No. 657,069. Patented Aug. 28, 1900.

# W. J. PATTERSON.

## CASTING METAL.

(Application filed July 31, 1899.)

(No Model.)

3 Sheets—Sheet 1.

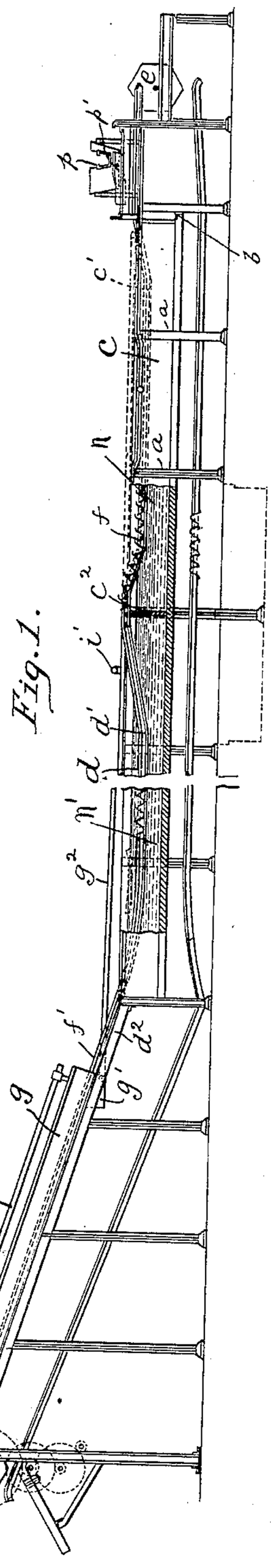


Fig. 1.

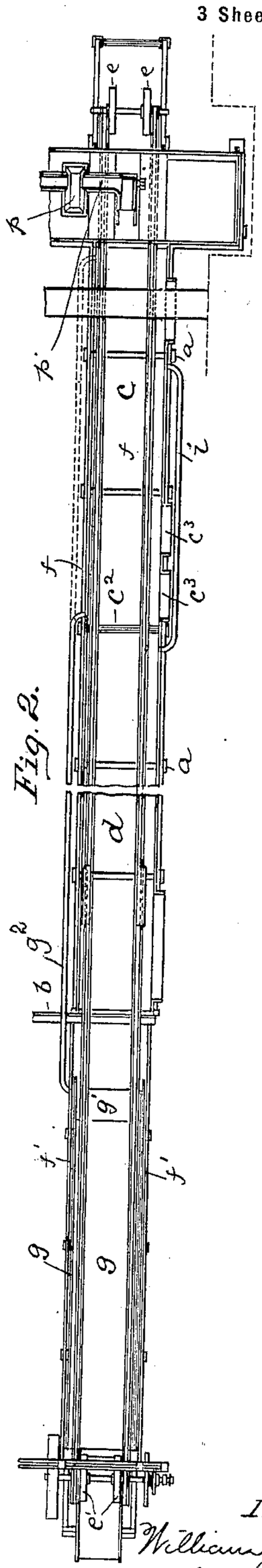


Fig. 2.

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3 Sheets—Sheet 2.

Fig. 3.

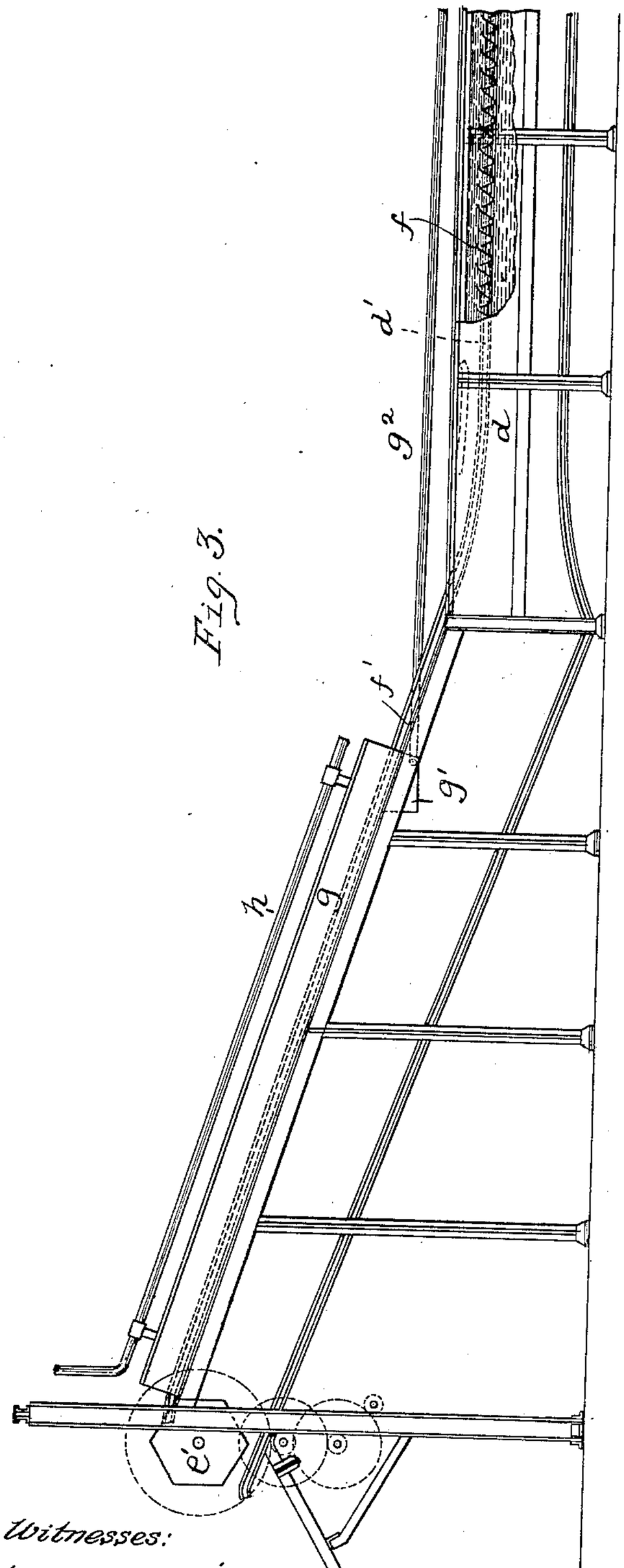
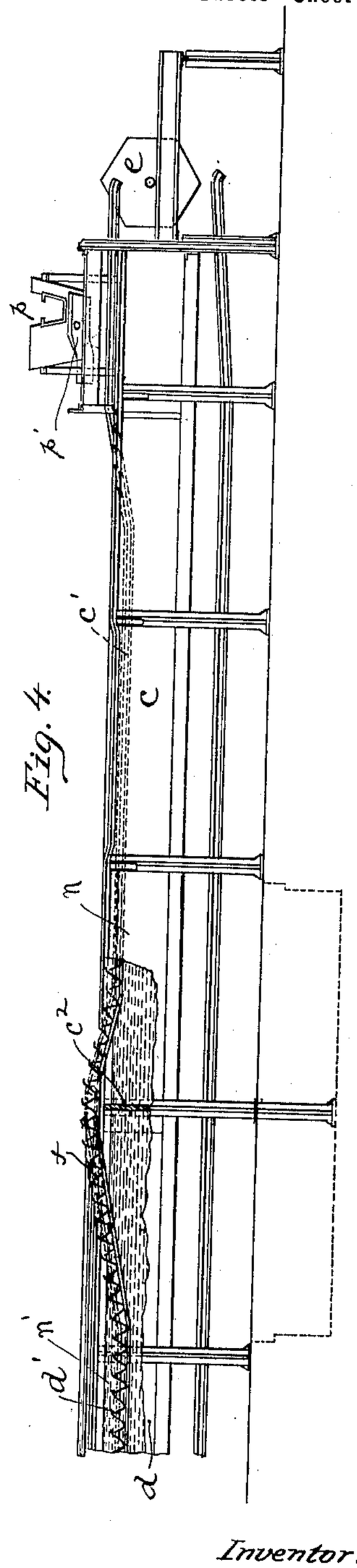



Fig. 4.

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(No Model.)

3 Sheets—Sheet 3.

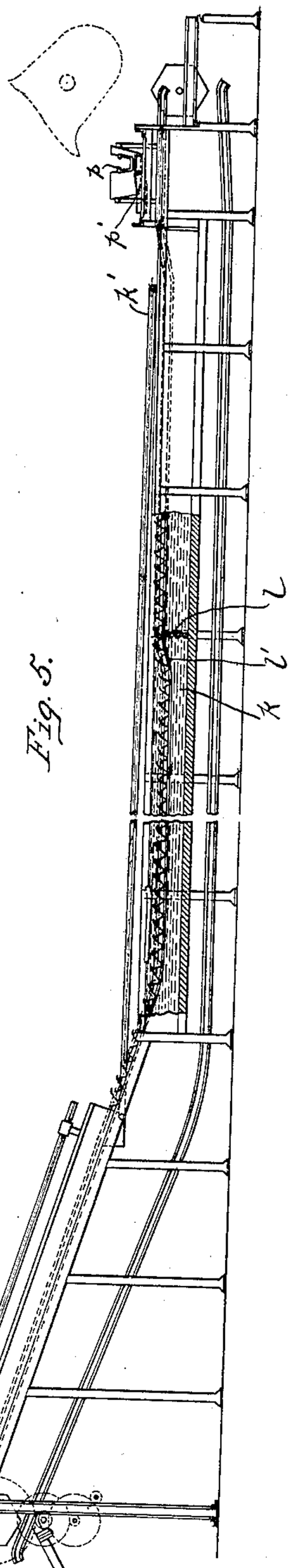

Fig. 5.

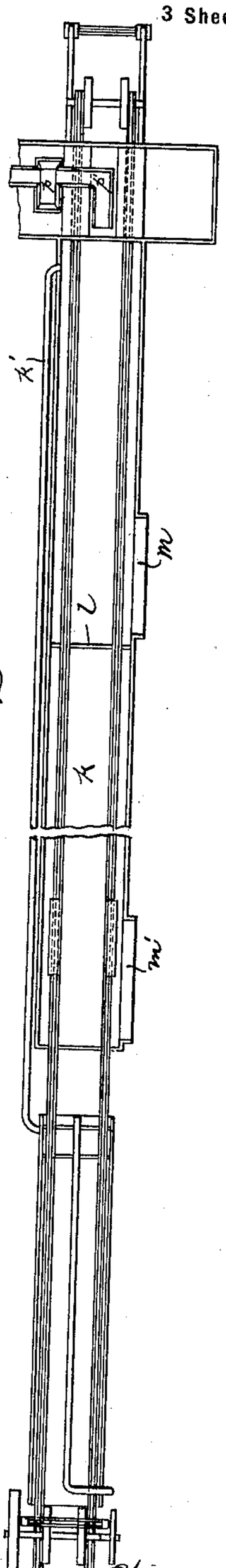

Fig. 6.

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# UNITED STATES PATENT OFFICE.

WILLIAM J. PATTERSON, OF PITTSBURG, PENNSYLVANIA.

## CASTING METAL.

SPECIFICATION forming part of Letters Patent No. 657,069, dated August 28, 1900.

Application filed July 31, 1899. Serial No. 725,604. (No specimens.)

*To all whom it may concern:*

Be it known that I, WILLIAM J. PATTERSON, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Casting Metals; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the casting of metals, and particularly, though not exclusively, to the casting of pig metal, the invention being an improvement on that set forth in Letters Patent No. 583,424, granted to A. M. Acklin May 25, 1897. According to the method of that patent the molten pig metal is poured into an endless connected series of traveling molds and is then carried first with the molds partially submerged through a body of water, after which the molds are completely submerged and carried through the water for the cooling of the metal contained therein, the molds being then withdrawn from the tank and carried over a sprocket at the end of the casting-machine and dumped therefrom, the molds returning to the opposite or pouring end. In the use of said apparatus the body of water was maintained at a low temperature to obtain, as was supposed, the most rapid cooling of the metal contained in the molds, and as operated it was found to be efficient. I have discovered, however, that a more rapid and efficient cooling can be obtained where the water in which the metal contained in the molds is completely submerged is maintained in a condition of ebullition, it being believed that the reason for this is that where the water is so cold that contact with the highly-heated metal does not cause boiling a thin film or layer of steam is formed over the surface of the metal, which prevents actual contact of the water with the metal and therefore retards the cooling of the metal in the molds.

The main object of this invention is therefore to overcome this difficulty in the treatment of the metal.

It consists, generally stated, in pouring the metal into the endless connected series of traveling molds and completely submerging the metal contained in the molds in a body of water in a state of ebullition, this state of ebullition being of course preferably obtained by maintaining the body of water sufficiently close to the boiling-point, so that the contact of the water with the hot metal or the molds containing it will lead to such ebullition or boiling and give free escape to the steam generated and cause repeated contact of the water with the metal or molds to cool the same. In practicing this method it is preferred to carry the metal first through a cooler body of water, such as by partially submerging the molds, until the metal is set to such extent that the metal itself will not boil upon contact with the water and then to submerge it in the body of water in a state of ebullition.

The invention also comprises certain other improvements in the apparatus suitable for practicing the invention.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is an elevation, partly in section, of the preferred form of the apparatus for practicing the invention. Fig. 2 is a top view of the same. Figs. 3 and 4 are enlarged side views, partly broken away, of the two ends of the machine; and Figs. 5 and 6 are views of another form of apparatus for practicing the invention.

Like letters of reference indicate like parts in each figure.

In the practice of the invention I employ practically the apparatus of said Acklin patent, except I prefer to employ two tanks instead of one, as better control of the condition of the water for treatment of the metal can be obtained. I will therefore describe the same where two such tanks are employed.

The framework of the apparatus may be of any suitable construction, that illustrated in the drawings consisting of standards *a*, connected with cross-bars *b* and otherwise suitably braced. Supported in the framework are the two tanks *c d*, separated by the partition $c^2$. At the receiving end of the machine is the sprocket-wheel *e*, at the delivery end thereof the sprocket-wheel *e'*, the endless connected series of molds *f* passing around these sprocket-wheels and also passing in regular course over tracks or guideways provided for them, such tracks, as illustrated in Fig. 1, ex-

tending through the tanks, the track $c'$ in the tank $c$ providing for the partial submerging of the molds therein and then rising up to the partition $c^2$, while the track $d'$ extends downwardly from said partition into the tank $d$, so as to entirely submerge the molds therein and then rises from said tank, connecting with the inclined track $f'$, extending upwardly toward the sprocket-wheel $e'$, at which point the metal is discharged. Extending under the inclined track $f'$ is the trough $g$, while above the track are the spray-pipes $h$, said spray-pipes being shown as extending longitudinally of the track, though any suitable arrangement thereof may be employed. At the foot of the trough $g$ is the basin $g'$, which receives the water from the spray-pipes, collecting the same, and having leading from its base the water-pipe $g^2$, which extends forward to the first tank $c$, communicating therewith, as shown in Fig. 2. Leading under the track from the basin $g'$ to the rear end of the tank $d$ is the second trough $d^2$, which receives any overflow or drippings of water and conducts the same into the tank $d$. The water-supply to the tank $d$ may be of course arranged in any suitable way—for example, by a pipe $i$, leading from the tank $c$ into the tank $d$. The tank $c$, having an overflow, as at $c^3$, provides means for regulating the temperature of the water in that tank or the tank $d$, having an independent supply-pipe $i'$, the object being of course to maintain the water in the tank $c$ sufficiently cool and quiescent to prevent ebullition, which might throw the water upon the surface of the metal contained in the partially-submerged molds and cause the boiling of the metal, and to maintain the water of the tank $d$ sufficiently hot that upon the submerging of the highly-heated metal in the same they will, through the heat absorbed by the water, maintain that body of water in a state of ebullition. Any suitable water-tank or apparatus for this purpose may of course be employed—for example, as shown in Figs. 5 and 6, where a single tank $k$ is used, as in the Acklin patent, above referred to. The water is fed at the receiving end of the tank, as at $k'$, where the molds are only partially submerged, so that as it flows backwardly toward the part of the tank where the molds are entirely submerged it will gradually absorb sufficient heat to maintain the water in that part of the tank in a state of ebullition. In this form of machine a partition $l$ may be used, over which the water may flow into the submerging-section of the tank, the tank having an overflow $m$ in front of the partition to regulate the temperature of the water where the molds are only partially submerged and an overflow $m'$ at the end of the tank from which the molds pass. In such case the two sections of the tank form, in effect, two tanks, one section $n$ for primary cooling and one section $n'$ for submerging. The usual pouring-basin $p$ for receiving the metal from the casting-ladle and having the troughs $p'$, carrying the metal in position for pouring into the molds, is of course employed, and the metal may be poured into the molds either when the molds are in the water or just before they pass into the tank, the result being the same.

In practicing the invention where the double-tank apparatus is employed the metal is poured in a continuous controllable stream into the basin $p$ and thence into the molds as they travel continuously under the pouring-spouts $p'$, and as the molds filled with metal travel within the tank $c$, the molds being only partially submerged therein, the cooling action of the water in the tank will cause the quicker setting of the metal to such extent that the metal itself will not boil when brought into direct contact with the water, the metal when first poured being so hot that the water coming in contact with the unset top face thereof causes the metal to boil and honeycombs such top face, and such honeycomb is liable to break off in the subsequent handling of the pig. This first body of water is therefore preferably maintained at the proper temperature for causing as rapid setting of the metal without contact therewith as practicable. At the proper time after the metal is so set, though still at a very high heat, the molds are carried up over the partition $c^2$ into the tank $d$, and the molds, with the metal contained therein, are entirely submerged in said tank, the water being brought into direct contact with the metal and the body of water being of such heat that contact with the metal will cause boiling or ebullition thereof, so providing for the escape of the steam as quickly as it is formed and the continual or repeated fresh contacting of the water with the metal, so that instead of the water being held from contact therewith by a layer of steam generated by the first contact of water with the metal this steam is permitted to escape and, though the water is hotter on account of the repeated fresh contact of the other portions of water directly with the metal, a more rapid cooling of the same is effected. After the metal has been carried through the tank $d$ it is carried up the inclined track $f'$ and may be still further cooled by the spraying of the water from the spray-pipes $h$ on its surface, so that when it is dumped from the machine by the passage of the molds around the sprocket-wheel $e'$ it is practically cold and may be delivered to the cars. The apparatus illustrated is arranged for the gradual heating of the water first as it is sprayed upon the metal and being carried up the inclined track $f'$, this water being collected in the basin $g'$ and carried in the pipe $g^2$ into the tank $c$, and as the water travels through this tank, it being itself gradually heated and then delivered into the tank $d$, by which time it is raised close to the boiling-point, so that the direct contact of the metal with the water will cause its boiling or ebullition, with

the result above described. Any suitable arrangement for the feeding of the water may, however, be employed.

In practicing the invention according to the apparatus shown in Figs. 5 and 6, where a single tank is employed, the water, which may, if desired, have been employed for spraying the molds, as shown in Figs. 1 and 2, is carried to the receiving end of the tank *k* and travels backwardly through that tank until it is sufficiently heated to boil upon direct contact with the metal, such as where the track *l'* passes down to a lower level or over the partition *l* and provides for the submerging of the molds and the metal contained therein, the water passing from the rear end of the tank at *m'*. The result in either case is practically the same, except that the temperature of the water can be more easily controlled in the apparatus of Figs. 1 and 2.

In either case I am able to obtain a more rapid and effectual cooling of the metal, while the amount of water used for cooling the same is considerably reduced, because of the slower flow of the water through the machine, while the machine may be shortened and have the same cooling powers.

No claim is made in this application for the apparatus above described, as the same is embodied in a divisional application filed December 6, 1899, Serial No. 739,386.

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

1. The herein-described method of casting metals, consisting in pouring the metal into an endless connected series of traveling molds and submerging the molds and their contents in and moving them through a body of water in a state of ebullition.

2. The herein-described method of casting metals, consisting in pouring the metal into an endless connected series of traveling molds, subjecting the molds to the cooling action of water and then submerging the molds and their contents in and moving them through a body of water in a state of ebullition.

3. The herein-described method of casting metals, which consists in pouring metal into an endless connected series of traveling molds, cooling the metal by partially submerging the molds in water, and then submerging the molds and their contents entirely in a body of water in a state of ebullition.

4. The herein-described method of casting metal, which consists in pouring the metal into an endless connected series of traveling molds, moving the molds containing the metal through a body of water the temperature of which is below the boiling-point, and then moving the molds through a body of boiling water.

5. The herein-described method of casting metal, which consists in pouring the metal into an endless connected series of traveling molds, submerging the molds containing the metal in a body of water at such temperature that it will be caused to boil by the heat of the metal.

6. The herein-described method of casting metal, which consists in pouring the metal into an endless connected series of traveling molds, partially submerging the molds containing the metal in water whereby the metal is partially cooled and the temperature of the water raised, and then completely submerging the molds containing the metal in a body of water in a state of ebullition, and at the same time adding to said body of water a supply from the body of water the temperature of which was raised by the partial submergence of the molds.

7. The herein-described method of casting metal, which consists in pouring the metal into an endless connected series of traveling molds, cooling the metal by first partially submerging the molds containing the same in water, then submerging the molds in a body of water in a state of ebullition, and then spraying the metal when still in the molds, collecting the water used in the spraying operation, conducting it into contact with the partially-submerged molds whereby its temperature is raised to a suitable point for complete submergence of the molds therein.

In testimony whereof I, the said WILLIAM J. PATTERSON, have hereunto set my hand.

WILLIAM J. PATTERSON.

Witnesses:

JAMES I. KAY,

ROBERT C. TOTTEN.