(No Model.) 2 Sheets—Sheet 1.

# C. E. GORE.

## WATER JACKET FOR METALLURGIC FURNACES.

No. 283,098. Patented Aug. 14, 1883.

Fig. 2

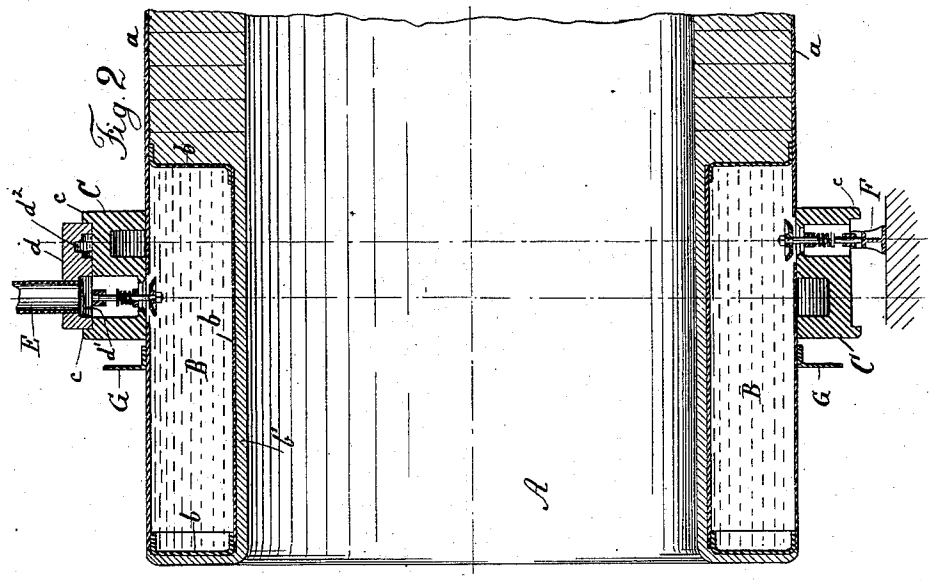
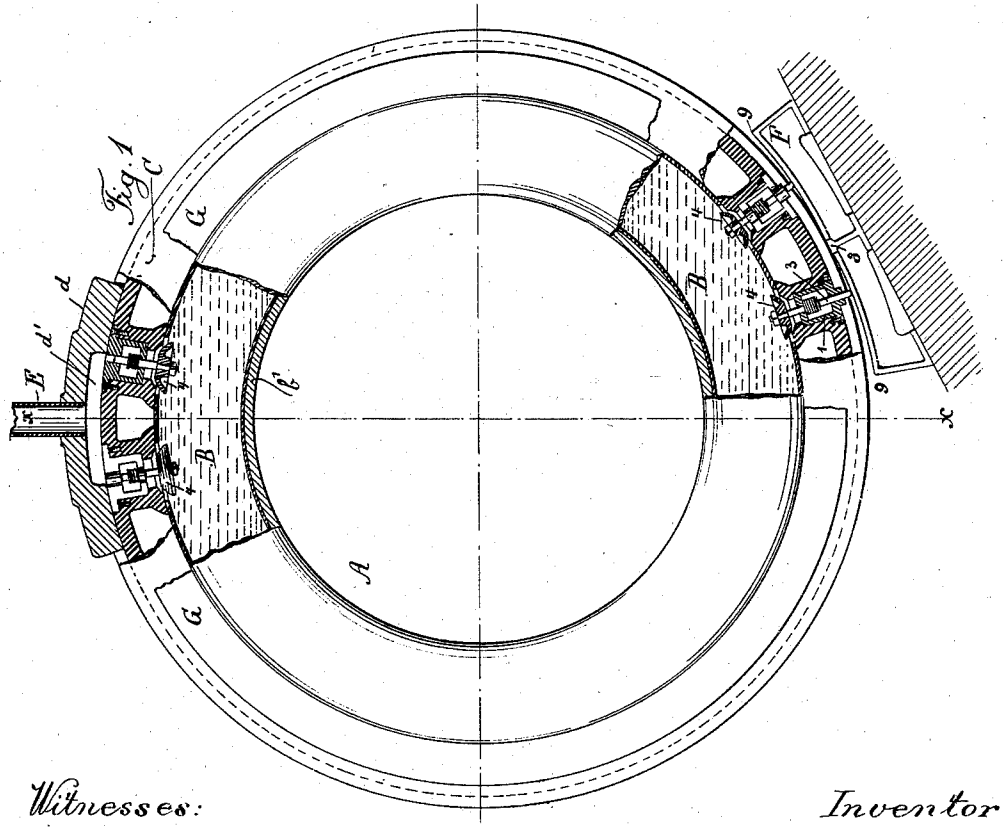



Fig. 1




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(No Model.) 2 Sheets—Sheet 2.

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## WATER JACKET FOR METALLURGIC FURNACES.

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Fig. 3

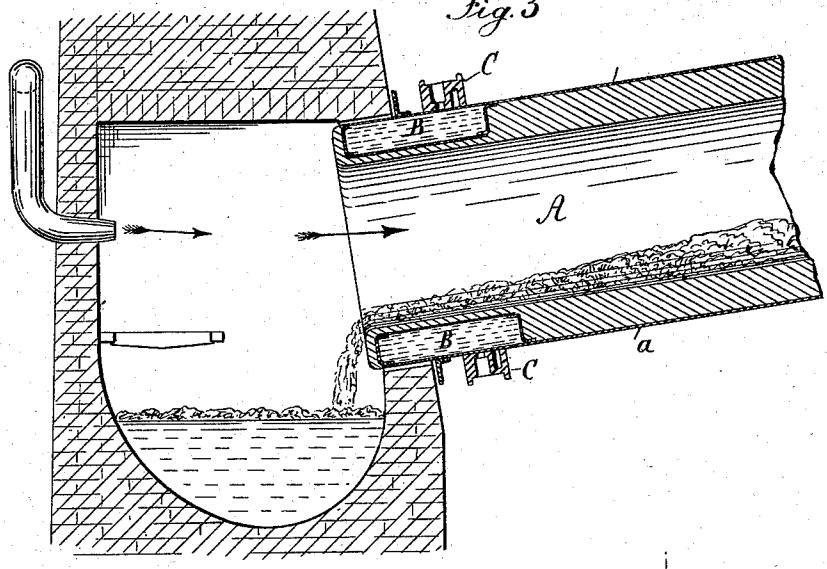



Fig. 4

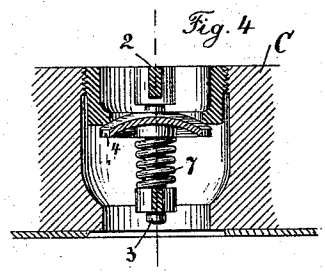



Fig. 6

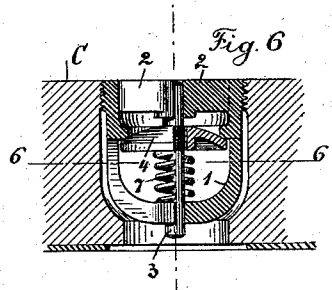



Fig. 5

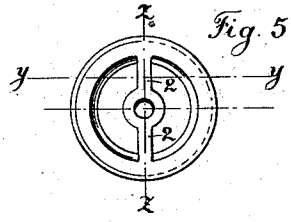



Fig. 7

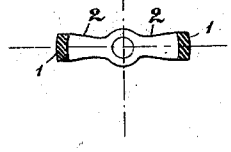
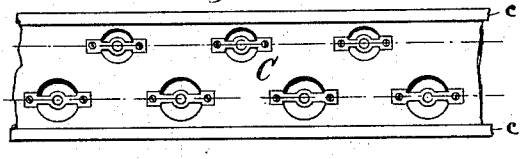



Fig. 8




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# UNITED STATES PATENT OFFICE.

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## WATER-JACKET FOR METALLURGIC FURNACES.

SPECIFICATION forming part of Letters Patent No. 283,098, dated August 14, 1883.

Application filed May 15, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. GORE, a citizen of the United States, residing at Lafayette, in the county of Tippecanoe and State of Indiana, have invented certain new and useful Improvements in Water-Jackets for Metallurgic Furnaces, of which the following is hereby declared to be a full, clear, and exact description, sufficient to enable others skilled in the art to make and use said invention.

My invention relates more particularly to water-jackets designed to cool the parts of revolving metallurgic furnaces most exposed to the destructive action of the flames and gases, and is generally applicable to roasting or smelting cylinders, rotary puddling-vessels, and the like, to which a slow revolution is imparted while the contained ore or metal is undergoing treatment.

In the accompanying drawings, which illustrate the invention as applied to an ore roasting or smelting cylinder, Figure 1 is an end elevation of the revolving drum, showing a section through the water-jacket, its supply-pipes, and valves, and also through the discharge-valves. Fig. 2 is a longitudinal vertical section through the drum and water-jacket on line *x x*, Fig. 1. Fig. 3 is a longitudinal vertical section through the drum and fire-chamber, showing the relation which the drum sustains to said chamber when mounted in position. Fig. 4 is a sectional view on line *y y* of Fig. 5, and Fig. 5 is a plan view of one of the valves and cages applied to the water-jacket. Fig. 6 is a view in elevation and partly in section on line *z z*, Fig. 5, of a valve and cage. Fig. 7 is a section view of a cage on line 6 6 of Fig. 6, and Fig. 8 is a plan view to illustrate the relative position of the supply and discharge valves in the water-jacket.

The cylinder A, which is sustained and revolved by any of the usual means now known in the art, has a hollow space or chamber, as at B, formed of an inside and two end sheets, *b*, of boiler-iron, which are firmly riveted together and to the outer shell or casing, *a*, of the cylinder. The chamber B constitutes the water-jacket, and in this instance is shown at the end of the cylinder, where it projects within the fire-chamber of the furnace. My invention is designed to secure an even and practically continuous supply and discharge of water into and from said jacket, and, as will hereinafter appear, the invention is not necessarily limited to any particular position of the jacket along the cylinder or vessel, but may be used with success at any one or more points where the intensity of the flame makes it advisable to apply a water-jacket.

A cast-iron ring, C, made either in one piece or of several pieces bolted together, is turned down on its inside to snugly fit the outer casing of the water-jacket, to which it is secured. Around the ring C, at suitable intervals, a double series of holes are cored out, which may be interspaced, as shown in Fig. 8, one of said series of holes being designed to receive the inlet-valves and the other to receive the outlet-valves of the water-jacket B. The cages 1, which sustain the valves, may screw into the holes of ring C, as in Fig. 6, or be held by screws, as in Fig. 1, or in any other manner suitable to insure a water-tight joint.

The cages 1 have cross-guides 2, within which move the stems 3, carrying the valve-disks 4. The disks may be threaded to the stems, as in Fig. 6, or be clamped against a shoulder thereon by set-nut, as in Fig. 1, and the seats for said disks 4 may be formed either upon the cage 1 or upon the ring C, Figs. 4, 6, and 1. A coil-spring, 7, of weak tension, secured to stems 3, bears against the valve-disks 4 and holds the same against their seats, except when forced inward, as hereinafter described.

The preferred form of valve is that shown in Figs. 4 to 7, inclusive, because the disks are contained within the cage, are easily fitted to the seat thereon, are less liable to get out of order, and may be quickly replaced when desired.

It will be noticed that the stems 3 of the discharge-valves are somewhat longer than in the supply-valves, so that when the disks are down against their seats the ends of the stems project beyond the face of the ring C. These ends of the discharge-valve stems should be hardened to increase their durability, and are made to project, for a purpose presently to be explained.

Between the side flange, *c*, of the ring C, and turned down to neatly fit the smooth outer face of said ring, is a block, *d*, past which said

ring constantly slides during rotation of cylinder A. The block $d$, being stationary, tends to drag on the face of ring C, and may have a Babbitt-metal wearing-plate on its under side and be provided with suitable springs or the like on its upper side, by which it may be forced tightly down upon the ring C to insure the existence of a water-tight joint between them. The block $d$ is recessed, as at $d'$, on its inner face, to provide a space or chamber for the inflowing water, and again at $d^2$, to allow the projecting stems of the discharge-valves to pass without interference with the block. The chamber $d^2$, formed in the block $d$, is in line with the series of inlet-valves secured to ring C, and each of said valves comes in turn beneath and in communication with the chamber $d^2$ as rotation of cylinder A proceeds. The water-supply pipe E, fastened to block $d$, opens into the chamber $d'$.

Opposite to block $d$ there is arranged in line with the stems of the jacket discharge-valves a stationary trip-plate, F, which is highest or nearest in contact with ring C at the median point, S, and slopes gradually down and away from said ring on both sides of the point S, and until the ends of the plate are reached, as at 9, thus forming a double cam-like face, against which the stems of the discharge-valves beat successively during revolution of cylinder A.

The plate F may be adjusted to and from the ring C by any suitable means, and in lieu thereof any other expedient may be adopted to trip the stems of the discharge-valves and to lift their disks each in turn away from their seats.

If, now, water at a sufficient head or pressure to overcome the feeble tension of springs 7 be admitted through pipe E into chamber $d'$, then as each supply-valve moves past said chamber in course of revolution the disk of the valve will be raised from its seat and the water be freely admitted to the interior of jacket B. The stems of the discharge-valves, each in turn coming in contact with the cam-face of trip-plate F, are pushed into the ring C, thus lifting the valve-disks away from their seats and allowing the water to discharge from the jacket. The peculiar contour of the face of the trip-plate allows the discharge-valves to open and close gradually, the ventage being greatest when the stems have reached the median point, S.

It is preferred in practice that the series of supply-valves and of discharge-valves be relatively arranged in such manner as to always secure the ingress and egress of water to and from the jacket, and in quantity constantly equal to the capacity of one valve at its point of greatest ventage. Thus, for example, it may be assumed that when a supply-valve is midway the chamber $d^2$ a discharge-valve is at the median point, S, of the trip-plate F. Then as each valve recedes from this central point in course of rotation, and tends gradually to close against the seat, its companion valve is approaching the central point, and is pushed farther and farther inward, either by the pressure of the water-supply from pipe E or the cam-face of plate F, as the case may be, and compensates by its increased ventage for the diminution of the retreating valve. This arrangement allows for a continuous supply of cold water and the discharge of hot water, vapors, or steam, which latter, if generated at any time, would speedily blow out through the opened valve or valves and fresh portions of cold water rush in to take its place.

The discharge-valve may be made somewhat smaller than the supply, in order to better insure the complete filling of the jacket, though in this, as in respect to the provision for the continuous supply and discharge of water just detailed, there is obviously much latitude, and the same may be wholly disregarded, though it were better in practice to observe the provisions herein set out.

Heretofore cylindrical water-jackets have been applied to revolving metallurgic furnaces, and provision has been made by intermittently-acting inlet-valves and an escape-pipe coiled about the cylindrical vessel to govern the supply and discharge of water into and from said jackets; but the water-discharge from said escape-pipe is limited, is irregular, and occurs only for a brief period at one stage in rotation of the vessel, whereas by providing a positively-acting trip-valve the discharge may be to the full capacity of the vent for almost the entire period of rotation, depending on the location, pitch, and extent of the trip mechanism with which the valve-stem co-operates. Again, it is important that the supply and discharge of water should be substantially continuous, and this the mechanism adverted to cannot effect.

A guard-plate, G, surrounds the cylinder A, and diverts the hot gases or flame which may escape from the furnace, so as not to strike or impair the ring C and its adjuncts. By adjusting cam-plate F to and from the ring C, the discharge-valves may be given greater or less ventage, as desired. The inner face of the water-jacket may have a thin coating, $b'$, of slag or silica to protect it from the flame, and there will be a suitable number of hand-holes to allow for cleaning interior of jacket, &c., as desired.

Without limiting myself to the precise details of structure herein described, and having thus set forth the invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In revolving metallurgic furnaces, the combination, with the water-jacket, of inlet and outlet valves and suitable mechanism co-operating therewith to shift said valves at intervals and permit the water to enter into and to discharge from said jacket, substantially as described.

2. In revolving metallurgic furnaces, the combination, with the water-jacket, of a series of inlet and a series of outlet valves, said double

series of valves being arranged relatively to each other and to suitable operating mechanism in such manner as to secure the continuous supply of water into and its discharge from said jacket, substantially as described.

3. The combination, with the water-jacket and the fixed ring about the same, of the block sliding thereon and the inlet-valve mounted in said ring, and adapted to admit water to the interior of the jacket when passing beneath the block, substantially as described.

4. The combination, with the water-jacket and the ring fixed about the same, of the discharge-valve mounted in said ring and adapted to be tripped at intervals to allow for escape of water from the jacket, substantially as described.

5. The combination, with water-jacket B, of the ring C, surrounding the same, a spring-seated discharge-valve, the stem of which projects beyond said ring, and a trip-plate, F, to engage said stem, substantially as described.

6. The combination, with the water-jacket and with the ring fixed about the same, of the stationary block past which the ring slides, a series of supply and of discharge valves set in said ring, and a trip-plate adapted to engage the projecting stems of the discharge-valves, substantially as described.

7. The combination, with the perforated water-jacket and the perforated fixed ring about the same, of the cage 1, the valve-stems 3, disks 4, and springs 7, substantially as described.

8. The combination, with water-jacket B and ring C about the same, of the block *d*, resting thereon and having channels $d'$ $d^2$, the supply-pipe E, the series of supply and discharge valves mounted in said ring C, and consisting of a cage, 1, stem 3, disk 4, and spring 7, and a trip-plate, F, to engage the projecting stem of the discharge-valve, substantially as described.

In testimony whereof, witness my hand this 4th day of May, A. D. 1883.

CHARLES E. GORE.

Witnesses:

FRANK M. CARY,

ALFRED H. DIVER.