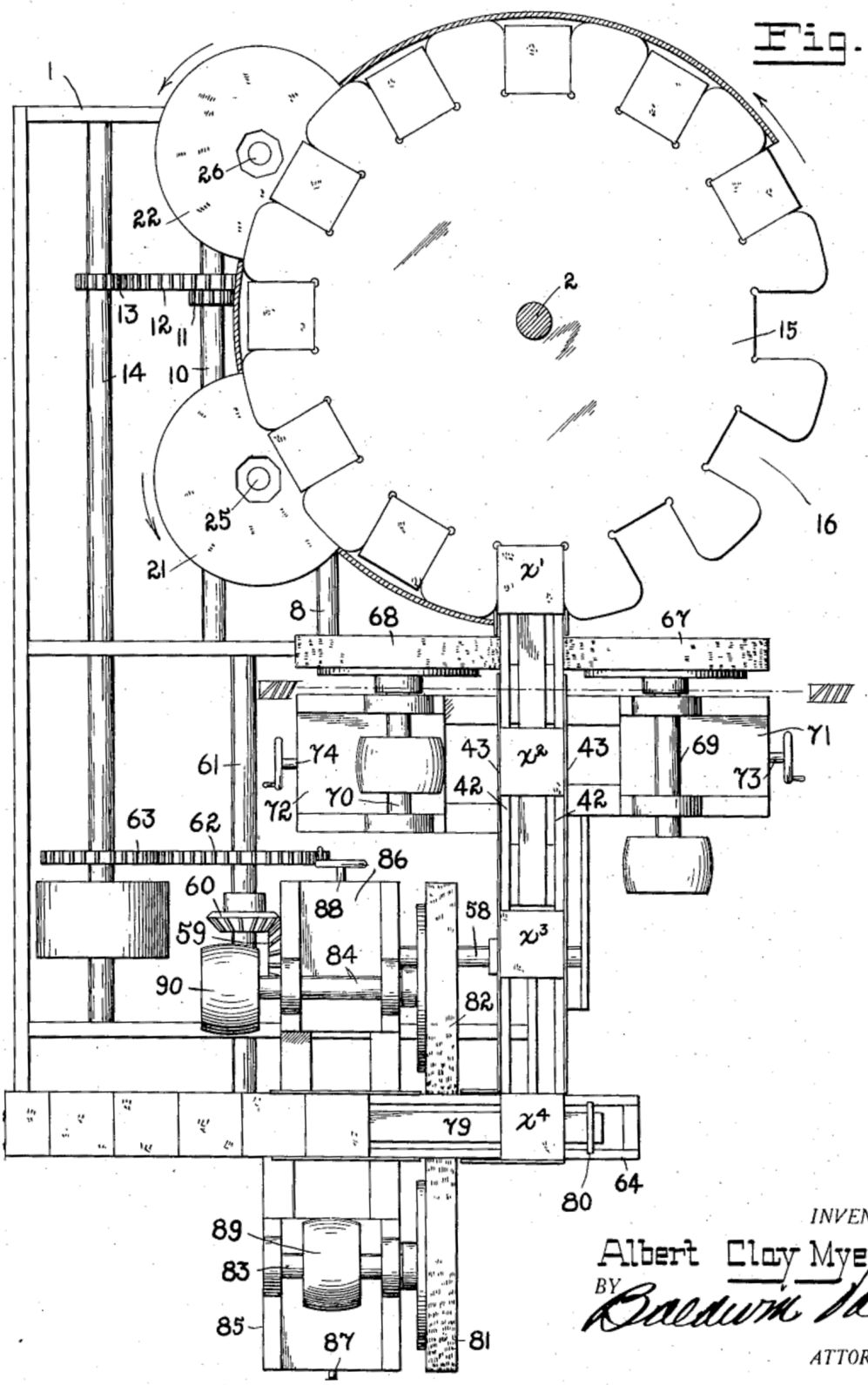
July 25, 1933. A. C. MYERS 1,919,639

TILE MACHINERY

Filed June 30, 1930 6 Sheets-Sheet 1

Fig. 1.



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July 25, 1933. A. C. MYERS 1,919,639

TILE MACHINERY

Filed June 30, 1930 6 Sheets-Sheet 2

Fig. 2.

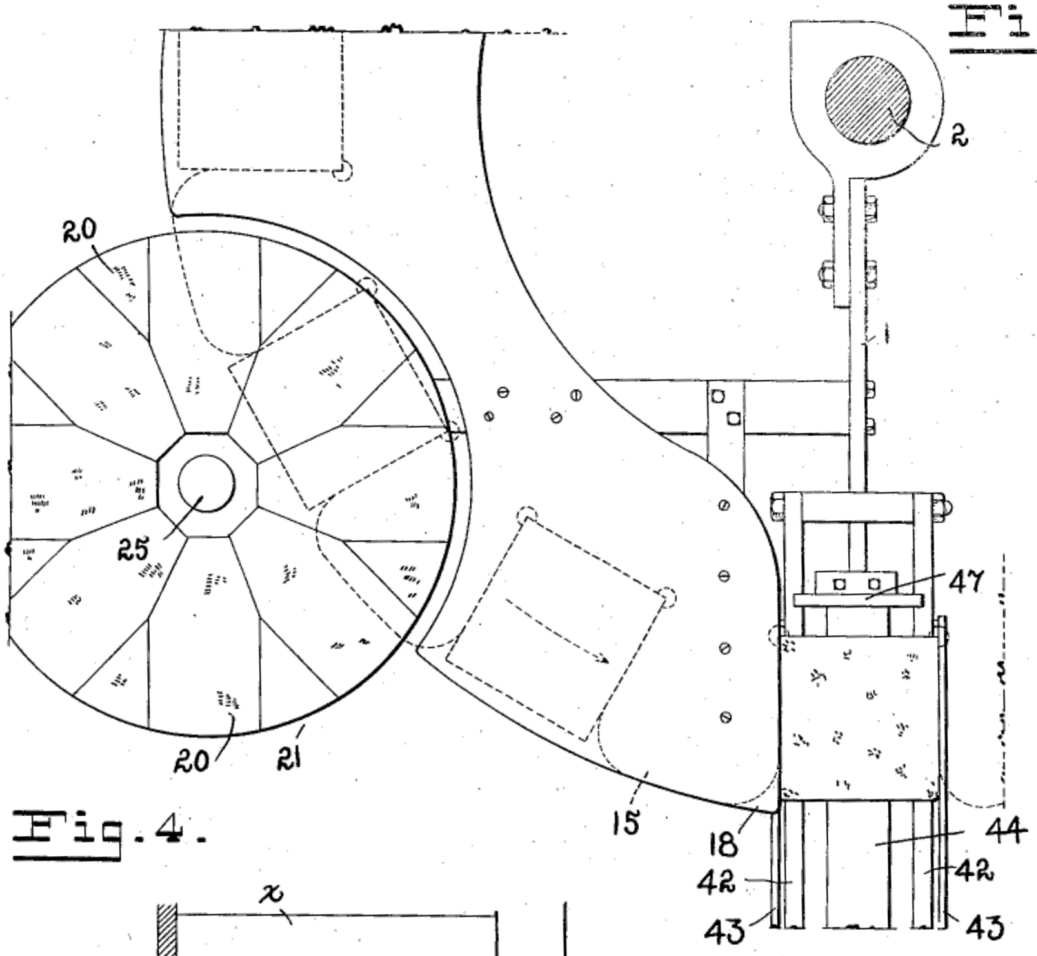


Fig. 4.

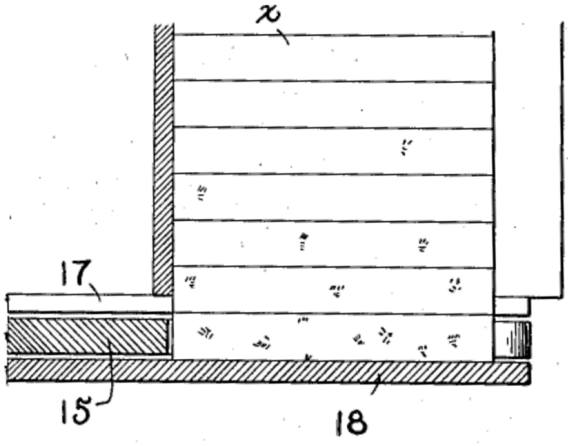
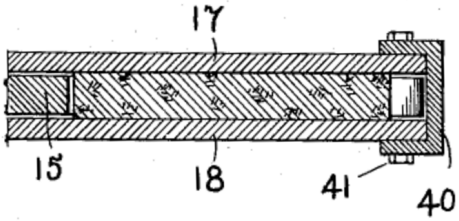


Fig. 5.



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July 25, 1933. A. C. MYERS 1,919,639

TILE MACHINERY

Filed June 30, 1930 6 Sheets-Sheet 3

Fig. 3.

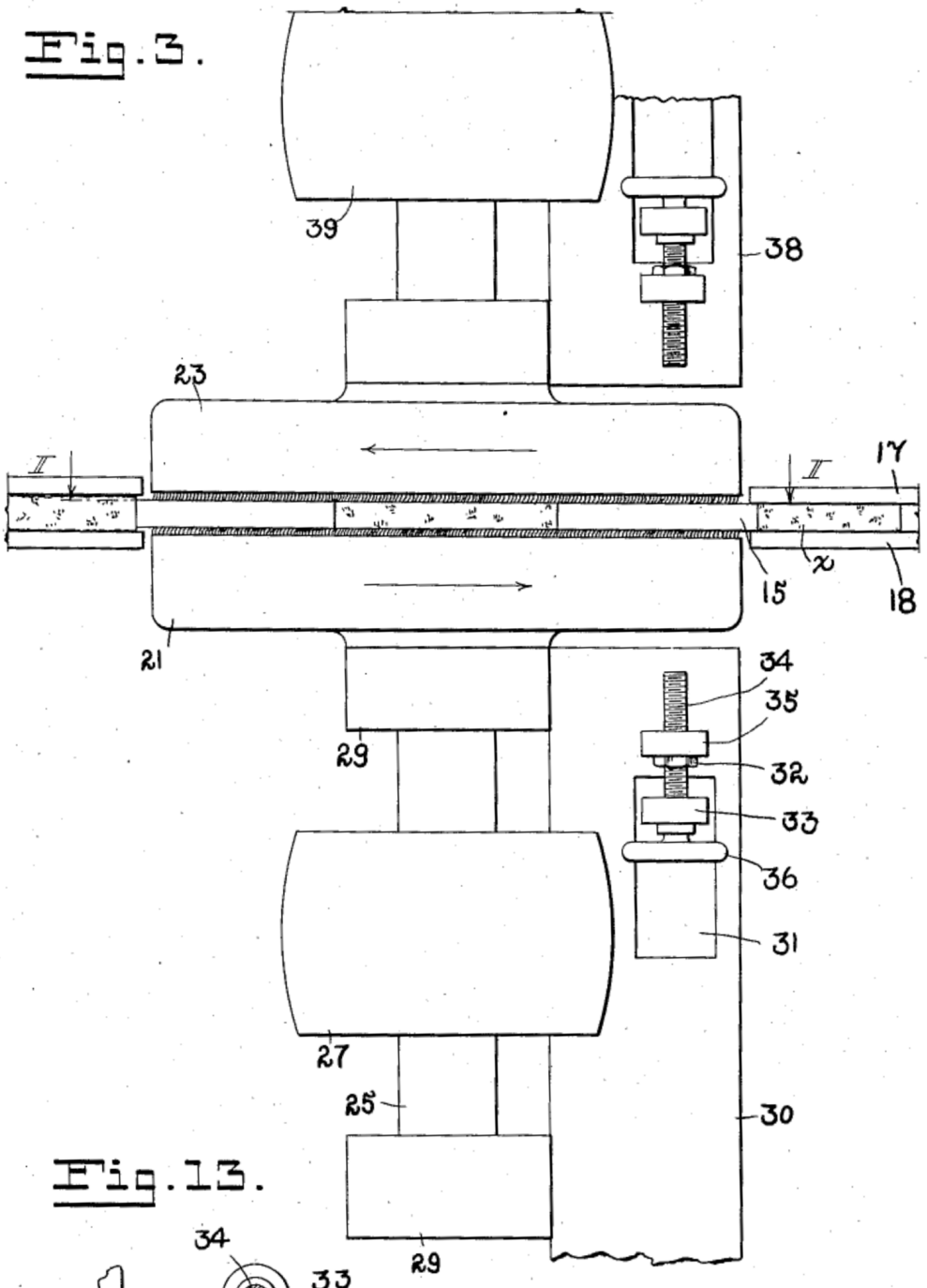
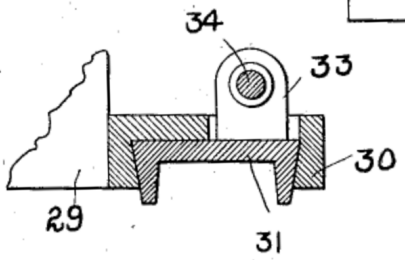


Fig. 13.



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July 25, 1933. A. C. MYERS 1,919,639

TILE MACHINERY

Filed June 30, 1930 6 Sheets-Sheet 4

Fig. 6.

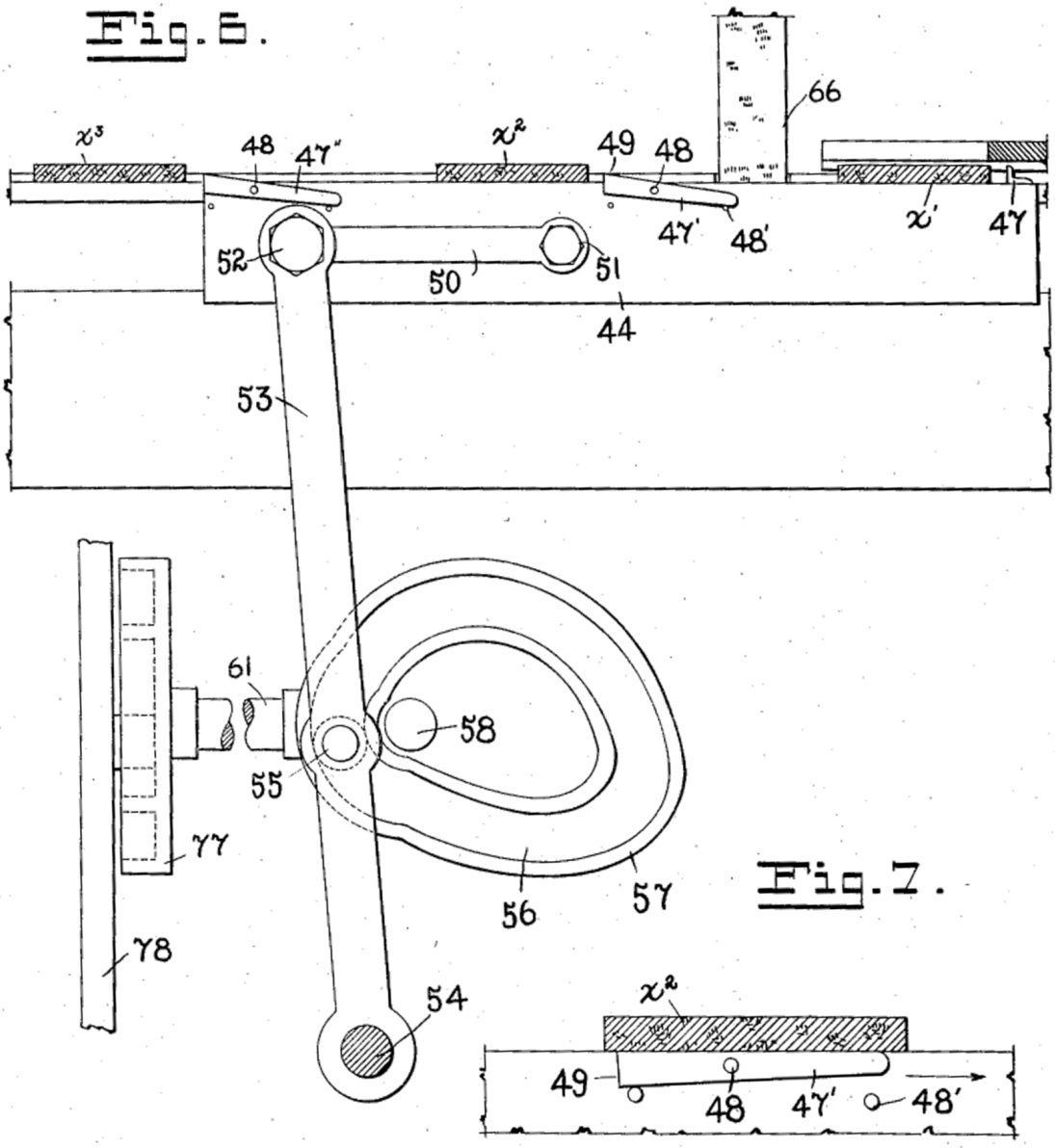

Fig. 7.

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July 25, 1933. A. C. MYERS 1,919,639

TILE MACHINERY

Filed June 30, 1930 6 Sheets-Sheet 5

Fig. 8.

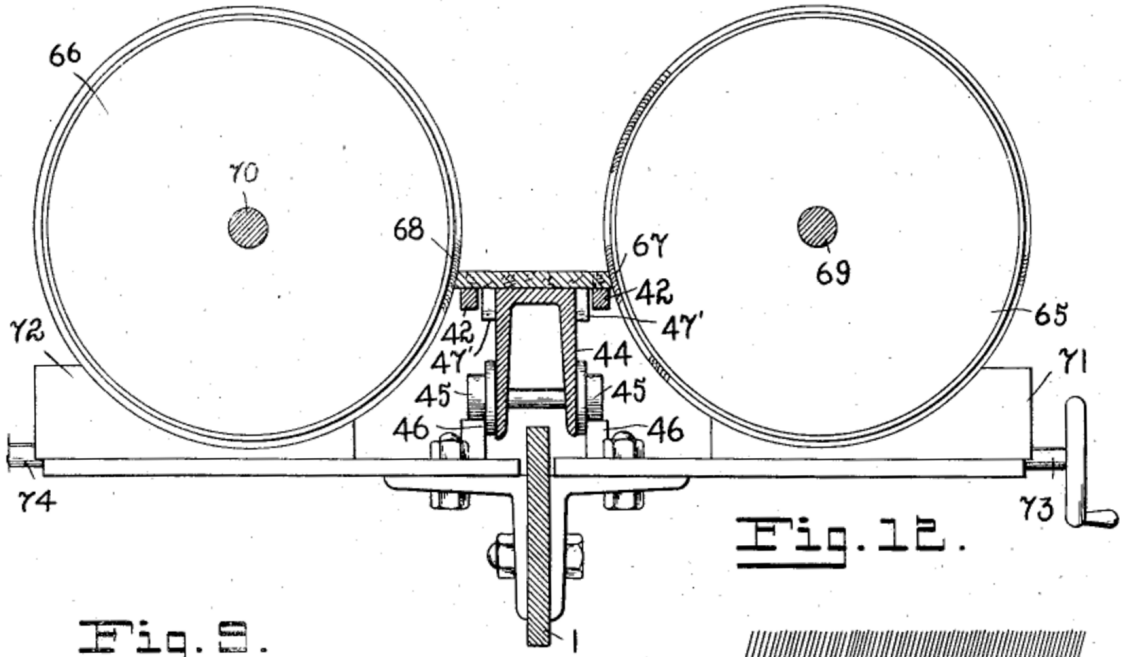


Fig. 12.

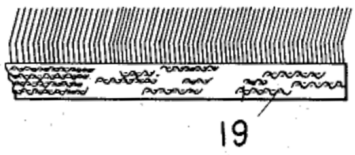
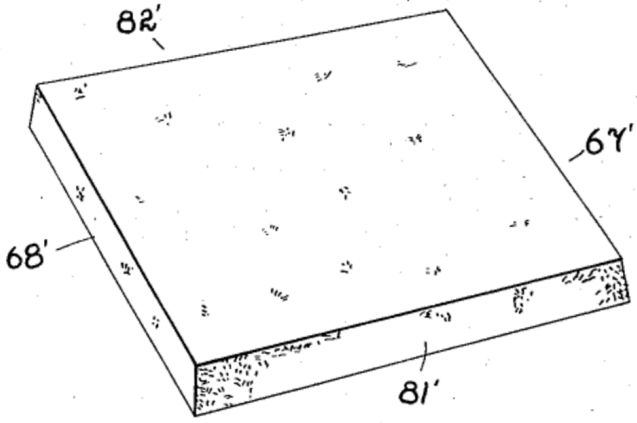


Fig. 9.



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July 25, 1933. A. C. MYERS 1,919,639

TILE MACHINERY

Filed June 30, 1930 6 Sheets-Sheet 6

Fig. 10.

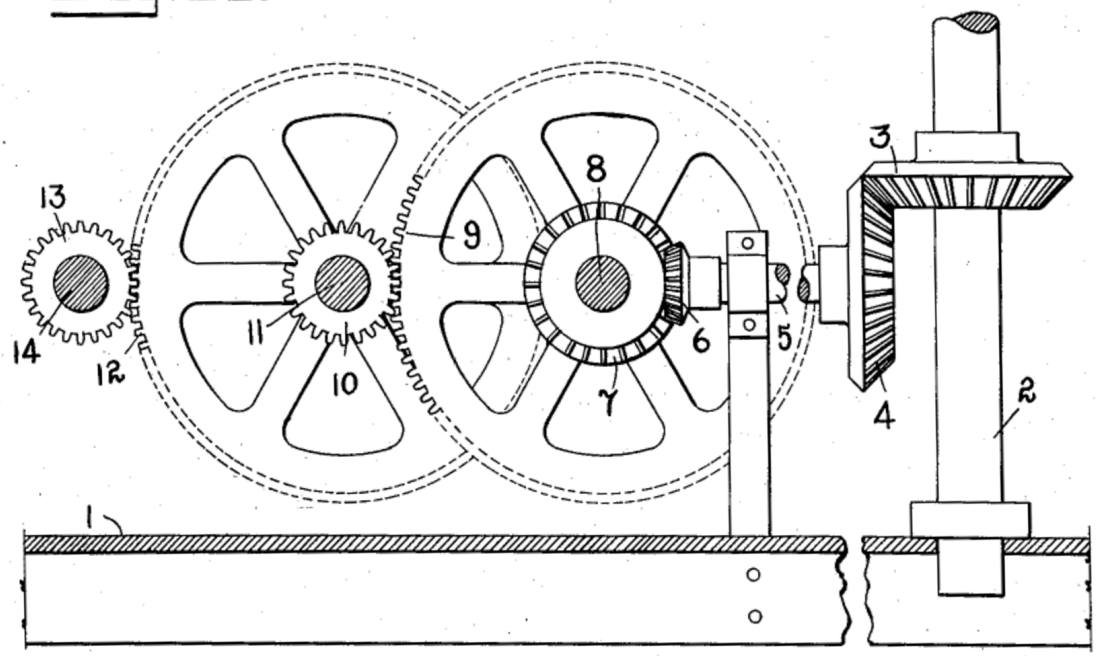
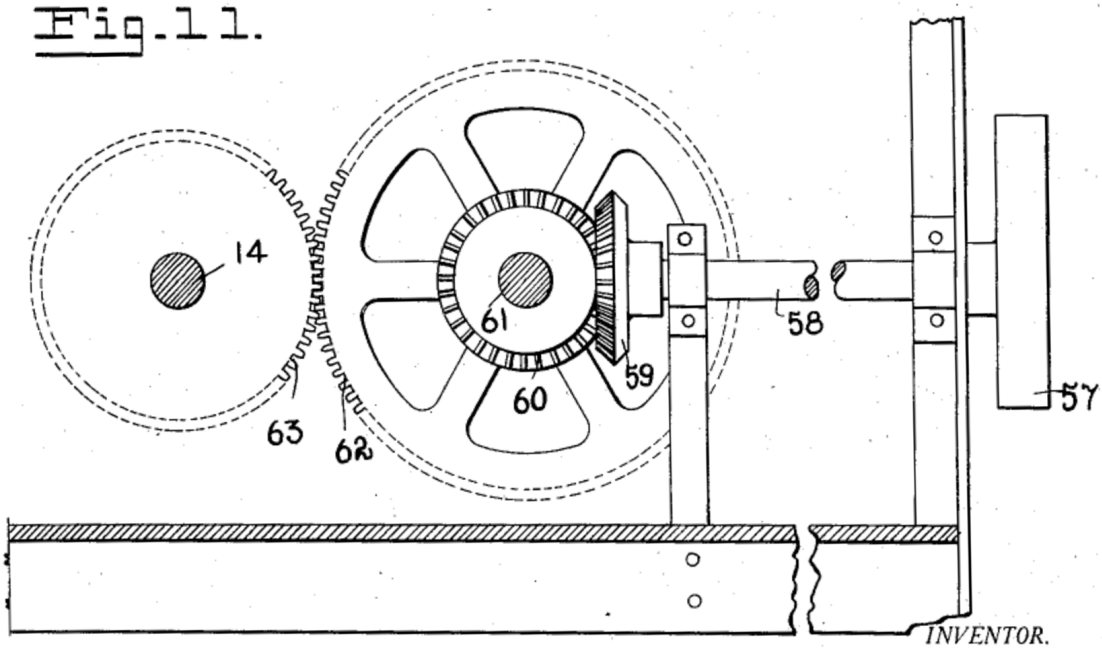


Fig. 11.



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Patented July 25, 1933 1,919,639

UNITED STATES PATENT OFFICE

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TILE MACHINERY

Application filed June 30, 1930. Serial No. 464,839.

This invention relates to improvements in tile machinery and the method of fabricating tile.

Among the objects of the invention are to simplify the method of producing tile, and to lower the cost of production by culling out defective tile before they reach the finishing stages.

Another object is to reduce the loss from breakage by subjecting the tile to the mechanical operations before the firing period.

Another object is to produce a tile mechanically standardized as to thickness, lateral dimensions and edge bevel, before glazing and firing.

A further object is to provide gaging, edging, and beveling machinery that will perform its functions on the unfired tile with accuracy and the minimum of breakage losses.

Other objects and advantages will appear as the description progresses.

In this specification and the annexed drawings, the invention is disclosed in its preferred form. But it is to be understood that it is not limited to this form. It is also to be understood that in and by the claims following the description it is desired to cover the invention in whatsoever form it may be embodied.

In the six sheets of drawings:

Fig. 1 is a plan view from above, of the general assembly of the gaging, edging and beveling machine, with the top guard plate removed from the gaging plate, from the line I—I upward, see Fig. 5.

Fig. 2 is a slightly enlarged fragmentary detail of the same, taken above the said top guard plate, showing the tile discharging mechanism from the gage wheel, indicated in dotted lines.

Fig. 3 is a fragmentary side elevation of the same.

Fig. 4 is a vertical section of the tile feed hopper.

Fig. 5 is a fragmentary detail in vertical section of the periphery of the gage plate mechanism.

Fig. 6 is a side elevation detail of the tile advancing mechanism.

Fig. 7 is a fragmentary detail of the tile engaging dogs of the advancing mechanism.

Fig. 8 is a vertical section of the tile advancing and conveying mechanism and the edging wheels, taken on the line VIII—VIII, Fig 1.

Fig. 9 is a perspective view from above of a tile manufactured in accordance with this invention.

Fig. 10 is an enlarged detail in elevation of the gear train drive for the gage plate.

Fig. 11 is a similar view of the cam driving mechanisms for advancing the tile on the conveyors.

Fig. 12 is a detail elevation view of a conventional carding brush.

Fig. 13 is a detail section view of the adjustable yoke bearings of the tile facing wheels.

In the production of tile in accordance with this invention, the properly blended and mixed clays are introduced into an auger or pressure press. The plastic clay issues from the press through a die, in the form of a flat ribbon, onto a stationary oiled plate. This ribbon is severed by cutting wires passed transversely through it, cutting it into squares, or tile blanks.

These still moist and plastic blanks are pushed onto flat topped trays with cleats on the under side of their ends, so that free circulation of air is provided for when the trays are stacked one above another. Any defective blanks are culled out by an inspector before the blanks reach the trays.

These trays are then conveyed to the ovens for baking. They are subjected to a circulating atmosphere at about 150° Fahrenheit, where they remain until they are hard and dry.

From the drying ovens the baked tile are conveyed to the trimming machine illustrated in the drawings. The tile may be carried on the trays or placed on drapers for mechanical transportation. They should be again inspected and defectives eliminated before being trimmed in the machine, to avoid processing any tile not structurally strong enough to withstand the operation.

These baked tile X are stacked vertically in the feed hopper as shown in Fig. 3.

The tile trimming machine comprises a main frame 1, preferably composed of architectural shapes and castings properly designed and rigidly constructed to hold the various mechanisms in proper relationship, see Fig. 1.

The vertical shaft 2 is suitably journaled in the main frame, and driven by the bevel gearing 3—4, see Fig. 10. The gear 4 is fixed on the shaft 5 which is, in turn, driven by the bevel pinion 6, enmeshed with the gear 7 fixed on the shaft 8 of the spur gear 9. This gear engages the pinion 10 on the shaft 11 of the gear 12. This gear engages the driving pinion 13 on the shaft 14 of a prime mover or line shaft. This train comprises a reduction gear for rotating the vertical shaft 2 at suitable speed, about R. P. M., the whole being suitably journaled in the main frame.

The gage plate 15 is fixed on the shaft 2, see Figs. 1, 2, 4, 5. This plate is preferably of hardened steel with a thickness equal to and determining the thickness of the tile. This plate has the peripheral gaps 16 therein, which are more than the width of the tile X, being fed thereto, see Fig. 4. As the gaps 16 pass beneath the vertical stack of blanks, each gap slides one tile from beneath the stack and carries it forward between the top and bottom shroud plates 17, 18, see Fig. 5. Each blank tile X is slightly thicker than the gage of the plate 15.

Unfired or merely baked tile cannot withstand the impact of abrasive wheels or metallic cutting tools. They fracture or disintegrate, under the chattering operation of every form of abrasive means available.

One of the salient features of this invention is the scratch brush surfaces of the trimming mechanisms. I have discovered that the resilient scratching operation of the conventional carding brushes as used in the textile industry are ideal for the trimming operation, see Figs. 2, 3, 8, 12.

These cards consist of a stiff fabric backing 19, through which short hooks of spring steel wire protrude to form a "pile" of crimped brush-like wire ends. These wires are crimped or bent toward the direction of travel where possible, especially in the edging operation, see Fig. 8.

In Fig. 2 the cards are cut into segments 20—20 and fixed to the faces of the wheels 21—22, respectively, fixed on the vertical shafts 25—26, driven at relatively high speeds, about 1000 R. P. M.

These shafts are preferably belt driven in opposite directions, from the shaft 14, or an independent source. The independent source is preferred because of the reverse directions of the shafts and their transverse axial relation to and increased speed ratio to the shaft 14. The respective drive belts engage the pulleys such as 27 on each shaft 25—26, see Figs. 1, 2, 3.

The upper and lower wheels 21—23, and the corresponding wheel 22 and its mate are similarly mounted on the main frame by adjustable means, see Fig. 3. Since their mounting and operation are the same, only one mounting will be described.

The shafts are journaled in bearings 29—29 in the yokes 30. These yokes are vertically adjustable in the guides 31 fixed to the main frame. The guides are dovetailed in the yokes to prevent displacement. The guide has a lug 33 extending through a slot in the yoke 30. The spindle 34 is swiveled in this lug and threaded in the lug 35 on the guide, so that the yoke may be raised and lowered by turning the handle 36 on the spindle and the desired adjustment locked by the bolt 32.

The wheel 22 and its mate are similar to the wheels 21—23 and are similarly mounted in adjustable yokes, adjustably fixed in guides fixed to the main frame. In this manner both sets of wheels 21 and its mate 23, and 22 and its mate, are vertically adjustable with respect to the opposite sides of the plate 15.

The top wheels revolve in opposite directions to the nether wheels in each set and are similarly driven by belts engaging the pulleys such as 39.

It is the function of these opposed carded wheels to scratch off and remove the excess thickness of baked tile extending laterally beyond the faces of the plate 15, see Fig. 3. The thickness of the hard plate 15 determines the thickness of the tile passing between the card wheels. The reverse rotation of these wheels described, counteracts the thrust of the wheels against the tile which is carried between the wheels by the rotation of the plate 15. The resilient scratching action of the card surfaces 20 has no tendency to fracture the baked tile even though a considerable thickness of material is removed over the full top and bottom areas of the tile.

From the last wheels 21—23 the tiles X are carried around by the plate 15 between the plates 17—18 and the peripheral guard 40, which latter counteracts the centrifugal force of the plate 15 acting on the tiles X. This guard is fixed to the plates 17—18 by the bolts 41 at proper intervals.

After being gaged to thickness, the blanks X drop from the gaps 16 onto the conveyor rails 42—42, between the vertical guards 43—43, both of which are supported on the main frame.

The conveyor truck 44, see Figs. 6–7, has the flanged rollers 45—45 thereon supported on the tracks 46—46, mounted upon the main frame 1. These rollers support the

weight of the truck and the flanges prevent lateral play.

The truck 44 has the fixed cross head 47 and tilting dogs 47′, 47″ pivoted thereon at 48. These dogs are fulcrumed on the pivots 48 so that they counterbalance and stop against the pins 48′ to hold the heads 49 normally above the level of the rails 42, to engage behind the tiles X^1, X^2, X^3, as they are moved forward by the cross head 47 as they drop from the gage plate.

The truck 44 is moved forward and back by the link 50, pivoted thereto at 51, and at 52 to the lever 53, that is in turn pivoted at 54 to the base of the main frame. The stud 55 on the lever has an antifriction roller engaging in the groove 56 on the cam wheel 57, see Fig. 6.

This cam is fixed on the end of the shaft 58, which is driven by the bevel pinion 59 fixed on the other end of the shaft 58, see Fig. 11. This pinion is enmeshed with the bevel gear 60 on the transverse shaft 61, driven by the spur gear 62 fixed thereon. The driving pinion 63 is fixed on the primary shaft 14 and drives the gear 62 in synchronism with the plate 15, both deriving their impulses from the shaft 14 with proper interposed gear ratios to cause the truck to move back and forth synchronously with the gaps 16 to remove the tile as they drop therefrom. The various intermediate shafts 58—61 are properly journaled in the main frame 1.

The dogs 47′ and 47″ are tipped to the horizontal position in passing under the tiles X^2, X^3, see Fig. 7, on the backward movement of the truck 44. As the cross head 47 engages behind the tile X^1 for the forward movement, the pair of dogs 47′ engage behind the tile X^2, and push it into the position X^3. An inspector should be stationed at the truck 44 to remove any tiles which show defects. From the position X, the tiles are pushed forward by the dogs 47″ off the ends of the rails 42 from whence they drop onto a similar set of rails 64′, see Fig. 1.

In passing from the position X^1 to X^2, the tile blank is pushed between the edging card wheels 65—66, see Figs. 1–8. These wheels have peripheral bands of carding 67—68 fixed thereon. The card material is the same as that described on the wheels at 20.

These wheels are mounted on their respective shafts 69—70 mounted in suitable bearings on the adjustable bed plates 71—72, guided on the main frame and laterally adjustable by the threaded spindles 73—74 engaging the main frame and swiveled in their respective bed plates. These shafts have the pulleys 75—76 fixed thereon respectively, and driven by belts engaging an overhead line shaft, not shown, or they may be individually motored. These card wheels scratch off the edges 67′ and 68′ of the tile blank. These wheels engage these edges at their diameters for perpendicular edges or below their diameters, as shown, to impart a bevel to the edges of the soft tile. The wheels both revolve to scratch downward against the tile, for obvious reasons, see Fig. 8. They form the bevel and also determine the width of the baked tile. The opposite edges are similarly treated by a similar means in connection with the rails 64, see Fig. 1.

The shaft 61 has a cam 77, like 57, fixed on the end thereof. The bevel gearing 59—60 being of the same pitch diameters, drive the shafts 58—61 at the same speed from the same source, the shaft 14. It is therefore possible by timing the cams 57—67 to synchronize the operation of the levers 53—78, and their combinative assemblies, to move the trucks 44—79 in unison. These trucks 44—79 are similar as to general construction and function, except that only the cross head 80 is required. This cross head 80 engages the baked tile X^4 and pushes it between the card wheels 81—82, which complete the other width and beveling of the tile edges 81′—82′.

The wheels 81—82 are respectively mounted on the shafts 83—84, suitably journaled on the adjustable bed plates 85—86 guided on the main frame and laterally adjustable by the threaded spindles 87—88 engaging the main frame and swiveled in their respective bed plates. The pulleys 89—90 are fixed on the shafts 83—84 and driven by belts to a line shaft or as described in connection with the similar wheels 67—68.

After passing between the wheels 81—82 the tiles are advanced along the rails 64—64 by each succeeding tile pushing the preceding one forward in solid formation, see Fig. 1. Here they should be again inspected and culled. From the rails 64—64 they are thus pushed onto a draper, not shown, still in solid formation, whereon they are sprayed with the liquid glazing material, preparatory to firing in the conventional manner.

If oblong tile are desired, either set of wheels 67—68 or 81—82 may be adjusted to meet the narrower or wider tile shape. These edging wheels and the conveyor and feed means such as 44 and 79 and the conveyors 42—42 and 64—64 may be duplicated and arranged at proper angles to each other to edge octagonal, hexagonal and other polygonal shapes.

By fabricating tile by the method and machinery of this invention, a fully standardized product results. The tiles are of uniform thickness and dimensions, and squared or beveled on the edges if desired.

Scratching the front, back and edge surfaces, as described, creates an ideal surface for adhesion to the cement base in which the

tile is set, as distinguished from tiles compressed in molds, which create dense, hard, less porous surfaces, both to the cement base and to the enamel for the tile faces. One of the advantages of this invention is that the ultimate product gives a soft toned coloring effect with an impervious face surface and a pervious back, with the necessary suction for the plastic base.

The beveled edges greatly facilitate the setting of the tile, since they can be set edge-to-edge in contact, the bevels automatically forming the "pointing" spaces for the intervening grout. The scratched edges also have a strong suction affinity for the grout, as previously explained. Such tiles will not drop out of wall and ceiling installations. The practice of this invention departs from the practice of grinding and tooling ceramic or fired tile.

In the present invention all mechanical operations are performed on the baked tile before it is glazed, decorated or fired.

Having thus described this invention what I claim and desire to secure by Letters Patent is:

1. A tile machine including a pair of interspaced abrasive wheels; and a gage plate movable between said wheels and having openings therethrough adapted to carry tile.

2. A tile machine including a pair of interspaced abrasive brushes; a gage plate movable between said brushes and having openings therethrough adapted to carry tile.

3. A tile machine including a pair of interspaced shroud plates; a pair of interspaced abrasive brushes having their faces alined with said shroud plates; and means for passing tile between said plates and brushes.

4. A tile machine including a pair of interspaced rotary abrasive brushes; a rotary gage wheel movable between said brushes and having openings therethrough adapted to carry tile; and means for feeding tile into and out of said openings.

5. A tile machine including a pair of interspaced shroud plates; a gage plate movable between said plates and having openings therethrough adapted to carry tile; abrasive means bearing against the opposite sides of said plate.

6. A tile machine including a pair of interspaced shroud plates; a gage plate movable between said shroud plates and having tile carrying openings therethrough; resilient abrasive means bearing against the face of said gage plate; means for feeding tile into said openings; interspaced tile edge abrading means; and means for carrying the tile between said edge abrading means from said openings.

7. A tile machine including a pair of interspaced shroud plates; a rotary gage plate movable between said shroud plates and having tile carrying openings therethrough; interspaced scratch brushes bearing against the opposite faces of said gage plate; means for feeding tile into said openings; interspaced tile edge abrading means; synchronized means for carrying the tile between said edge abrading means from said opening; and means for moving said tile laterally between another set of interspaced tile edge abrasive means.

8. A tile machine including a gage plate having openings therethrough; a pair of scratch brushes bearing on opposite sides of said gage plate; means to feed tile into the openings in said gage plate; means to eject the tile from said openings after the tile have been passed between said scratch brushes; a conveyor to receive the tile when ejected from said gage plate; a pair of scratch brushes mounted on each side of said conveyor and adapted to contact the edges of the tile when moved by the conveyor.

9. A tile machine including a resilient abrasive means to trim the top and bottom of a tile; means to move said tile through said abrasive means; a conveyor to receive the trimmed tile; resilient abrasive brushes mounted on each side of said conveyor and angularly disposed to the plane of the tile; means to move the tile along said conveyor between said brushes, thereby trimming the sides of said tile; a second conveyor disposed at right angles to the first conveyor and adapted to receive the tile from the first conveyor; resilient abrasive brushes on each side of the second conveyor and angularly disposed to the plane of the tile; and means to pass the tile between said brushes, thereby trimming the ends of the tile.

10. A tile machine including a pair of interspaced driven wheels mounted on parallel shafts, abrasive brushes on the peripheries of said wheels, a conveyor adapted to feed tile between said brushes below the plane of the axis of said wheels to trim and bevel the ends of said tile.

11. A tile machine including a rotatable gage plate having openings therethrough; interspaced shroud plates on each side of said gage plate; means to feed tile into said openings in said gage plate; a pair of adjustably mounted resilient abrasive wheels bearing on said gage plate and the tile in the openings in said gage plate; and means to rotate said abrasive wheels in opposite directions.

12. A tile machine including a rotatable gage plate having openings therethrough adapted to carry tile; interspaced shroud plates on each side of said gage plate; a peripheral guard fixed to said shroud, and adapted to arrest centrifugal movement of the tiles; and abrasive brushes adjacent said gage plate and adapted to trim the top and bottom of said tile.

13. A tile machine including a conveyor, means to feed tile seriatim onto said conveyor, a pair of interspaced driven wheels mounted on parallel shafts on opposite sides of said conveyor, abrasive brushes on the peripheries of said wheels, a second conveyor disposed angularly to the first conveyor and adapted to receive tile therefrom, and a pair of similar interspaced driven wheels having abrasive brushes on their peripheries mounted on parallel shafts on opposite sides of the second conveyor.

14. A tile machine including a pair of conveyor rails, means to feed tile seriatim onto said rails, a reciprocating truck between and beneath said rails, depressible dogs mounted on said truck and adapted to engage and intermittently advance said tile, a pair of interspaced driven wheels mounted on opposite sides of said conveyor, abrasive brushes on the peripheries of said wheels; a second pair of conveyor rails arranged at right angles to the end of and adapted to receive tile from the first conveyor, a second truck between the second pair of conveyor rails and timed in synchronism with the first truck, tile engaging means of said second truck, and a pair of interspaced driven wheels having abrasive brushes on their peripheries mounted on opposite sides of said second pair of conveyor rails.

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