

March 20, 1928.

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APPARATUS FOR PRODUCING CLAY PRODUCTS

Filed April 11, 1924

4 Sheets-Sheet 1

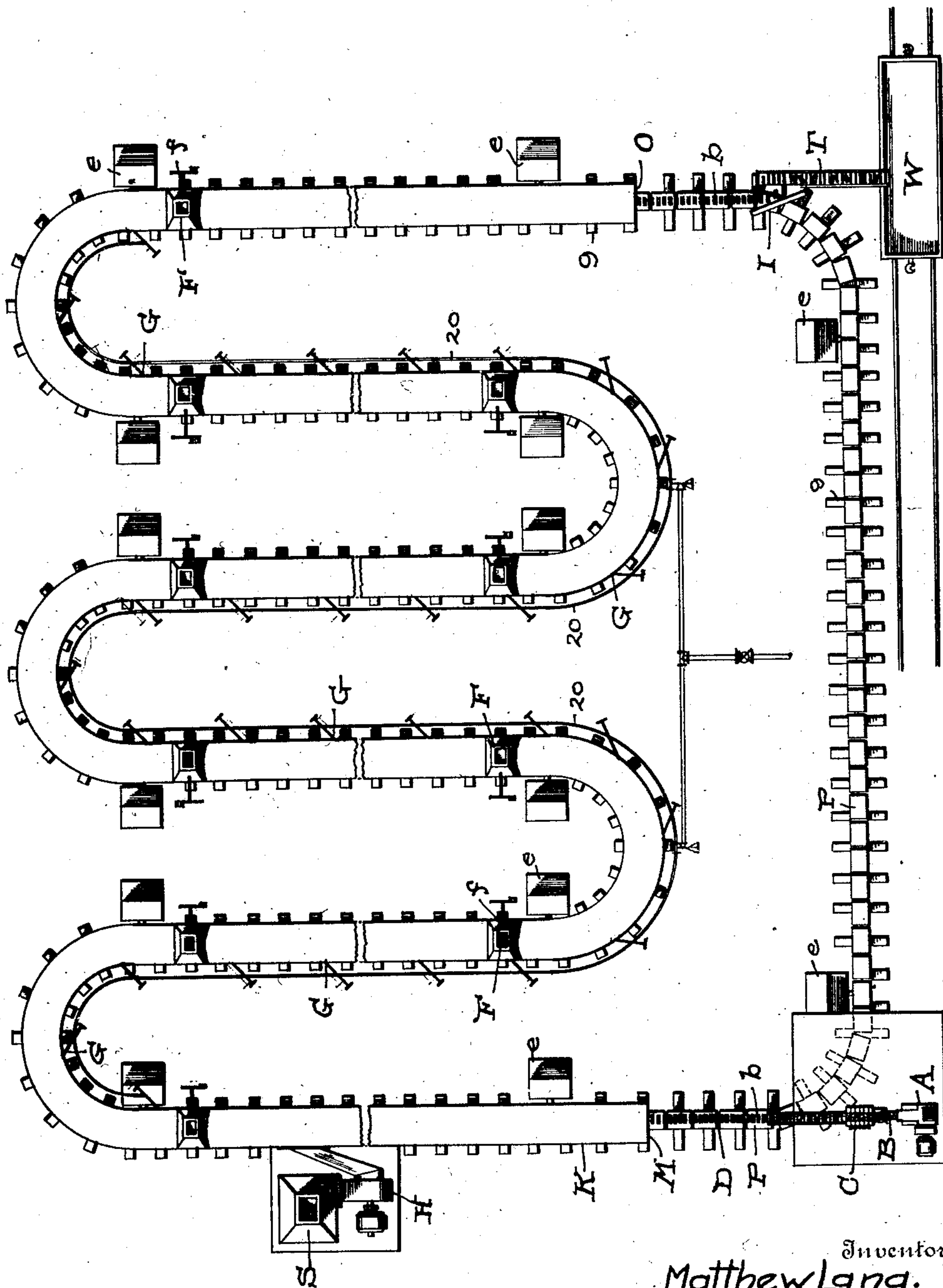


FIG. 1

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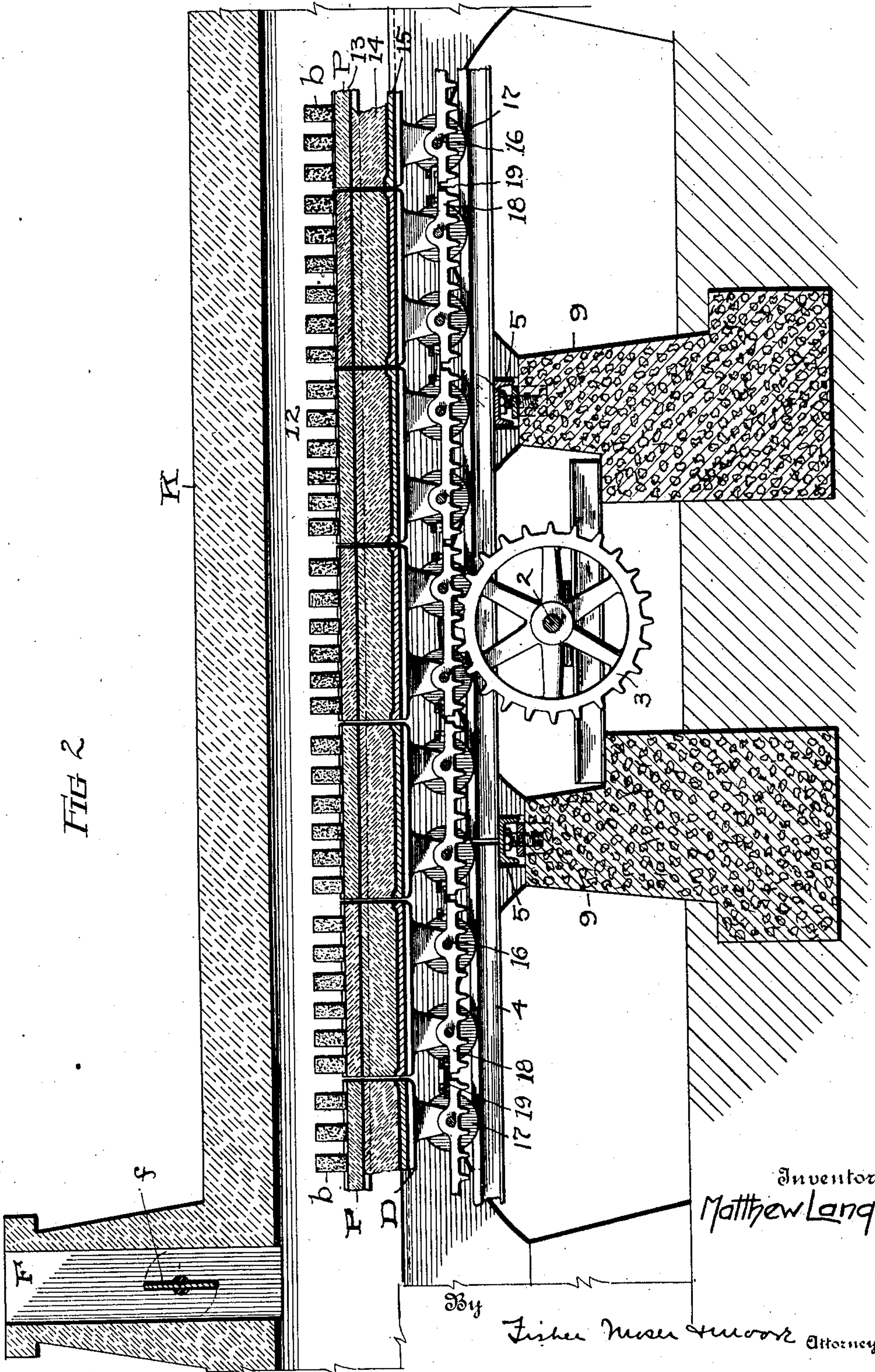
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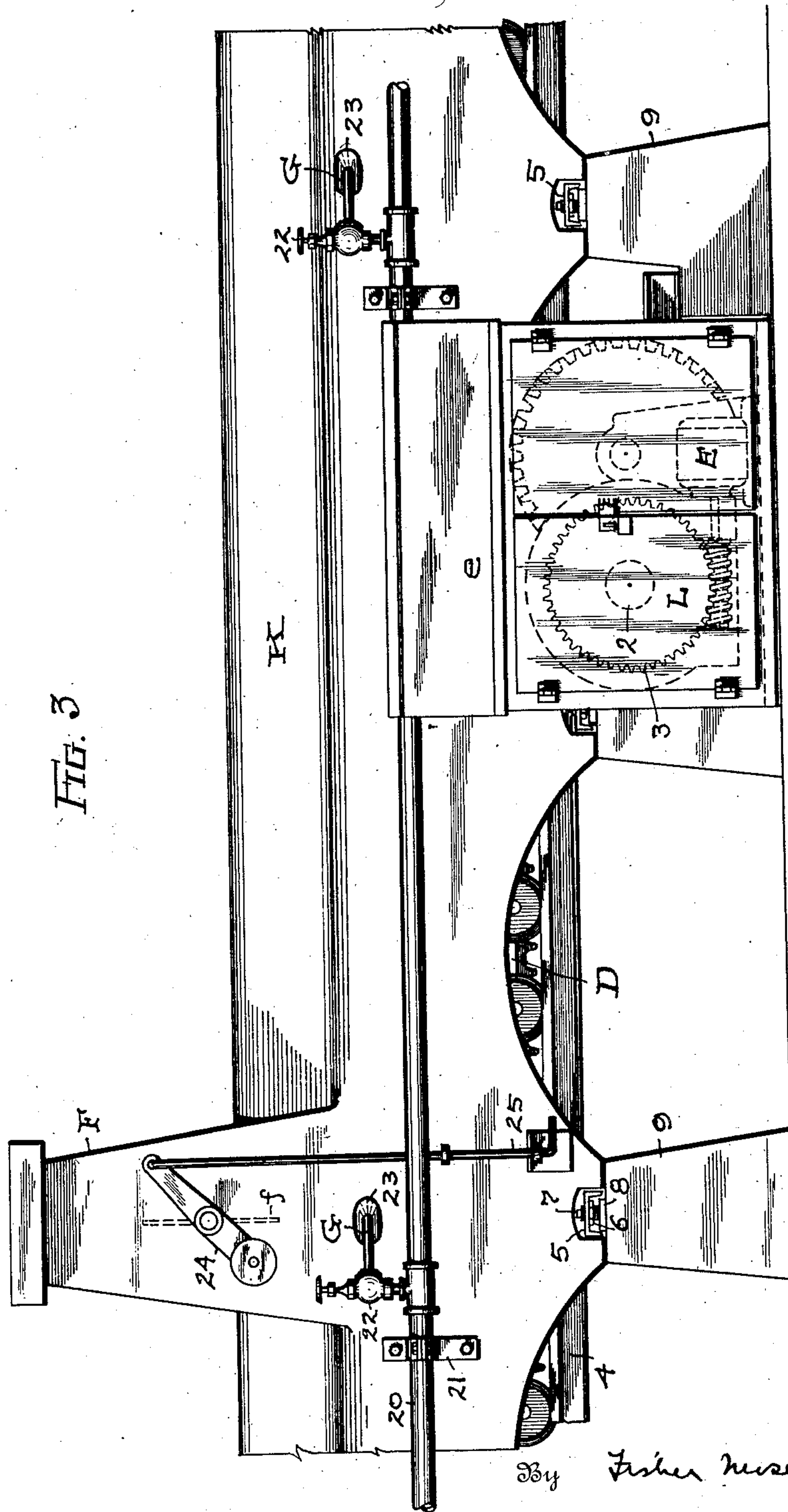
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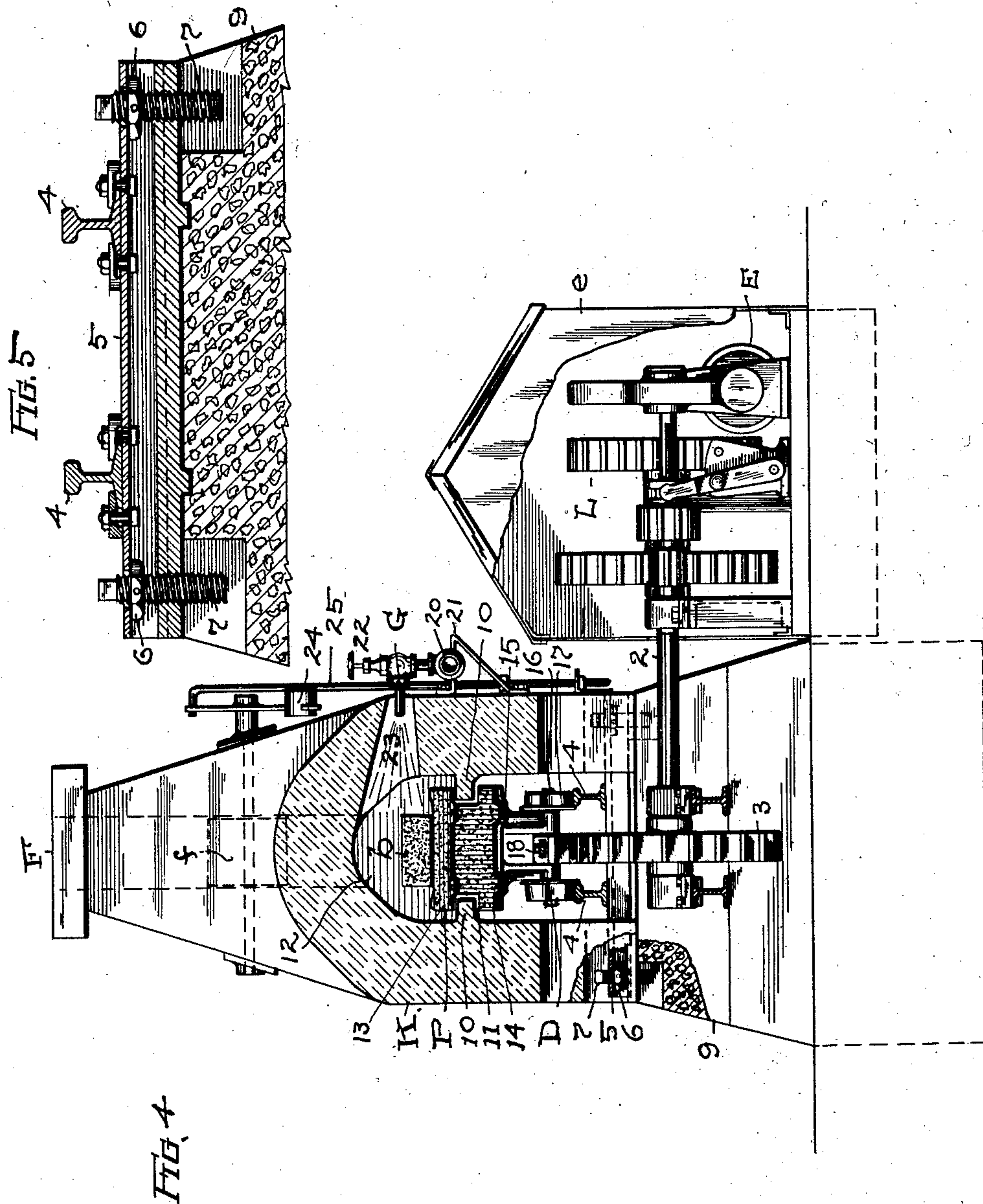
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APPARATUS FOR PRODUCING CLAY PRODUCTS.

Application filed April 11, 1924. Serial No. 705,827.

My invention relates to an apparatus for drying and burning clay products, such as brick, sewer pipe, tile and other wares, and my general object is to effect the drying and burning of such products in an economical and efficient way without manual labor and in a greatly shortened space of time as compared with present practices. Assuming that brick is the product to be produced, my inventive concept involves the handling and treatment of this product, by automatic mechanism including an automatic kiln from the initial formation of the brick in a green state in a pug mill or brick machine until the burnt or completed brick is loaded into a car or vehicle for transportation. In general, the sequence of steps consists in first forming the brick by machine; in feeding the brick continuously from the machine to an endless conveyor of fire pallets; in passing the brick continuously by means of the conveyor through a circuitous kiln constructed and arranged to first dry the green bricks and then to burn them while under constant movement; and in finally delivering the completed brick directly into a railway car for immediate transportation. In practicing this method I utilize an automatic apparatus substantially as hereinafter shown and described and as exemplified in the accompanying drawings, in which Fig. 1 is a plan or top view of the complete apparatus on a greatly reduced scale, and it should be understood that this view does not disclose the full or extreme length of the apparatus that may be used but is only indicative thereof.

Fig. 2 is a vertical section of a portion of the kiln on a larger scale. Fig. 3 is a side view of the portion of the kiln shown in Fig. 2. Fig. 4 is a vertical section transversely of the kiln. Fig. 5 is a cross section of the track and its adjustable supporting tie, this view being on a larger scale than Fig. 4.

In practicing my invention, the bricks or other product to be treated may be first formed and produced according to any accepted mode and machine, preferably, by automatic machinery adapted to effect continuous production and discharge of the product. For example, in making bricks I may use a common type of pug mill A, from which the clay will be extruded in the form of a rectangular bar B having the desired cross section and dimension of the bricks to

be made therefrom. The extruded bar is plastic and is forced by the continuous operation of the pug mill into and through a wire cutting machine C of any well known kind or type, which serves to sever bar B into sections or bricks b of predetermined thickness. As rapidly as these bricks are cut from the bar they are pushed onward in a straight line and deposited successively upon the refractory fire pallets P of an endless fire conveyor D and carried into the mouth or entrance M of a circuitous kiln K which is relatively small in cross section but of great length. The length of this kiln may vary dependent upon the kind or class of the product being made, and in making certain classes of bricks the kiln may be approximately 2500 ft. or more in length. Conveyor D comprising pallets P moves continuously but slowly throughout the full length of the kiln, and the bricks B on the pallets are exposed singly and successively to drying, burning, vitrifying and cooling temperatures for predetermined periods of time in their travel through the kiln. Finally the completed bricks emerge in a more or less cool state, from the outlet end O and are automatically shunted by a stationary intercepting and deflecting bar I from the pallets P to a gravity roller transfer device T which is adapted to deposit the bricks either in a pile or into a freight car W for transport to its ultimate destination.

From the foregoing it will be noted that no hand labor of any kind is resorted to from the beginning to the end of the making of the brick, that is to say, from the time it is produced at the pug mill until the completed brick is loaded into the freight car or dumped in a pile. Thus the bricks are automatically produced and delivered to the conveyor pallets in a green state, and automatically carried into the kiln. The kiln receives the bricks singly and successively and discharges the finished bricks coincidentally in the same way, the kiln being completely charged or loaded with bricks throughout its length, and each brick is separated from the others and constantly exposed to the flames of a series of oil or gas burners G arranged at intervals throughout the major length of kiln K. The temperatures maintained within the kiln may vary dependent upon the kind of ware being treated, and also upon the speed of the con-

veyor and the length of the kiln. Heating of the kiln and the products or ware passing therethrough may also be gradually accomplished by maintaining different temperatures at different points or within predetermined sectional lengths of the kiln, beginning with an exposure at atmospheric temperature and conditions at the entrance, until the temperature is raised up to 2000°, or even as high as 4000° with certain products, before the product is discharged automatically. Moreover during the latter period of travel of the product through the terminal section of the kiln the temperature may be lowered and a gradual cooling of the product effected before its automatic discharge and delivery into the open atmosphere. Regulation of the temperatures within the kiln may be effected by control of the valved burners G, and also by means of a series of ventilating flues F and dampers f located at intervals in each section of the circuitous kiln. A main stack S having a motor driven exhaust or suction fan H may also be used at the intake end of the kiln, preferably 100 feet more or less from the entrance M, to remove the moisture-laden air from the intake drying section of the kiln and promote a draft or circulation through the main part of the kiln, the direction of movement of the heated air within the major length of the kiln being inversely to the travel of the conveyor and product, excepting at the entrance and for a given length of the intake section up to stack S where a lower temperature is maintained to effect initial drying of the green product preparatory to its delivery to the hotter zones or sections where burning and even vitrifying results may be obtained. Before the product is automatically discharged from the kiln it is allowed to cool gradually, the outlet section of the kiln being heated to gradually lower temperatures. In this way a green product or ware may be automatically dried and subjected to gradually increasing firing temperatures, and then finally to gradually cooling temperatures before being automatically discharged and directly loaded upon a transporting vehicle without manual labor and also without incurring delay in the setting and filling of the kiln, in firing the kiln, and in the drawing or unloading of the same. The burning and vitrifying steps may also be accomplished with less labor and within much shorter periods of time than with other methods and apparatus known to me and in common use.

In loading the bricks automatically upon pallets P, the bricks are shoved one at a time down a slight incline upon the pallets as the conveyor moves slowly onward, and each brick is deposited upon one edge in slightly spaced relation to the preceeding brick which has been moving forward at a

slightly faster speed, the conveyor D moving a bit more rapidly than the feed movements of the pug mill or brick machine A.

A steady movement and continuous travel of the endless conveyor D and its pallets P is produced by a series of electric motors E and speed reducing power transmitting gears L contained within a suitable weather-protecting housing e arranged at intervals at the side of the kiln. The gearing L for each motor drives a shaft 2 carrying a large gear 3 situated centrally between two rails or tracks 4—4 extending longitudinally within the open bottom of kiln K. These rails or tracks are supported upon cross girders or metal ties 5, the opposite ends of which are adjustably supported by nuts 6 and vertical screws 7 extending upwardly from beams 8 resting upon transverse concrete piers or abutments 9 for the arched kiln K. The tracks 4 may be leveled by the adjustable means described, and the conveyor D thereby caused to travel without interference or friction with the side walls of the kiln, and which side walls are preferably provided with inwardly extending ledges or ribs adapted to occupy longitudinal channels or grooves 11 within the opposite sides of pallets P. The channels provide a substantially closed labyrinth or irregular passage at each side of the elongated firing chamber 12 of kiln K, and the pallets are made of refractory material. The superposed pallet sections may be of different refractory characteristics or properties, and the upper section 13 is preferably removable and replaceable. The bottom section 14 is mounted upon a metal bed plate 15 having depending brackets carrying separate shafts 16 for separate sets of flanged wheels 17 adapted to ride on tracks 4. A toothed bar or gear rack 18 is suspended from the shafts 16 centrally between the brackets and wheels, and these rack bars have the same length as each conveyor section and its pallets P. The rack bars of the successive sections are pivotally connected together by links 19, thereby providing an endless chain of operating rack bars which are adapted to be engaged centrally by the large driving gear 3 on each motor-driven unit of the elongated kiln. The conveyor operating units comprise independent electric motors, but the load is distributed and divided uniformly as the conditions or any given installation may require.

The desired firing or burning temperatures are obtained by oil or gas burners G deriving their supply of oil or gas from a main pipe supported upon brackets 21 at one side of kiln K, and having controlling valves 22 at each burner G. These burners may be placed to direct the gas into flaring openings 23 formed in either one or both side walls of the kiln above the line of travel of pallets

P, and the burners G and their openings 23 may be placed at an inclination relatively to the longitudinal medial line of the kiln and conveyor therein, so that the flames
 5 from the burner will be directed into the burner chamber 12 to strike the edge and face of the segregated bricks at an angle and to fill the relatively small firing chamber 12 completely and fully throughout the
 10 course of travel of the bricks. The intake of air to promote combustion may be regulated by the size of the openings 23, and the size of the irregular passages or labyrinths 11, and the unburnt combustibles or
 15 carbon may be permitted to escape at the ventilating flues F, which may be opened or closed partly or entirely by their dampers or valves f. Each damper may be set and controlled by a counter-weighted arm 24
 20 and an operating link or rod 25 placed in an accessible position outside of the kiln. The electric motors E may be electrically connected to permit common starting and stopping movements thereof and to divide the
 25 load, and different speeds of conveyor D may be obtained by setting or shifting the speed change gears L, or the gears may be disconnected to render any given motor unit inactive.

30 What I regard as my invention or discovery and desire to claim, is:

1. An apparatus for making clay products, comprising an arched kiln having an open bottom, an endless track and an endless
 35 conveyor close to said open bottom, a series of valved burners arranged at intervals longitudinally of the kiln and a series of power units for the conveyor located at intervals longitudinally of the kiln.

40 2. An apparatus for making clay products

comprising an arched kiln, an endless track, an endless conveyor riding on said track and a series of valved burners located at intervals longitudinally of the kiln and arranged at
 45 an acute angle and opposite to the movement of said conveyor on said track.

3. An apparatus for making clay products comprising an arched kiln with an open bottom and supported on abutments, an endless track leading through the lower part of
 50 said kiln and supported by said abutments, an endless conveyor supported by said endless track, driven means on said conveyor, driving means arranged between said abutments engaging said driven means, and
 55 power units for said driving means located at intervals longitudinally of the kiln.

4. An apparatus for making clay products comprising an arched kiln supported on abutments and open at its bottom between
 60 said abutments, an endless track in the lower part of said kiln and supported by said abutments beneath said open bottom, an endless conveyor on said endless track, a series of valved burners located at intervals longitudinally of the kiln, valved ventilating flues
 65 at intervals longitudinally of the kiln, and a series of power units for driving said endless conveyor at intervals longitudinally of the kiln.

5. An apparatus for making clay products, comprising a kiln having a track extending
 70 longitudinally thereof at its bottom, an endless conveyor riding upon said tracks, and means adapted to adjust said track and
 75 thereby said conveyor relatively to the walls of said kiln.

In testimony whereof I affix my signature.

MATTHEW LANG.