(No Model.) 2 Sheets—Sheet 1.

J. FERNALD.

TILE MACHINE AND CUTTER.

No. 493,077. Patented Mar. 7, 1893.

Fig. 1.

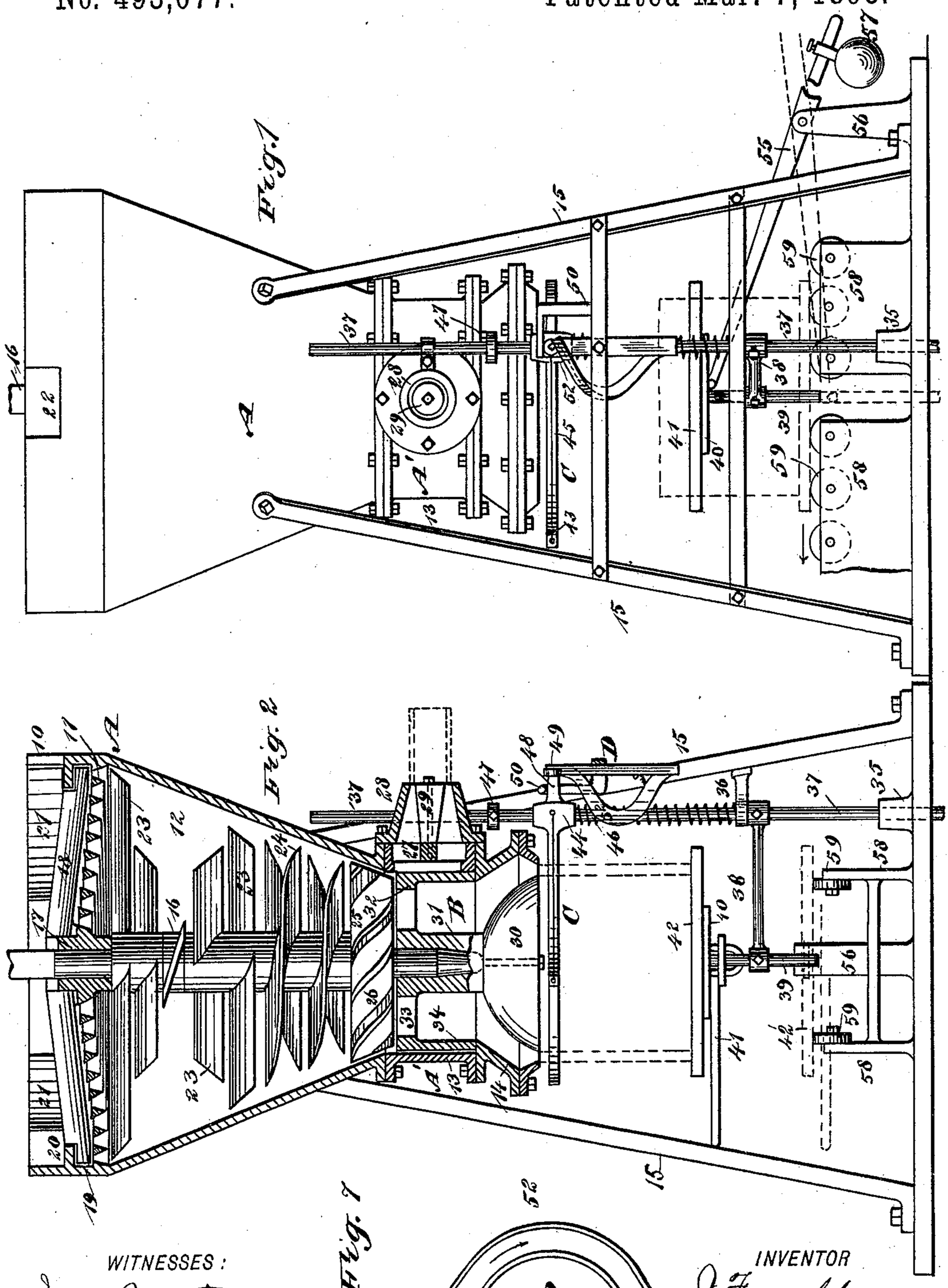
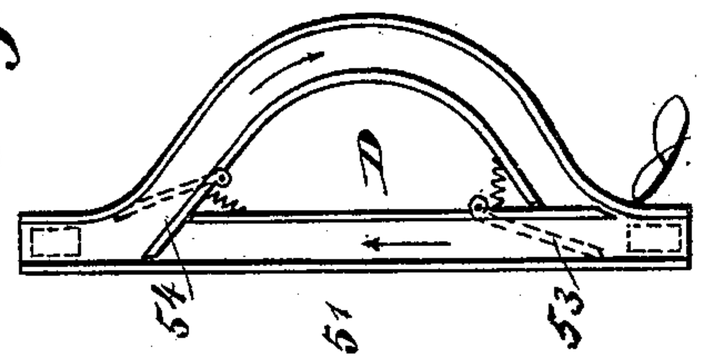


Fig. 2.

Fig. 7.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4

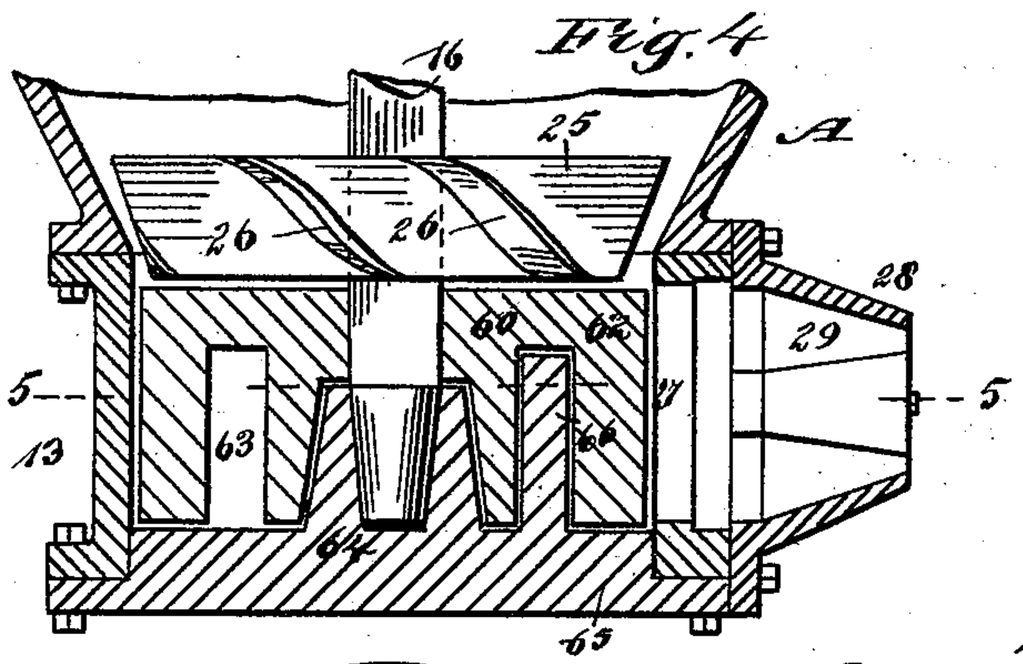


Fig. 5

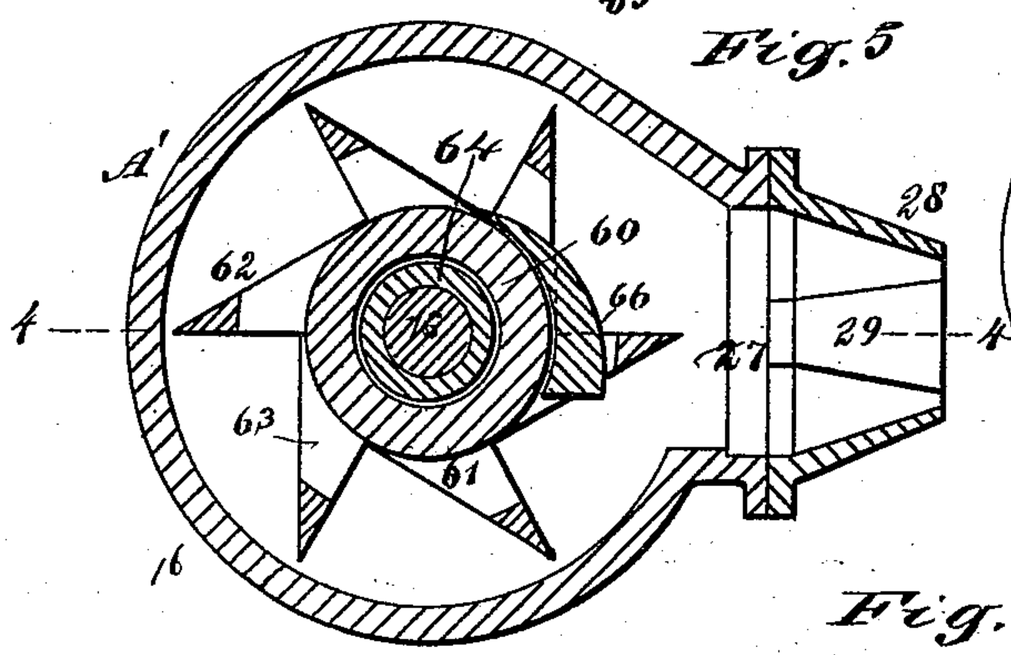


Fig. 6

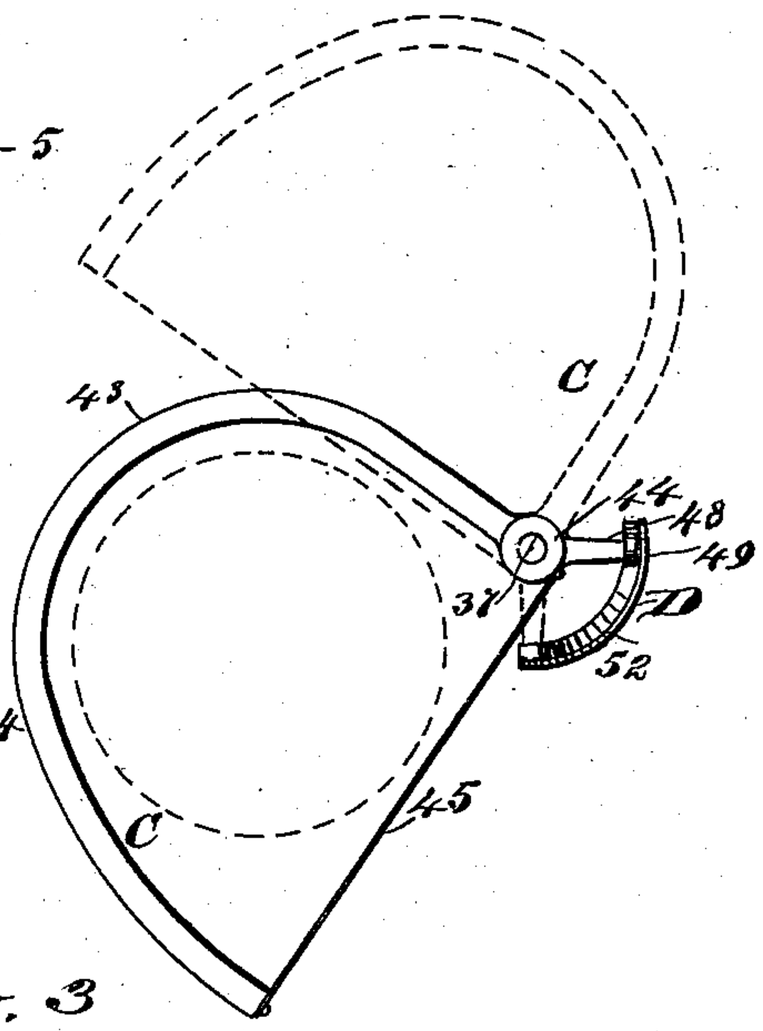
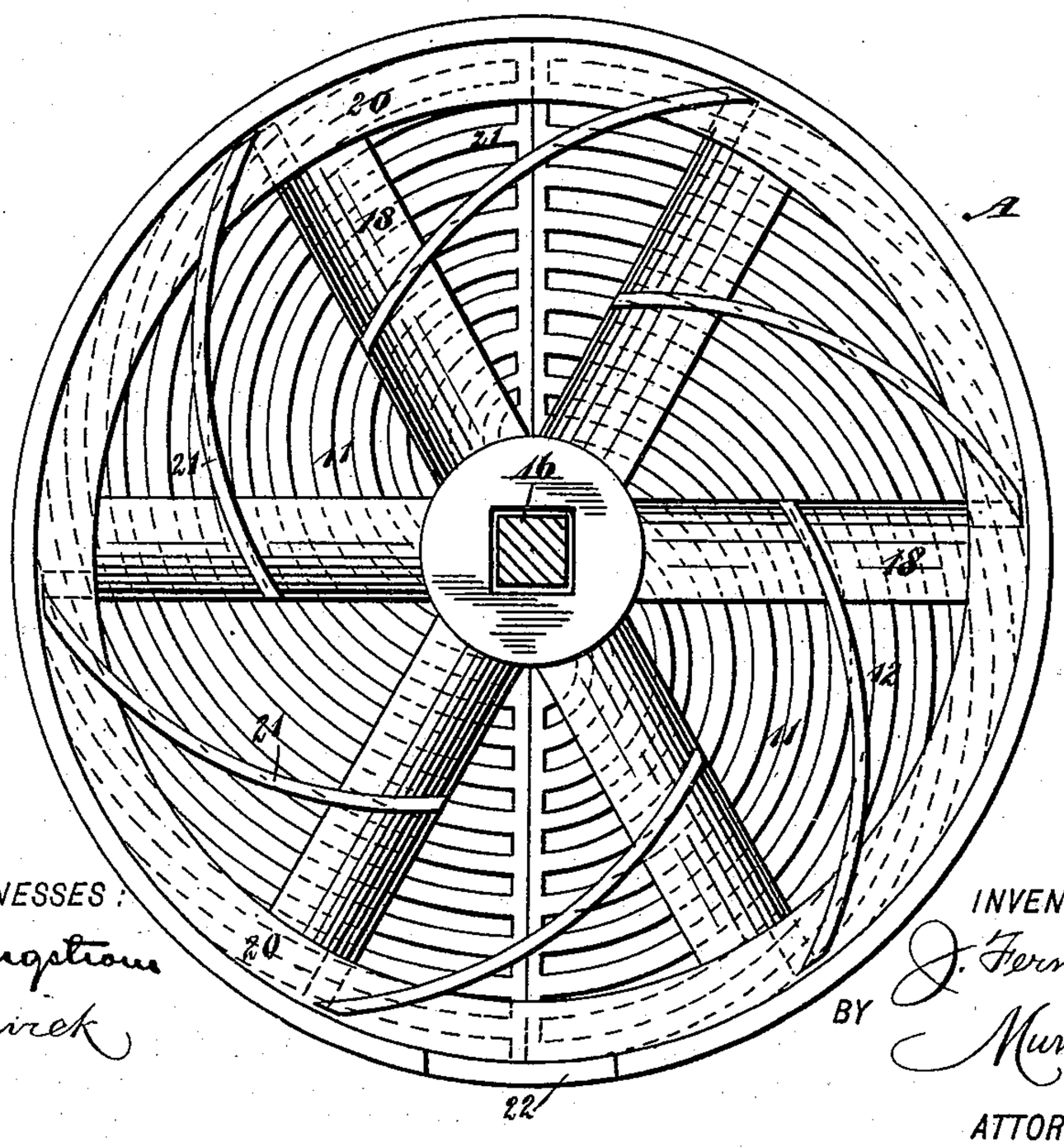


Fig. 3



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UNITED STATES PATENT OFFICE.

JOHN FERNALD, OF WELLINGTON, ILLINOIS.

TILE MACHINE AND CUTTER.

SPECIFICATION forming part of Letters Patent No. 493,077, dated March 7, 1893.

Application filed June 25, 1892. Serial No. 437,943. (No model.)

To all whom it may concern:

Be it known that I, JOHN FERNALD, of Wellington, in the county of Iroquois and State of Illinois, have invented a new and useful Improvement in Tile-Mills, of which the following is a full, clear, and exact description.

My invention relates to an improvement in tile mills, and has for its object to provide a mill of simple, durable and economic construction, capable of expeditiously and accurately producing pipes or tiles of different sizes, the said pipes or tiles to be constructed from clay or from any composition of the consistency of clay.

Another object of the invention is to construct the machine in such manner that the larger tiles or pipes may be delivered from the machine in a vertical direction, and whereby the smaller tiles or pipes may be made to leave the machine or mill in a horizontal position.

Another object of the invention is to provide a means whereby when a predetermined length of pipe or tile has left the machine or mill a cutter will automatically act to sever the length from the body or continuous portion of the tile.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth and pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar figures and letters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the mill or machine. Fig. 2 is a vertical section taken through the center. Fig. 3 is a plan view of the hopper section of the mill, the drive shaft being in section. Fig. 4 is a vertical section through the delivery chamber of the mill, said section being taken practically on the line 4—4 of Fig. 5, illustrating the formation of the operative parts of this chamber when the tile is to be horizontally delivered. Fig. 5 is a horizontal section through the delivery chamber, taken practically on the line 5—5 of Fig. 4. Fig. 6 is a detail view of the cutter and its cam guide, the cutter being shown in two positions, one in positive lines and the other in dotted lines; and Fig. 7 is a plan view of the cam guide of the cutter.

The frame of the machine may be said to consist of a casing A, the upper portion of the casing being utilized as a hopper to receive the clay, and being designated by the reference numeral 10. The lower portion of the casing is divided from the upper portion by a grate partition 11, which may be provided with a flat top, or the top of the partition may be convexed, as shown in Fig. 2. The lower chamber 12 of the casing, formed by the addition of the partition 11, may be properly termed a pug chamber, and the entire casing may be designated a mud drum. The casing or mud drum A, rests upon a second casing A′, and this casing is made in two sections, which are designated as 13 and 14, and the interior of the attached casing A′, is used as the delivery chamber. The mud drum A, is tapering, and the lower casing A′, at its upper end, is of a diameter about equal to the diameter of the lower end of the mud drum. The lower section 14 of the lower casing A′, is made more or less angular in cross section, and is bolted or otherwise removably attached to the upper section of the casing; and the upper section of the lower casing is bolted to the mud drum, while all these parts are held in a vertical position through the medium of suitable legs 15, which legs are preferably suitably braced.

A shaft 16, is vertically located in the central portion of the mud drum, the lower end of the shaft being held to revolve in a suitable bearing located in the lower casing A′. The shaft is capable of slight upward movement when occasion may demand, as it is mounted to turn in a hub 17, secured in the grating 11, at the central portion thereof. The upper portion of the shaft 16, is preferably rectangular in cross section, and the shaft is of greatest diameter between its lower bearing and the grating. Above the grating the shaft has mounted thereon a series of radial bars or arms 18, the side faces of which arms are more or less inclined or beveled, the inclination of all the arms being in the same direction, that is, in transverse section the arms are the same. The arms at their lower edges are preferably made to conform to the

shape of the grating 11; and if the upper face of the grating is convexed the under surfaces of the arms are inclined, while if the upper face of the grating is straight the lower edges of the arms are of like formation. The outer extremities of all the arms, however, are reduced, and are made to enter and turn in an annular space 19, located beneath a flange 20, formed upon the inner face of the hopper, the upper edges of the arms being flush with the upper face of the flange. The arms also carry a series of curved fingers 21, one finger being attached to each arm at each end; and the outer ends of the fingers travel upon the upper surface of the flange 20. Thus as the clay is placed in the hopper and the shaft is rotated, any stones, or like material, that may be in the clay is worked to the outer edges of the arms, or to the inner walls of the hopper, and the arms 18, effectually press the clay downward between the bars of the grating into the pug chamber 12, while the revolution of the shaft 16, also causes the arms to feed the stones, or other foreign matter, up their inclined surfaces to the upper face of the flange 20, and as the fingers 21, are constantly sweeping over this surface, they carry before them the stones or foreign matter until an opening 22, is reached, shown in Fig. 3, at one side of the hopper, and when the stones are opposite this opening the fingers force them out through it.

Beneath the grating the shaft 16, is provided with a series of radial blades 23. These blades may be of the same length, or may be of different lengths, and are arranged so that two directly opposing blades will not be in alignment, but will be placed at right angles to each other, as shown in Fig. 2.

Beneath the blades 23 one or more sets of spirally arranged feed blades 24, are secured to the shaft, and these blades are located near the bottom portion of the pug chamber. The shaft 16, also carries at the extreme lower end of the pug chamber a disk 25, having a series of peripheral spiral ribs 26. The blades 23, as the shaft 16, revolves, act to pug the earth, while the spiral blades 24 feed the pugged material to the disk 25, and the latter by means of its peripheral ribs forces the material downward into the delivery chamber within the casing A′. This delivery chamber is provided in its upper section, at one side, with a circular opening 27, the said opening being partially closed by a nozzle 28, shaped essentially as the frustum of a cone, the nozzle being horizontally located; and within this nozzle, and within the opening 27 a shaper 29, is located, being rigidly held in a horizontal position, the shaper being more or less conical, and it is placed at the center of the opening 27 and nozzle 28, its widest end facing outward. The outer end of the shaper 29, is practically flush with the outer edge of the nozzle, as shown in Figs. 2 and 4. This nozzle and the shaper 29, are only employed when the tile is to be made small and is to be delivered horizontally. A space exists between the outer edge of the shaper and the contiguous edge of the nozzle, the space being circular, and when the clay is forced out through this space it is of tubular form.

I will first describe, however, the construction of the mill when it is adapted to deliver large tiles and in a vertical direction: When large tiles are to be formed a shaper B, is employed, located within the delivery chamber. This shaper at its lower end is somewhat semi-spherical or semi-circular as illustrated at 30 in Fig. 1, and the lower edge of the shaper is practically flush with the lower edge of the lower section of the said casing A′, and the space between the lower portion of the shaper B and the lower end of the lower casing A′, determines the thickness of the tile to be formed, as the space is circular and the material is forced out through this space to produce the tile.

A hub 31, is attached to, or is rendered an integral part of the lower or shaping portion 30 of the shaper, and in this hub the lower end of the shaft 16, has a bearing. The hub is provided at its upper end with a cap 32, located horizontally beneath the delivery disk 25, and this cap is provided with a circular opening 33, located around the hub, and with a flange 34, which extends downward to a bearing against an inner annular rib or projection formed upon the lower section of the lower casing A′, as is likewise best shown in Fig. 2. By this means the shaper B, is held in a fixed position within the delivery chamber of the mill, and the flange cuts off all communication between this chamber and the nozzle 28.

At one side of the mill, upon its base, a socket 35, is produced, and a bracket 36, is usually located above the socket. In this socket and bracket a vertical shaft 37, is loosely mounted, and a horizontal arm 38, is attached to the shaft 37 in such manner that it will be immediately below the bracket 36 when the shaft is in its normal position; and this arm carries at its inner end a post 39, which is adjustable within the arm, and this post is provided at its upper end with an attached or integral table 40, and a foot rest 41, projected outward from the table in direction of one side of the mill. This table is adapted to support a pallet 42, and the pallet is adapted to receive and support a tile when it is finished, as shown in dotted lines, Fig. 2.

The shaft 37, carries a cutter C, and this cutter, as shown in Fig. 6, consists of a skeleton body 43, which is somewhat semi-circularly shaped, approximating somewhat the letter U in shape. The frame of the cutter is horizontally located, and is provided with a hub 44 at one end, the said hub being usually mounted upon the shaft 37; and the extremities of the frame or body of the cutter are connected by a cutting wire 45. The cutter is supported by a spring 46, the spring coiling around the

shaft 37. The hub of the cutter frame rests upon the upper portion of this spring and the lower end of the spring has bearing upon the bracket 36, while a slight distance above the hub a collar 47, is secured upon the shaft in such a manner as to render it adjustable. The hub of the cutter frame is provided with an outwardly-extending arm 48, carrying a friction roller 49; and the upward movement of the cutter frame is limited by a stop 50, attached to the frame of the mill, and adapted to engage with the upper surface of the arm or extension 48 of the cutter frame, as is shown in both Figs. 1 and 2. The cutter C, is adapted to execute a part of a revolution, and this is brought about through the action of a cam D. This cam is of peculiar construction, and is secured to the frame-work of the supporting mechanism of the body of the mill. It is shown in detail in Fig. 7, and in position in Figs. 1 and 2.

The cam comprises two tracks 51 and 52, the two tracks merging into each other at top and bottom. One of these tracks is curved to throw the wire through the tile and return it to its place, while the other is straight to prevent the wire from interfering with the next tile, and each track is provided with an outer and an inner marginal flange. At the lower junction of the two tracks a spring-controlled gate 53, is located, and a second spring-controlled gate 54, is located at the upper junction of the tracks.

The table 40, is normally held in an upper position against the tension of the spring 46 by means of a lever 55, fulcrumed upon a suitable post 56, attached to the base of the mill, as shown best in Fig. 1. The outer end of this lever is provided with an adjustable weight 57, and the inner end of the lever engages with the under face of the table.

A platform 58, is established upon the base of the mill, about at the central portion thereof, the platform being divided at its center to admit of the downward movement of the post 39 connected with the table 40. The platform, as shown in Fig. 2, comprises two spaced and vertical members, each of which has journaled at its upper edge a series of friction rollers 59.

In the operation of the mill, in producing large and vertically delivered tiles, the material from which the tiles are to be made is placed in the hopper of the mud drum, pressed through the bars of the grating, chopped or pugged by the blades 23 and is delivered to the disk 25 by the spiral or delivery blades 24; and by means of the ribs 26 upon the disk, the pulverized material mixed to a consistency suitable to form tile or pipe is pressed downward into the delivering chamber contained in the lower casing section A′, from whence the material is forced out around the lower end of the shaper B, between the periphery of the shaper and the lower edge of the casing, the material thus leaving the delivery chamber in a hollow, cylindrical or tubular shape, and the lower end of the tile is adapted to rest upon the pallet 42. When the weight of the tile upon the pallet is sufficient to overcome the resistance of the weighted lever 55 upon the table the table is pressed downward, and carries with it the shaft 37. The friction roller 49, connected with the cutter frame, rests normally in the upper portion of the cam D. Thus when the shaft is carried downward a sufficient distance to cause the collar 47, to bear upon the hub of the cutter frame, the cutter frame is pressed downward against the tension of the spring 46, and is given a partial revolution by reason of the friction roller 49 traveling down the track 52 of the cam; and as this movement is given to the cutter its cutting wire passes through the continuous tile and cuts from it a proper length, and as the tile continues to descend, the arm and cutting wire are returned by the lower cam to their original positions. The table will at this time have reached its lowermost position, which as shown in dotted lines, Fig. 2, will cause the pallet to rest upon the friction rollers 59, and the table is held in this position by the operator placing his foot upon the arm 41 projected from the table, the table being maintained in its lowermost position until the pallet is removed from the table and from the mill, at which time another pallet is placed upon the table. Pressure is then removed from the table arm 41, and the weight 57, acts to force the table upward to its normal position, and that quite quickly. The lower gate 53 is provided upon the cam track in order that after the friction roller has passed the gate and entered the lower end of the cam, it can not return to the track it left but must travel up the next track 51; and the upper gate 54, is provided in order that when the friction roller has passed this gate it can not descend by way of the track 51 but must follow the course of the track 52. It will be observed that this mill is exceedingly simple, that it is economic, and further, that it is more or less automatic in its action, the cutting of the tile being perfectly automatic. When the tile is to be delivered in small shapes and horizontally, the lower section 14 of the lower casing A′, is removed and likewise the shaper B, and the shaper is substituted by a stellated plunger 60, shown best in Figs. 4 and 5. The arms of this plunger are not straight, but they extend from the hub 61 of the plunger more or less tangentially, and the under surface of each arm 62 of the stellated plunger is provided with a transverse recess 63, as is best shown in Figs. 4 and 5. The stellated plunger receives support by being fitted over a hub 64, which receives the lower end of the shaft 16, and is formed upon the central portion of a plate 65, the latter being bolted to the lower edge of the upper section of the lower casing A′, closing the lower end of said casing and compelling the material in the delivery chamber to pass out around the side shaper 29, as shown in dotted lines in Fig. 2.

In order that the clay or material employed may not only be fed to the shaper 29 but that it may also be thoroughly pulverized or pugged, a cam 66, is formed upon the upper face of the plate 65 adjacent to the hub 64, the cam being more or less spiral, and the arms of the stellated plunger can pass this cam only through the medium of their grooves or slots 63, as best shown in Fig. 4.

It will be understood that in connection with the horizontal shaper any desired form of cutting mechanism may be employed.

The upper faces of the grating 11, are provided preferably with grooves in order that the clay will cling thereto until forced down through the spaces of the grating.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a tile or similar mill, the combination, with a hopper and a grating constituting a partition therein, of a shaft held to turn in the hopper and likewise in the grating, arms carried by the shaft and radiating therefrom, the lower edges of which arms engage with the upper face of the grating, a smooth and flanged section at the periphery of the grating, and curved fingers attached to the arms, one end of which travels upon the smooth surface, being adapted to carry stones and the like to an opening formed in the hopper, as and for the purpose specified.

2. In a mill for making tiles or like articles, the combination, with a hopper, a grating constituting a horizontal partition in said hopper, and a flange formed above the periphery of the grating, of a shaft held to turn in the hopper and grating, arms carried by the shaft and extending radially therefrom, the side faces of the arms being beveled or inclined, and curved fingers attached to the arms, the said fingers being adapted to travel upon the flange in direction of an opening formed in the hopper, substantially as and for the purpose set forth.

3. In a tile mill or like machine, the combination, with a mud drum provided with an opening therein at its side, a grating forming a horizontal partition in the drum, a shaft turning in the drum and passing through the casing, and arms radiating from the shaft over and in engagement with the upper surface of the grating, said arms having inclined sides, a flange formed over the periphery of the grating, and curved fingers attached at one end of the arms, the opposite ends of the fingers being adapted to travel upon the grating, of pug blades attached to the shaft beneath the grating, spiral conveyer blades secured to the shaft below the pug blades, a delivery disk also carried by the shaft and located beneath the conveyer blades, a delivery chamber located beneath the delivery disk, and a shaper contained in the said chamber, as and for the purpose set forth.

4. In a tile mill or like machine, the combination, with the delivery section of the mill, of a shaft capable of end movement, an arm attached to the shaft and carrying a table adapted to receive a pallet, a cutter, spring-supported and loosely mounted upon the shaft, said cutter consisting essentially of a U-shaped frame and a cutting wire, a collar secured to the shaft above the cutter, an arm projected from the cutter at its pivot point and provided with a friction roller, a cam comprising one spiral and one straight track, united at their ends and adapted to receive the friction roller of the cutter, and a weighted lever having a bearing against the table, as and for the purpose set forth.

5. The combination, with the delivery section of a tile mill, of a cutter located beneath the same, comprising an essentially U-shaped arm and a wire connecting the ends thereof, a pivotal support maintaining the cutter, an arm projected from the pivot of the cutter and carrying a friction roller, and a cam adapted to receive the friction roller, comprising two oppositely-curved and spirally shaped tracks converging at their upper and lower ends, as and for the purpose specified.

6. The combination, with the delivery section of a tile mill, of a cutter located beneath the same, comprising an essentially U-shaped arm and a wire connecting the ends thereof, a pivotal support maintaining the cutter, an arm projected from the pivot of the cutter and carrying a friction roller, and a cam adapted to receive the friction roller, comprising two oppositely-curved and spirally-shaped tracks converging at their upper and lower ends and provided with spring-controlled gates at their junctions, as and for the purpose specified.

7. In a tile mill, or a mill of a similar character, a receiving chamber the base of which is provided with a hub and a spirally arranged cam, the chamber being also provided with an outlet and a shaper located within the outlet, a stellated plunger held to revolve in the chamber over the base, the arms of the plunger being provided with recesses or slots to receive the cam, as and for the purpose specified.

8. In a tile mill, or like machine, the combination, with the pug mechanism, of a delivery chamber the base of which is provided with a hub and a spirally-arranged cam, the sides of the chamber being provided with an outlet and a shaper located therein, and a stellated plunger held to turn in the chamber upon the hub of its base, the arms of the plunger being tangential to its hub and provided with openings or slots to receive the cam, as and for the purpose specified.

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