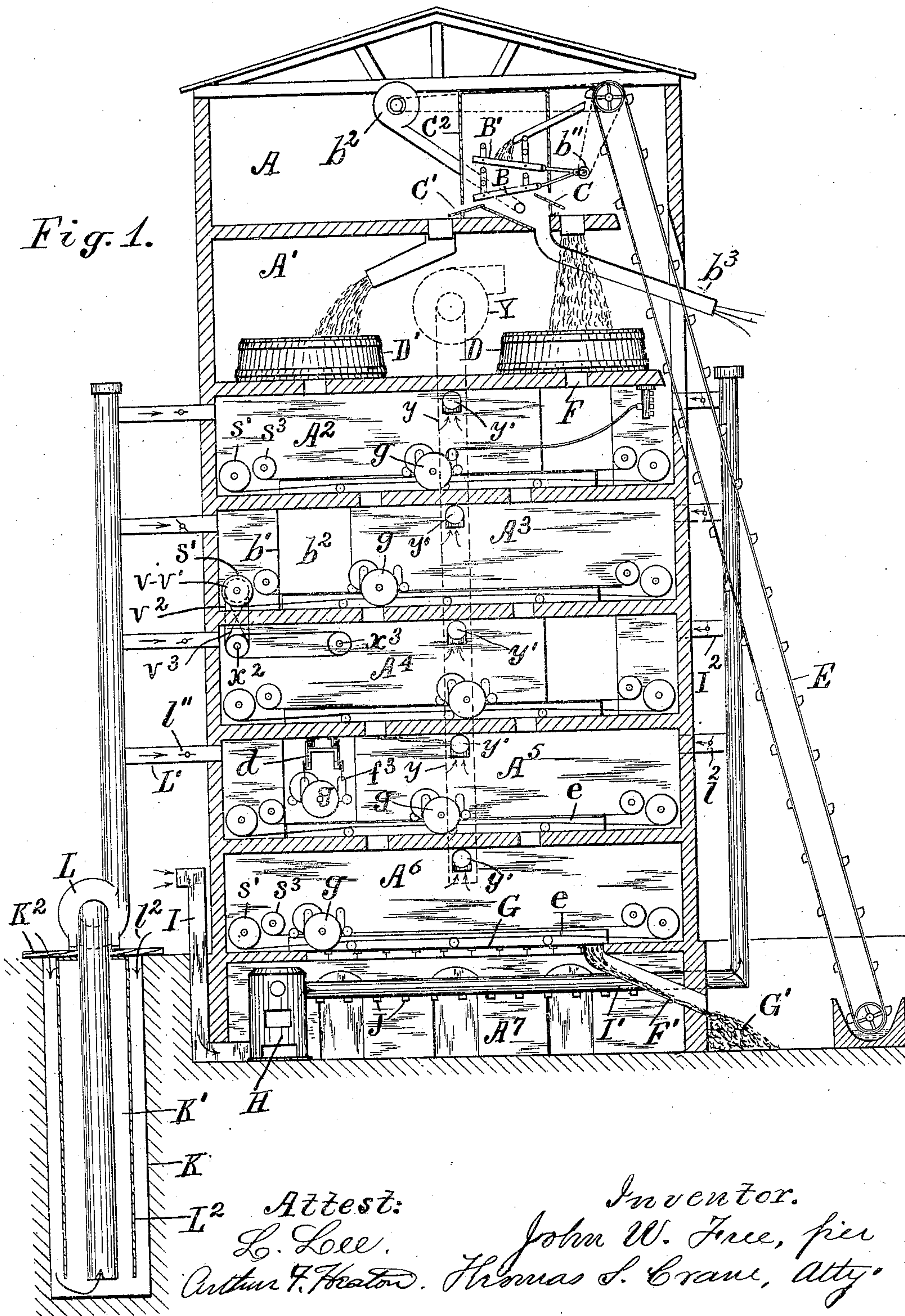


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APPLICATION FILED NOV. 21, 1904.

5 SHEETS—SHEET 1.

Fig. 1.



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5 SHEETS—SHEET 2.

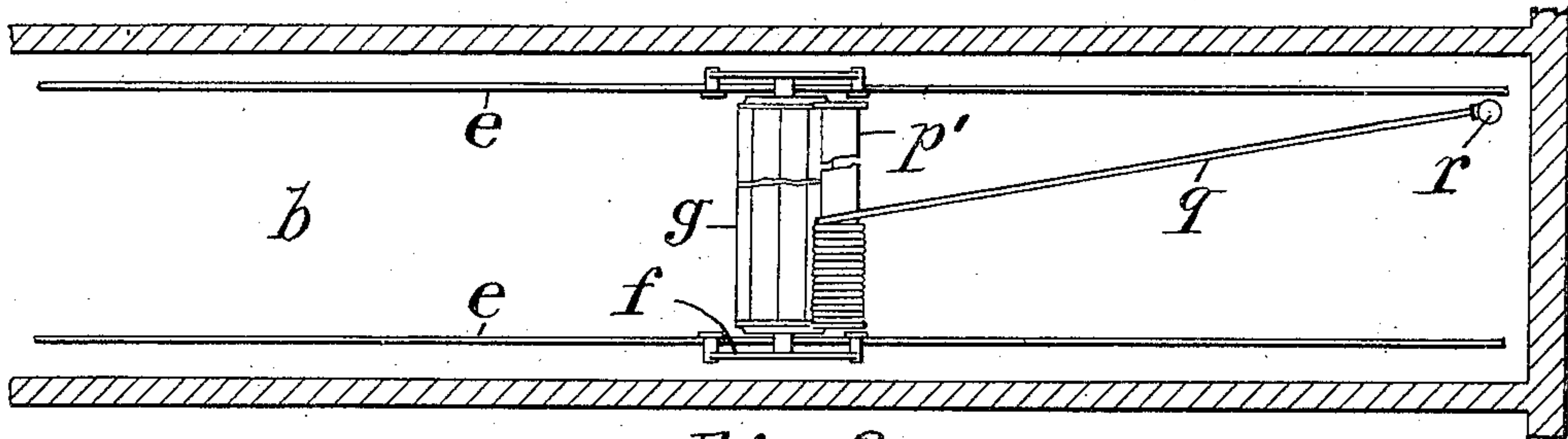


Fig. 2.

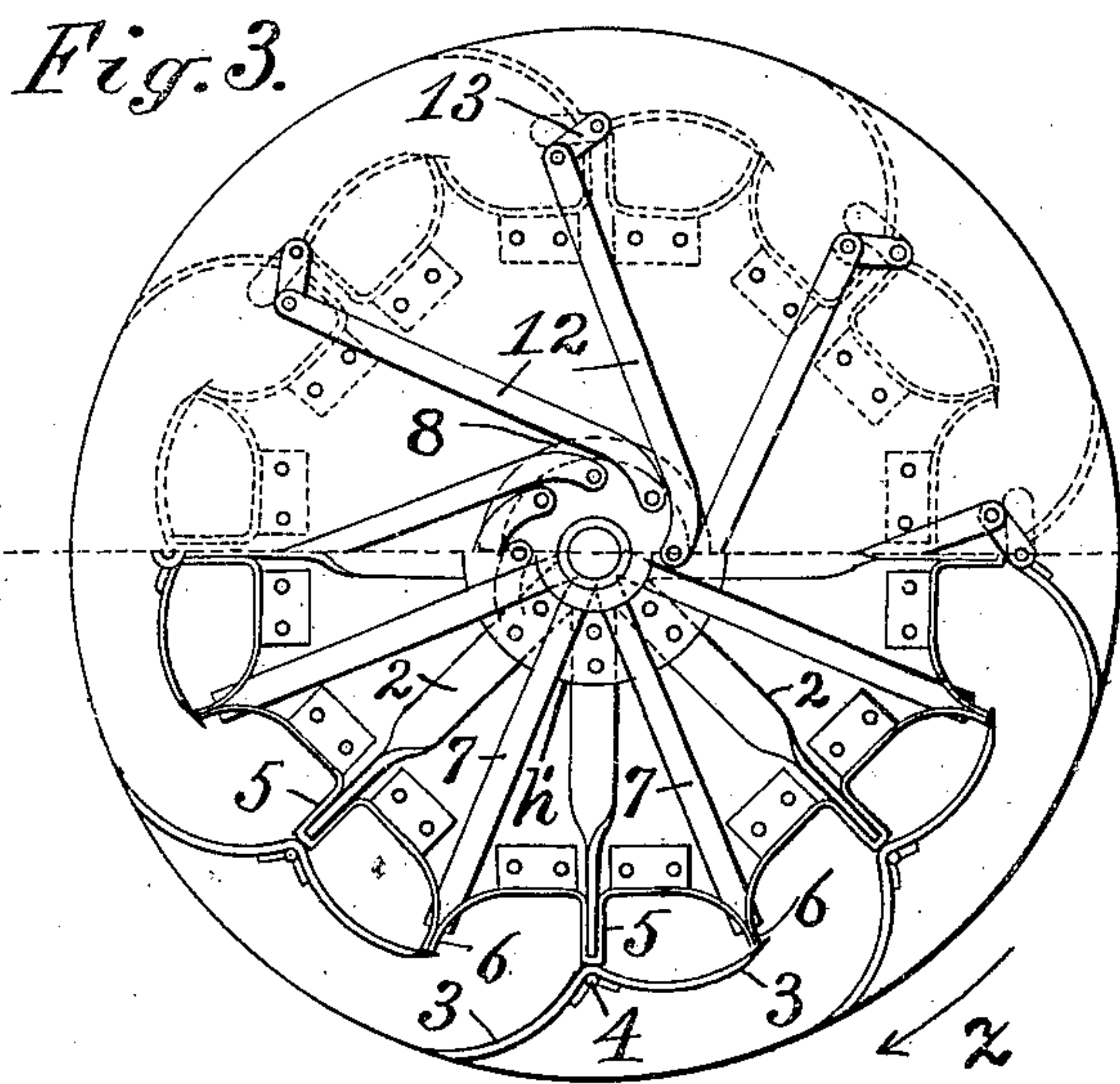


Fig. 3.

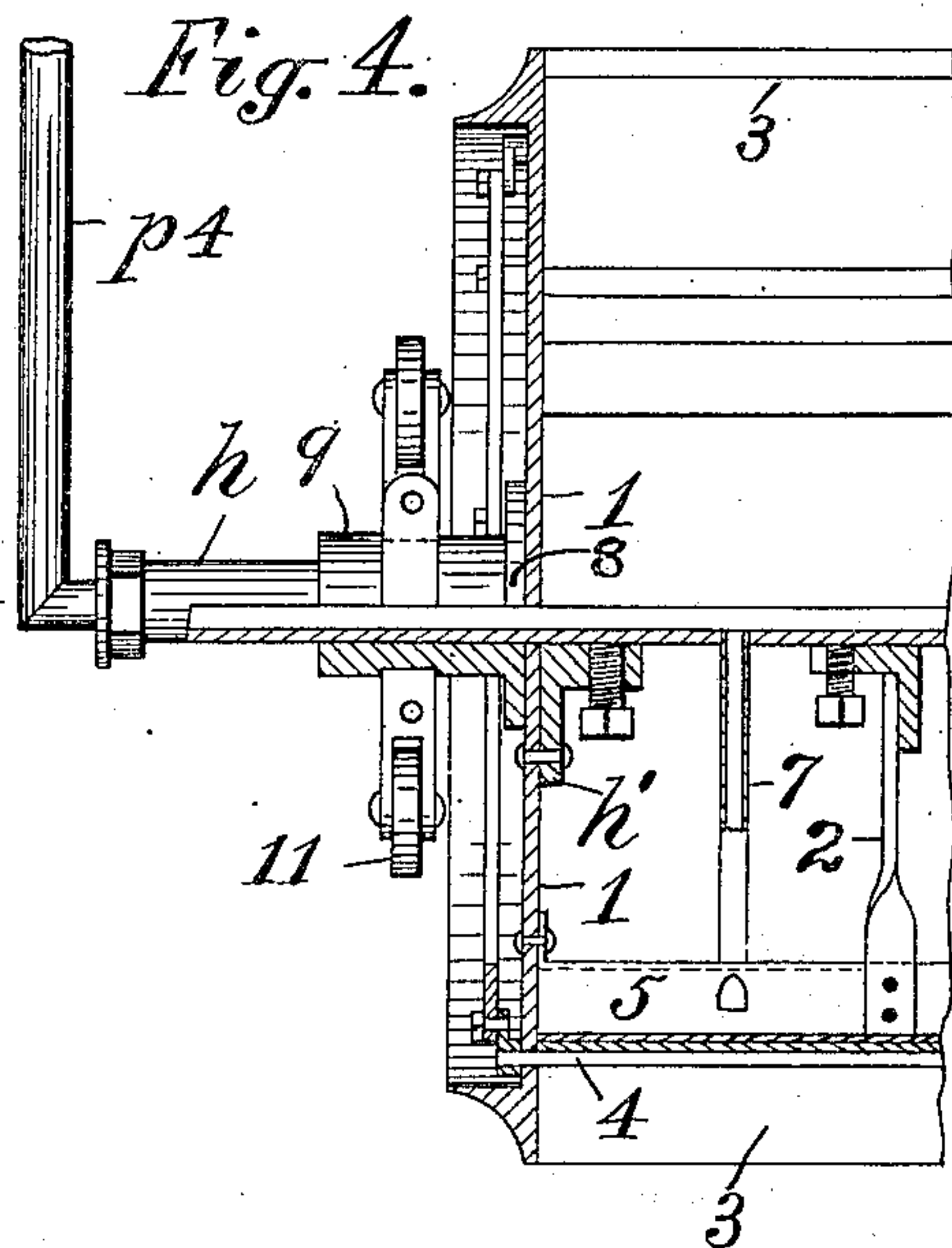


Fig. 4.



Fig. 5.

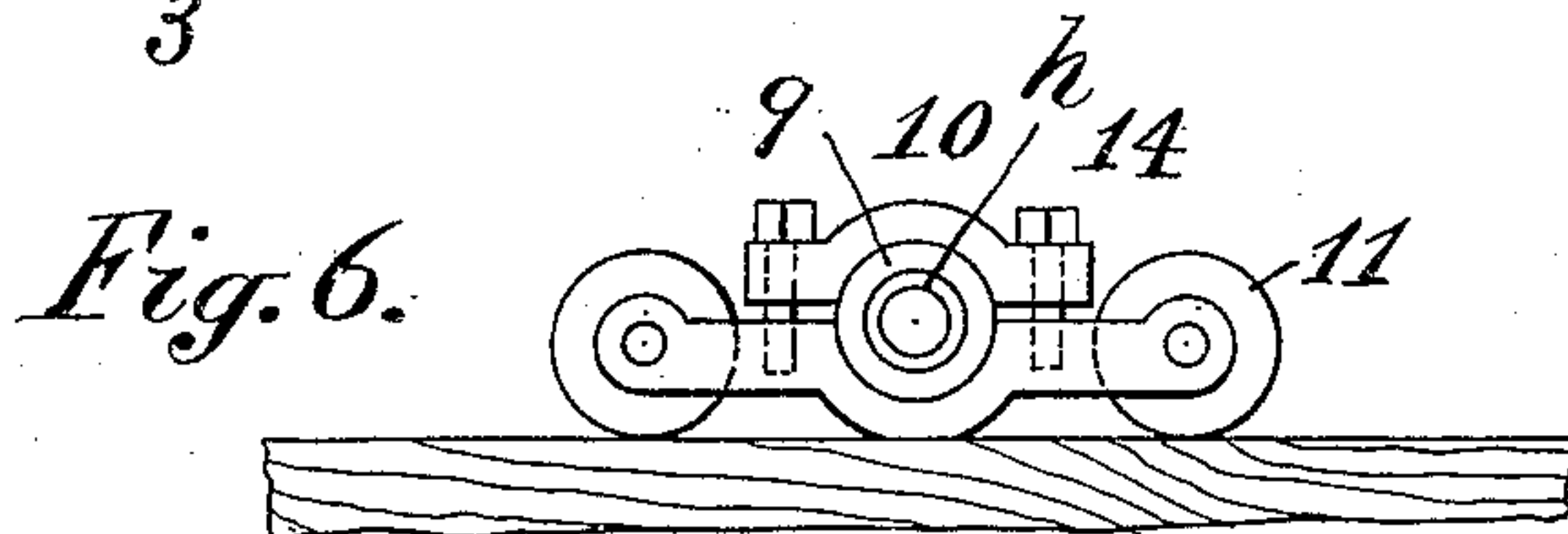


Fig. 6.

Attest:
L. Lee.
Cuthbert F. Fruton.

Inventor.
John W. Free, per
Thomas S. Crane, Atty.

No. 836,925.

PATENTED NOV. 27, 1906.

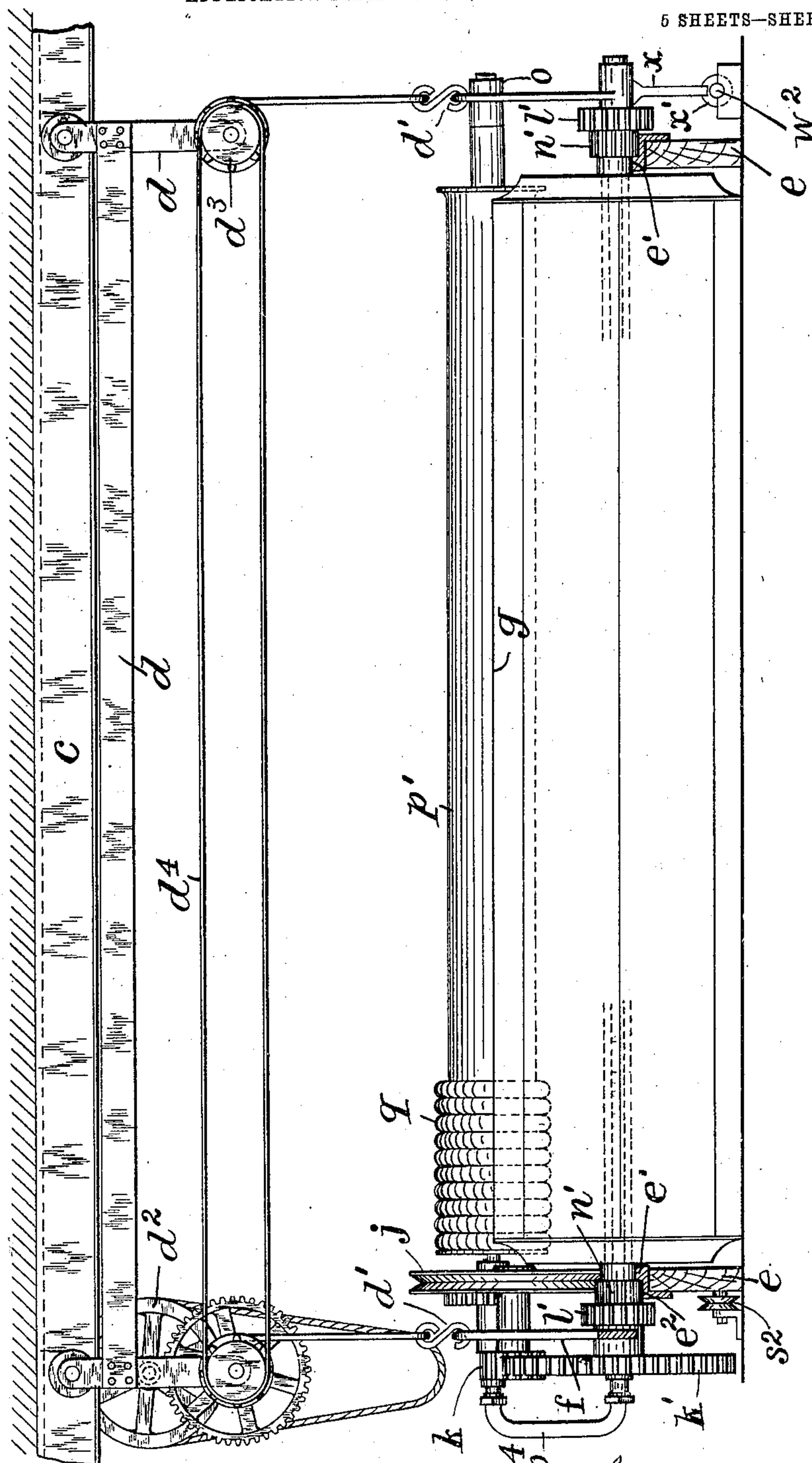
J. W. FREE.

MALTING APPARATUS.

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Fig. 7.



Attest:
L. L. W.
Arthur F. Heaton.

Inventor.
John W. Free, per
Thomas S. Crane, Atty.

No. 836,925.

PATENTED NOV. 27, 1906.

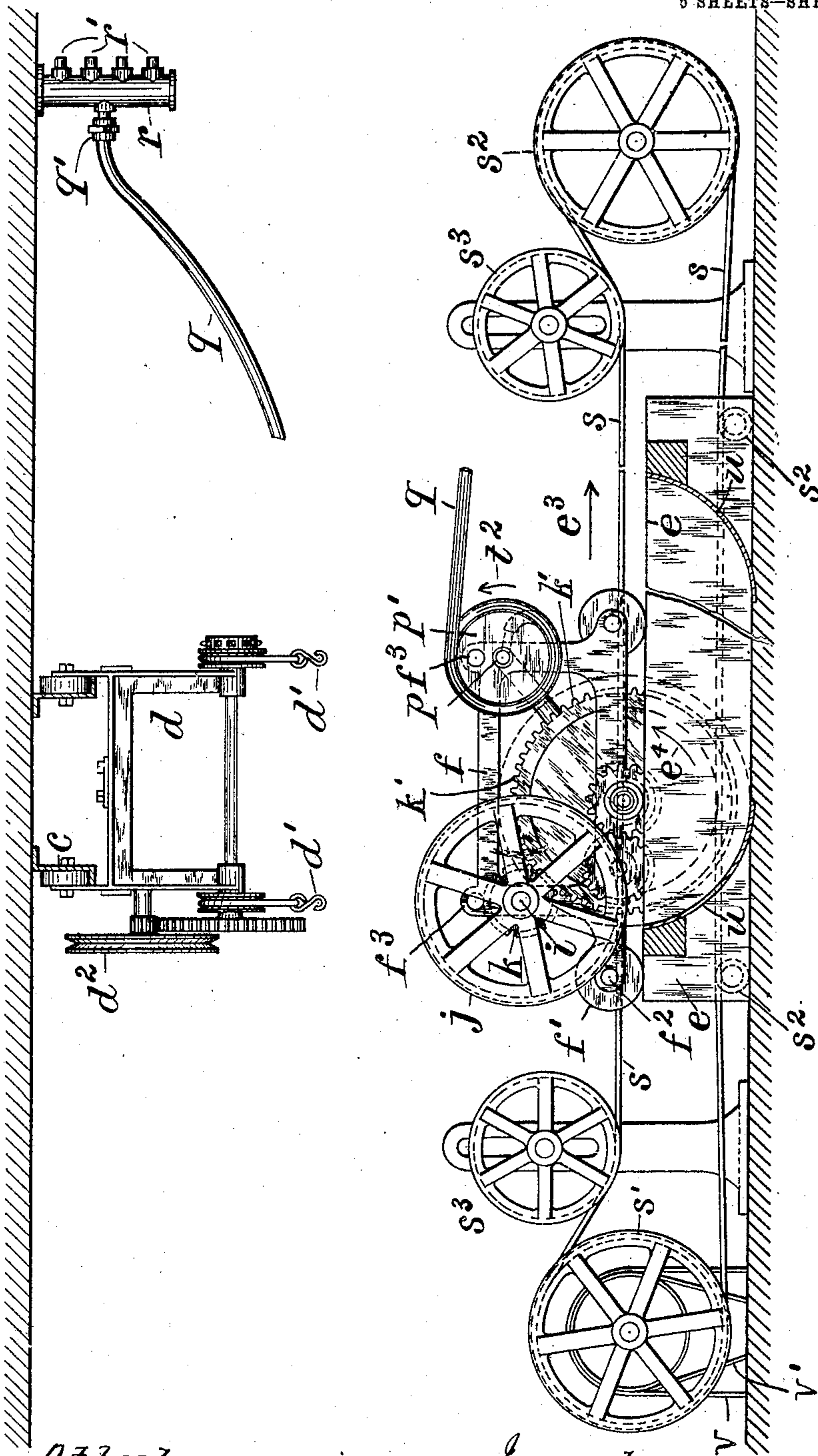
J. W. FREE.

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Fig. 8.



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Lo. Lee,
Arthur F. Heaton

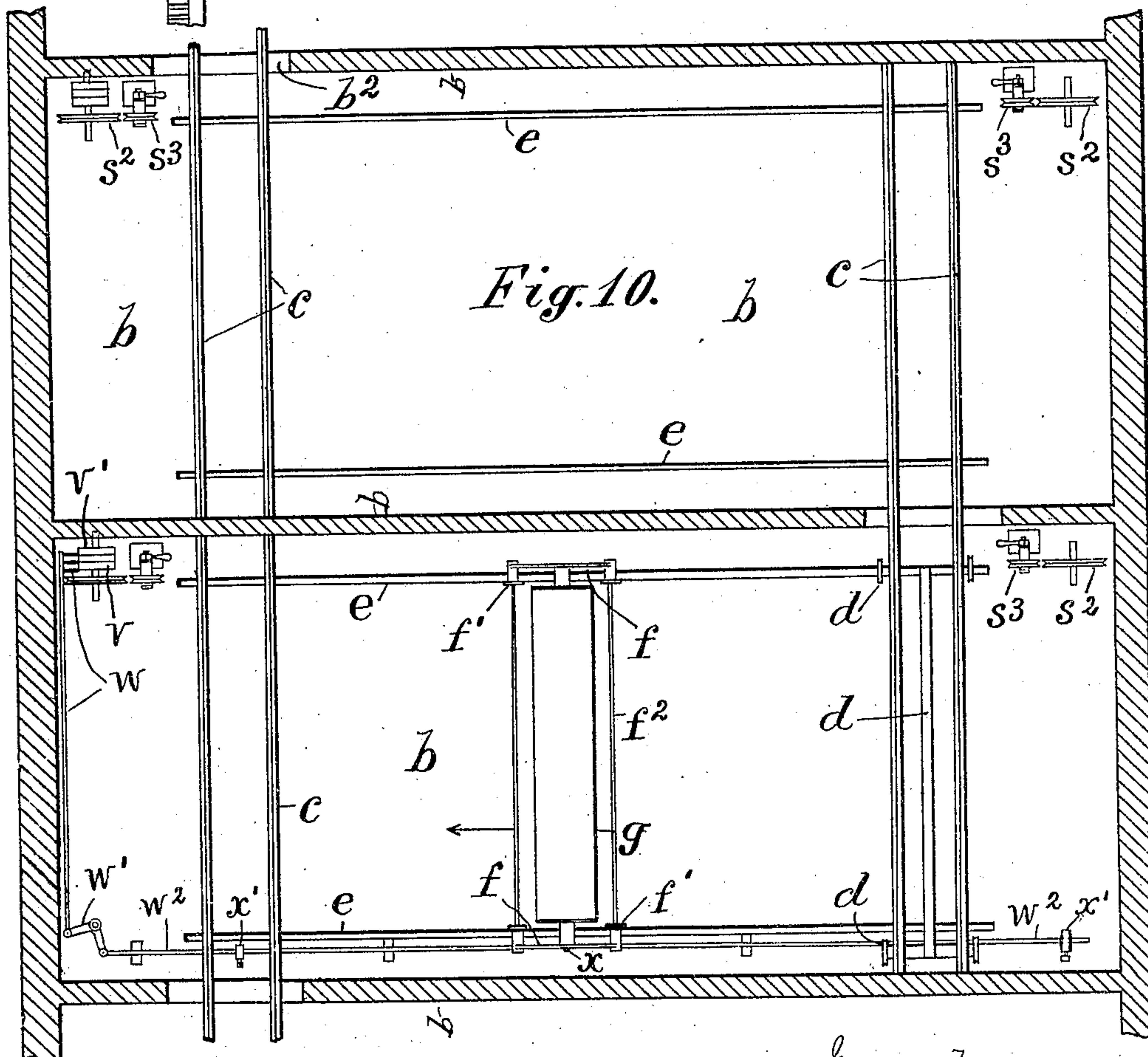
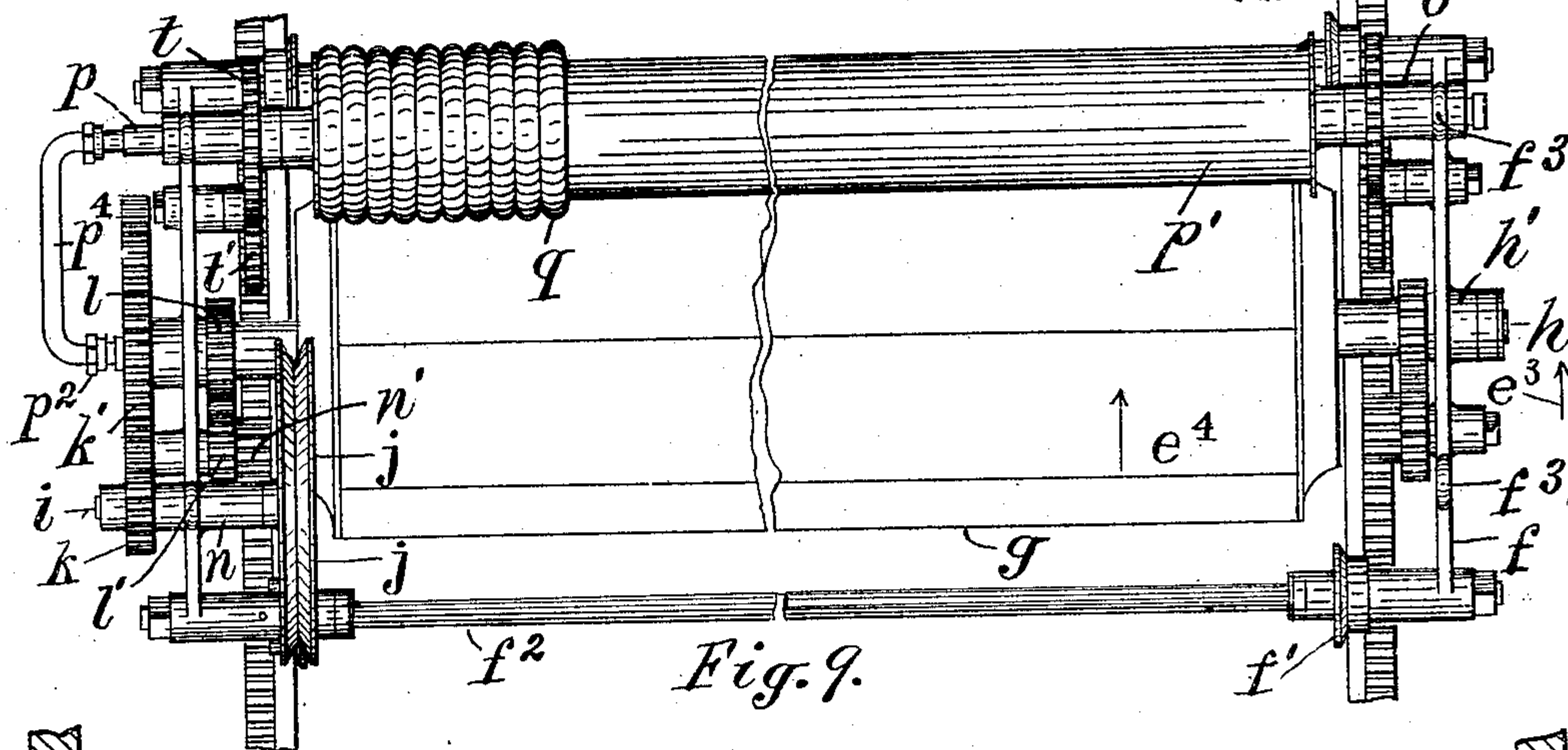
Inventor.
John W. Free, per
Thomas S. Crane, atty

No. 836,925.

PATENTED NOV. 27, 1906.

J. W. FREE.
MALTING APPARATUS.
APPLICATION FILED NOV. 21, 1904.

5 SHEETS SHEET 5.



Attest:
L. Lee
Arthur F. Horton.

Inventor.
John W. Free, per
Thomas S. Crane, Atty.

UNITED STATES PATENT OFFICE.

JOHN W. FREE, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO INTERNATIONAL MALT MACHINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF SOUTH DAKOTA, AND STANDARD FINANCE COMPANY, A CORPORATION OF NEW YORK.

MALTING APPARATUS.

No. 836,925.

Specification of Letters Patent.

Patented Nov. 27, 1906.

Application filed November 21, 1904. Serial No. 233,750.

To all whom it may concern:

Be it known that I, JOHN W. FREE, a citizen of the United States, residing at No. 1135 Broadway, New York, county of New York, and State of New York, have invented certain new and useful Improvements in Malting Apparatus, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to facilitate the preparation of the grain for malting, the distribution of the grain from floor to floor in a building having several stories so that it may be successively treated upon the said stories, the regulation of the temperature in the malting-rooms, the agitation of the malt upon the malting-floors, the moistening of the same when required, and the direct mixing of cold and hot air with the malt to effect its growth, and the continuous agitation of the malt upon the drying-floor when transferred thereto from the malting-floors.

The invention includes particularly a stirring device adapted to run automatically back and forth throughout the length of the malting-floor, the stirrer having reversible blades to agitate the malt equally when moved in either direction upon the floor.

It also includes a particular construction of the stirring devices and a series of adjacent malting-floors, so that the same stirring device can be transferred bodily from one floor to another, and thus operate in succession upon a series of floors.

The invention will be understood by reference to the annexed drawings, in which—

Figure 1 is a sectional elevation of a building showing the various appliances provided for malting the grain. Fig. 2 is a diagram of one of the malting-floors and the stirring device with connection to a stand-pipe for supplying hot or cold fluids to the malt. Fig. 3 is an end view of the stirring-drum, the head being cut away from the lower part of the view to show the interior parts. Fig. 4 is a side elevation of one end of the stirring-drum in section at the center line where hatched. Fig. 5 is a plan view of one of the reversible buckets. Fig. 6 is an end view of the drum-axle and the friction-clamp for reversing the bucket. Fig. 7 is a side elevation of the

stirring device and the traveling crane for the same with the hoisting-gear. Fig. 8 is an end elevation of the same with the cord-driving attachments and the stand-pipe and its connections. Fig. 9 is a plan of the stirring-drum and its carriage-fixtures, and Fig. 10 is a diagram showing two adjacent malting-floors with the means for shifting the stirring-drum and its carriage from one floor to another.

In Fig. 1 a malt-house of seven stories and basement is shown, with apparatus for cleaning and grading the grain in the top story A, bins for storing grain in the next story A', a heating apparatus in the basement A', the first story A⁶ arranged for drying the grain, and the intermediate stories A² to A⁵, inclusive, provided with malting-floors and apparatus for stirring the grain while malting. Each of these intermediate stories is provided with several adjacent malting-floors b, separated by partitions b', with doorways b² through the same.

Figs. 7, 8, and 10 show track-rails c upon the ceiling over the malting-floors extended through the doorways b² and provided with a traveling crane d, having four hoisting-wheels to raise four hooks d' simultaneously and gearing operated by a grooved wheel d² with endless cord depending therefrom.

The axles of the hoisting-wheels are connected by chain-wheels d³ and a chain d⁴, which is represented merely by parallel lines in Fig. 7. The hoister serves to transfer the stirring apparatus from one malting-floor to another, as may be required, so that the malt in each floor may be stirred at intervals without providing a separate stirring-drum and propelling devices for each floor.

To prepare the grain for malting, an elevator E is provided to raise the grain to the top story A, where it is discharged upon sieves B and B', adapted to grade the grain by separating the coarse from the fine kernels, the coarse kernels falling on a chute C, which delivers them into the bin D in the story A', while the other sieve delivers the finer grain upon a chute C', which discharges the grain into a separate bin D'. The belt of the elevator E is driven from the bottom and furnishes means of conveying power to the story A for agitating the sieves B B' by the

crank b'' and for driving a fan b^2 to blow away the dirt which is separated from the grain in the sifting operation. This is effected by inclosing the sieves in a casing C^2 , to which the pipe of the blower b^2 is extended, and leading a discharge-pipe b^3 from the casing to the outer side of the building. The grain is thus sifted and cleaned before it is discharged to the bins. Passages F are extended through the malting-floors into the stories below and would be provided with any suitable gates for discharging the grain to the floors upon such lower stories.

With a series of stories, as shown in Fig. 1, the malt may be partly treated upon the floor in each story and then discharged to the story below, being finally discharged into the lower story A^6 , which is provided with a drying-floor G for drying the malt.

An air-heater H is shown in the basement with a duct I to supply the air thereto and a discharge-pipe I' , having nozzles J , opening into the basement to heat the drying-floor.

The drying-floor is provided with a traversing stirring-drum g , which agitates the grain upon the perforated floor and thoroughly separates all the sprouts therefrom, and the floor may be perforated to discharge the sprouts into the basement below, where they would be collected and used for fodder, fertilizers, &c.

A chute F' discharges the dried grain G' from the drying-floor.

The hot-air pipe I' is shown extended upwardly to the story A^2 , and branch pipes I^2 are extended into each of the stories A^2 to A^6 , inclusive, and provided with a damper l^2 , which regulates the introduction of hot air into the story to warm the malting-floor, as may be required.

When the malting-floor requires cooling, it is effected by air cooled in an earth well K , having an outlet-pipe K' , extended nearly to the bottom and connected with a suction-fan L , from which branches L' are extended to the several stories containing malting-floors. These branch pipes are provided with dampers l'' , by which the supply of cold air may be regulated. The earth well is shown provided with a beam K^2 across the top to sustain the blower L and with an inner jacket L^2 , extended downward in the well near its outer wall and connected closely at the top to the pipe K' . The air entering the well is thus compelled to pass close to the wall of the well, as shown by the arrows l^2 , and the heat is thus abstracted from the thin layer of air, which is thus materially cooled before it is withdrawn by the exhaust-blower. The wall of the well may be of earth when the latter possesses sufficient stability or of thin stone or metal in contact with the earth to conduct the heat effectively from the air.

Each malting-floor, as shown in Figs. 1, 2,

7, 8, and 10, is provided with guard-beams e , having a portion of the upper surface covered by smooth rails e' and the remaining portion covered by a tooth-rack e^2 . A carriage is formed with end frames f , having car-wheels f' to run upon the rails e' , and the frames are tied together by cross-bars f^2 and provided with four eyes f^3 , in which the hooks d' of the crane may be inserted to lift the carriage. (See Figs. 7, 8, 9.) The carriage sustains the stirring-drum g , having hollow shaft h fitted to bearings h' upon the frames f . A bearing n upon the frame carries a shaft i , with driving-sheave j upon one end and pinion k upon the other end, which meshes with a gear k' upon the stirring-drum shaft. The hollow shaft also has a gear l , and a stud is mounted upon an adjacent boss on the frame f and carries a gear l' in mesh with the gear l and a pinion n' in mesh with the rack e^2 . The frame also has bearings o , carrying a tubular shaft p , upon which is mounted a reel p' , carrying a hose q . One end of the hose is connected with the tubular shaft p and the other end with a stand-pipe r . (Shown in Figs. 2 and 8.) The end of the reel-shaft p is connected with the end of the stirrer-shaft h by the pipe p^4 and swivel-couplings p^2 . The stirring-drum and all of the parts described are movable with the carriage, and the wheel j is driven by an endless cord s , (see Figs. 1 and 8,) which propels the carriage along in the direction of the arrow e^3 in Figs. 8 and 9 upon the rack e^2 by the rotation of the gear n' and simultaneously revolves the drum g in the direction indicated by the arrow e^4 in Figs. 8 and 9.

The hose-reel is provided with a gear t , (see Fig. 9,) and the frame f carries a stud with an intermediate gear t' , which meshes with the rack e' and with the gear t , so that the forward motion of the carriage causes the rotation of the reel in the direction of the arrow t^2 in Fig. 8, thus winding up the hose as the carriage moves toward the stand-pipe r and unwinding it when moved in the reverse direction. Each malting-floor is provided with such a stand-pipe and the pipe furnished with a number of nozzles r' , which in practice would be connected with suitable pipes to supply hot and cold air and hot and cold water at pleasure to the hose. Such hot or cold fluid is distributed into the malt from the hollow shaft of the stirring-drum, as hereinafter described.

The cord s is automatically reversed by means hereinafter described to traverse the carriage and stirring-drum back and forth over the length of the malting-floor. The malting-floor would in practice be made about one hundred feet long; but the guard-beams e are shown broken in Figs. 8 and 9, and thus only a little longer than the carriage, for want of room upon the drawings.

The space between the beams near their opposite ends is closed by shields u , which

hold the grain up to the stirring-drum as it reaches the ends of its travel, so that all of the grain may be agitated at each traverse of the carriage.

5 The driving-cord s is propelled by grooved pulley s' , which runs over idlers s^2 and under tightening-wheels s^3 . The shaft of the pulley s' is provided, as shown in Figs. 1 and 10, with pulleys v v' , to which straight and
10 crossed belts v^2 and v^3 are applied in the usual manner (see Fig. 1) and shifted alternately into operation at the opposite end of the carriage movement by a shifter w , bell-crank w' , and rod w^2 , extended adjacent to one of the
15 guard-beams e . (See Figs. 7 and 10.) A dog x upon the carriage contacts with adjustable collars x' upon the rod w^2 when the carriage reaches the opposite ends of the floor, thus reversing the driving-cord s and traversing the carriage back and forth until stopped
20 by the attendant.

Any ordinary means of driving the straight and crossed belts may be used, an illustration being shown in the story A^4 of the building in
25 Fig. 1, where a counter-shaft x^2 is shown to carry the pulleys which drive the straight and crossed belts and driven in turn by a line-shaft or power-shaft x^3 . The same or equivalent means would be furnished for each of
30 the malting-floors, but are not shown in all of the stories on account of the smallness of the scale in Fig. 1.

In practice a number of the malting-floors b are constructed side by side upon each
35 story, two of such floors being shown in Fig. 10, and the doorway b^2 in the intermediate partition, as well as the track-rails c , are arranged in line with the stirring-drum carriage when the latter is at one end of its
40 travel. This facilitates the transfer of the stirring device from one malting-floor to another, which is effected by raising one or both of the tightening-wheels s^3 to loosen the driving-cord s when the motion of the same
45 is stopped and unwrapping the driving-cord from the driving-wheel j , which frees the carriage completely from the driving-cord.

The hose g is also disconnected from the stand-pipe r by its coupling q' , and the hooks
50 d' of the hoister are then engaged with the eyes f^3 upon the carriage-frame and the carriage lifted sufficiently for the stirring-drum to clear the top of the guard-beams e . The carriage can then be readily shifted by the
55 traveling crane over the guard-rails e' upon the adjacent malting-floor and set thereon and connected with the driving-cord s on such floor. The hose g is then connected to the stand-pipe r upon the ceiling of such adjacent
60 floor, and the stirring device is then ready to operate upon such floor, as already described.

In Figs. 1 and 10 the doorways between the adjacent floors are shown arranged alternately at opposite ends of the floors, as it

is preferable to run the stirring-drum only three times over the malt, which causes the carriage to stop at the opposite end of the floor from which it was started.

As the malt on each floor only requires 70 stirring at intervals, the stirrer, with its carriage, can after the malt upon one floor has been stirred be transferred to another, and so to all of those upon the same story and returned to the first-named floor to repeat the 75 stirring thereon. In order that the buckets of the stirring-drum may lift the malt when turned in opposite directions, they are in the present invention made each with two curved blades or flaps 3, formed of a single piece of 80 sheet metal and provided at the middle of the width with journals 4 and with mechanism for tripping the blades upon the journals when the motion of the drum is reversed. The construction is shown in Figs. 3 and 4, 85 where the hollow shaft h is represented with circular flanges h' secured thereon, with the end ones attached to heads 1 and the intermediate ones attached to radial arms 2. These arms carry a sheet-metal shell at a 90 suitable distance from the periphery of the drum to form bucket-spaces for receiving the malt. The shell is formed with ribs 5 adjacent to the journals of the buckets and with intermediate ridges 6, upon which the flaps 95 of the buckets close. In the lower part of Fig. 3 the right-hand flaps are shown pressed against the ridges to adapt the left-hand flaps for lifting the grain when the drum turns, as indicated by the arrow z ; but in the 100 upper part of Fig. 3, which is not in section, the opposite flaps are in contact with the ridges, and the buckets are arranged to lift the grain when the drum rotates in the opposite direction. Pipes 7 are shown extended 105 from the interior of the hollow shaft outwardly to perforations in the ridges 6, so as to discharge fluid at both sides of the ridges into the bucket-spaces containing the grain, whichever way the drum is rotated, and hot 110 and cold fluid supplied through the hose g is thus thrown directly into the grain as it is stirred by the drum. To reverse the buckets automatically when the drum is traversed and rotated in opposite directions, a disk 8, 115 with sleeve 9, is fitted loosely upon the stirrer-shaft h and is embraced by a friction-clamp 10, having wheels 11 to run upon the rail e' . The disk 8 is provided with a series of crank-pins which are connected by links 12 to 120 cranks 13, one upon the journal of each of the double-flap buckets. When the rotary motion of the drum is reversed, the disk 8 is held from reversing with a certain resistance due to the friction of the clamp 10, and this 125 causes the drum to turn in relation to the disk, so that the links 12 reverse the motion of the buckets. The movement of the buckets into the grain serves thereafter to hold them in their newly-adjusted position, facing 130

toward the grain as the drum advances, the hub 9 of the disk continuing to rotate in the clamp in spite of the frictional resistance. This resistance is sustained by the wheels 11 running upon the track e' and is in practice very slight, as only a trifling force is required to reverse the buckets.

This malting apparatus is largely automatic in its operation and furnishes means for cleaning the grain, for moving it from one story to another in the building, for drying it upon the lower story after it has completely germinated, for heating or cooling the air over the malting-floors, for supplying hot or cold fluids directly to the grain through the agency of the stirring-drum, and for operating the same stirring-drum upon different floors in the same story by elevating and transporting its carriage bodily from floor to floor.

The traveling crane or hoister may be called a "transfer" apparatus, by which the stirring-drum is rendered available for use upon several floors.

To draw the fetid air from different stories, a blower is shown in Fig. 1 upon the rear side of the building connected by a pipe y with an outlet-flue y' in each of the stories. The outlets may be furnished with dampers in the usual manner to regulate the outflow of the air, and the inflow of cool or hot air may thus be regulated in a measure by the discharge of foul air. Such provision for removing the fetid air is of great importance in producing the most rapid and beneficial germination of the grain, as the fetid air contains germs of decay, which are very injurious to the grain. By securing pure fresh heated air to the perforations of the drying-floor G the malt is dried more rapidly and thoroughly than when the grain is merely laid in contact with heated surfaces, as fresh air is constantly introduced to the grain for absorbing the moisture and passes through the grain in air-currents, which come in contact with every particle of the grain as it is agitated by the stirrer g . The entire apparatus is thus adapted to malt the grain in the most rapid and perfect manner.

Having thus set forth the nature of the invention, what is claimed herein is—

1. The combination, with a series of malting-floors side by side upon the same level, of the guard-beams e extended at opposite sides of each floor, a carriage having the car-wheels f' to run upon the said guard-beams and provided with a stirring-drum, and detachable means, as the cord s , for rotating the drum and propelling the carriage, the carriage resting movably upon the upper sides of the guard-beams and being fitted interchangeably to the guard-beams at the sides of the several malting-floors, and means for raising the carriage for the stirring-drum to clear the guard-beams, and transporting the carriage and stirring-drum laterally from one floor to

another and depositing the same upon the guard-beams thereon.

2. The combination, with a series of malting-floors side by side upon the same level, of the guard-beams e at opposite sides of each floor, a carriage having the car-wheels f' to run upon the said guard-beams and provided with a stirring-drum, and detachable means, as the cord s , for rotating the drum and propelling the carriage, the carriage resting removably upon the upper sides of the guard-beams and being fitted interchangeably to the guard-beams at the sides of the several malting-floors, a ceiling-track transverse to the several floors and transfer apparatus upon the ceiling-track for lifting the carriage for the stirring-drum to clear the guard-beams and transporting the carriage and stirring-drum laterally from one floor to another and depositing the same upon the guard-beams thereon.

3. The combination, with a series of malting-floors side by side upon the same level, of guard-beams with track-rails at opposite edges of each floor, a carriage with wheels fitted to said rails and a stirring-drum upon the carriage, a ceiling-track transverse to the several floors, and transfer apparatus upon the ceiling-track for lifting the carriage and drum and transferring it from one floor to another.

4. In a malting apparatus, the combination, with a carriage supported to travel over the malting-floor, of a stirring-drum sustained thereon and having heads at opposite ends with reversible buckets journaled upon the heads, means for propelling the carriage in reverse directions over the floor, and means actuated by the carriage-propelling mechanism for reversing the buckets.

5. In a malting apparatus, the combination, with a carriage supported to travel over the malting-floor, of a stirring-drum sustained thereon and having heads at opposite ends with reversible buckets journaled upon the heads, means for propelling the carriage in reverse directions over the floor in the same plane, means provided with a friction-sleeve for reversing the buckets, and a stationary clamp held adjustably upon the sleeve for reversing the same when the carriage is reversed.

6. In a malting-drum, the combination, with a central shaft and heads having bearings for reversible buckets, a casing fitted between the heads with ribs adjacent to the journals and ridges intermediate to the ribs, and double-flap buckets fitted at the middle of their width to the said ribs and having journals at the ends fitted to the said bearings, and the edges of the flaps adapted to fit reversibly upon the ridges intermediate to the ribs.

7. A stirring-drum having heads at opposite ends with bearings for reversible buckets,

buckets having journals fitted to the bearings and projected at one end outside of the head and provided each with a reversing-crank, a sleeve fitted rotatably upon the shaft and provided with a flange, and links connecting said flange with the reversing-cranks, and an adjustable clamp upon the sleeve for holding the same to reverse the buckets when the motion of the drum is reversed.

8. In a malting apparatus, the combination, with a malting-floor having guard-beams *e* with track-rails at opposite edges of the floor, of a carriage with bearings, a stirring-drum having shaft fitted to the bearings

and provided with reversible buckets, a rope-sheave upon the carriage with gearing for rotating the drum and gearing for propelling the carriage, means actuated by the carriage-propelling mechanism and provided with a friction-sleeve for reversing the buckets, and an endless rope traversed over the sheave to actuate the mechanism.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN W. FREE.

Witnesses:

L. LEE,

THOMAS S. CRANE.