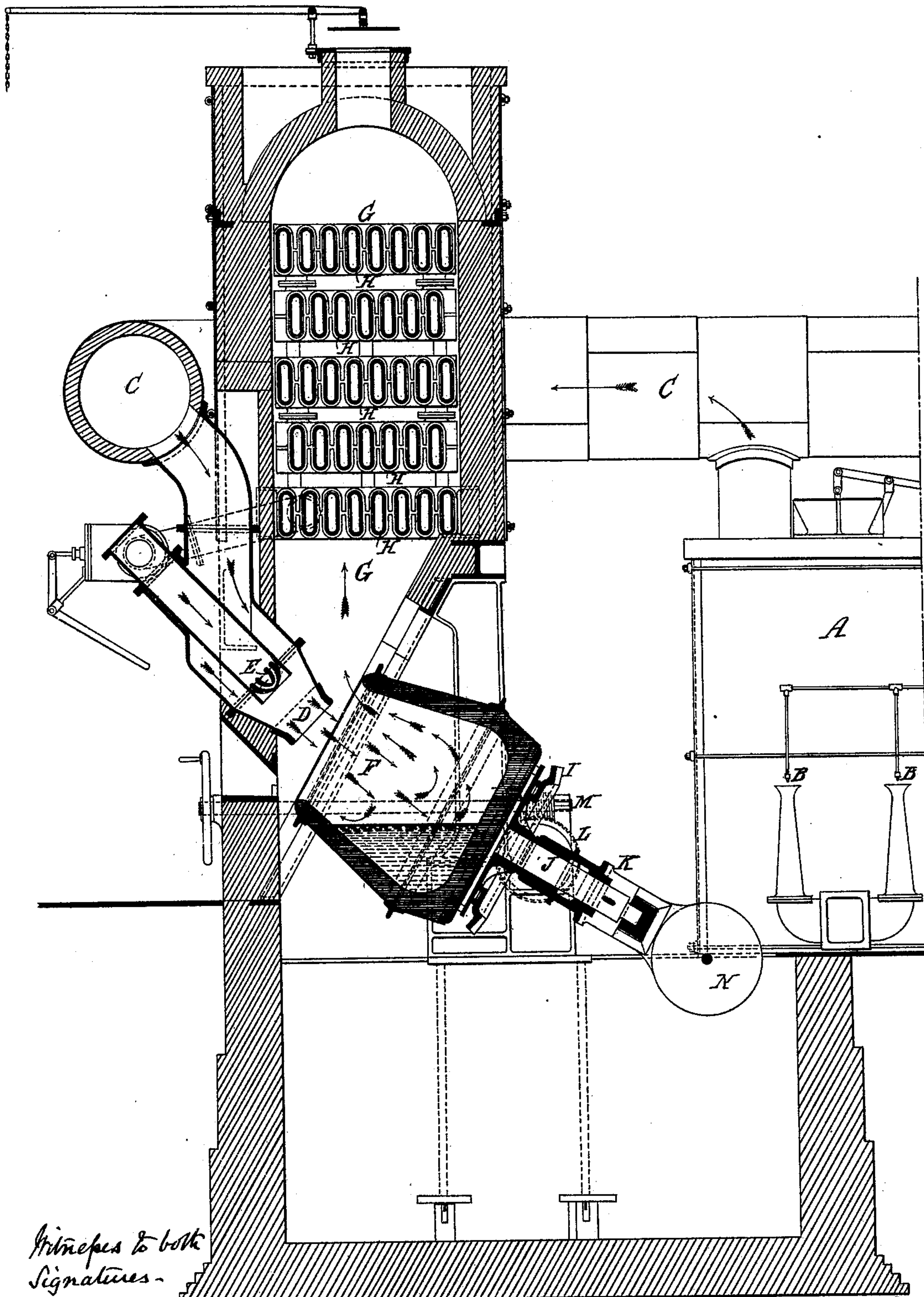


S. GODFREY & R. HOWSON.  
Revolving Puddling Gas-Furnace.

No. 213,330.

Patented Mar. 18, 1879.



Witnesses to both  
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# UNITED STATES PATENT OFFICE.

SAMUEL GODFREY AND RICHARD HOWSON, OF MIDDLESBOROUGH-ON-TEES,  
ASSIGNORS TO HENRY A. GADSDEN, OF LONDON, ENGLAND.

## IMPROVEMENT IN REVOLVING PUDDLING GAS-FURNACES.

Specification forming part of Letters Patent No. **213,330**, dated March 18, 1879; application filed December 21, 1877; patented in England, December 20, 1875, and January 29, 1877.

*To all whom it may concern:*

Be it known that we, SAMUEL GODFREY, engineer, and RICHARD HOWSON, engineer, both of Middlesborough-on-Tees, in the county of York, Kingdom of Great Britain and Ireland, have invented certain new and useful Improvements in Gas-Furnaces, which improvements are fully set forth in the annexed specification.

Our invention relates to that type of furnaces which use commingled air and gas as fuel, and which are suspended upon trunnions and an axis in such a manner that they may be rotated and tilted to certain angles when in use; and its novelty consists in providing the working-chamber of such furnaces with a counter-balance weight, for the purpose of facilitating its tilting movements, and for aiding in holding it in any desired position when in operation, said chamber being so arranged that it may be rotated and tilted into such a position that any fluid it may contain may be poured out of its mouth, or any solid substance may be readily removed therefrom, in which respects it differs from any now in use with which we are acquainted; and it further consists in combining with a working-chamber of the construction above described certain air and gas induction pipes and a chamber and pipes for heating the air previous to its being injected into the working-chamber, as will be fully explained hereinafter.

It is apparent that this furnace may be used for melting steel and for various other purposes, such as making soda-ash and roasting ores.

The furnace is of a rotary construction, the working-chamber being a pan-shaped vessel mounted on an axis, which axis is, by preference, caused to revolve at an angle with the horizon, but it revolves in a frame furnished with trunnions in such a way that the angle can be changed, so that the mouth of the pan can at one time be brought opposite to the gas tuyere or burner, and at another the contents can be tilted out.

Referring to the drawings which shows a cross-section of a furnace as adapted to puddling purposes, F is the pan, lined with oxide of iron, and in this the charge of metal is

placed. The pan is caused to revolve by means of a pinion working into the bevel-wheel I. This wheel is mounted on an axis, J, running in a trunnion-frame, K, the whole being shown working at an angle in the normal position for puddling. On one end of the trunnion is keyed a worm-wheel, L, actuated by the worm M, which worm can either be worked by hand or by self-acting means.

It will thus be understood that by turning the worm-shaft the pan can be tilted to any angular position desired. In order to balance the weight of the pan the trunnion-frame is furnished with a counter-weight, N.

We now proceed to describe the mode in which the flame is introduced into the revolving chamber or pan. The gas which we employ may be manufactured by means of the Siemens or other producer, or it may be ordinary illuminating-gas stored in gas-holders.

In the drawing we have shown part of the exterior of a gas-producer, A, of the Brook and Wilson type described in their specification filed in the United States Patent Office the 21st day of December, 1877. Its construction is immaterial to this description, except in the respect that the air required for partial combustion to generate the gas is forced into the interior by means of a steam jet or jets marked B B in the drawing. This enables the gas to issue from the generator with some degree of pressure, which assists the blow-pipe action, hereinafter to be described. The gas, after it has left the generating-chamber, finds its way along the main C, and issues ultimately at the tuyere or burner D. At this point it meets with a stream of air blowing through the perforated nozzle E, which has the effect to divide the current of air into a series of jets, and thus cause a more thorough admixture thereof with the gas before it reaches the burner, the effect being to produce a more thorough combustion, and thus greater economy of fuel. The combined jet is thus projected in a state of violent combustion onto the surface of the metal, which, by reason of the revolution of the pan, is in a constant state of motion, and thus becomes refined, for the purposes of steel, or converted into wrought-iron, as is well understood. The requisite pressure of air is pro-



cured by means of a mechanical blower or blast-engine, which it is unnecessary to describe, and the pipe which admits the air to the burner is supplied with a valve, to enable it to be put on or off or regulated in accordance with the quantity required at any part of the operation. The gas-main C is also furnished with a valve for a similar purpose. The blow-pipe jet having done its work inside the pan, the products of combustion escape in the direction of the arrows by the annular space between the burner and the orifice of the pan, and it is a special feature of our invention that the mouth of the pan is at all times free from contact with the burner or with any rubbing-surface, thereby avoiding the destructive action of friction which appertains to revolving furnaces of the ordinary type. The products of combustion are now allowed to pass into the chamber G, which is traversed by a series of heating-pipes, H, and then pass away into the atmosphere. Through these heating-pipes the air is conducted in its way from the blower to the tuyere, and thus becomes heated, for the purpose of economizing fuel.

In order to protect the burner D from the

effects of intense heat, it may consist of the well-known coil, through which water is caused to circulate; but instead of water it will be found that a small jet of steam is sufficient.

We claim—

1. In combination with a counterbalanced working or puddling chamber, F, the fixed and perforated air-induction pipe E and the fixed gas-induction pipe D, the air-pipe terminating within the gas-pipe, whereby the jets of air and gas are thoroughly commingled previous to their entrance into the puddling-chamber, substantially as set forth.

2. In combination with a counterbalanced working or puddling chamber, F, a series of air-heating tubes, H, and a gas-receiving chamber, G, the lower portion of which is angular in form, as shown, whereby it is adapted to the reception of the heated gases from the puddling-chamber when it is in its working position, as set forth.

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