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AUTOMATIC METAL FEED FOR CONTINUOUS CASTING MACHINES.

APPLICATION FILED FEB. 2, 1915.

1,139,888.

Patented May 18, 1915.

3 SHEETS—SHEET 1.

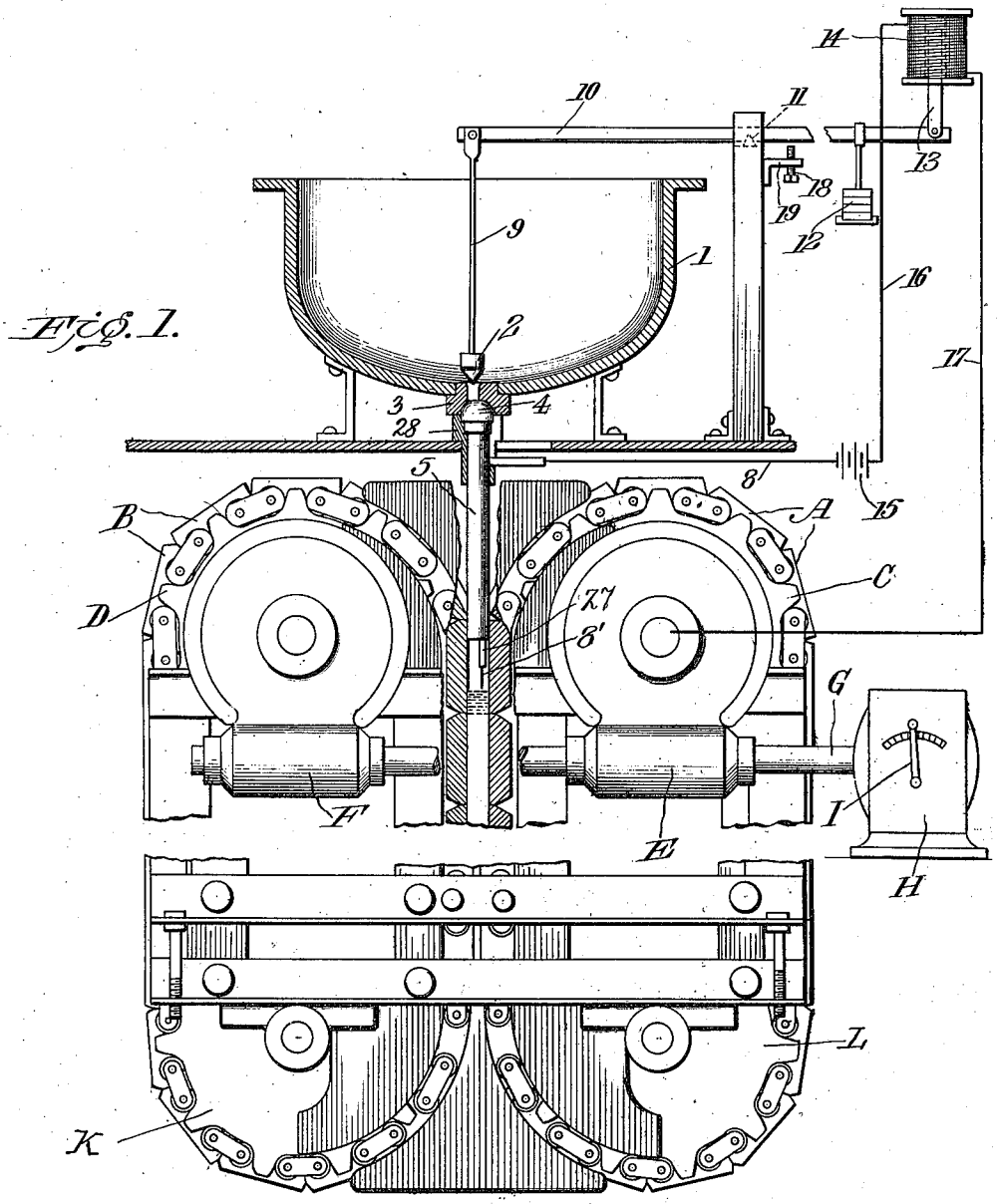

Fig. 1.

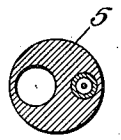

Fig. 3.

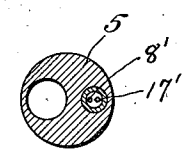

Fig. 4.

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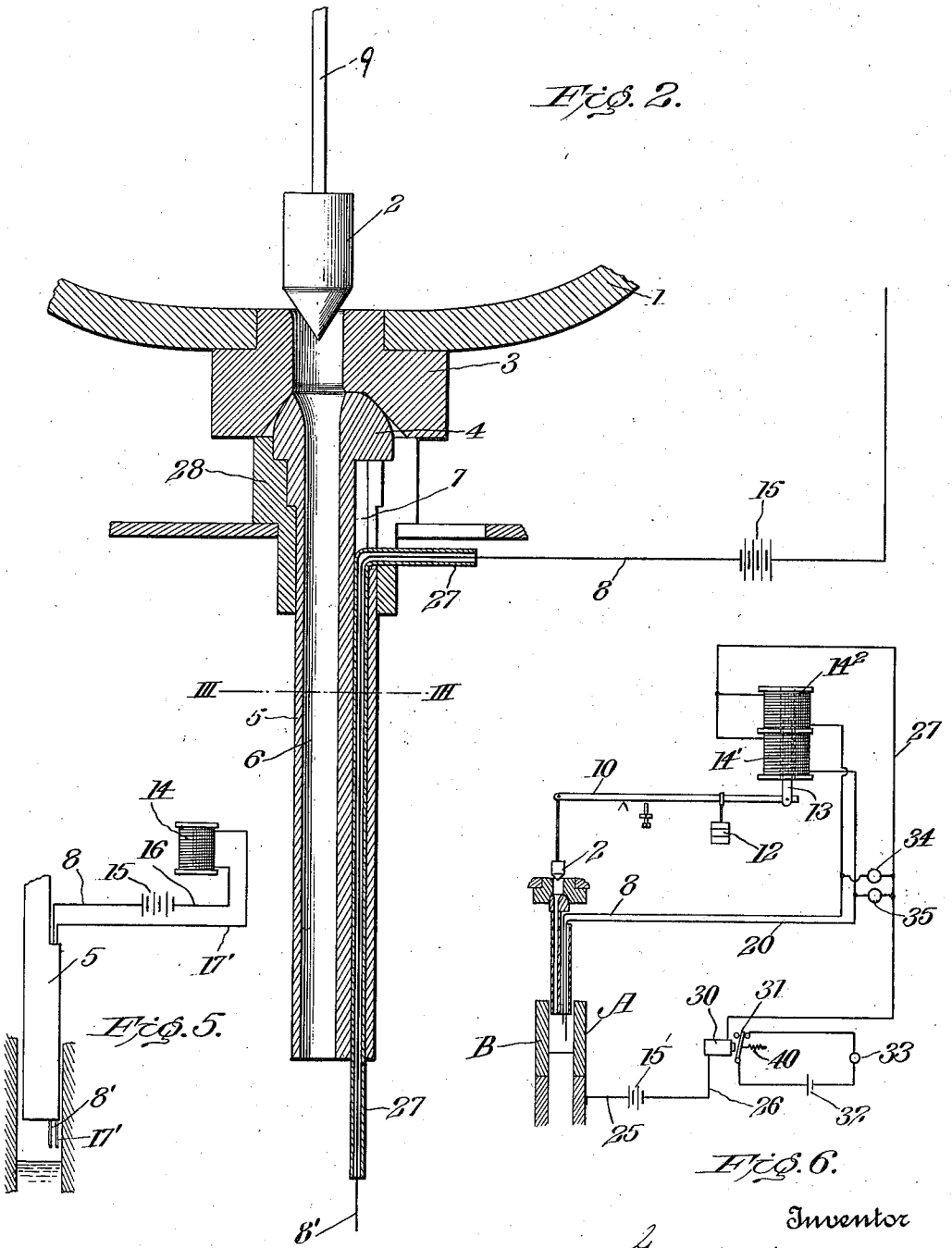

Fig. 2.

Fig. 5.

Fig. 6.

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3 SHEETS—SHEET 3.

Fig. 7.

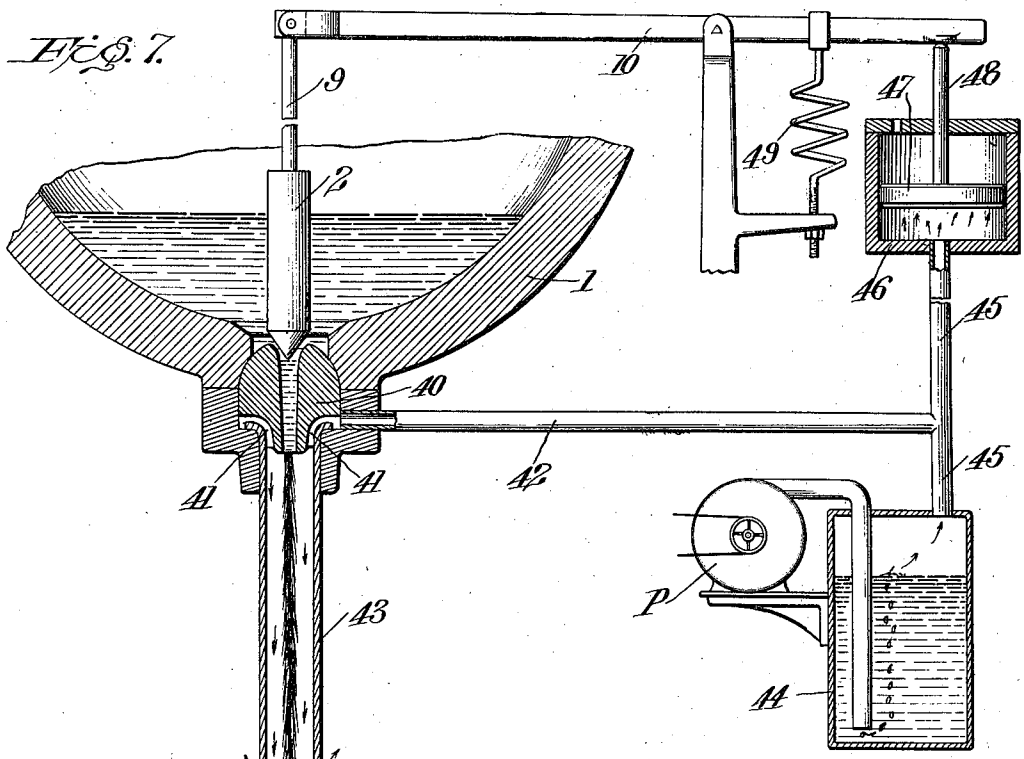
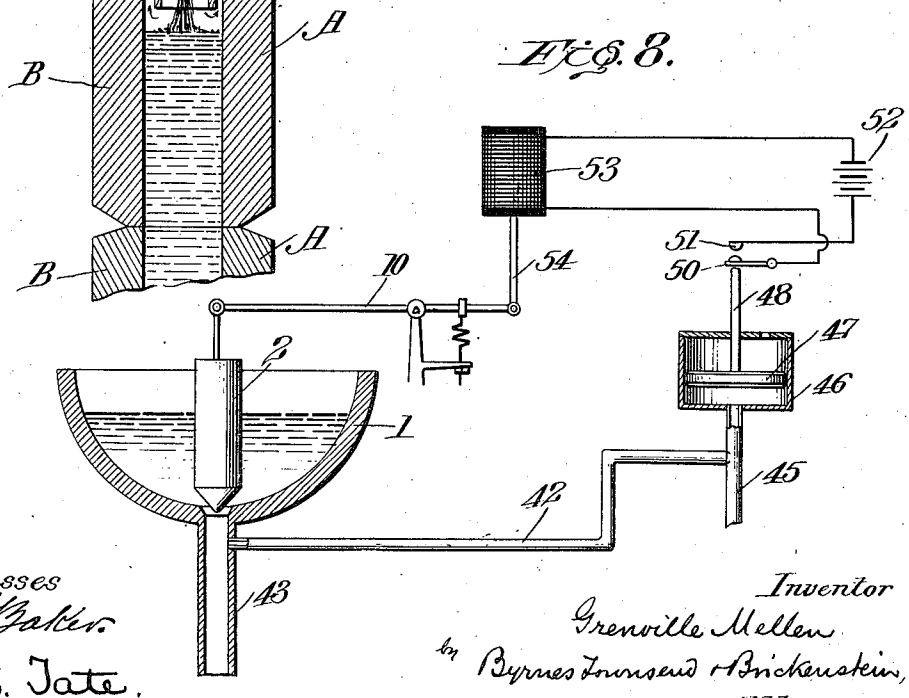


Fig. 8.



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UNITED STATES PATENT OFFICE.

GRENVILLE MELLEN, OF WEST ORANGE, NEW JERSEY, ASSIGNOR TO CONTINUOUS CASTING CORPORATION, OF NEWARK, NEW JERSEY, A CORPORATION OF VIRGINIA.

AUTOMATIC METAL-FEED FOR CONTINUOUS CASTING-MACHINES.

1,139,888. Specification of Letters Patent. Patented May 18, 1915.

Application filed February 2, 1915. Serial No. 5,772.

To all whom it may concern:

Be it known that I, GRENVILLE MELLEN, a citizen of the United States, residing at Llewellyn Park, West Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Automatic Metal-Feeds for Continuous Casting-Machines, of which the following is a specification.

My invention relates to an automatic metal feed for continuous casting machines, and is particularly designed to deliver molten metal to a machine in which the molding cavity is upright or in a substantially vertical position.

The particular form of casting machine to which my invention is applied, is shown in my prior application Serial No. 748,251, filed February 13, 1913, although it is capable of use with other types of machines, whether the molds be movable or stationary; and is further adapted for use in other relations where the level of molten metal is to be maintained.

In the machine of my prior application, the mold proper is formed by two endless chains of mold blocks, the blocks being provided with suitably shaped cavities, so that when coöperating blocks are brought into engagement, there is formed an uninterrupted mold cavity into which metal is continuously introduced at the upper end and from whose lower end there is delivered a formed bar or rod of any desired length. It is important to maintain uniform the supply of metal to the mold cavity, as if the supply is too rapid, the metal overflows and puts the machine out of operation; if too slow, an imperfect rod is formed.

My invention provides means for automatically maintaining the level of the liquid in the mold cavity or other container at a substantially fixed point, or within given limits, and further provides means for informing the operator as to variations in such level.

In the accompanying drawings Figure 1 is a more or less diagrammatic view showing some of the parts in section; Fig. 2 is a vertical section, on a larger scale, of the metal pot, and the delivery tube; Fig. 3 is a cross-section on plane III—III of Fig. 2; Fig. 4 is a cross-section of a modified form of delivery tube; Fig. 5 is a diagram of a modification; Fig. 6 is a diagram of still another modification; Fig. 7 is a diagrammatic showing of a modification; and Fig. 8 is a diagrammatic showing of another modification.

Referring to the drawings, 1 is a receptacle for molten metal having a tap-hole in its bottom, which is opened and closed by a valve 2, preferably made of carbon, and having a tapered end. The tap-hole is formed in a hollow plug 3, preferably of graphite, fitted into the bottom of pot 1. The plug 3 has at its bottom a socket or recess to receive the head 4, which may be a single piece of graphite.

5 is a tube, also preferably of carbon and having a bore 6 for passage of molten material, and a second bore 7, having a slot opening at its upper end, into which is inserted a silica tube 27, through which extends the wire 8, the terminal portion 8′ of the wire extending downward beneath the tube.

28 is a metal sleeve surrounding and supporting, by means of the shoulders shown, the tube 5 and head 4.

The mold cavity is formed between two endless chains of mold blocks A, B, supported by sprocket-wheels C, D, which are driven by any suitable mechanism such as worms E, F, on shaft G of the variable speed motor provided with a suitable speed-changing controller I. The mold chains pass over suitably mounted sprockets K, L at the lower portion of the machine.

The valve 2 is carried by a rod 9 pivoted to one end of beam 10, mounted on a knife-edge fulcrum 11. The beam carries adjustable weights 12, and has its other end pivoted to the core 13 of a solenoid 14.

18 is an adjustable stop carried by bracket 19. The solenoid circuit consists of wire 8, battery 15, wire 16, solenoid 14, and wire 17, which is connected to any suitable part of the frame of the machine so that it is in conductive connection with the molten metal in the mold.

The operation of the device will be apparent. When the molten metal rises in the mold high enough to make contact with the terminal 8′, the circuit is closed, the core 13 is pulled up, and the valve 2 is entirely or

partially closed, according to the adjustment of the machine. As soon as the metal in the mold drops below the end of terminal 8′, the circuit is broken and the weight 12 causes the valve 2 to rise and admit a further supply of molten metal.

Instead of using a single wire, two suitably insulated wires may be passed through the tube 7, as shown in Fig. 4, the ends of the wires protruding below the end of tube 5 to the same extent (see Fig. 5), the circuit being closed by the molten metal coming into contact with the ends of the wires.

In case a graduated action of the valve 2 is desired, two solenoids 14′, 14^2, may be used. In this case, two wires 8 and 20 (Fig. 6) are used, one extending below the other. When the metal rises in the mold high enough to make contact with the lower end of wire 20, the circuit is closed through wire 25 (in metallic connection with the mold, as in Fig. 1) battery 15′, wire 26, relay 30, wire 27, solenoid 14′ and wire 20. The solenoid 14′ thereupon acts to partly close the valve 2. If the metal rises still further into contact with the end of wire 8, a second circuit including the solenoid 14^2 is closed, whereupon the valve 2 is still further moved to entirely shut off the metal.

In case it is desired to afford an indication of the fall of metal in the mold below a fixed point, such as the end of wire 20, a relay 30 may be connected in circuit with battery 15′, as shown. When the connection is broken, the relay armature 31 is retracted by spring 40, and closes a local circuit through battery 31, and indicator 33, which may be a bell or signal light. Similar indicators 34, 35 may be connected to afford visual or audible indications of changes of level, so that the operator may further adjust, if necessary, the conditions of casting by properly varying the speed of the machine. Obviously, the audible or visual indications of level-change may be used without the automatic control of the metal-supply, and the operator can control the casting conditions in accordance with such indications by manual control of the valve 2 and the controller I.

In Fig. 7 is shown an automatic control device pneumatically, instead of electrically, actuated. The connection piece 40, preferably of graphite, fitting into the opening in the bottom of the casting-pot, is provided with grooves 41, through which a gas, preferably non-oxidizing in character, is forced from pipe 42 into the casting-tube 43, the gas escaping around the end of the tube, as long as the end of the tube is not sealed by the molten metal in the mold cavity. Gas under pressure is delivered to the tube 42, by a pump P which forces air through a closed vessel 44 partly filled with alcohol or hydrocarbon liquid. From the tank 44, the gas passes through pipe 45, either into pipe 42, or into cylinder 46, having a piston 47. The piston rod 48 is arranged to press upwardly against the end of the pivoted beam 10, when the piston rises. The beam is counterbalanced by an adjustable spring 49. In operation, if the metal rises toward the end of the casting tube, the flow of gas from the end of the tube is gradually diminished, and the pressure within the cylinder 46 gradually rises forcing the piston upward and thereby gradually lowering the valve 2 to diminish the flow of metal from the supply pot 1 until the predetermined normal conditions are reëstablished.

In the modification shown in Fig. 8, the piston rod 48, as it rises, brings the contacts 50, 51 together and closes an electric circuit comprising battery 52 and solenoid 53, whose plunger 54, is connected to and operates the beam 10. The operation of this form of device will be readily understood without further description.

While I have described several forms of apparatus in more or less detail, my invention is not limited to details of construction, as those familiar with the art will readily understand that equivalent or modified constructions may be used to effect the same result.

I have referred to "wires" extending into the mold, by which I mean not merely metal wires, but also rods composed either in whole or in part of any suitable conducting material such as carbon or graphite. Practice has shown that the terminals, in particular, are best made of carbon or graphite.

My invention broadly includes such and other variations or modifications.

What I claim is:—

1. The combination with a vertically arranged mold, of means for delivering metal thereinto and means controlled by variations of level of molten metal in the mold for determining the supply of metal thereto.

2. The combination with a vertically arranged mold, of means for delivering metal thereinto and means controlled by variations of level of molten metal in the mold for automatically controlling the supply of metal thereto.

3. The combination with a vertically arranged mold, of a metal receptacle, a tube extending therefrom into the mold, a valve controlling the flow of metal into the tube, and means controlled by variations of level of molten metal in the mold for automatically operating said valve.

4. The combination with a vertically arranged mold, of a metal receptacle, a tube extending therefrom into the mold, a valve controlling the flow of metal into the tube, and means controlled by variations of level of molten metal in the mold for automatically operating said valve, said means com-

prising a wire extending into said mold and electromagnetic mechanism connected to said valve.

5. The combination of a metal receptacle, an opening therein, a valve, a mold, a delivery tube extending into the mold, a wire having its terminal near the end of the tube, and electromagnetically operating means for actuating the valve included in circuit with said wire.

6. The combination of a metal receptacle, an opening therein, a valve, a mold, a delivery tube extending into the mold, two wires having their terminals extending different distances from the end of the tube, and two solenoids arranged to actuate said valve, each solenoid included in circuit with one of said wires.

7. The combination with a vertically arranged mold of a circuit terminal extending into the upper portion thereof, said terminal included in a circuit containing a relay and a signal operated by said relay when the circuit is broken.

8. A delivery tube for casting machines having therein a passageway for molten metal and a bore open at the bottom, an insulating tube extending through said bore, and a wire extending through and beyond said insulating tube.

In testimony whereof I affix my signature in presence of two witnesses.

GRENVILLE MELLEN.

Witnesses:

GEORGE W. SCHUMAN,

DORA G. RONORTH.