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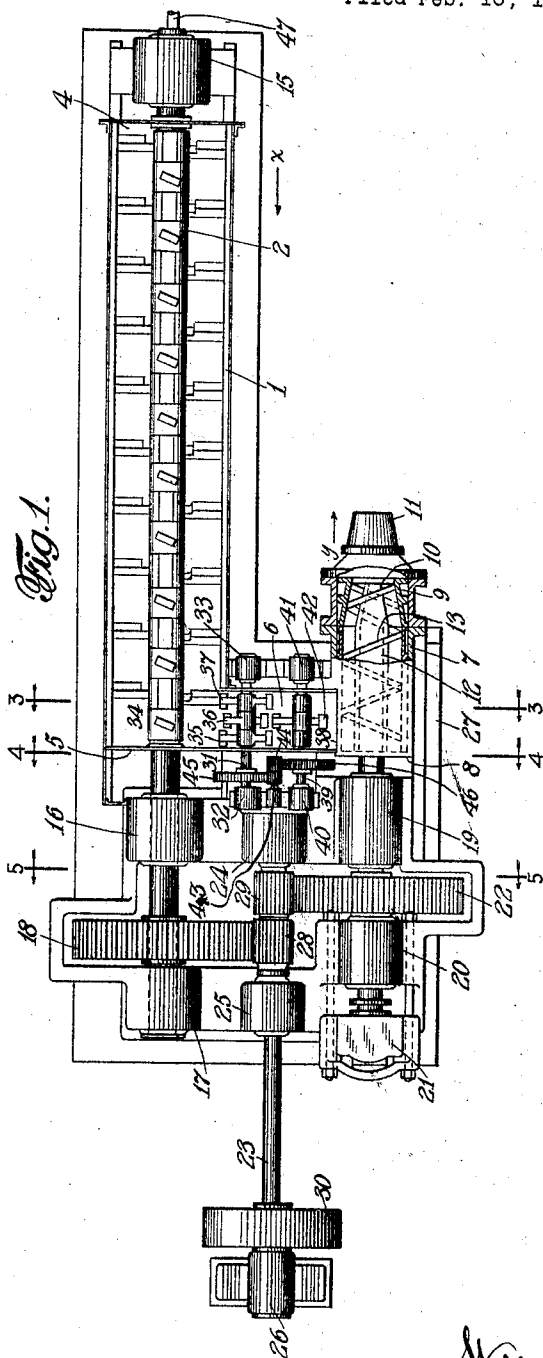
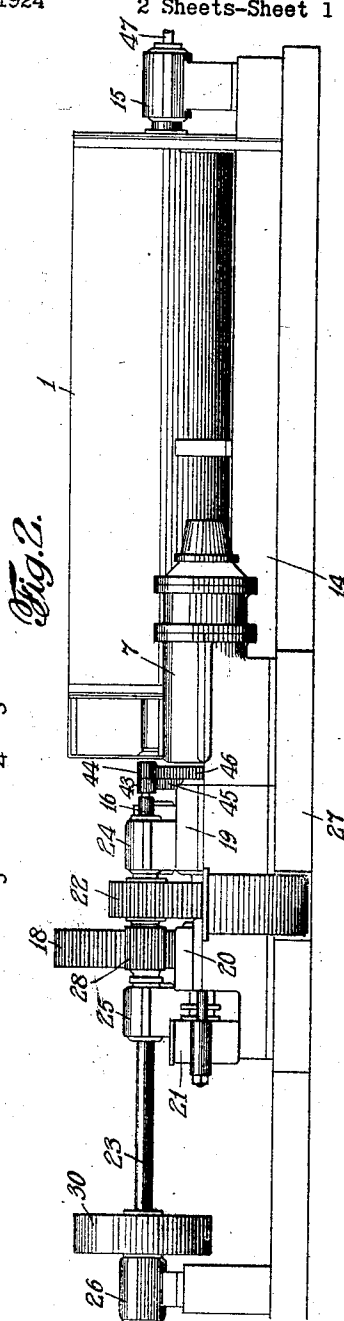
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CLAY TEMPERING AND EXPRESSING APPARATUS

Filed Feb. 16, 1924

2 Sheets-Sheet 1



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June 1, 1926.

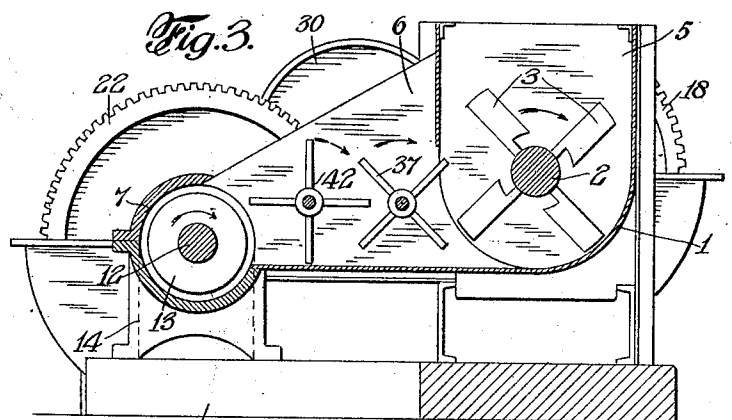
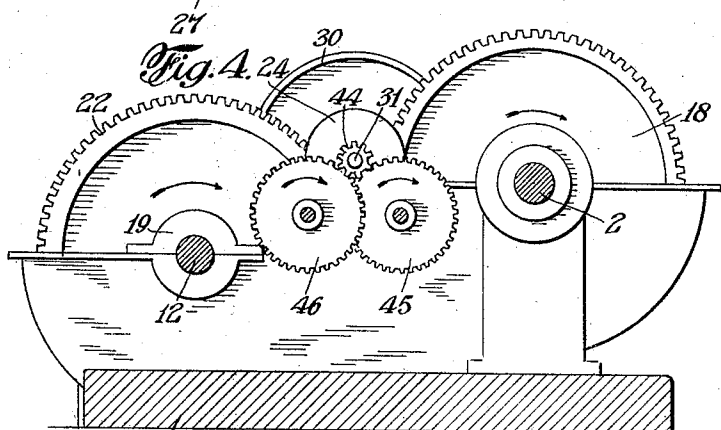
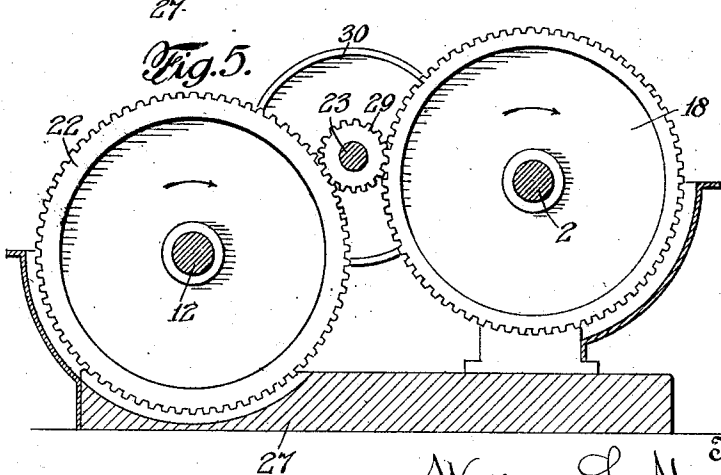
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CLAY TEMPERING AND EXPRESSING APPARATUS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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CLAY TEMPERING AND EXPRESSING APPARATUS.

Application filed February 16, 1924. Serial No. 693,151.

My invention consists in the novel features hereinafter described, reference being had to the accompanying drawings, which show one embodiment of the same selected by me for purposes of illustration, and the said invention is fully disclosed in the following description and claims.

In the construction of machines for tempering and expressing clay in the production of brick, tile and other clay products, where these instrumentalities are combined in a single machine, the expressing mechanism is usually arranged either on the same shaft as the tempering mechanism or the expressing mechanism is located laterally of the delivery end of the tempering mechanism and projects beyond the same and in the same direction. These constructions are open to numerous objections, among which may be noted the following. The expressing mechanism is employed usually to force a stream of clay through a die or between dies, for the purpose of imparting a desired form to the expressed stream of clay, and this operation requires a great deal of power. In the constructions above referred to, the expressing devices must necessarily be located at a very considerable distance from the power actuating mechanism, thus subjecting the driving shaft for the expressing device to great torsional strain and increasing the difficulty of operating the expressing mechanism. Again, in such constructions, the stream of clay issues from the expressing mechanism at a considerable distance from the tempering mechanism and separate operatives are necessary to insure the correct and continuous operation of these two mechanisms.

My invention has for its object a novel construction in which the tempering mechanism and expressing mechanism are arranged side by side and preferably in substantially the same horizontal plane, the discharge end of the tempering mechanism being connected to the inlet end of the expressing mechanism at a point closely adjacent to the driving means for both mechanisms, the direction of movement of the clay in the tempering mechanism being opposite that of its movement through the expressing mechanism. As the expressing mechanism is shorter than the tempering mechanism it follows in this construction that the discharge end of the expressing mechanism is located alongside of the tem-

pering mechanism and between its ends, so that the operation of both devices may be readily observed and looked after by a single operator and the driving means for the expressing mechanism, together with the necessary thrust-bearing for the shaft thereof are located closely adjacent to the expressing mechanism, thus dispensing with the necessity of the long shaft and obviating the extreme torsional strains incident to the operation of apparatus in which such long shafts are employed. My invention also contemplates the arrangement of a common driving shaft for both mechanisms disposed centrally between the shafts of the tempering and expressing mechanisms effecting a more even and well balanced drive for the same, and the tempering and expressing mechanisms are connected closely adjacent to said driving means by a throat in which I prefer to locate transferring mechanism for insuring the transfer of the clay from the tempering mechanism to the expressing mechanism, which transferring mechanism is also conveniently operated from the centrally disposed driving shaft, and preferably from an axially aligned extension thereof.

Referring to the accompanying drawings, Fig. 1 is a top plan view, partly in section, of a combined clay tempering and expressing mechanism embodying my invention and selected by me for purposes of illustration thereof.

Fig. 2 is a side elevation of the apparatus illustrated in Fig. 1.

Fig. 3 is an enlarged transverse vertical section on line 3—3 of Fig. 1.

Fig. 4 is an enlarged transverse vertical section on line 4—4 of Fig. 1.

Fig. 5 is an enlarged transverse vertical section on line 5—5 of Fig. 1.

As illustrated in these figures, the clay tempering mechanism or "pug mill" as it is commonly called, comprises a horizontally disposed cylinder or casing, 1, which may be open at the top as shown, or may be closed, as desired, said cylinder being provided with a longitudinal shaft, 2, on which are secured tempering blades, 3, for mixing the clay with water, and bringing it to the proper condition of plasticity. The tempering cylinder is provided with means for moving the clay as it is operated upon by the tempering blades from the inlet end, indicated at 4 in the direction of the arrow, *x*, in

Fig. 1, toward the discharge end of the cylinder, indicated at 5 and this may be accomplished by setting the tempering blades, 3, at a considerable angle, as indicated in Fig. 1, so that the tempering blades themselves perform the function of feeding the clay endwise from one end of the cylinder to the other, or any other different or additional means may be employed for insuring the longitudinal feed of the clay through the tempering cylinder, if desired. Adjacent to the delivery end of the tempering cylinder it is connected by a transversely disposed throat or passage, 6, with the cylinder, 7, of the expressing mechanism, commonly termed the "auger", which is disposed with its axis substantially parallel to the axis of the tempering cylinder, and has its inlet end, 8, adjacent to said throat and located substantially in alignment transversely of the machine with the discharge end, 5, of the tempering cylinder. The outlet end of the expressing cylinder is provided preferably with tapering portions, 9, leading to the discharge outlet, 10, which preferably communicates with a suitable die, indicated at 11, for giving the expressed stream of clay the desired form, as for a brick, pipe or hollow tile, as the case may be, it being understood that the stream of clay will be suitably severed into individual bricks, pipes or tiles by means of cutting mechanism, not shown, in any usual or desired manner. The expressing cylinder is provided with a longitudinal shaft, 12, extending longitudinally therethrough, and provided with an expressing screw or auger, indicated at 13, for feeding and expressing the tempered clay from the cylinder in the direction of the arrow, *y*, in Fig. 1. It will be noted that the arrangement of the cylinders, 1 and 7, is such that the movement of the clay through the expressing cylinder is in a direction exactly opposite to the direction of movement of the clay through the tempering cylinder, and that the discharge aperture of the expressing cylinder and the die or dies connected therewith, are located alongside of the tempering cylinder and between the inlet and outlet ends thereof.

The tempering and expressing cylinders are preferably mounted on a suitable base, indicated at 14, which preferably also supports the main portions of the driving mechanism. The shaft, 2, of the clay tempering mechanism is provided adjacent to the outer or inlet end of said cylinder with a thrust bearing, 15, and adjacent to its delivery end with supporting bearings, 16, and 17, between which the shaft is provided with a large gear wheel, 18. The shaft, 12, of the expressing mechanism is provided adjacent to its inlet end with bearings, 19 and 20, and thrust-bearing, 21, extending across the end of the shaft, 12, in alignment with the axis

thereof, to receive the severe end thrust of said shaft, said shaft being also provided between the bearings, 20 and 19, with a large gear wheel, 22. I prefer to mount the main driving shaft, indicated at 23, in bearings, 24 and 25, supported on the main frame or base of the machine, and in an exterior bearing, 26, which may be separately supported upon the same foundation, 27, or independently supported as preferred, the said driving shaft being located between and parallel to the shafts, 2 and 12, of the clay tempering and expressing mechanisms, and provided with driving pinions, 28 and 29, between the bearings, 24 and 25, and meshing respectively with the gear wheels, 18 and 22, for operating the shafts of the tempering and expressing mechanisms at the desired relative speeds. This construction provides a well balanced driving mechanism and insures the durability and efficiency of the machine. The arrangement of the driving gears, 18 and 22, in different planes transversely of the machine, and the provision of the two separate driving pinions, 28 and 29, also contributes to these effects. There is great stress applied to the gear teeth of the pinions, 28 and 29. The engagement of the pinion, 28, with the gear, 18, will tend to react on the driving shaft, 23, in an upward direction, which reaction will be counteracted by the contrary reaction between the pinion, 29, and the gear, 22. The shaft, 23, may be driven from an electric motor or other source of power means of cog, chain or pulley drive gearing as may be desired. In the present instance I have shown the driving shaft provided with a driving pulley, 30, adapted to be connected by means of a belt with a pulley on the motor or other source of power.

The throat, 6, which connects the delivery end of the tempering mechanism with the inlet end of the expressing mechanism, is preferably provided with a horizontally disposed bottom wall and inclined upper wall, as indicated in Fig. 3, to direct the tempered clay from the cylinder, 1, to the cylinder, 7, and this throat or passage connecting the two cylinders is preferably provided with transferring mechanism for positively transferring the tempered clay from the cylinder, 1, to the cylinder, 7. In this instance the transferring mechanism comprises a plurality of rotary paddles so constructed that they cannot come into contact with each other. In the present instance I have shown the throat, 6, provided with a shaft, 31, mounted in bearings, 32 and 33, on opposite sides of the throat adjacent to the delivery orifice, 34, of the tempering cylinder, 1, the said shaft, 31, being provided with a plurality of rotary paddles, in this instance three sets, 35, 36 and 37. Adjacent to the receiving aperture, 38, of the ex-

pressing cylinder, 7, at the other end of the throat, I provide a similar shaft, 39, mounted in bearings, 40—41, on opposite sides of the throat and provided with one or more rotary paddles, three sets of rotary paddles, 42, being shown in this instance. The shafts, 31 and 39, are located, as will be seen, on opposite sides of and equally distant from the axis of the main driving shaft, 23, and said shaft or an extension thereof, is provided with pinions, 43 and 44, which respectively engage a gear wheel, 45, on the paddle shaft, 31, and a gear wheel, 46, on the paddle shaft, 39, thus providing a balanced driving mechanism for the paddles. The reactions between the separate pinions, 43 and 44, and the respective driving gears, 45 and 46, of the paddle shafts, counterbalance each other in the same manner as in the case of the driving mechanism for the shafts of the tempering and expressing cylinders. Each of these paddles comprise a hub provided with outwardly extending arms, carrying paddle blades (or any convenient form of paddles may be employed) and the paddle blades of the various circular series of paddles on the respective shafts, 31 and 39, are so arranged with respect to their driving gearing, and with respect to each other, that they cannot at any time strike each other. While I have shown the throat, 6, provided with transfer mechanism in the form of rotary paddles, or rotary blades, I wish it to be understood that I do not limit myself to this construction as other forms of mechanism may be employed for positively effecting a transfer of the clay from the discharge end of the tempering cylinder to the inlet end of the expressing cylinder.

As previously stated, the stream of clay issuing from the die, 11, operatively connected with the expressing mechanism, may be severed into individual bricks, pipes, tiles, etc., by suitable cutting mechanism (not shown). I prefer to provide the shaft, 2, of the tempering mechanism, with an extension, 47, at its outer end, as indicated in Figs. 1 and 2, as a convenient means of providing the necessary power for operating said cutting mechanism, which may be of any desired or usual character, and which may be connected to said shaft extension, 47, by cog, chain or belt and pulley power transmission, as may be found most desirable.

The operation of my improved apparatus is as follows. The driving shaft, 23, is operated, as before stated, from an electric or other motor, or a driving shaft, or other suitable source of power, preferably an electric motor, and said shaft will drive the shaft, 2, of the tempering mechanism in such direction as to both temper the clay and convey it from the inlet end, 4, thereof, in

the direction of the arrow, *z*, Fig. 1, toward the outlet end. At the same time the shaft, 12, of the expressing mechanism is operated in such direction as to force the clay in the opposite direction, indicated by the arrow, *y*, Fig. 1. The driving shaft also imparts rotary movement to the transfer paddles located in the throat, 6, connecting the tempering mechanism and expressing mechanism. The clay, and a certain amount of water is preferably introduced into the tempering cylinder or casing, 1, adjacent to the inlet end, 4, thereof, in any suitable manner, and the tempering blades, 3, will effect the mixing of the clay and water and the tempering thereof to the required degree of plasticity. The clay in the cylinder, 1, is gradually fed toward the delivery end of the cylinder or casing where it passes through the discharge aperture, 34, into the throat, 6, and is fed or transferred by the paddles, 35 and 36, through said throat and through the inlet aperture, 38, of the expressing cylinder, 7, where it is engaged by the expressing screw, or auger, 13, and moved in the direction of the arrow, *y*, Fig. 1, toward and discharged through the delivery aperture, 10, and expressed through the die, 11, from which the clay issues in a stream of the desired cross sectional form and is thereafter severed into individual bricks, pipes, tiles, etc., as the case may be, according to the type of die employed, which may be of any desired or usual character.

It will be seen that the apparatus is extremely compact, the two cylinders or casings of the tempering mechanism and expressing mechanism, respectively, being arranged side by side and preferably in substantially the same horizontal plane and connected by the throat, 6, the direction of movement of the clay through the tempering cylinder being exactly opposite to the direction of its movement through the expressing cylinder, and the expressing die being located alongside of a portion of the tempering cylinder between the ends thereof so that the correct operation of the tempering mechanism and expressing mechanism can readily be observed and secured by a single operator. It will also be noted that the delivery end of the tempering mechanism and the inlet end or receiving end of the expressing mechanism are located in substantially the same transverse vertical plane and closely adjacent to the driving mechanism, so that only a short shaft for the expressing screw or auger is required and the driving gear for this shaft, which requires the greatest exertion of force to operate it is brought very close to the inlet end of the expressing cylinder, as is also the step or thrust bearing for said shaft. It will also be noted that the main driving shaft is located between the gears on the

driving shafts for the tempering mechanism and expressing mechanism respectively, thus providing a well balanced driving mechanism, and that the main driving shaft or an extension thereof, also drives the rotary paddles or transfer mechanism from a point substantially centrally between the shafts thereof. The construction of this apparatus is extremely convenient and efficient, and the objections hereinbefore noted as incidental to the use of the prior forms of apparatus for these purposes are entirely obviated.

What I claim and desire to secure by Letters Patent is:—

1. A machine of the character described, comprising among its members, a horizontal clay tempering cylinder, and a horizontal clay expressing cylinder, arranged side by side in substantially the same horizontal plane, the discharge end of the clay tempering cylinder being connected to the inlet end of the clay expressing cylinder, by a substantially horizontal throat, clay feeding devices in said respective cylinders for feeding the clay in opposite directions therein, and transferring mechanism located in said throat for positively transferring the clay therethrough from the tempering cylinder to the expressing cylinder.

2. A machine of the character described, comprising among its members, a horizontal clay tempering cylinder, and a horizontal clay expressing cylinder, arranged side by side in substantially the same horizontal plane, the discharge end of the clay tempering cylinder being connected to the inlet end of the clay expressing cylinder, by a substantially horizontal throat, clay feeding devices in said respective cylinders for feeding the clay in opposite directions therein, a plurality of rotary clay transferring devices located in said throat and having their axes in different locations transversely thereof, whereby the clay is positively transferred from one end to the other of said rotary transferring devices through said throat from the tempering cylinder to the expressing cylinder.

3. In a machine of the character described, the combination of a horizontally disposed clay tempering cylinder provided with a longitudinal shaft, and rotary clay tempering and feeding devices thereon, of a horizontal clay expressing cylinder located alongside of and in substantially the same horizontal plane as the tempering cylinder, said cylinders being connected by a transverse, horizontal throat, a rotary shaft in

said expressing cylinder provided with clay expressing means for moving the clay toward the outlet of the expressing cylinder, and in a direction opposite to that of the movement of the clay in the tempering cylinder, a driving gear on each of said shafts, said gears being located adjacent to the contiguous ends of the cylinder, a driving shaft having its axis located between axes of the shafts of the tempering and expressing mechanism, said driving gears being located out of alignment transversely of the machine, separate pinions on the driving shaft, one of which engages each of said driving gears, a pair of rotary paddle shafts extending through said throat and located in different positions transversely of the machine and on opposite sides of a line coaxial with the driving shaft, paddles on said rotary paddle shafts within said throat for positively transferring the clay from the tempering cylinder to the expressing cylinder, driving gears on said paddle shafts, said driving shaft having an extension located between said driving gears and provided with separate pinions in different transverse planes engaging the driving gears of the paddle shaft.

4. In a machine of the character described, the combination of a horizontally disposed clay tempering cylinder provided with a longitudinal shaft, and rotary clay tempering and feeding devices thereon, of a horizontal clay expressing cylinder located alongside of and in substantially the same horizontal plane as the tempering cylinder, said cylinders being connected by a transverse, horizontal throat, a rotary shaft in said expressing cylinder provided with clay expressing means for moving the clay toward the outlet of the expressing cylinder, and in a direction opposite to that of the movement of the clay in the tempering cylinder, a driving gear on each of said shafts, said gears being located adjacent to the contiguous ends of the cylinder, a driving shaft having its axis located between axes of the shafts of the tempering and expressing mechanism, the shaft of the expressing cylinder being provided with a thrust-bearing extending transversely across one end of said shaft in alignment with the axis thereof, and said driving shaft being geared with said driving gears.

In testimony whereof I affix my signature.

WILLIAM LEE HANLEY, JR.