragmentary plan view of one embodiment of the improved apparatus, portions being broken away and illustrated in section;

Fig. 2, a vertical longitudinal sectional view thereof as on line 2—2, Figs. 1, 3, and 4;

Fig. 3, a transverse sectional view thereof as on line 3—3, Figs. 1 and 2;

Fig. 4, an end view thereof as in the direction of the arrows 4—4, Figs. 1 and 2; and

Fig. 5, a longitudinal vertical sectional view illustrating another embodiment of the apparatus including three of the improved dies operating in tandem.

Similar numerals refer to similar parts throughout the drawings.

The improved process of the present invention, includes alternately compressing a clay column from different directions, and moving the column longitudinally during the compressing operations, for rendering the material of the column more dense and homogeneous.

This novel process is preferably carried out by the use of the improved apparatus hereof, one embodiment of which is indicated generally at 10, in Figs. 1 to 4, inclusive, and which includes longitudinally spaced rectangular frames 11 and 12.

The frame 12 is preferably located in abutment with the exit end 13 of means indicated generally at 14 for continuously feeding under a suitable pressure a column of clay through the frames and the improved mechanism mounted and operated therein.

The clay feeding means 14 may include a tubular casing 15 at the exit end 13 of which there is located an orifice 16, and a screw conveyor or auger 17 is operatively mounted within the casing 15 for delivering under any desired pressure, clay or shale, preferably in the stiff mud condition, through the orifice 16.

The frames 11 and 12 operatively mount an improved power driven die indicated generally at 18.

The improved die 18 preferably includes vertically spaced movable top and bottom pressure members 19^a and 19^b, respectively, and laterally spaced movable side pressure members 19^c and 19^d.

These pressure members are preferably in the form of tapered plates which are preferably made of either rolled steel or steel casting, reinforced or ribbed if necessary to attain the necessary strength.

The adjacent side faces of the pressure members are bevelled, and in their position of extreme displacement towards each other, the inner surfaces of the pressure members preferably determine a right rectangular pyramid whose longitudinal axis is horizontal.

As best illustrated in Figs. 3 and 4, the longitudinal side faces 20^a and $20^{a'}$ of the top pressure member 19^a, the longitudinal side faces 20^b and $20^{b'}$ of the bottom pressure member 19^b, the longitudinal side faces 20^c and $20^{c'}$ of the side pressure member 19^c, and the longitudinal side faces 20^d and $20^{d'}$ of the side pressure member 19^d, are each beveled at an angle of substantially 45° for making joints at the corners which are nearly but not entirely tight, so that air may escape through these joints as the air is worked out of the moving clay column by the action of the pressure members.

A smoothing liner plate 21 is preferably provided at the exit end of each pressure member, and a non-slip corrugated liner plate 22 is preferably provided at the entrance end of each pressure member.

The set of top and bottom pressure members 19^a and 19^b are driven mechanically in a horizontal and vertical direction, and the set of side pressure members 19^c and 19^d are driven mechanically in a horizontal and lateral direction, the separate members of each set moving towards and away from each other simultaneously, and the members of one set moving towards each other when the members of the other set are moving away from each other, and the members of one set preferably attaining a position of extreme displacement towards each other at the time the members of the other set reach their position of extreme displacement away from each other.

Accordingly the sets of pressure members apply alternate compression strokes from different directions upon the clay column, the directions of the compression strokes of one set of pressure members being preferably in a plane at right angles to the plane including the directions of the compression strokes of the other set.

Means for driving the pressure members may include an upper eccentric 23^a secured upon a preferably horizontal shaft 24^a which is journaled in the frame 12 above the upper pressure member 19^a. The eccentric 23^a is rotatably mounted in an eccentric strap 25^a extending upwardly from and preferably integral with the upper pressure member 19^a.

In a like manner, a lower eccentric 23^b is secured upon a preferably horizontal shaft 24^b which is journalled in the frame 12, below the lower pressure member 19^b. The eccentric 23^b is rotatably mounted in an eccentric strap 25^b preferably integral with and extending downwardly from the lower pressure member 19^b.

Similarly, at the outside of the side member 19^c, an eccentric 23^c is secured upon a preferably vertical shaft 24^c which is journalled in the frame 12 at the outside of the side pressure member 19^c. The eccentric 23^c is rotatably mounted in an eccentric strap 25^c preferably integral with and extending outwardly from the side pressure member 19^c.

Finally, at the outside of the side member 19^d, an eccentric 23^d is secured upon a preferably vertical shaft 24^d which is journalled in the frame 12 at the outside of the side pressure member 19^d. The eccentric 23^d is rotatably mounted in an eccentric strap 25^d preferably integral with and extending outwardly from the side pressure member 19^d.

For carrying out the desired movements, the upper and lower eccentrics 23^a and 23^b

are arranged to be rotated 180° out of phase with each other; and similarly the side eccentrics 23^e and 23^d are arranged to be rotated 180° out of phase with each other.

For attaining the alternate compression of the moving clay column, the top and bottom eccentrics as a set, are rotated 180° out of phase with the side eccentrics as a set.

As illustrated, the strap and eccentric connection of the pressure members with the frame 12 is at the entrance end of the pressure members, and the exit end of the top pressure member 19^a is pivotally connected with the lower end of a link 26^a, the upper end of which is pivotally connected with the frame 11.

Likewise, the exit end of the lower pressure member 19^b is pivotally connected with the upper end of a link 26^b, the lower end of which is pivotally connected with the frame 11.

Similarly, the exit end of the side pressure member 19^c is pivotally connected with the inner end of a link 26^c, the outer end of which is pivotally connected with the frame 11.

Finally, the exit end of the side pressure member 19^d is pivotally connected with the inner end of a link 26^d, the outer end of which is pivotally connected with the frame 11.

The links thus oscillate from the frame 11 and are proportioned, so that the exit ends of the opposite dies of each set will move towards each other to compress the column passing therethrough on the forward and compression movement of the eccentrics for that set, releasing on the return stroke.

The amount of compression from the links is preferably very slight, and in the present embodiment including a single power driven die, the motion of the exit ends of the side pressure members is mainly for smoothing the column passing therethrough, maximum compression and working of the clay column being attained by the entrance ends of the pressure members.

For simultaneously driving the several eccentrics, the upper horizontal shaft 24^a extends outwardly from one side of the frame 12, and is connected with a motor or the like not shown.

All the shafts are connected with each other by sets of bevel gearing 27, whereby rotation of the upper shaft 24^a causes the side shafts and the lower shafts to rotate in the desired phase relation, as indicated by the arcuate arrows on each shaft.

For each complete revolution of the drive shaft 24^a, each set of eccentrics is driven through a complete revolution, thereby alternately compressing and releasing the column in the horizontal and then in the vertical direction during each revolution, and the operation of each set of pressure members advancing the column from the entrance end through the exit end.

The movement of the pressure members as illustrated, is attained by mechanical means, but cams and electrically operated solenoids, may be utilized for this purpose.

The operation of the sets of pressure members, the individual members of which alternately move towards and away from each other, serves to work the clay column, drive air out of the column, and to form the column into a homogeneous densified bar from which the brick may be cut to size.

The auger 17 maintains a pressure on the column as it advances through the power driven die 18, so that the speed of the clay column is substantially the same as the speed of the forward strokes of the side members, whereby the column will flow continuously through the power driven die without slip.

This auger pressure will vary as the taper of the die, and the hardness or water content of the clay or shale fed into it.

The embodiment 110 of the apparatus illustrated in Fig. 5 includes clay feeding means 114 feeding a clay column C successively through a plurality of power driven dies 118^a, 118^b, and 118^c, respectively, the construction and operation of each of which is similar to that described for the power driven die 18, the exit opening of each die corresponding to the entrance opening of the next and the exit opening of the final die being of the desired size.

By the use of a plurality of power driven dies, a very homogeneous and densified clay column is attained.

I claim:

1. The process of forming a column of material such as clay for making brick and the like, which includes alternately compressing the column from different directions.

2. The process of forming a column of material such as clay for making brick and the like, which includes alternately compressing the column from directions angularly spaced from each other substantially 90°.

3. The process of forming a column of material such as clay for making brick and the like, which includes longitudinally moving the column and simultaneously and alternately compressing the column from different directions.

4. The process of forming a column of material such as clay for making brick and the like, which includes longitudinally moving the column and simultaneously and alternately compressing the column from directions angularly spaced from each other substantially 90°.

5. Apparatus for forming a column of material such as clay for making brick and the like, including means for alternately compresing the column from different directions.

6. Apparatus for forming a column of material such as clay for making brick and the like, including means for alternately compressing the column from directions angularly spaced from each other substantially 90°.

7. Apparatus for forming a column of material such as clay for making brick and the like, including means for moving the column longitudinally and simultaneously and alternately compressing the column from different directions.

8. Apparatus for forming a column of material such as clay for making brick and the like, including means for moving the column longitudinally and simultaneously and alternately compressing the column from directions angularly spaced from each other substantially 90°.

9. Apparatus for forming a column of material such as clay for making brick and the like, including sets of oppositely spaced pressure members, and means for alternately moving the members of the sets towards and away from each other.

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