No. 655,296.

Patented Aug. 7, 1900.

R. G. COLLINS.

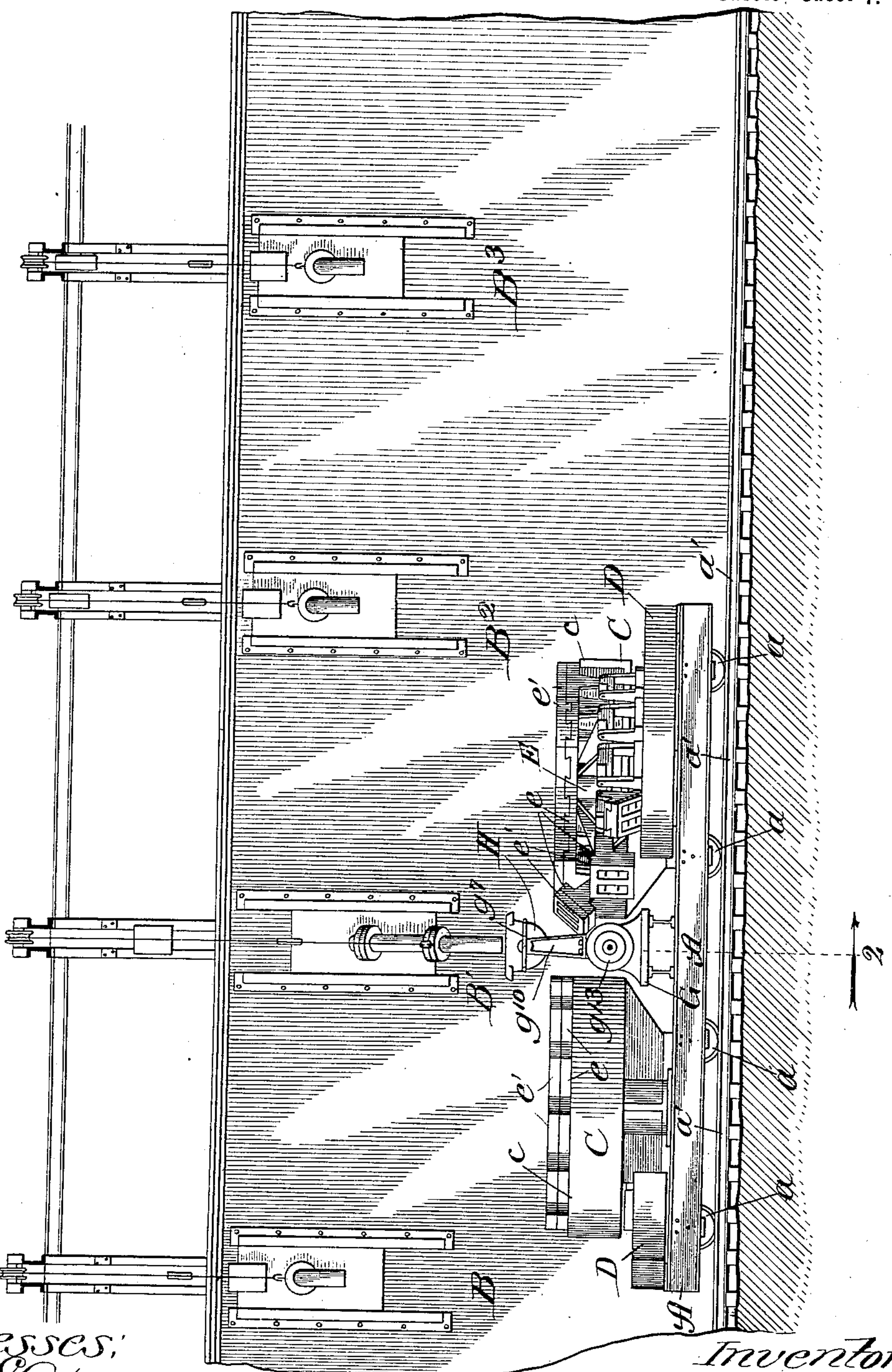
AUTOMATIC CASTING MACHINE.

(Application filed Oct. 24, 1898.)

(No Model.)

8 Sheets—Sheet 1.

Fig. 1.



Witnesses:
Chas. E. Gaylord,
Lute S. Alter

Inventor:
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No. 655,296. Patented Aug. 7, 1900.

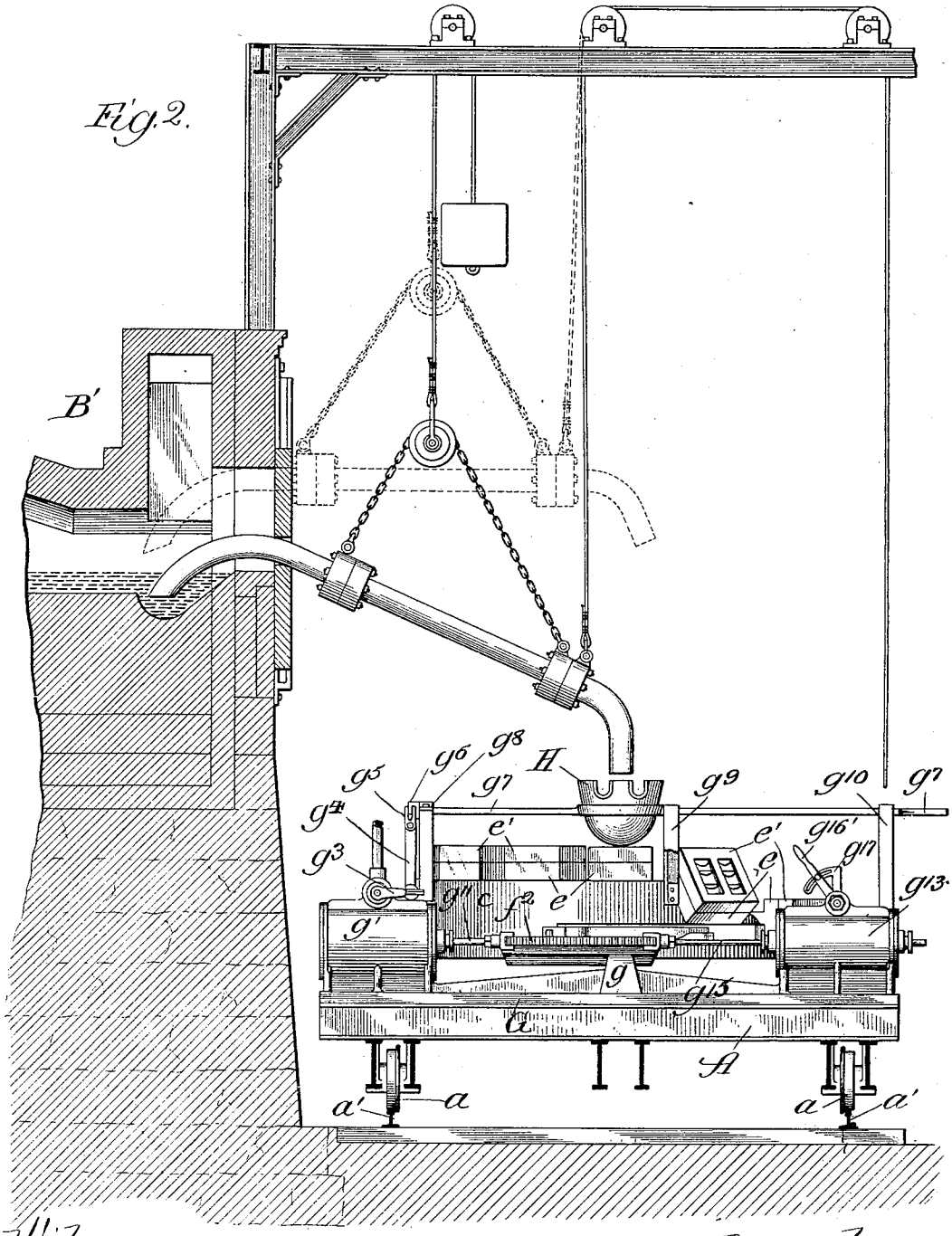
R. G. COLLINS.

AUTOMATIC CASTING MACHINE.

(Application filed Oct. 24, 1898.)

(No Model.) 8 Sheets—Sheet 2

Fig. 2.




Witnesses:
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# R. G. COLLINS.

## AUTOMATIC CASTING MACHINE.

(Application filed Oct. 24, 1898.)

(No Model.) 8 Sheets—Sheet 3.

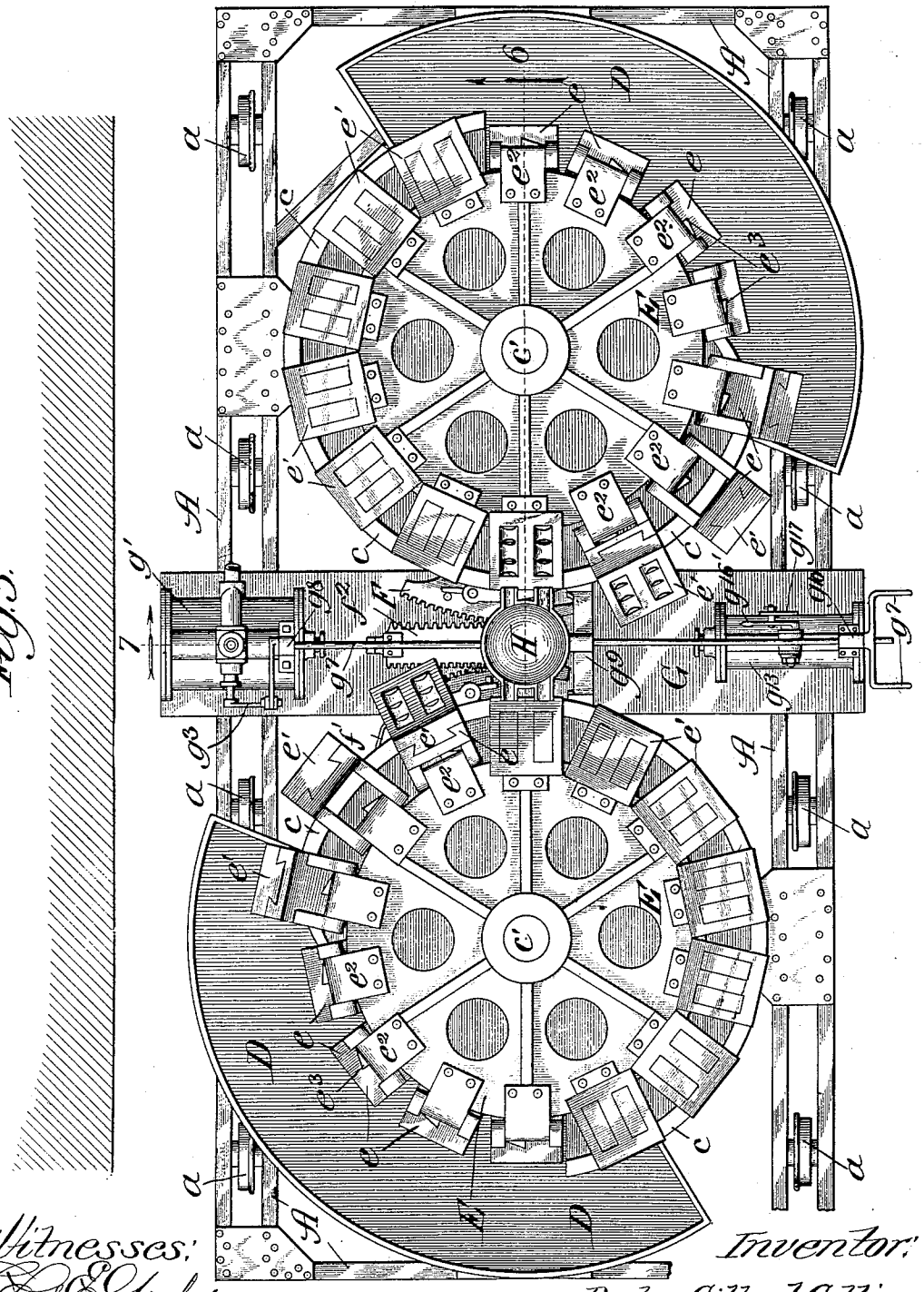


Fig. 3.

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## AUTOMATIC CASTING MACHINE.

(Application filed Oct. 24, 1898.)

(No Model.) 8 Sheets—Sheet 4.

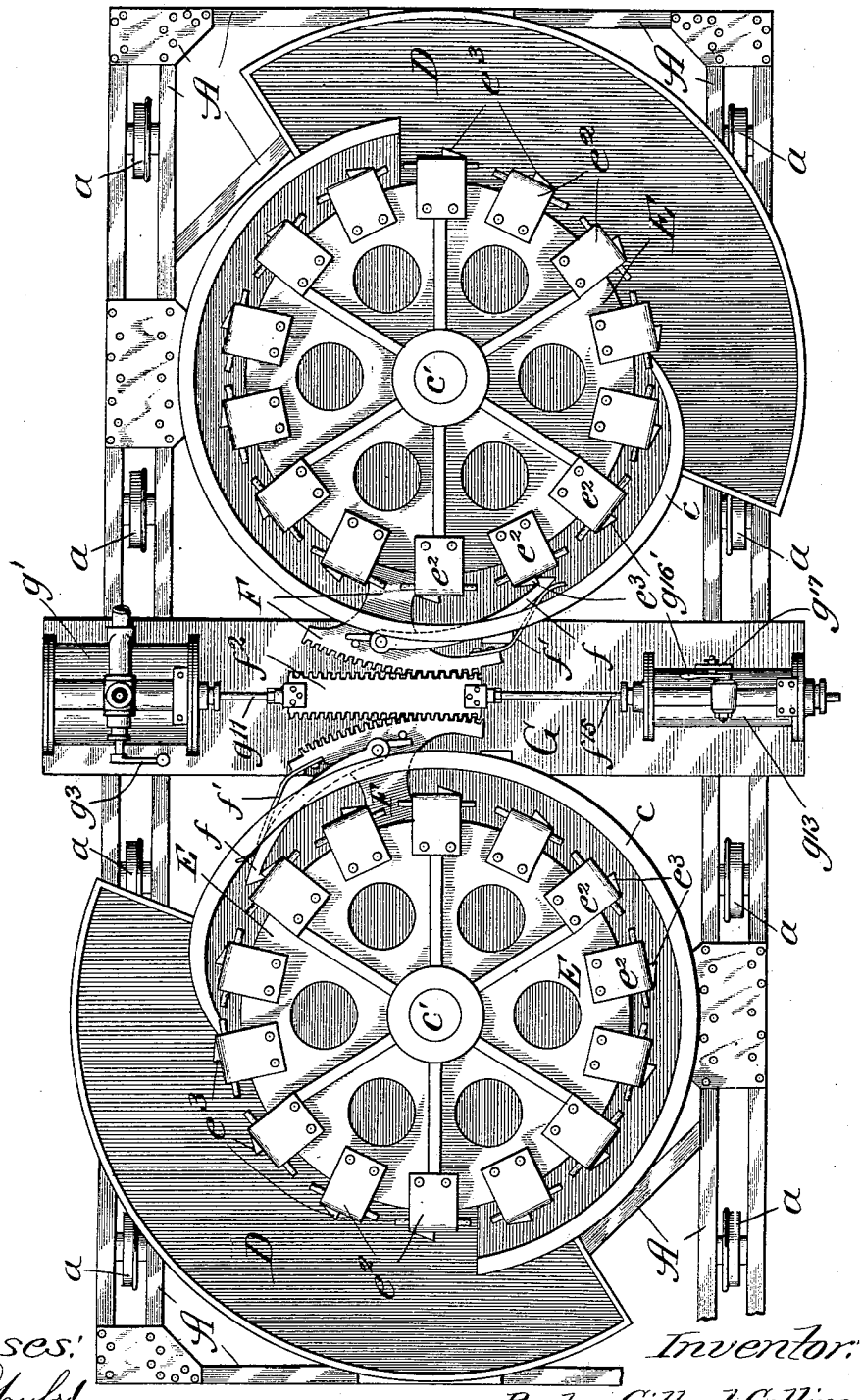


Fig. 4.

Witnesses:
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Luther S. Sollers.

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No. 655,296. Patented Aug. 7, 1900.

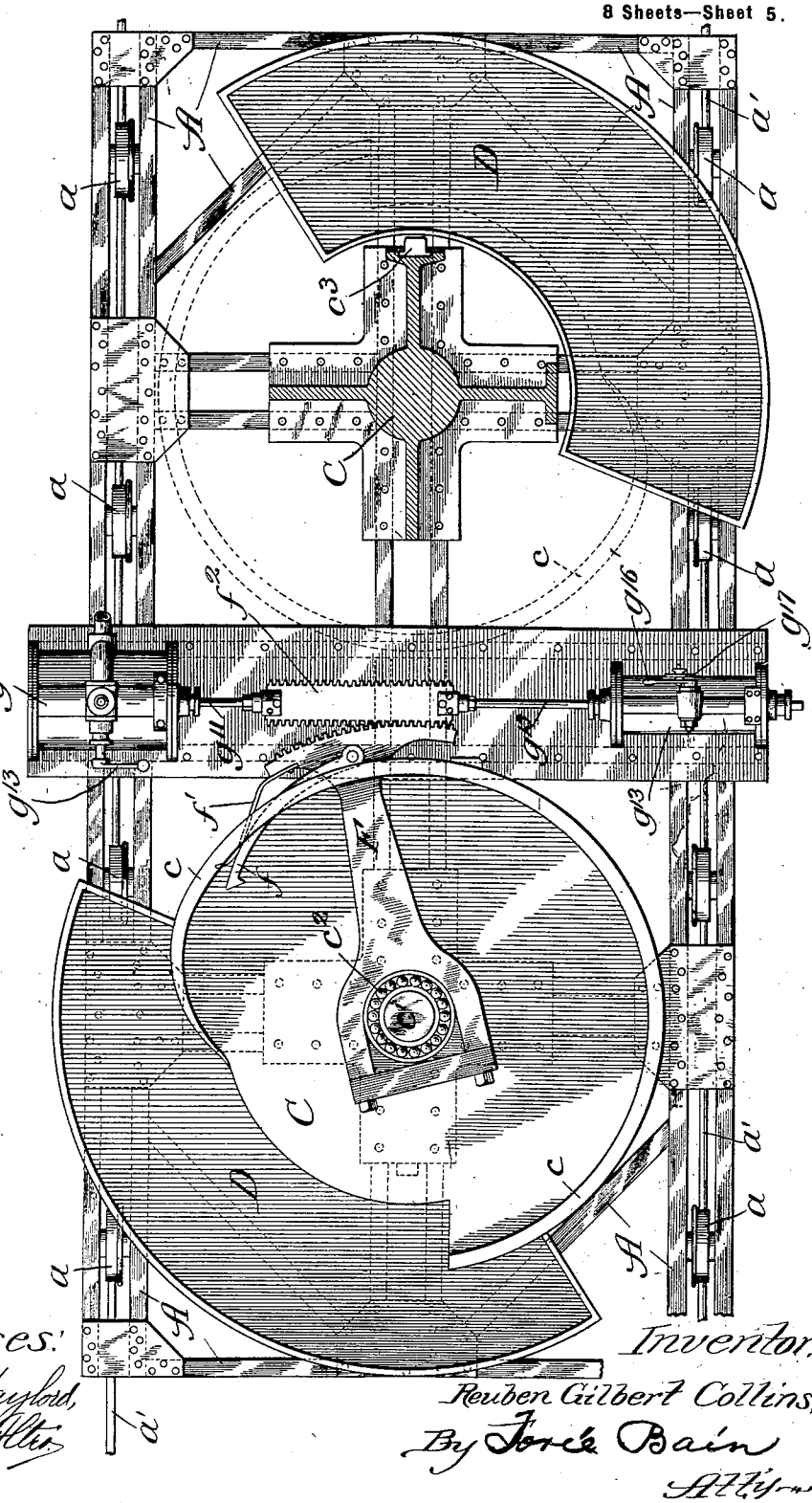
# R. G. COLLINS.

## AUTOMATIC CASTING MACHINE.

(Application filed Oct. 24, 1898.)

(No Model.) 8 Sheets—Sheet 5.

Fig. 5.




Witnesses:
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No. 655,296. Patented Aug. 7, 1900.

# R. G. COLLINS.

## AUTOMATIC CASTING MACHINE.

(Application filed Oct. 24, 1898.)

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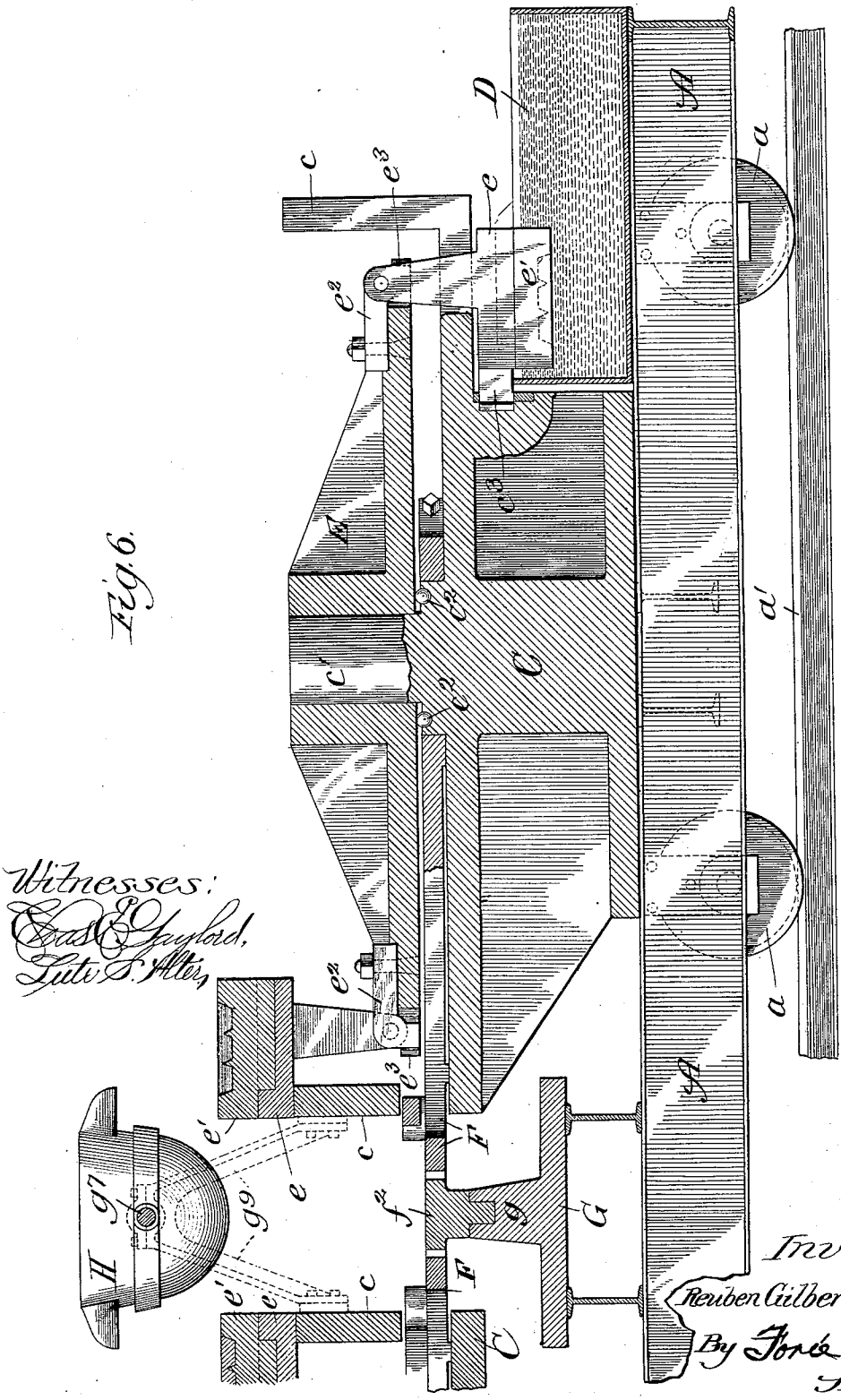



Fig. 6.

Witnesses:
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# R. G. COLLINS.

## AUTOMATIC CASTING MACHINE.

(Application filed Oct. 24, 1898.)

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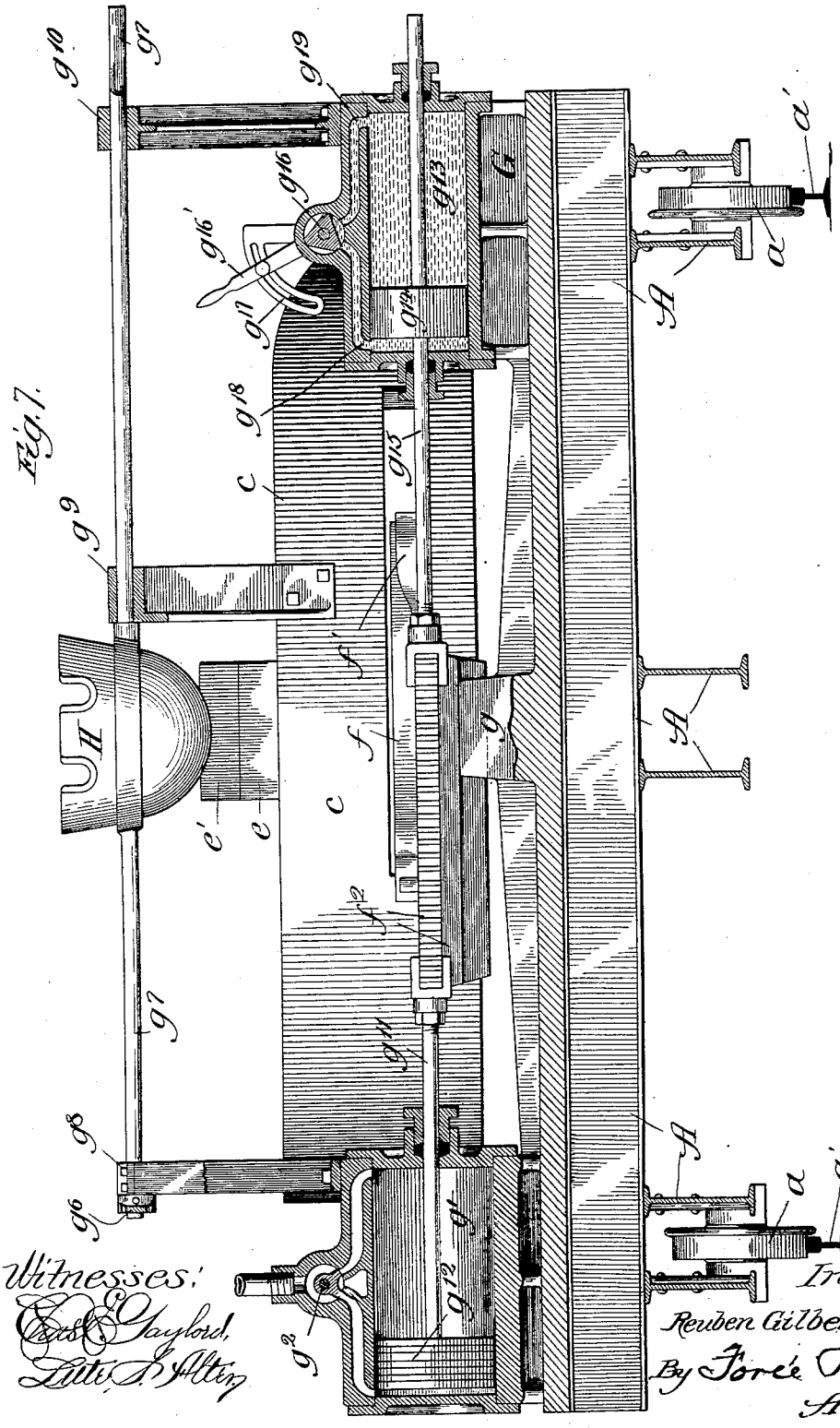



Fig. 7.

Witnesses:
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No. 655,296. Patented Aug. 7, 1900.

# R. G. COLLINS.

## AUTOMATIC CASTING MACHINE.

(Application filed Oct. 24, 1898.)

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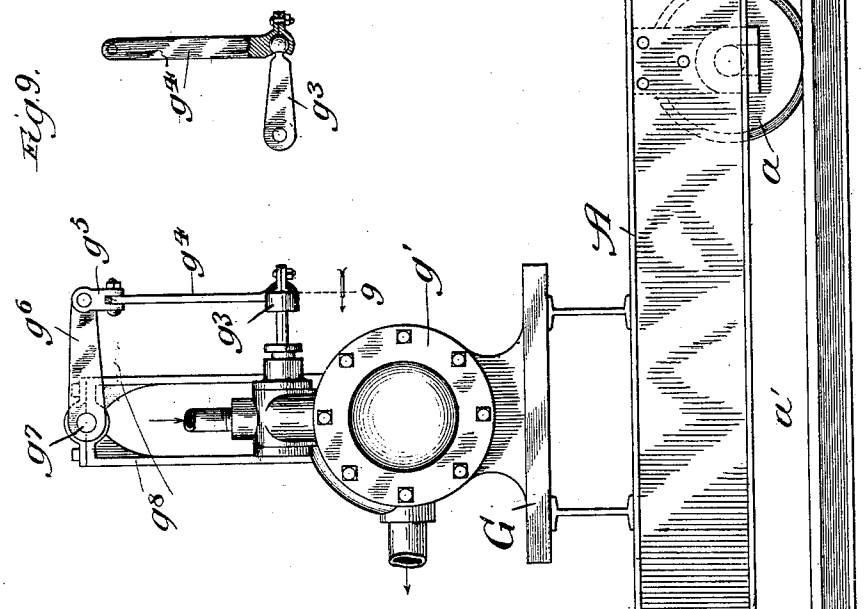
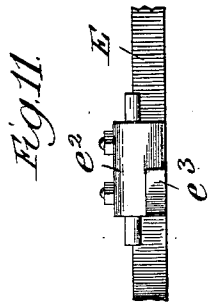
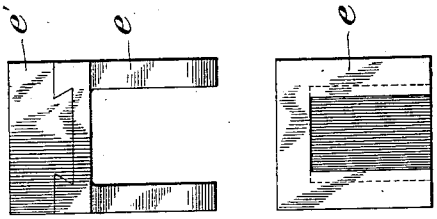



Fig.8.




Witnesses:
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Luther S. Miller.

Inventor:
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By Dorsey Bain
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

REUBEN GILBERT COLLINS, OF DOLLAR BAY, MICHIGAN.

## AUTOMATIC CASTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 655,296, dated August 7, 1900.

Application filed October 24, 1898. Serial No. 694,401. (No model.)

*To all whom it may concern:*

Be it known that I, REUBEN GILBERT COLLINS, a citizen of the United States, residing in Dollar Bay, in the county of Houghton and State of Michigan, have invented a new and useful Improvement in Automatic Casting-Machines, (Case No. 2,) of which the following is a specification.

My invention relates to automatic casting-machines. It is designed more especially for the purpose of casting metal, such as copper and the like, into ingots, cakes, bars, bricks, and other similar forms into which the various metals are converted when they are prepared for the market.

Copper is usually smelted and refined in a reverberatory furnace, from which it is dipped in hand-ladles by the workmen, who pour it into copper-molds. The molds containing the hot but solidified copper are then inverted and turned into water, when the ingot, bar, or cake will fall out of the mold and be chilled by the water, from which it is then taken in a finished state.

It requires great skill and care to maintain the molten copper in "pitch" during the time when it is being dipped from the furnace. It frequently happens that the metal will lose this condition before it has all been taken from the furnace, in which event it becomes necessary to cease in the operation, close the door, and to manipulate the remaining copper by agitation, by adding carbon, by increasing the temperature, or otherwise until the copper has been again brought back into the desired pitch, which is a condition it acquires when it is in proper temper to be poured into molds. The effect of the cold air acting through the open door of the furnace from which the copper is taken tends to cool the charge by direct contact, and by checking the combustion-draft it also produces a chemical change in the copper, all of which causes the copper to lose its tempered condition, which it is important for it to possess. Therefore it becomes very necessary to take the copper from the furnace as expeditiously as possible, so that it may be done before the copper charge has had time to cool sufficiently to cause it to lose the condition which is so highly desirable, if not necessary. When the copper has been taken from the furnace in a very short period of time, its quality is more regular and uniform and the value of the product is correspondingly increased.

A reverberatory furnace containing nine tons of copper can be dipped out and molded into ingots by the present method with the labor of six men on an average of two hours. With my machine an equal amount of copper may be taken from a furnace and molded into ingots with the service of one man within approximately thirty minutes, the comparison being very favorable for my machine in time and expense for labor, besides accomplishing the work within the time permissible, for it is to be done while the copper holds its condition.

Briefly stated, my machine in its preferred form consists of two intermittently and alternatingly revolving tables, each table carrying near its periphery a series of mold-carriers which are raised to and held in a vertical position by resting on the edge of a spiral cam which lies in the path of the mold-carriers. The cam is abruptly terminated at its higher point, from which the mold-carriers in turn are precipitated, being inverted. As they drop off they hang pendent until raised again by the said spiral cam. When the mold-carriers are thus inverted, the carriers, mold, and ingot or cake are immersed in water. The ingot falls out of the mold by the shock imparted by the carrier striking a fixed but replaceable anvil arranged for this purpose. The mold and carrier remain in the water-bath for a certain definite portion of the revolution of the table and are cooled thereby until they are automatically raised into a vertical position, when the mold is again ready for the reception of the molten metal. The motion of the tables carrying the mold-carriers and molds is produced by a power which is controlled by the man who manipulates the ladle. The ladle is located in a plane above the tables and in a position midway between them. It is preferably provided with two lips on each opposite side, so that two molds may be filled at one and the same time on either side. After a pair of molds have been filled on one side of the ladle the operation of tilting the ladle for the purpose of filling a pair of the molds on the opposite side liberates

the motive power which moves the table on which the molds have just been filled, thereby carrying them ahead one notch and substituting an empty pair ready to be filled. At the same time a mold-carrier on an approximately-opposite side of the said table drops off of the spiral cam, falls into the water and disposes of its ingot, and remains in the water until raised again, as explained, in the course of the operation.

The ladle for my molding-machine may be kept filled with molten metal by the use of my siphon, which forms subject-matter for another patent application filed September 14, 1898, Serial No. 690,937.

My invention will be more readily understood by referring to the accompanying drawings, in which—

Figure 1 is a side elevation of one of my machines mounted on a truck-platform and adapted to be moved into position in front of any one of the furnaces shown. Fig. 2 is a broken-away end elevation taken through the line 2 of Fig. 1 and showing the furnace in section. Fig. 3 is a plan view of my machine, showing the mold-carriers in their various and respective positions. Fig. 4 is a plan view taken on a plane below that of Fig. 3, showing the tables with the mold-carriers and molds removed, also showing the spiral cam on which the mold-carriers are supported. Fig. 5 is a horizontal section taken below the tables, showing the motive mechanism and the spiral cam on the left-hand machine and a section through the cross-shaped base-piece on right-hand machine. Fig. 6 is a longitudinal vertical section of the right-hand machine, taken below the ladle through line 6 of Fig. 3. Fig. 7 is a vertical transverse section of the same machine, taken below the ladle through line 7 of Fig. 3. Fig. 8 is a broken-away end view of the machine, showing the steam-cylinder and the valve-operating mechanism. Fig. 9 is a detail of the valve-connecting crank, taken partly in section through line 9 of Fig. 6. Fig. 10 is an elevation of a mold-carrier, showing a mold in place therein. Fig. 11 is a broken-away side view of the table, showing one ratchet-tooth and a reinforced piece upon which the mold-carrier is pivoted. Fig. 12 is a top view of mold-carrier, shown also in elevation in Fig. 10.

Like letters denote corresponding parts in all of the figures.

With reference to Figs. 1 to 9, inclusive, A is a rectilineal base-frame, preferably made of I-beams mounted upon track-wheels $a$, which forms a carriage for the support of my machine. The carriage thus formed is adapted to be run on the track $a'$, which is designed to be laid in front of the various furnaces B B′ B² B³. (Shown in Fig. 1.)

C is a cross-shaped base-piece (shown in longitudinal section in Fig. 6 and in horizontal section, Fig. 5) bolted firmly to frame A, as plainly indicated in Fig. 5. A spiral flange-cam $c$, made integral with base C, rises vertically therefrom, as shown in Fig. 6, but for sake of clearness is not extended in this figure. It extends concentrically with the center of the base-casting C for the greater part of the circumference, as shown in plan in Figs. 4 and 5. The cam extends over and into a sector-shaped tub D, disappearing in the bottom thereof and terminating abruptly above said tub, as shown in Figs. 3, 4, 5, and 6.

A ribbed rotatable table E is carried by the trunnion $c'$ and rests upon ball-bearings $c^2$. This table is free to revolve around this trunnion when propelled by the motive mechanism. Around the periphery of the table there are located, equidistant apart, a number of mold-carriers $e$, which have a dovetail groove cut into their upper surface, into which the ingot-molds $e'$ are placed, as shown in Fig. 10. The carrier $e$ is pivoted on the bearings carried by reinforcing-piece $e^2$. The carrier $e$ will be maintained in a vertical position only when supported by the spiral cam $c$.

Referring to Figs. 2 and 3, it will be seen that several of the mold-carriers over the water-tub are hanging pendent from the pivot attached to the piece $e^2$ and that the mold is therefore inverted while several other of the mold-carriers are being raised into a vertical position as they advance around the increasing spiral cam $c$. When they reach a point in front of the ladle, they are in an upright position, having arrived at the apex of the cam's height, as also shown in Fig. 6. They remain in this vertical position until they reach the truncated end of the cam $c$, when they will fall of their own weight. As they fall they strike anvil $c^3$.

A ratchet-tooth $e^3$ projects from the tables E between the legs of each of the mold-carriers, as shown in the various figures.

An arm F is pivoted around an enlargement of the trunnion $c'$ (shown in Fig. 5) and is provided with a sector of gear-teeth on its outer extremity. It oscillates through a slot cut in cam $c$ and gives motion to the tables, as more fully hereinafter explained. It carries a ratchet-pawl $f$, which is pivoted thereto and which is held in position by spring $f'$. (Shown more plainly in Fig. 5.)

Referring to Fig. 7, G is a base-plate carrying two operative cylinders, one on either end, and an intermediate rack-guide $g$. Cylinder $g'$ is adapted for steam, compressed air, or the like and is the means by which power is produced for rotating the tables. The controlling-valve $g^2$ is operated by the rocker-arm $g^3$, which is provided with a ball upon its outer end, forming a ball-and-socket joint with link $g^4$. (See Fig. 9.) The link $g^4$ is pivoted in the stirrup $g^5$, the latter being pivotally attached to crank-arm $g^6$, which is rigidly attached to ladle-carrying shaft $g^7$, while this is supported by three bearing stands or brackets $g^8$ $g^9$ $g^{10}$. Just outside of the bracket $g^{10}$ the shaft $g^7$ is bifurcated, forming handles by which the shaft may be rocked and the ladle

tilted for the purpose of pouring the molten metal into the molds and for the purpose of operating the steam-valve $g^2$. The piston-rod $g^{11}$ is rigidly attached to the double-geared rack $f^2$, which slides on the guide $g$, Fig. 7. When the valve $g^2$ is partially rotated in one direction, it admits steam into the cylinder $g'$, which causes the piston $g^{12}$ to make one full stroke. The steam or compressed air remains behind the piston after the completion of the stroke and holds the mechanism firmly in position. When the valve $g^2$ is rotated in the opposite direction, steam is admitted on the opposite side of the piston, and the exhaust is opened by the operation of the valve, when the steam on the inactive side will escape. To prevent too quick or sudden motion by the reciprocation of the motive mechanism, a regulating hydraulic cylinder $g^{13}$ is provided. The piston $g^{14}$ is rigidly attached by rod $g^{15}$ to the double-geared rack $f^2$ and moves with it, as plainly shown in Fig. 7. The cylinder $g^{13}$ is filled with a fluid, such as oil, the resistance to the displacement of which by the piston $g^{14}$ acts as a dash to control the reciprocating motion. A by-pass valve $g^{16}$ is attached to and may be rotated by lever $g^{16'}$, which may be held in a set position by link $g^{17}$. Two valve-ports $g^{18}$ and $g^{19}$ open into opposite ends of the cylinder.

The ladle H is not different from ordinary ladles of this class, with the exception that it is provided with two lips on each side. It is held in place by a ring formed in the shaft $g^7$.

In Figs. 1 and 2 I have shown my siphon as a means for conducting the metal from the furnace into the ladle on my machine. I do not wish to be confined strictly to the use of the siphon for this purpose, as any convenient means may be used.

I will now describe the operation of my machine. Referring to Figs. 1 and 2, it will be seen that the machine occupies a position in front of the furnace B'. The siphon has been adjusted in position and it is conducting a stream of molten metal into the ladle H. The size of the stream has been determined. It has been secured by adjusting the height of the outside end of the siphon with relation to the height of the inside end thereof by the means shown. The tilting of the ladle is not sufficient to prevent the metal from being deposited therein. A man who operates the machine stands in position grasping the handles formed by the bifurcated shaft $g^7$. It is of course understood that the machines on either side of the ladle are identical in every respect, even with reference to their direction of rotation. Referring to Figs. 3 and 4, it will be seen that both machines turn clockwise. The molds that are in front of the ladle on the left-hand machine have just been filled and the ladle is now in an upright position. The piston $g^{12}$ has made a full stroke and valve $g^2$ is closed. (See Fig. 7.) The ratchet-pawl $f$ has been carried back and has become engaged with a ratchet-tooth $e^3$ on the left-hand table E, Fig. 4. Now, then, when the ladle H is tilted so as to fill the molds $e'$, which are now ready and in position on the right-hand machine, the rotation of the shaft $g^7$ to the right lifts the crank-arm $g^6$, which raises the stirrup $g^5$, link $g^4$, and rocker-arm $g^3$, Fig. 8, which rotates the valve $g^2$ to the left and which admits steam through the left-hand port behind the piston $g^{12}$, thus giving a full stroke of the piston and connecting mechanism to the right. At the same time piston $g^{14}$ moves a full stroke in direction toward the right and displaces the liquid contained in the cylinder $g^{13}$, by-pass ports $g^{18}$ and $g^{19}$, and valve-case $g^{16}$, which liquid and piston act as a dash to steady and regulate the motion produced in cylinder $g'$. The speed with which the system may be moved will depend in a great measure upon the area of the opening in the by-pass, which may be governed by valve $g^{16}$, which may be retained in position by securing lever $g^{16}$ to link $g^{17}$ in the manner shown after it has been set for the desired speed. When the motive system is reciprocated, as before stated, the pawl $f$, having caught behind and engaged with a ratchet-tooth $e^3$ on the left-hand-machine table, will move forward and rotate the said table a given distance by virtue of the toothed rack $f^2$, which meshes in the toothed sector F and is given motion thereby. As the sector F carries the ratchet-pawl $f$, the table is moved the distance of the space between the centers of the adjacent mold-carriers. While the molds on the right-hand tables are being filled the left-hand table is moving, as before explained, and the molds that have previously been filled on the left-hand table are being moved away from the ladle and are replaced by the next succeeding pair of empty molds. At the same time a mold-carrier on a practically-opposite side of the said table has passed the truncated end of the spiral cam and has fallen over into the water-bath D, striking in its fall the removable anvil $c^3$, Fig. 6. The concussion produced by the mold-carriers striking the anvil causes the ingots to fall from the molds $e'$ into the water contained in the tank D. It will be noticed that the mold is also practically submerged in the water, where it will remain and become cooled until raised by the spiral cam $c$. (See Figs. 1 and 3.) As the rack $f^2$ reciprocates in the manner described the pawl $f$ of the machine not in motion is advanced to a position where it engages with a ratchet-tooth $e^3$ of its respective machine-table, ready to rotate the said table one space as soon as the motion of the rack is reversed, which is effected when the ladle is tipped in the opposite direction.

The cycle of the performance is as follows: When the ladle is tipped toward the right-hand machine and while the molds thereon are being filled, motion is imparted to the table of the left-hand machine by virtue of the rotative operation of the steam-valve $g^2$,

which is set into position for the purpose by the instrumentality of the ladle-carrying shaft $g^7$, as before explained, and the left-hand table E is rotated a certain definite distance, which is just sufficient to move one pair of molds $e'$, that have last been filled on that table, out of the way, and to substitute in position an empty pair ready to be filled. At the same time that the first pair of molds are moved up in position, the pair that have been longest filled on that table, the copper in which is practically solid, are dumped into the water. While the ladle occupies a vertical position both machines are motionless; but when it is tipped to the left the right-hand table is set in motion in the manner set forth and for the purpose described, and when the ladle is tipped to the right the left-hand table is set in motion, the cycle of operation being the same for each machine.

It will be noticed that the molds are stationary while being filled and that the table on one machine is moving while the molds on the table of the table of the opposite machine are being filled. The propelling power is alternately applied to the two tables.

The truck on which my machine is mounted and the track upon which it runs are not essential to its operation, as a machine may be permanently located convenient to each or as many furnaces as may be desirable. I have described my machine with two revolving tables; but it is plainly evident that it may be constructed and operated with a single table.

It is obvious that many variations in the respective features of my machine may be made without departing from the spirit and intent of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a casting-machine, a ladle or like receptacle for containing material to be cast, a series of molds, a vertically-spiral track or guide lying near the said ladle, on which said molds are adapted to be moved, a device for controlling the movement of the said molds, a shaft or the like, for supporting said ladle, and an operative connection between said support and said controlling device, whereby said molds are governed in their movements by the movement of said support, substantially as set forth.

2. In a casting-machine a ladle or like receptacle, for containing material to be cast, a support for the said ladle, a series of molds, suitable mechanism for moving the said molds in progressive order, a track or guide for said molds lying near said ladle, and a controller for the said mechanism adapted to be operated by the movement of said ladle, substantially as set forth.

3. A casting-machine consisting of a base, a rotatable table carried thereon, a series of mold-carriers pivotally attached thereto, and a cam inclined at one end and truncated at the other end, by which the said mold-carriers are raised and from which they fall at the respective points in their path, both terminals of the said cam being in or over a water-bosh into which the castings are deposited, substantially as described.

4. A casting-machine comprising a base, a rotatable table carried thereon, a series of mold-carriers pivotally attached thereto, detachable molds within said carriers, a water-bosh, a vertically-spiral track or guide for said mold-carriers, precipitously terminating above said water-bosh, substantially as set forth.

5. A casting-machine consisting of a ladle pivotally supported, two rotatable tables, one on each side of the said ladle, a series of molds carried by each of the said tables, and a mechanism by which intermittent impulses, or a step-by-step motion is imparted to each table, substantially as described.

6. A casting-machine comprising a base, a rotatable table provided with a series of ratchet-teeth, or notches, molds equaling the ratchet-teeth in number, carried on said table, an oscillating lever carrying a pawl adapted to engage in the said ratchet-teeth, a reciprocating mechanism for moving said lever, a ladle mounted upon a trunnion or shaft, a controller for said reciprocating mechanism, and a lever or the like connecting said controller with said trunnion, whereby the movement of said molds is governed, substantially as set forth.

7. A casting-machine comprising a base, a rotatable table provided with a series of ratchet-teeth, or notches, molds equaling the ratchet-teeth in number, carried by the said table, an oscillating lever carrying a pawl, adapted to engage with the said ratchet-teeth, a reciprocating mechanism for moving the said lever, a ladle, a shaft upon which said ladle is supported, and a controller operated by the said shaft for governing the movement of the said table, substantially as described.

In testimony whereof I have signed this specification, in the presence of two subscribing witnesses, this 14th day of October, 1898.

REUBEN GILBERT COLLINS.

Witnesses:
JAMES MCRAE,
WILLIAM H. ROWE.