

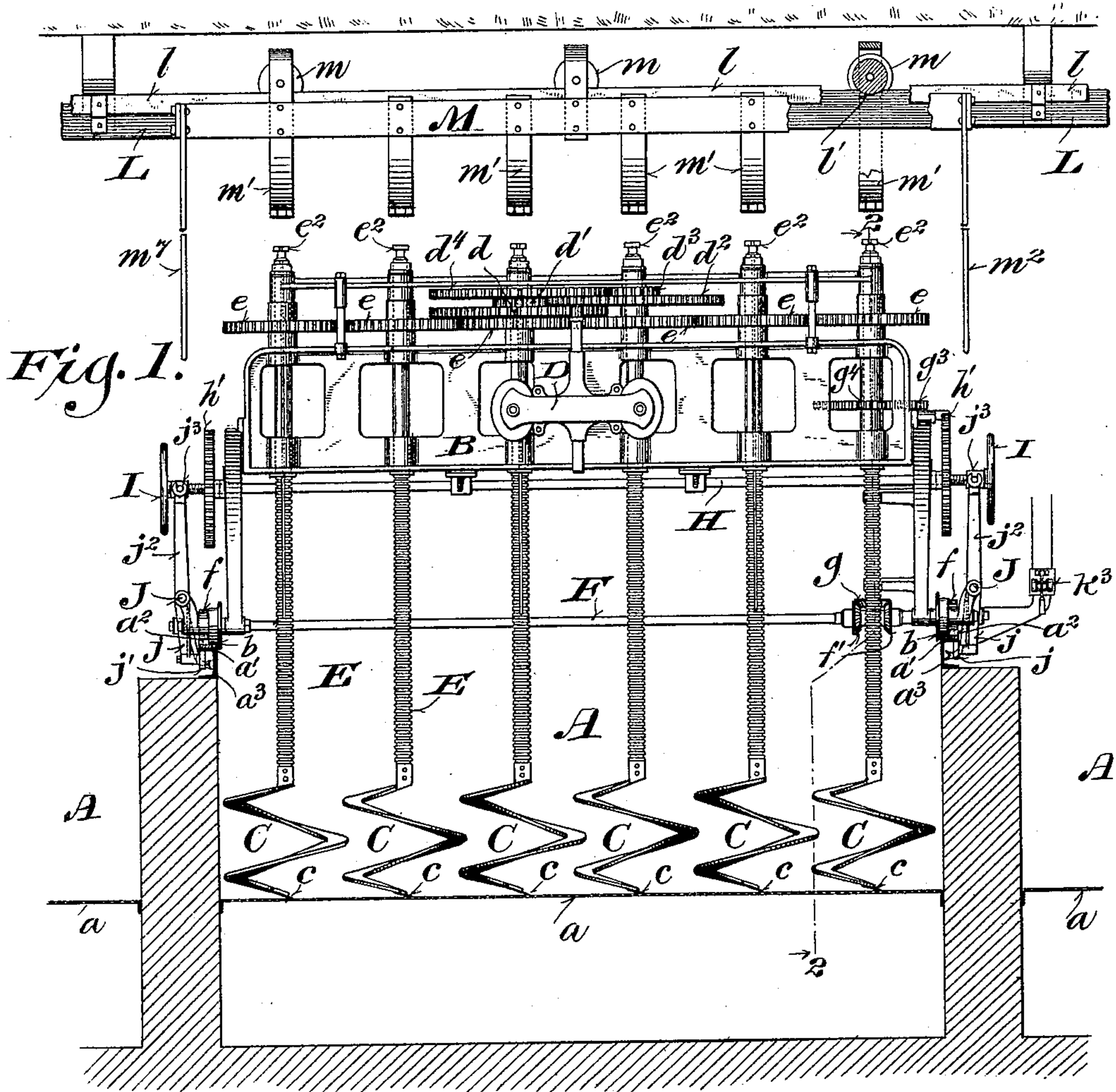
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5 Sheets—Sheet 1.

J. F. THEURER & R. BIRKHOLZ.  
MALTING APPARATUS.

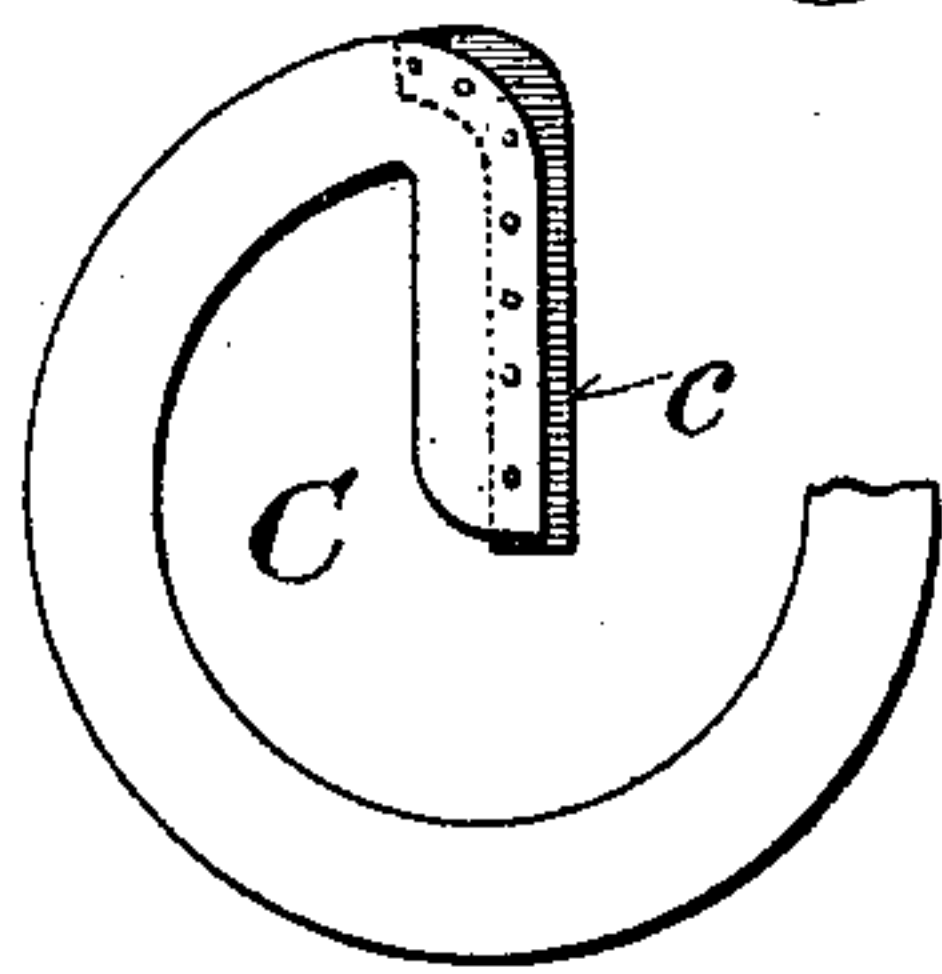
No. 582,327.

Patented May 11, 1897.



*Fig. 8.*

Witnesses:  
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(No Model.)

5 Sheets—Sheet 2.

J. F. THEURER & R. BIRKHOLZ.  
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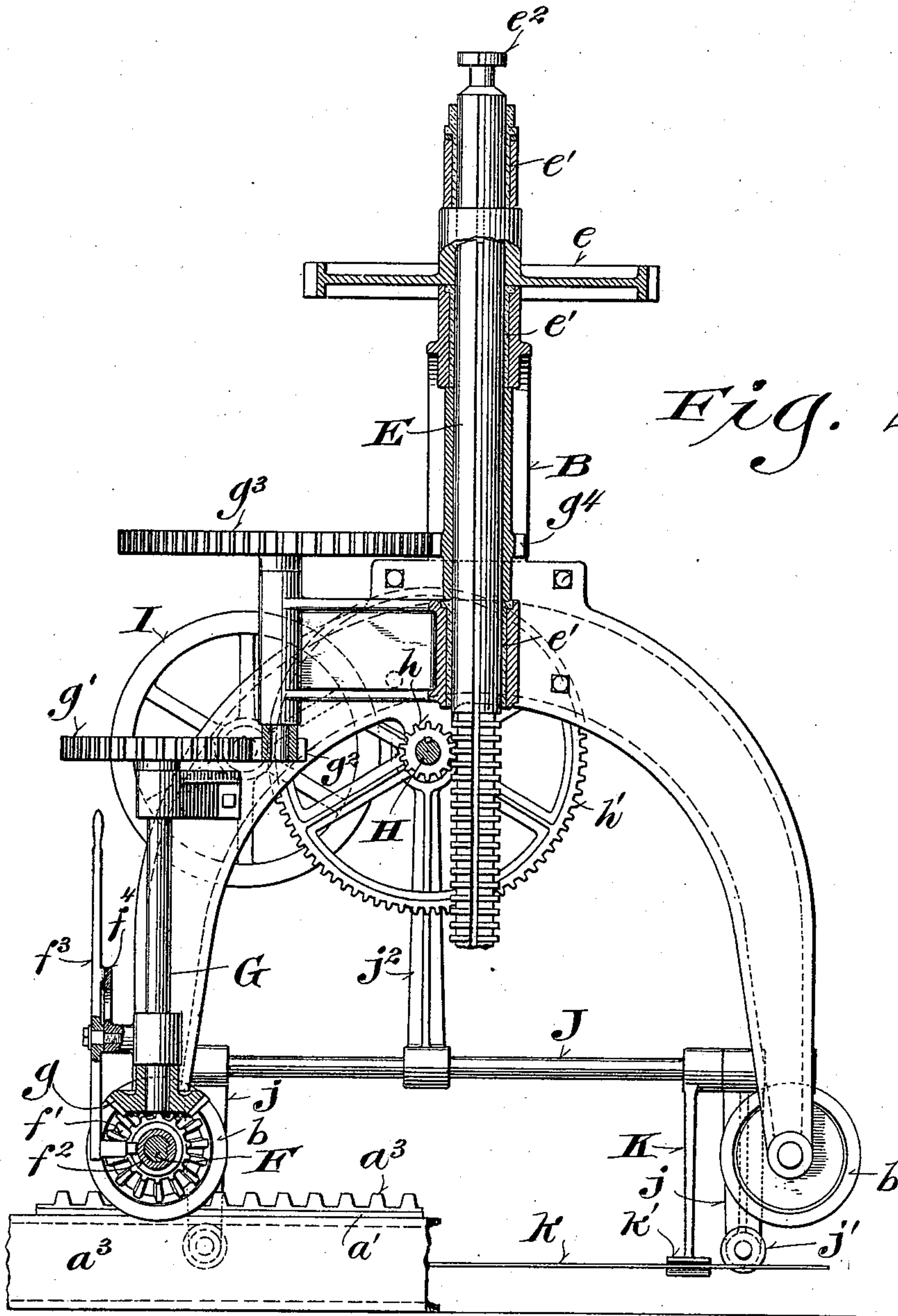


Fig. 2.

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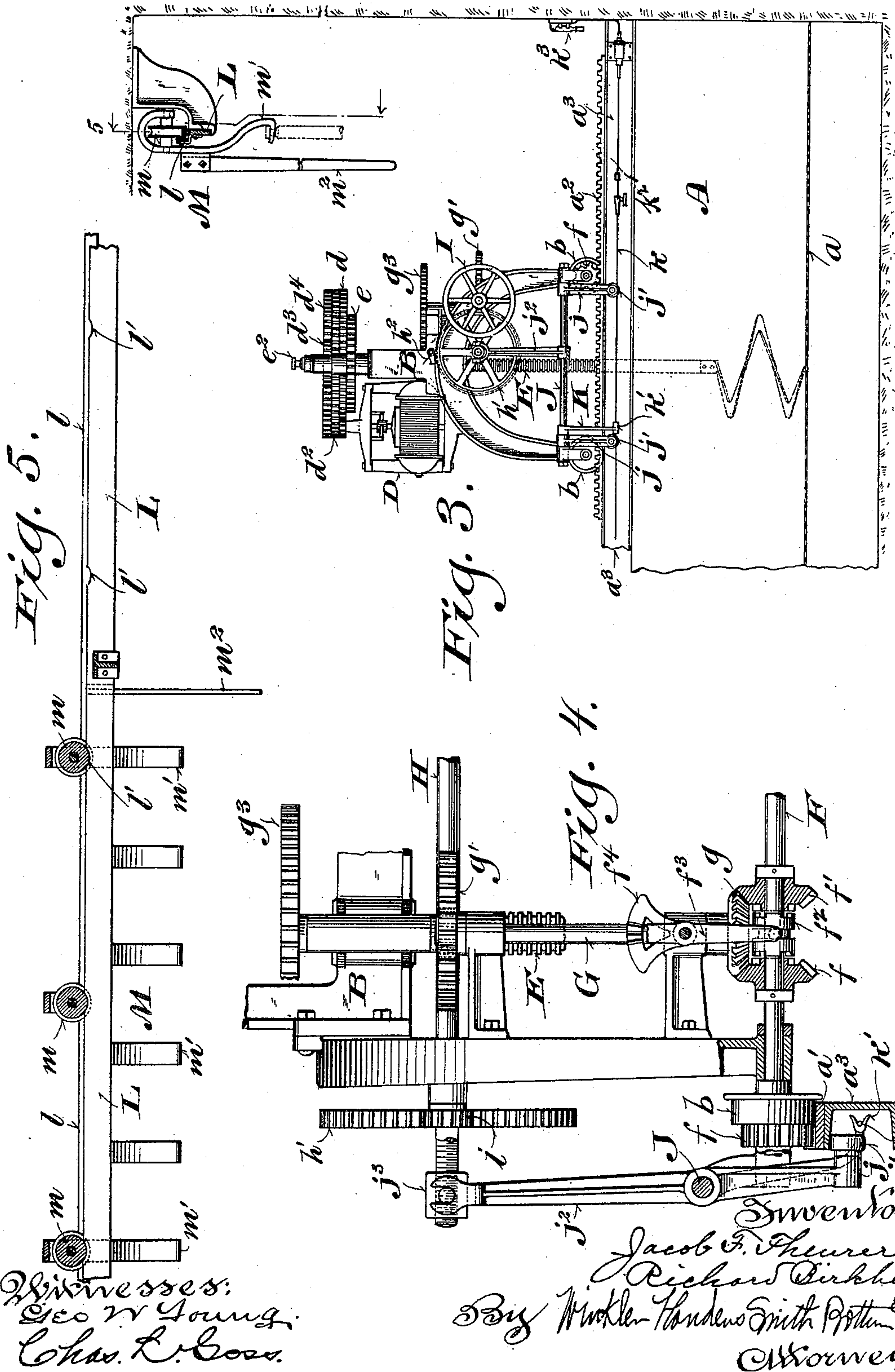
(No Model.)

5 Sheets—Sheet 3.

J. F. THEURER & R. BIRKHOLOZ.  
MALTING APPARATUS.

No. 582,327.

Patented May 11, 1897.



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5 Sheets—Sheet 4.

## MALTING APPARATUS.

Patented May 11, 1897.

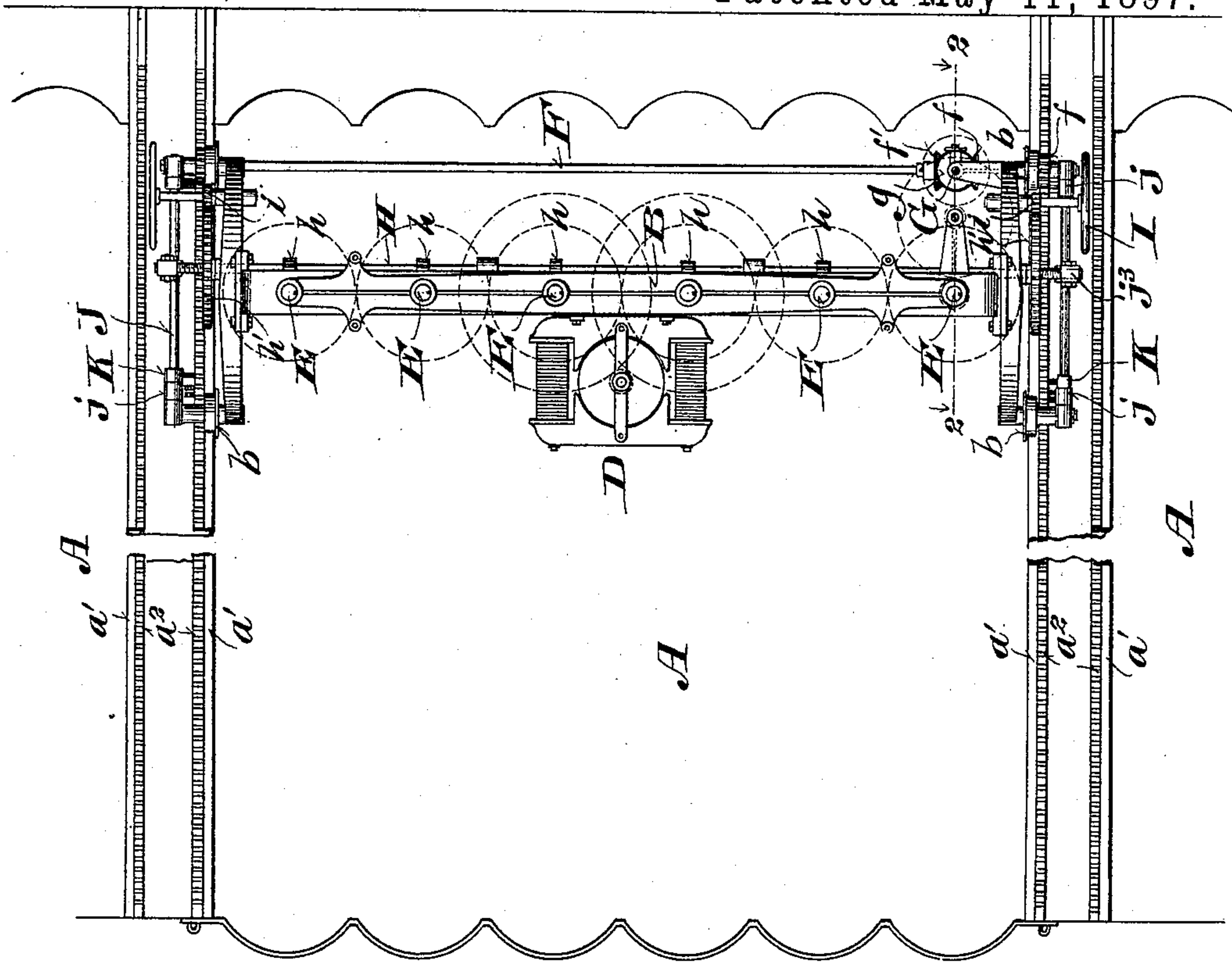


Fig. 6.

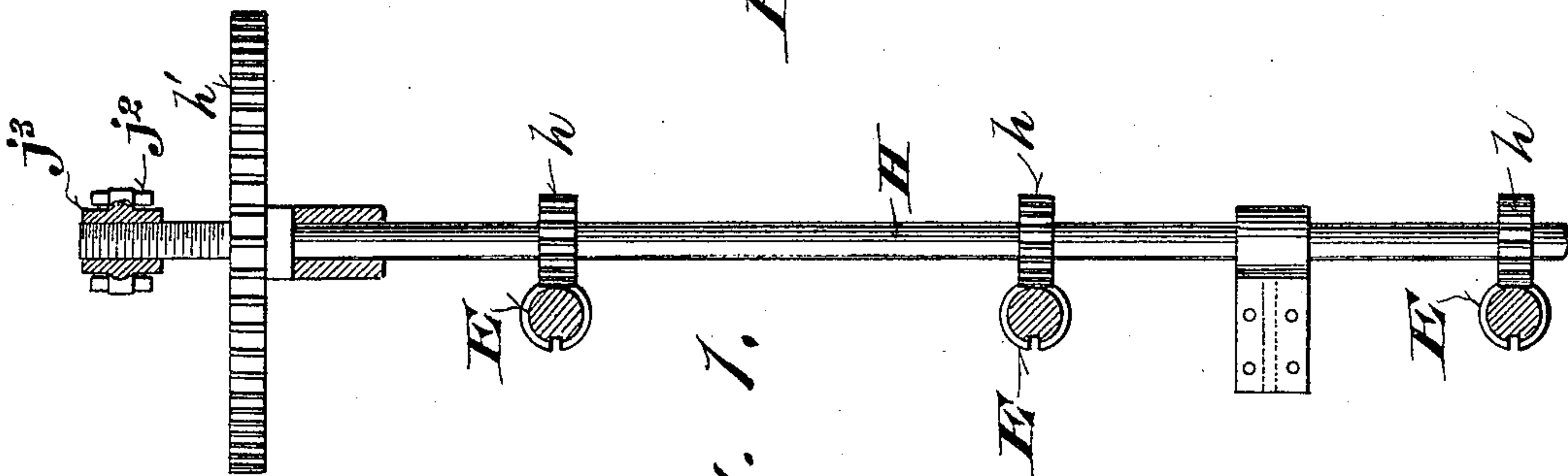


Fig. 1.

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5 Sheets—Sheet 5.

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MALTING APPARATUS.

No. 582,327.

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Fig. 10.

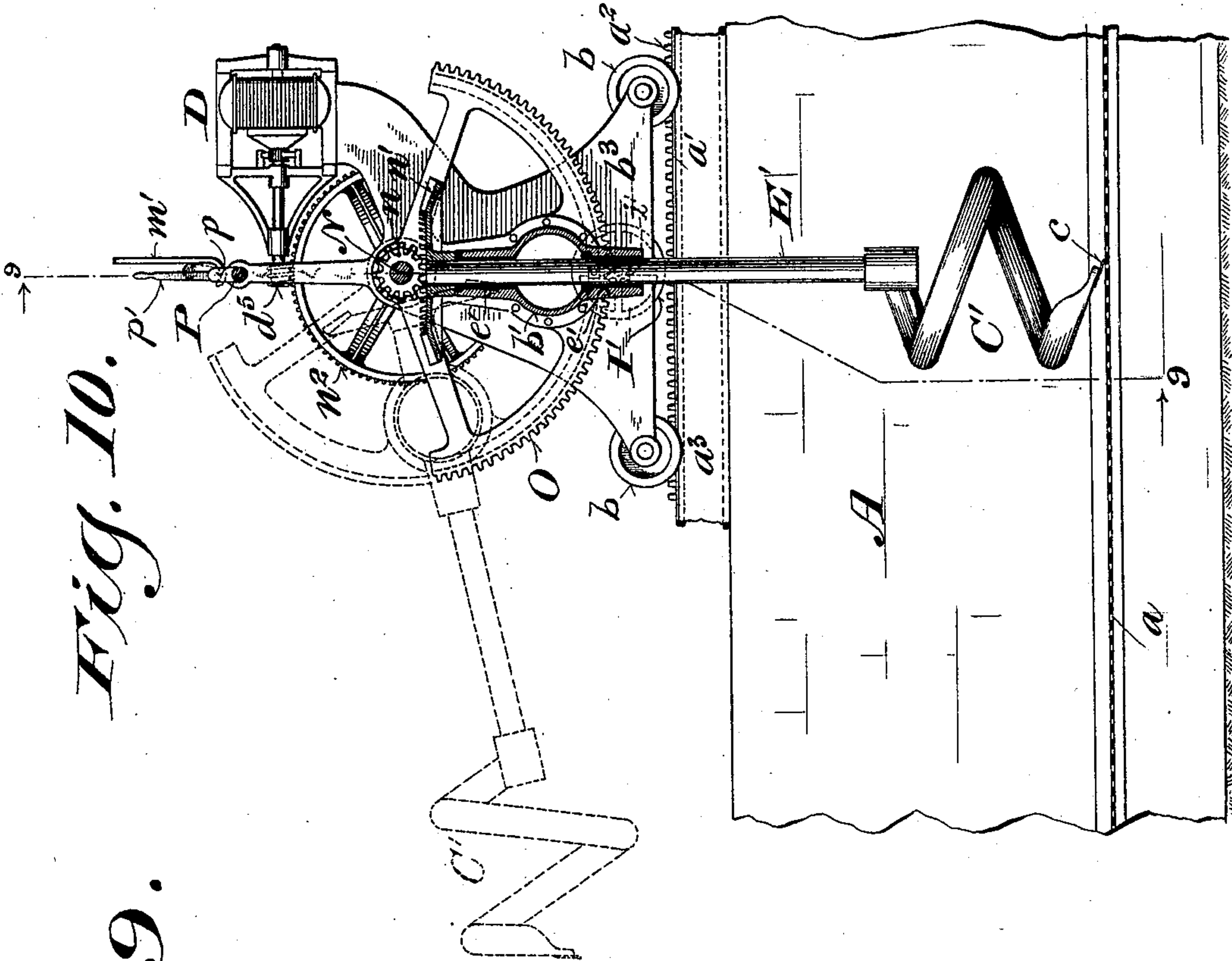
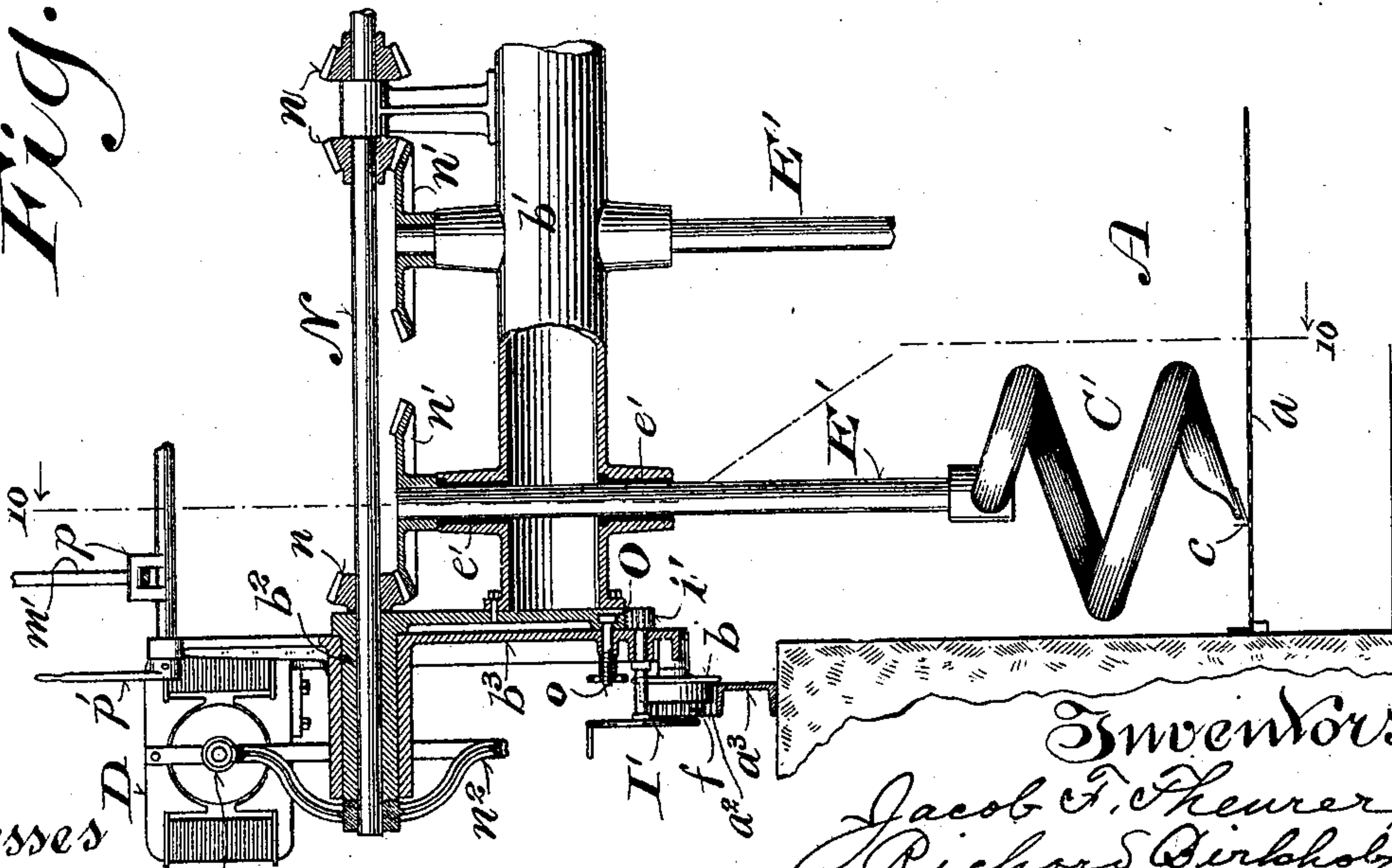


Fig. 9.



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# UNITED STATES PATENT OFFICE.

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## MALTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 582,327, dated May 11, 1897.

Application filed December 5, 1893. Serial No. 492,835. (No model.)

*To all whom it may concern:*

Be it known that we, JACOB F. THEURER and RICHARD BIRKHOLOZ, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Malting Apparatus; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The main objects of our invention are to transfer the malt-turner from one trench or compartment to another and thus utilize one turner for a number of compartments; to provide the turner with a motor for propelling it and turning the stirrers and thus dispense with extraneous driving connections; to avoid the use of oil as a lubricant for the turner and thus prevent injury to the malt from that source, and generally to improve the construction and operation of devices of this class.

It consists, essentially, of certain peculiarities in the construction and arrangement of the component parts of the apparatus, as hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a vertical section of a part of a series of malt trenches and compartments and a front or side elevation of the malt-turner and of the trolley for transferring it from one compartment to another. Fig. 2 is a vertical cross-section, on an enlarged scale, of the malt-turner, taken in a plane indicated by the line 2 2, Figs. 1 and 6. Fig. 3 is an end elevation of the apparatus shown in Fig. 1. Fig. 4 is a side elevation, on an enlarged scale, of one end of the malt-turner, showing the running and propelling and track connections. Fig. 5 is a vertical longitudinal section of the trolley and its track-supports on the line 5 5, Fig. 3. Fig. 6 is a plan view of the malt-turner and of a trench or compartment with portions of two adjoining compartments.

Fig. 7 is a detail view, on an enlarged scale, of the lifting-shaft and connections by which the rotary stirrers are withdrawn from the malt in the compartments and the traveling turner is raised bodily clear of said compartments for transferring it from one to another. Fig. 8 is a plan view of one of the spiral stirrers; and Figs. 9 and 10 show a modification of the malt-turner, Fig. 9 being a partial front or side elevation and partial longitudinal section on the line 9 9, Fig. 10, and Fig. 10 being a vertical cross-section on the line 10 10, Fig. 9.

Our improved apparatus is employed in the flooring or germinating process of malt manufacture ordinarily extending over a period of three or four days to turn and separate the malt at intervals more or less frequent according to its condition.

Referring to Figs. 1, 3, and 6 of the drawings, A A represent trenches or compartments of a malting plant provided with perforated floors *a a*, upon which the malt is spread. Below these floors are the usual spaces into which air, moist, cool, or heated, as required, is forced and thence upwardly through said perforated floors and the malt spread thereon.

The turner by which the malt is automatically separated, loosened, and turned and the free circulation of air through the same is permitted consists generally of a carriage-frame B, provided at the ends with flanged wheels *b b*, which are supported and guided upon tracks or ways *a' a'* on the partitions between the several compartments, rotary stirrers C C, and a motor D, connected with and arranged to rotate said stirrers. The stirrers C C consist, preferably, of spiral bars or strips, which may be of any form—round, prismatic, or flat in cross-section—and are provided at their lower intumed ends, as shown in Fig. 8, with scrapers *c*, adapted to bear upon or run close to the perforated floors *a a*. They are secured to the lower ends of rotary racks E E, which are supported vertically parallel with and equidistant from each other in bearings in the carriage-frame B and are connected at their upper ends by gears *e e*, arranged to turn adjacent stirrers in opposite directions. The spirals of the stirrers are alternately reversed or made rights and lefts,



as shown in Fig. 1, to effect the proper movement and action of the scrapers. The several rotary racks are freely movable vertically in their bearings and through their connecting-gears  $e e$ , which are held from turning thereon by keys in their hubs engaging with longitudinal grooves or key-seats in said racks, as shown most clearly in Figs. 1, 2, and 7. The bearings in which said racks are supported and turned are provided with graphite bushings  $e' e'$ , as shown in Fig. 2, whereby the use of oil or greasy lubricants is avoided and the contamination and injury of the malt by oil or grease is prevented.

The armature of the electric motor D is connected by a train of speed-reducing gears  $d, d', d^2, d^3$ , and  $d^4$  with one of the rotary racks, from which a rotary movement is communicated through the gears  $e e$  to the other racks. The gears  $d$  and  $d'$  are rigidly connected concentric with each other and loosely mounted upon one of the racks. The gears  $d^2$  and  $d^3$  are similarly connected and mounted upon an adjacent rack, the larger gear  $d^2$  meshing with the smaller gear  $d'$  and the smaller gear  $d^3$  meshing with the larger gear  $d^4$ , which is mounted upon the same shaft with the gears  $d$  and  $d'$ , but prevented from turning thereon by a key like or similar to that of the gears  $e e$ .

F is a carriage-propelling shaft extending horizontally from end to end of the malt-turner and provided at the ends with pinions  $f f$ , which mesh with racks  $a^2 a^2$  on the partitions between the compartments A A. At an intermediate point between its ends said shaft is provided with a pair of bevel-gears  $f' f'$ , loosely mounted thereon and adapted to be connected therewith one at a time by an intermediate clutch  $f^2$ , which is shifted in either direction and held in place by a lever  $f^3$  and a notched segment  $f^4$ , as shown in detail in Figs. 2 and 4. The gears  $f' f'$  mesh with opposite sides of a similar gear  $g$ , fixed on the lower end of a shaft G, which is provided with a spur-gear  $g'$ , meshing with a pinion  $g^2$  on a parallel vertical shaft, provided in turn at its upper end with a gear  $g^3$ , meshing with a pinion  $g^4$ , mounted upon one of the rotary racks E and held from turning thereon by a key like or similar to those of the gears  $e e$ .

When the clutch-sleeve  $f^2$  stands in its middle position, as shown in Fig. 4, the gears  $f' f'$  will turn loosely on shaft F, and the carriage will stand still while the motor D is running. By moving said clutch-sleeve into engagement with one of said gears  $f' f'$  on either side thereof the carriage will be propelled through the connections above described. Shifting said clutch-sleeve from one gear to the other will reverse the movement of the carriage.

H is a lifting-shaft supported by suitable bearings in the carriage-frame parallel with the shaft F and provided with pinions  $h h$ , which mesh with the rotary racks E E, as shown in Fig. 7. At the ends of the carriage it is provided with gears  $h' h'$ , engaged by

pinions  $i i$  on the shafts of hand-wheels I. (Shown in Figs. 1 and 6.)

The carriage is provided at each end with a horizontal transverse rock-shaft J, which is provided at or near each end with a depending arm  $j$ , carrying a friction-roller  $j'$ , adapted to engage with the under side of the way on which the carriage-wheels  $b b$  travel, and thereby prevent the accidental lifting of the carriage and hold it securely in place upon its ways. Each of said shafts is also provided with an upwardly-extending arm  $j^2$ , to the upper end of which is pivoted a nut  $j^3$ , threaded upon the adjacent end of the lifting-shaft H, as shown in detail in Figs. 4 and 7. By means of this connection the rollers  $j' j'$  are simultaneously swung outwardly clear of the carriage-ways when the stirrers are raised by the hand-wheels I I. The tracks  $a'$  and racks  $a^2$  are preferably mounted upon channel-iron beams or supports  $a^3$ , in the channels of which the electric wires or conductors  $k k$  for supplying the motor D with current are stretched, as shown in Figs. 1, 2, 3, and 4. Upon the rock-shafts J J are mounted arms K K, which are formed or provided with brushes or sliding contacts  $k' k'$ , arranged to traverse the wires  $k k$ , forming electrical connections therewith. They are also suitably insulated and connected by wires or conductors (not shown) with the terminals of the motor D. The same movements of the hand-wheels I I which raise and lower the stirrers C C and swing the rollers  $j' j'$  into and out of engagement with the carriage-ways or channel-iron supports  $a^3 a^3$  also operate to carry the contacts  $k' k'$  into and out of engagement with the wires or conductors  $k k$ .

$h^2$  is a pawl or dog pivoted to one end of the carriage-frame and arranged to be turned into and out of engagement with the teeth of the adjacent gear  $h'$  and thereby lock and hold the stirrers C C and the rotary racks E E, to which they are attached, in any desired position.

Each of the conductors  $k k$  is provided at each end with a tapering insulated trip-block  $k^2$ , as shown in Fig. 3, which is adjustably held thereon by a set-screw or other means, and is set so as to automatically disengage the contact  $k'$  from said conductor, and thus stop the turning-machine at the desired point.

$k^3$  represents a switch by means of which the conductors  $k k$  of any trench or compartment A may be connected or disconnected with the main feeding-wires.

Referring to Figs. 1, 3, and 5, L represents a track or way located above each end of a series of trenches or compartments transverse to the carriage-ways  $a' a'$ .

M is a trolley suspended by its grooved wheels  $m m$  upon said track L and provided with a number of depending hooks  $m' m'$ , which are constructed and arranged to engage with heads  $e^2 e^2$  on the upper ends of the rotary racks and stirrer-shafts E E. It is provided at or near each end with depending han-



dles  $m^2 m^2$ , by means of which said hooks are swung into and out of engagement with the heads on said stirrer-shafts, and the trolley, with the malt-turning machine suspended thereon, is propelled upon the track L from one compartment to another. The track L is provided upon the front side with a guard-rail  $l$ , by which the trolley-wheels  $m m$  are retained thereon. Depressions or seats  $l' l'$  for the trolley-wheels are formed in the track L to arrest and hold the trolley in the proper positions for receiving the malt-turning machine from or delivering it to the several compartments over which said track extends.

Our improved apparatus operates as follows: The stirrers C C being lowered into working position, as shown in Fig. 1, and the clutch  $f^2$  set to propel the carriage in the proper direction, the operator turns the switch  $k^3$  to supply current to the conductors  $k k$  of the trench in which the turning-machine is placed. The motor, being thus supplied with current through said conductors and the contacts  $k' k'$  and their connections, operates through the train of gears hereinbefore described to turn the adjacent stirrers in opposite directions and through the propelling-shaft F, its pinions  $f f$ , and the racks  $a^2$  to move the carriage slowly forward. The combined rotary and traversing or advance movements of the stirrers thus produced effectually turn, separate, and loosen all the malt contained in that department, thus allowing free access of air to every part thereof. Upon the arrival of the carriage underneath the track L at that end of the compartment toward which it is advancing the contacts  $k' k'$  ride upon the tapered insulating stop-blocks  $k^2 k^2$ , thus depriving the motor of current and automatically stopping the machine. The operator now moves the clutch  $f^2$  into its middle position, as shown in Fig. 4, out of engagement with either of the gears  $f' f'$  and shifts the stop-blocks  $k^2$  out of engagement with the contacts  $k'$ , thus restoring the electric connections between the motor and the conductors  $k k$  and causing it to turn the stirrers without moving the carriage. The trolley M having been brought directly over the malt-turner and being held in place by the engagement of its wheels  $m m$  with the seats  $l' l'$  in track L, the dog  $h^2$  is disengaged from the adjacent gear  $h'$  and the hand-wheels I I are turned in the proper direction to lift the stirrers C C from the malt out of the trench. The rollers  $j' j'$  and the contacts  $k' k'$  are simultaneously swung outward through their connections with the lifting-shaft H hereinbefore described clear of the overhanging racks  $a^2 a^2$ . The contacts  $k' k'$  are constructed and arranged, however, to maintain electrical connections with the conductors  $k k$  for a sufficient length of time to rotate the stirrers C C until they are withdrawn from the malt and thereby facilitate their withdrawal therefrom. When the stirrers are lifted out of the trench above the carriage-ways  $a' a'$  and

the reduced portions of the stirrer-shafts just below their heads  $e^2 e^2$  are brought directly opposite and engaged by the hooks  $m m$  of the trolley, the hand-wheels I I are turned in the opposite direction, thus lifting the carriage-frame B bodily upon the racks E E until it entirely clears the tracks  $a' a'$  and is suspended from the trolley M. The dog  $h^2$  is now turned into engagement with the adjacent gear  $h'$ , thus holding the carriage-frame in its elevated position upon said racks. In this position the machine is carried by the trolley to another compartment or trench, into which it is lowered by means of the hand-wheels I I, the trolley being arrested and held in the proper position for the purpose by the depressions or seats  $l' l'$  in the track L.

Referring to Figs. 9 and 10, showing a modification of the malt-turner, particularly with reference to the method and means of raising and lowering the stirrers, the stirrer-shafts E' E' are held immovably lengthwise in bearings provided therefor in a girder or cross-piece  $b'$ , which is provided at the ends with offset arms and hollow trunnions  $b^2$ , supported and capable of turning in boxes in the ends  $b^3$  of the carriage-frame.

N is a horizontal shaft extending from end to end of the carriage and supported at its ends in the hollow trunnions  $b^2$ . It is provided with bevel gears or pinions  $n n$ , which engage with similar gears  $n' n'$  on the upper ends of the stirrer-shafts. The motor D, which in this case is mounted upon one end of the carriage-frame, has a worm  $d^5$  on the armature-shaft meshing with a worm-gear  $n^2$  on shaft N, whereby the stirrers are turned.

The cross-piece or girder  $b'$ , carrying the stirrers C' C', has at the ends concentric with shaft N segment-gears O O, engaged by pinions  $i'$  on the shafts of hand-wheels I', by means of which said gears, together with the girder  $b'$ , may be turned in either direction around shaft N and the stirrers thus raised and lowered from and into the malt-trenches, as indicated by dotted lines in Fig. 10. The stirrers are rigidly held in their working or elevated positions by locking devices, which may consist of screws  $o$ , held in the ends of the carriage-frame and having heads engaging arc-shaped slots in the gears O, and of hand-nuts arranged to draw said gears tightly against the adjacent ends, as shown.

A horizontal shaft P, having bearings in the ends  $b^3$  of the carriage-frame, return-cranks  $p$  for attachment to the hooks  $m' m'$  of the trolley, and an arm  $p'$  at each end afford convenient means of suspending the malt-turner from the trolley and lifting it clear of the ways between the compartments.

Turning the cranks  $p$  by means of arms  $p'$  from their upper position, where they are engaged by the hooks or hangers of the trolley, into their lower position a little past a perpendicular lifts the malt-turner bodily from its ways and holds it without other means of fastening in its elevated position.



With our improvements as hereinbefore described we are thus enabled to dispense with the cumbersome, complicated, and troublesome cable-driving connections which have heretofore been employed in apparatus of this class for propelling the malt-turners through the trenches or compartments. We are also enabled to employ a single malt-turner to do the required work of a number of compartments. The transfer of the turner from one compartment to another is easily and quickly effected without removing the walls or partitions of the compartments or disturbing the malt contained therein. The cost of the apparatus is materially reduced and its construction and operation greatly simplified.

Various changes in the minor details of construction of the apparatus other than those specified may obviously be made within the intended spirit and scope of our invention.

We claim—

1. A malt-turner consisting of a carriage provided with propelling-wheels adapted to traverse elevated tracks or ways at the sides of a malt-trench; spiral stirrers adapted to turn normally on vertical axes and movable vertically with respect to the carriage so as to admit of their being lowered into and raised from the malt while the carriage is at rest, a motor mounted upon said carriage and connected with said stirrers, and reversing and controlling mechanism for connecting said motor with the propelling-wheels of the carriage, such mechanism consisting of a bevel driving-gear, a driven shaft, two bevel-gears loosely mounted on said shaft in mesh with opposite sides of said driving-gear, a clutch feathered on said shaft and a lever for throwing said clutch into engagement with either driven gear or holding it out of engagement with both, substantially as and for the purposes set forth.

2. In a malt-turner, the combination of a carriage, rotary spiral stirrers having bearings in said carriage and movably connected therewith so as to be raised and lowered from and into the malt, mechanism for lifting and lowering said stirrers, and a motor connected with said stirrers so as to rotate the same while they are being lifted out of or lowered into the malt, substantially as and for the purposes set forth.

3. In malting apparatus, the combination of a number of trenches, tracks at the sides thereof, a malt-turner adapted to traverse said tracks and provided with rotary stirrers having rack-shafts movable vertically in said carriage, a lifting-shaft provided with pinions engaging said rack-shafts, a track extending over said trenches transversely to said carriage-tracks, and a trolley mounted thereon, provided with connections for the attachment of said rack-shafts thereto, substantially as and for the purposes set forth.

4. In malting apparatus, the combination of a number of trenches, tracks at the sides

thereof, a malt-turner adapted to traverse said tracks and comprising stirrers having vertically-movable rack-shafts; laterally-movable rollers adapted to engage the under side of said tracks, and a lifting-shaft having pinions engaging said rack-shafts and connections with said rollers whereby they are moved clear of said tracks simultaneously with the withdrawal of the stirrers from a trench, substantially as and for the purposes set forth.

5. In malting apparatus, the combination of a number of trenches, tracks at the sides thereof, and a malt-turner comprising a carriage adapted to traverse said tracks, vertically-movable rotary rack-shafts provided with stirrers, gears loosely keyed upon and connecting said rack-shafts with each other, and a horizontal lifting-shaft provided with pinions engaging with said rack-shafts, substantially as and for the purposes set forth.

6. In malting apparatus, the combination of a number of trenches, tracks at the sides thereof, and a malt-turner comprising a carriage adapted to traverse said tracks, rotary rack-shafts movable vertically in said carriage and provided with spiral stirrers, a horizontal lifting-shaft provided with pinions engaging with said rack-shafts, and a hand-wheel geared with said lifting-shaft, substantially as and for the purposes set forth.

7. In malting apparatus, the combination of a number of trenches, tracks at the sides thereof, and a malt-turner comprising a carriage adapted to traverse said tracks, rotary stirrers having rack-shafts vertically movable in said carriage, a lifting-shaft provided with pinions engaging with said rack-shafts, and rock-shafts parallel with said tracks, provided with arms carrying rollers adapted to engage the under side of said tracks and retain the carriage thereon and with arms connected with nuts threaded on said lifting-shaft, whereby the withdrawal of said stirrers from a trench simultaneously moves said rollers out of range with said tracks, substantially as and for the purposes set forth.

8. In malting apparatus, the combination of a number of trenches, channel-iron ways at the sides thereof, electric conductors stretched in the channels of said ways parallel therewith, and a malt-turner comprising a carriage adapted to traverse said ways, a motor mounted thereon, vertically-movable stirrers connected with said motor, laterally-movable contacts connected with said motor and adapted to engage with and traverse said conductors, and means of simultaneously raising or lowering said stirrers and moving said contacts out of or into engagement with said conductors, substantially as and for the purposes set forth.

9. In malting apparatus, the combination of a number of trenches, parallel ways at the sides thereof, a malt-turner adapted to traverse said ways and provided with rotary turners having rack-shafts movable vertically in said carriage, a lifting-shaft provided with



pinions engaging with said rack-shafts, a  
track extending over said trenches trans-  
versely to said ways, and a trolley mounted  
thereon and provided with hooks or hangers  
5 adapted to be engaged with said rack-shafts  
and thereby suspend said malt-turner, sub-  
stantially as and for the purposes set forth.  
In testimony that we claim the foregoing as

our own we affix our signatures in presence  
of two witnesses.

JACOB F. THEURER.  
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