

No. 696,324.

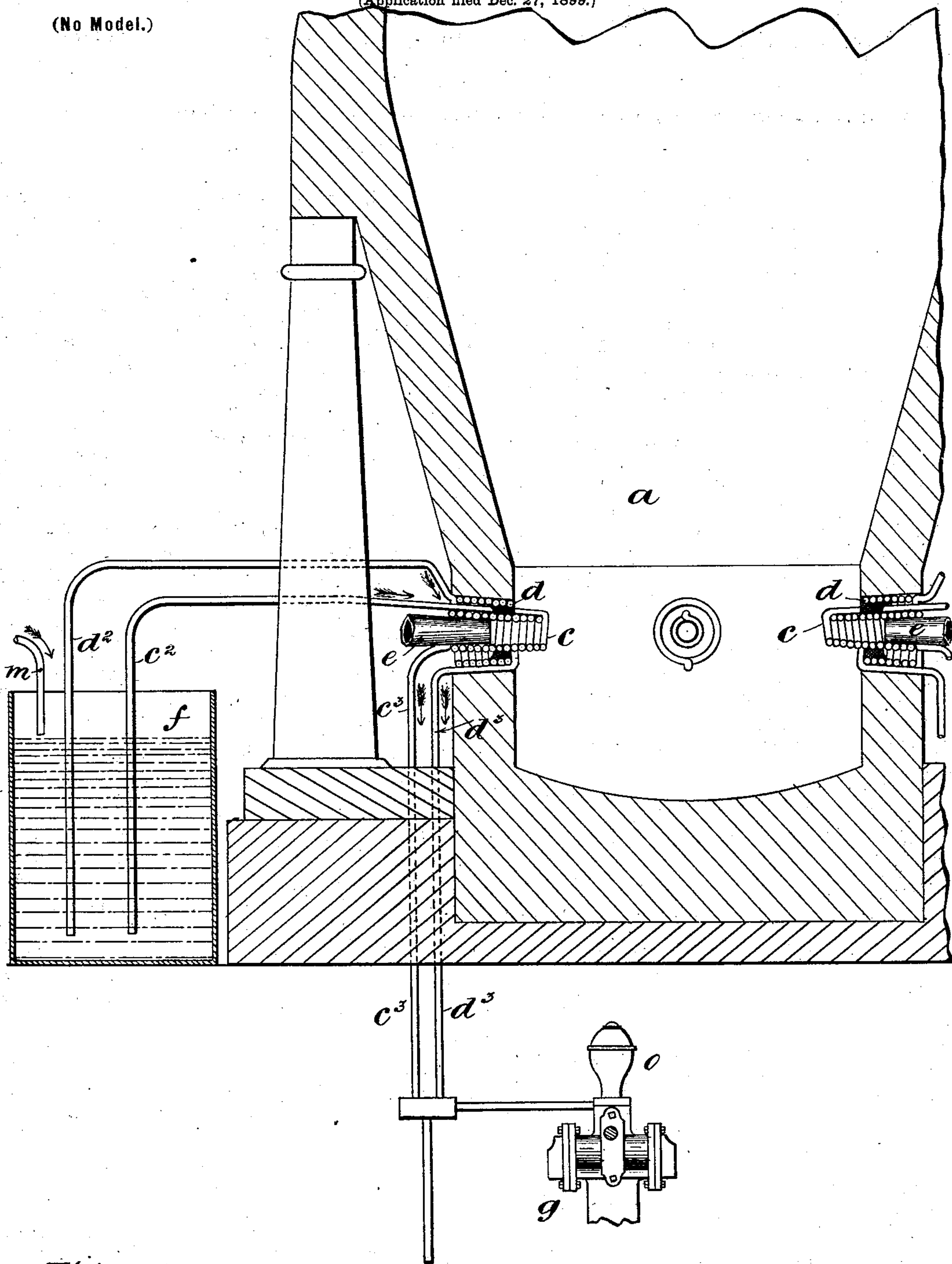
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W. J. FOSTER.

METHOD OF CIRCULATING WATER THROUGH THE TWYERS AND COOLERS OF
BLAST FURNACES.

(Application filed Dec. 27, 1899.)

(No Model.)



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM JAMES FOSTER, OF DARLASTON, ENGLAND.

METHOD OF CIRCULATING WATER THROUGH THE TWYERS AND COOLERS OF BLAST-FURNACES.

SPECIFICATION forming part of Letters Patent No. 696,324, dated March 25, 1902.

Application filed December 27, 1899. Serial No. 741,740. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JAMES FOSTER, a subject of the Queen of Great Britain, residing at Arnside House, Gordon street, Darlaston, in the county of Stafford, England, have invented certain new and useful Improvements in or Relating to the Circulation of Water Through the Twyers and Coolers of Blast-Furnaces, of which the following is a specification.

This invention has reference to the circulation of water through twyers and coolers of blast-furnaces for keeping the said twyers and coolers, particularly their extreme inner or nose ends, from becoming burned. Such twyers and coolers are usually constructed of a number of tubular spirally-winding coils or of a double casing divided up into communicating chambers. When a twyer or cooler is burned, a hole or a number of such are made in the water-passages—namely, in the walls of the winding-coils or in the casing of the communicating chambers.

The present system of water circulation in twyers and coolers is one in which the water is forced or pushed through the twyers and coolers from the water-supply end, and this at a considerable pressure in order to insure a very rapid flow and a constant and quick change of the water through the coils or chambers of the twyers and coolers. In order to effectively accomplish this, it is often necessary to feed the water to the said twyers and coolers from a considerable elevation in respect thereof, sometimes as much as sixty feet. Practical experience clearly shows that no matter how good such water circulation may be it is impossible (even if the twyers and coolers are frequently changed) to prevent the said twyers and coolers at times burning out, and this without it being possible from a practical standpoint to ascertain that the same has taken place. The burning out of the twyers and coolers allows part of the circulating water to flow into the furnace with very serious results to the interior and to the working which is taking place.

Now this invention is an improved system of water circulation, as aforesaid, which will prevent the flow of water into the furnace should any of the twyers or coolers burn out. The said improved system is characterized

by the application of a force at the discharge end of the twyers and coolers to pull, draw, or suck the water through the latter in contradistinction to pushing it through from the water-supply end, as before defined, and also by arranging the water supply or feed in respect to the twyers and coolers so that without the pulling or drawing through force, as aforesaid, in the operation no water can flow, so that the flow of water from the supply must automatically cease immediately a hole sufficiently large is burned in the twyers and coolers to cause a break or a diminution of the suction in the system.

The invention can be carried into effect by the application of a pump at the discharge end of the twyers and coolers or by causing the system to act on the principle of a siphon, with the long leg of the siphon at the discharge end of the twyers or coolers, as shown in the drawing, in which arrangement the considerable fall given through the long leg of the siphon creates a greater velocity of the water at the discharge end, inducing a sucking action, which pulls the water through the twyers. In the case of the former at the discharge end of the twyers or in the case of a siphon action the pulling or drawing through force at the discharge end of the twyers or coolers exceeds any pushing-through force which may be present on the supply end of the twyers and coolers, although according to this invention a strong point is claimed by arranging the water-supply so that the circulating water before passing through the twyers and coolers must be lifted.

In the accompanying sheet of drawing a diagram shows a practical way of carrying this invention into effect, the twyers and coolers being shown constructed of tubular coils.

In this diagram, *a* is the furnace.
c c are the tubular blast-twyers.
d d are the tubular coolers.
e e are the blast-supply pipes.
f is the water-supply, and *g* is the water-discharge.

Arrows are used to indicate the direction of the water circulation.

The water-supply *f* is a tank, into which feed-pipes *c*² *d*² dip. These pipes lead, respectively, to the twyer *c* and the cooler *d* and are connected up to the coils composing

them, so that the water first flows to the inner or nose ends. Pipes c^3 d^3 are respectively attached to the discharge ends of the coils of the twyer and cooler and are connected up
 5 with a pump o , placed in some suitable and convenient position. The pipe m may supply water to the tank of the water-supply f .

From the said drawing and the foregoing it will be clearly seen that the water at the
 10 supply end of the twyers and coolers has to be lifted before it can flow, and this is done by means of the pump o at the discharge end. It will also be obvious that if the twyer or cooler gets burned out air is at once admitted
 15 and a break caused in the water-supply.

If the hole burned in the twyer or cooler is not too large a one, the continued working of the pump will sometimes cause a piece of substance inside the furnace, such as graphite,
 20 to be drawn into the said hole and effect a temporary repair.

If the circulating water is not lifted at the supply end, a valve may be fitted to the said end to automatically close immediately the
 25 pull on the water from the pump is lessened by the air admitted through the twyers or cooler burning.

I desire it understood that I do not limit myself to the particular means shown and
 30 described for drawing the water through the twyers and coolers, as I regard my invention as residing, broadly, in the arrangement at the discharge side of twyers or coolers of any suitable means for drawing the water there-
 35 through in contradistinction to means ar-

ranged at the supply end for forcing the water therethrough.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination with a furnace, of a hollow twyer suitably connected thereto and adapted to have a cooling medium circulate therethrough, a hollow cooler surrounding
 45 said twyer, and means connected with the hollow space of said cooler and twyer for pulling the cooling medium therethrough, preventing the cooling medium from escaping through an opening which may be burned in
 50 the twyer from the heat of the furnace, and for closing up said opening by the pulling or drawing on of the slag-making material within the melting zone of the furnace.

2. The combination with a furnace, of a hollow twyer exposed to the melting zone of
 55 said furnace and adapted to conduct a cooling medium, and means connected with the hollow space of said twyer for pulling the cooling medium therethrough and which is adapted to seal an accidental opening formed
 60 in the twyer, by drawing the material within the melting zone thereto.

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

WILLIAM JAMES FOSTER.

Witnesses:

GEO. TUERY,
 A. F. BIDDLE.