(No Model.) 2 Sheets—Sheet 1.

D. R. S. GALBRAITH.

ORE ROASTING FURNACE.

No. 408,476. Patented Aug. 6, 1889.

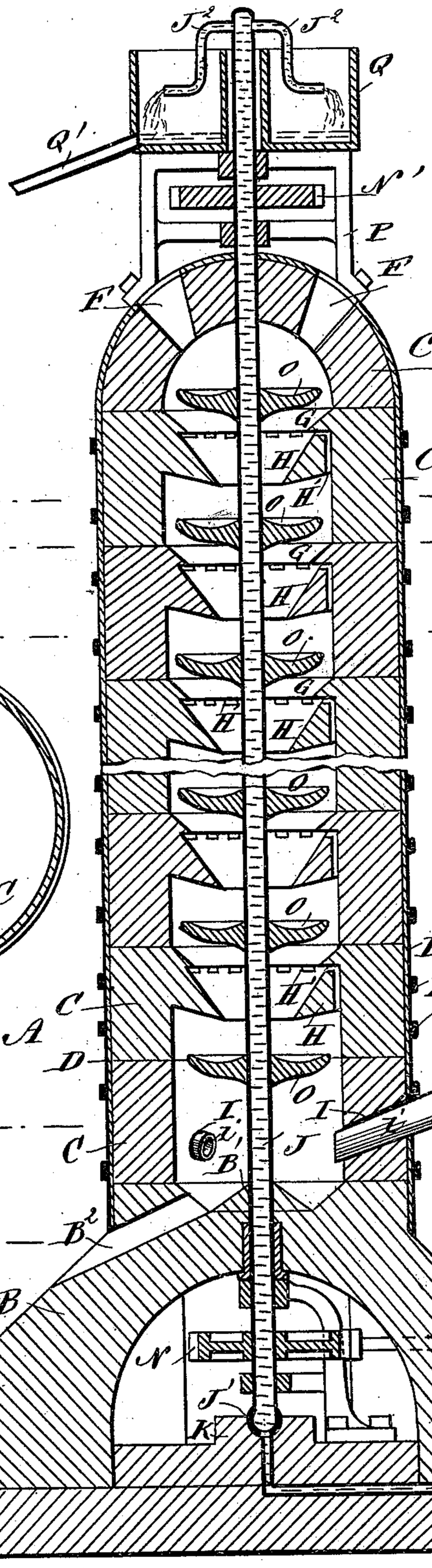


Fig. 1

Fig. 2

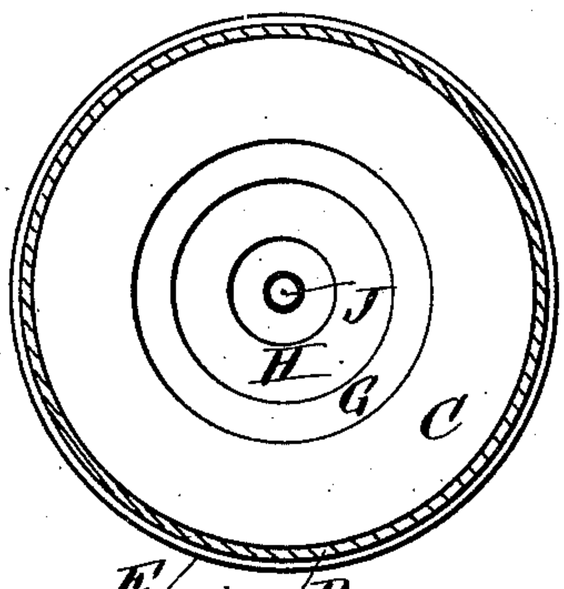
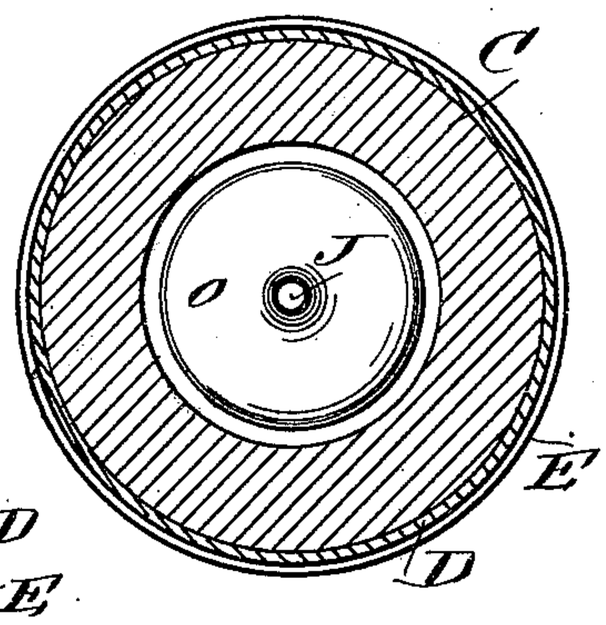


Fig. 3



WITNESSES:

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C. Sedgwick

INVENTOR:

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(No Model.) 2 Sheets—Sheet 2.

D. R. S. GALBRAITH.

ORE ROASTING FURNACE.

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Fig. 4

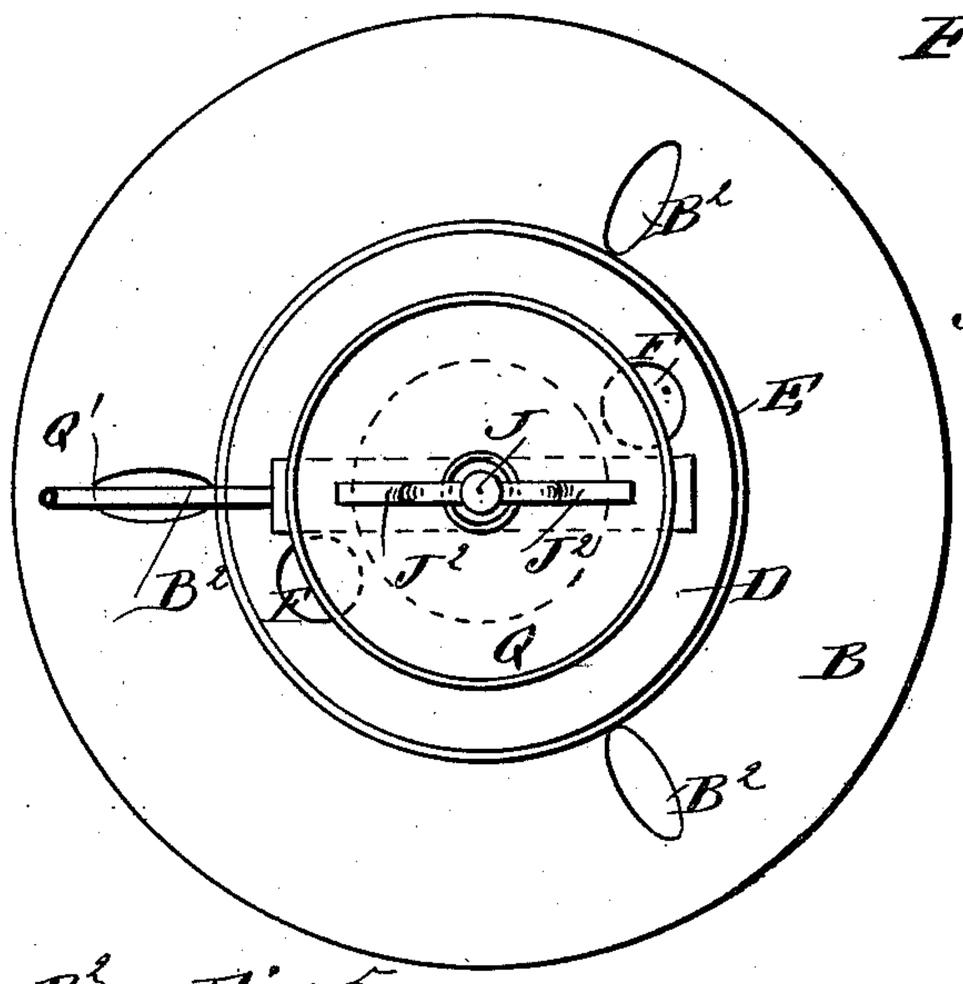
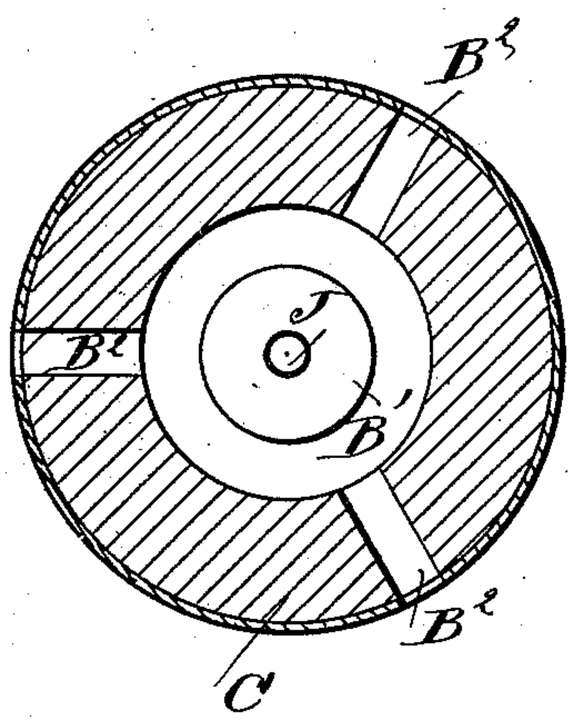


Fig. 7

Fig. 5



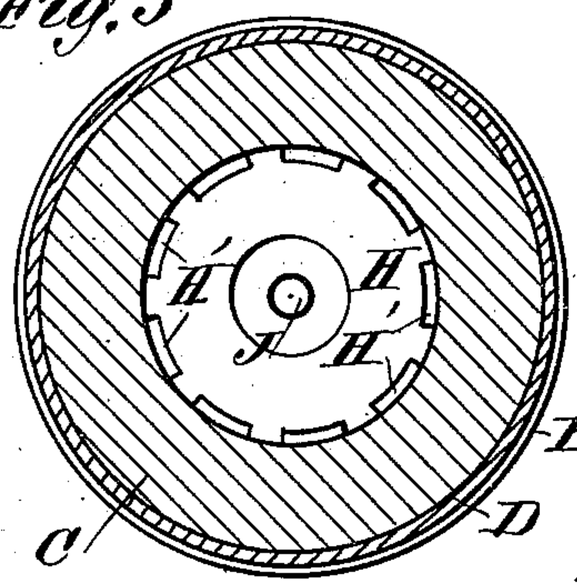


Fig. 6

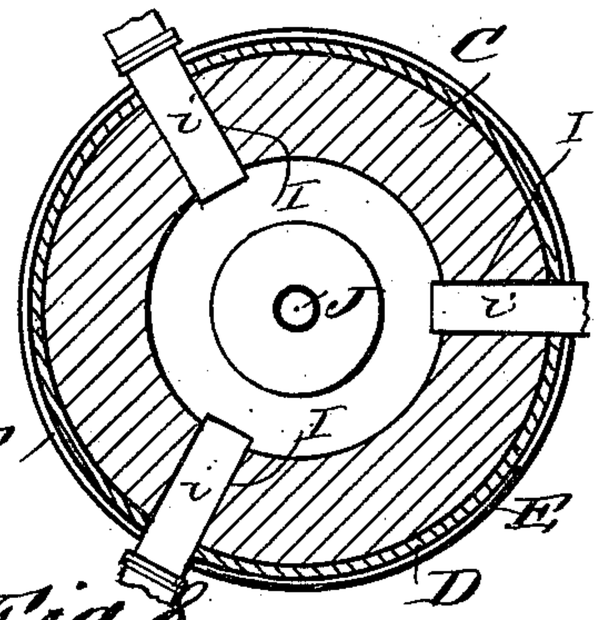
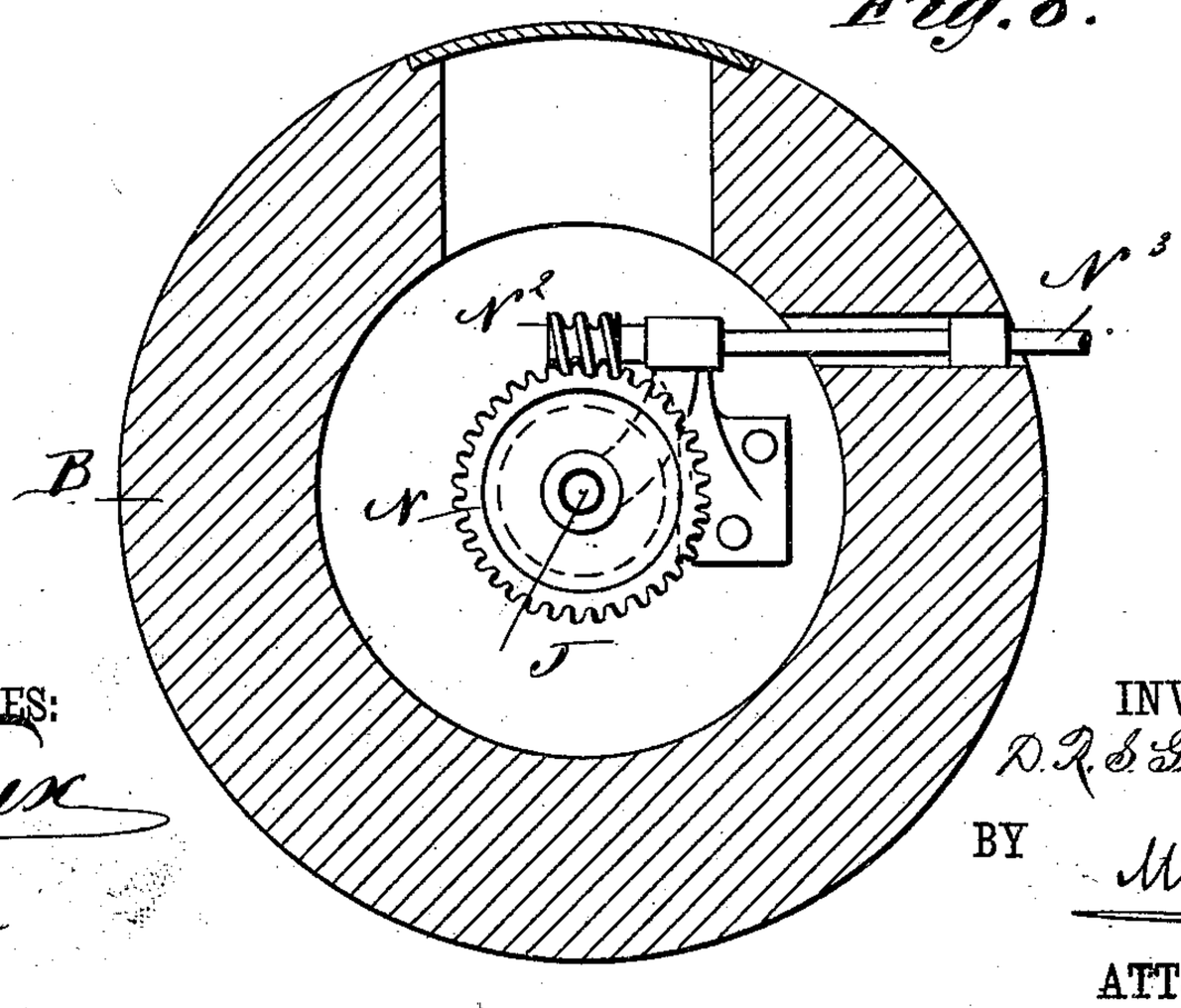


Fig. 8.



WITNESSES:

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INVENTOR:

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UNITED STATES PATENT OFFICE.

DAVID R. SHIRREFF GALBRAITH, OF AUCKLAND, NEW ZEALAND.

ORE-ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 408,476, dated August 6, 1889.

Application filed March 5, 1888, Serial No. 266,150. (No model.) Patented in New Zealand August 22, 1887, No. 2,507, and August 31, 1887, No. 2,518.

To all whom it may concern:

Be it known that I, DAVID RANKEN SHIRREFF GALBRAITH, of Auckland, New Zealand, have invented a new and Improved Ore-Roasting Furnace, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved ore-roasting furnace which is simple in construction, portable, and specially adapted to secure the suspension of the finely-divided ores or other substances in a gas or mixture of gases and at the required temperature during a certain length of time.

The invention consists of a shaft-furnace made in sections, each provided with inclined offsets, and of a revolving shaft having disks on which said inclined offsets discharge.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement. Fig. 2 is a sectional plan view of the same on the line *x x* of Fig. 1. Fig. 3 is a like view of the same on the line *y y* of Fig. 1. Fig. 4 is a plan view of the improvement. Fig. 5 is an inverted sectional plan view of the improvement on the line *z z* of Fig. 1. Fig. 6 is a similar view of the same on the line *u u* of Fig. 1. Fig. 7 is a like view of the same on the line *v v* of Fig. 1, and Fig. 8 is a similar view on the line *w w* of Fig. 1.

The improved ore-roasting furnace A is provided with a suitably-constructed base B, on which are set the ring-sections C, one being placed on top of the other, and being made of fire-clay or other suitable material. The several ring-sections C are covered on the outside by a sheet-metal casing D, bound by rings E. The top section C′ is rounded and is provided with suitable inlet-funnels F, through which the ore to be treated is introduced into the interior of the shaft-furnace A.

Each of the ring-sections C is provided with an inwardly-projecting inclined offset G, which discharges on a like offset H, provided with a number of openings H′, which extend upward and out under the bottom of the inclined offset G, as is plainly shown in Fig. 1. The openings H′ are for the purpose of admitting the gases from one section to the other. In the ring-section next to the base B are formed a number of inlet-openings I for admitting suitable gas or a mixture of gases to the interior of the shaft-furnace A by means of the tuyeres *i*, which are to be connected with a suitable gas-producer. The openings I are connected exteriorly with suitable apparatus for manufacturing the necessary quantity of gas by any well-known means.

Centrally in the furnace A is mounted to rotate a hollow shaft J, provided on its lower end with a ball-joint J′, resting in a foot K, secured in the base B. The ball-joint J′ has an opening which connects with the pipe L, held in the bottom of the base B, and serving to introduce cold water into the hollow shaft J. On the top of the latter, a suitable distance above the top section C′, are formed two downwardly-extending branch pipes J^2, which open into a reservoir Q, supported on a suitable bracket P, fastened to the top section C′, as shown in Fig. 1. From the reservoir Q leads a pipe Q′, to carry off the surplus water discharged by the branch-pipes J^2 into the reservoir Q.

The hollow shaft J is set in motion by suitable means, preferably, however, by the worm-wheels N and N′, each meshing into a worm N^2, secured to a shaft N^3, receiving a rotary motion by a suitable mechanism connected with the said shaft N^3. On the hollow shaft J are secured a number of dished disks O, located a short distance below each inclined offset H, so that the latter discharges on the respective disk O, near its connecting-point with the shaft J. On top of the base B is formed the cone B′, which leads to the outlet-openings B^2, formed in the base B, and serving to carry off the waste ore.

The operation is as follows: The finely-powdered ore is fed in at the top of the furnace through the funnels F, and the necessary gas or mixture of gases is supplied to the furnace through the inlet-openings I, so that the in-

terior of the furnace is completely filled with the gas or mixture of gases. The shaft J is caused to revolve at a suitable speed, whereby its disks O receive a similar movement and the finely-powdered ore fed in at the top of the furnace first passes on the first disk O, is thrown outward by centrifugal force from the said disk, and falls on the inclined offset G, from which it passes on the inclined offset H, and in doing so passes over the upper ends of the openings H′, through which gas can escape, so that the ore comes in contact with the gas at all sides. The ore from the first inclined offset H passes into the next disk O, and from the latter is thrown outward again by the rotation of the said disk and thrown on the next inclined offset G and down to the offset H in the same manner as above described. Thus the ore passes from one disk to the next by passing over the inclined offsets G and H, so that the powdered ore is kept in a state of constant motion in its descent from one disk to the other, the inclined offsets G and H always throwing the ore upon or near the center of the next disk below. Thus each particle of ore is suspended in a gaseous temperature at a red heat for a period under the control of the operator.

The time during which the ore is exposed to the action of the gas depends upon the rate of revolution of the shaft J and the height of the furnace A.

If desired, two or more furnaces may be used in series, the discharge of one being the supply of the other, thus obviating the use of too long a shaft by using only one of the furnaces. A gas or gases for feeding the furnace will be made by means of ordinary gas-producers. The due passage of the gas through the furnace can be accomplished by means of an exhaust-fan or other suitable arrangement. Air or steam may also be injected, if deemed necessary, to secure chemical or physical action on the ore. A fume or dust-condenser may also be added to suit the requirements of the ore under treatment. The disks O, instead of being hollow, may be made of solid material—of fire-clay—with a suitable metal frame-work, if necessary.

It is understood that the cold water circulating through the shaft J keeps the same cool. The waste ores finally pass out through the openings B^2 in the base B.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. In an ore-roasting furnace, the combination, with a shaft-furnace provided with feed-openings F at the top, the inclined offsets G, the inclined and apertured offsets H, under the offsets G, and the gas-inlet openings I, near the bottom, of the rotary shaft J, and the dished disks O on the shaft, substantially as described.

2. In an ore-roasting furnace, the combination, with the sectional furnace A, provided with the openings F, the inclined offsets G H, the gas-inlet openings I, and the exit-opening B^2, of the rotary hollow shaft J, and the dished disks O on the said shaft, substantially as herein shown and described.

3. In an ore-roasting furnace, the furnace A, provided with feed-openings F, the inclined offsets G, the inclined offset H, below the offsets G, and provided with the openings H′, under the said offsets G, in combination with the rotary hollow shaft J, and the disks O, having dished upper faces and arranged on the shaft under the offsets H, substantially as herein shown and described.

4. In an ore-roasting furnace, the combination, with a shaft-furnace and the reservoir Q on the top of the same, of the hollow shaft J, mounted to rotate in the furnace and provided with the branch pipes J^2 at its upper end and connected at its lower end with a water-supply pipe, and the disks O on the shaft, substantially as herein shown and described.

D. R. SHIRREFF GALBRAITH.

Witnesses:
JOHN CODLING,
THOMAS MAUGHAM.