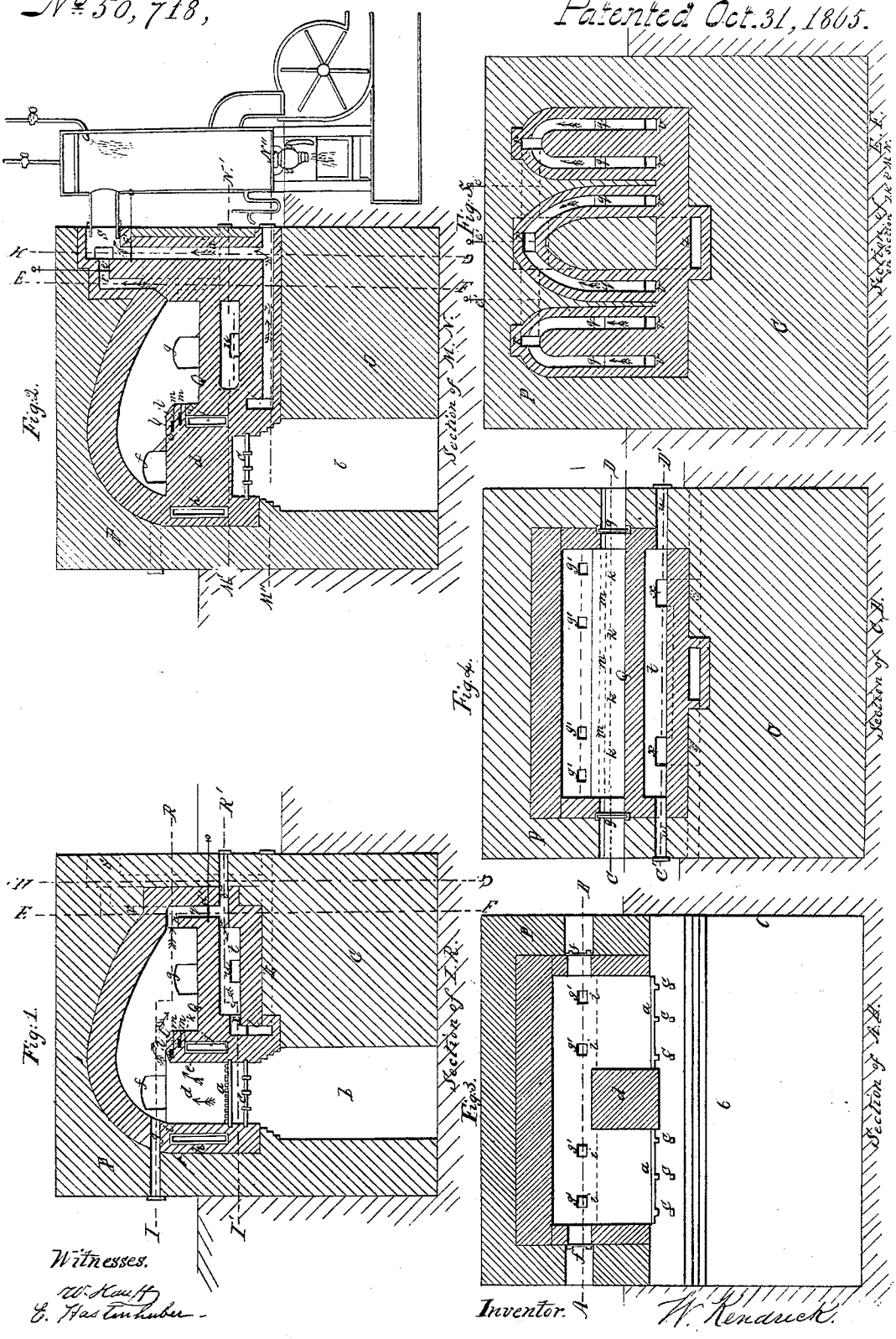
W. Kendrick,

Reverberating Furnace,

No. 50,718, Patented Oct. 31, 1865.



Witnesses.
W. Kauffman
E. Hastenhuber

Inventor.
W. Kendrick.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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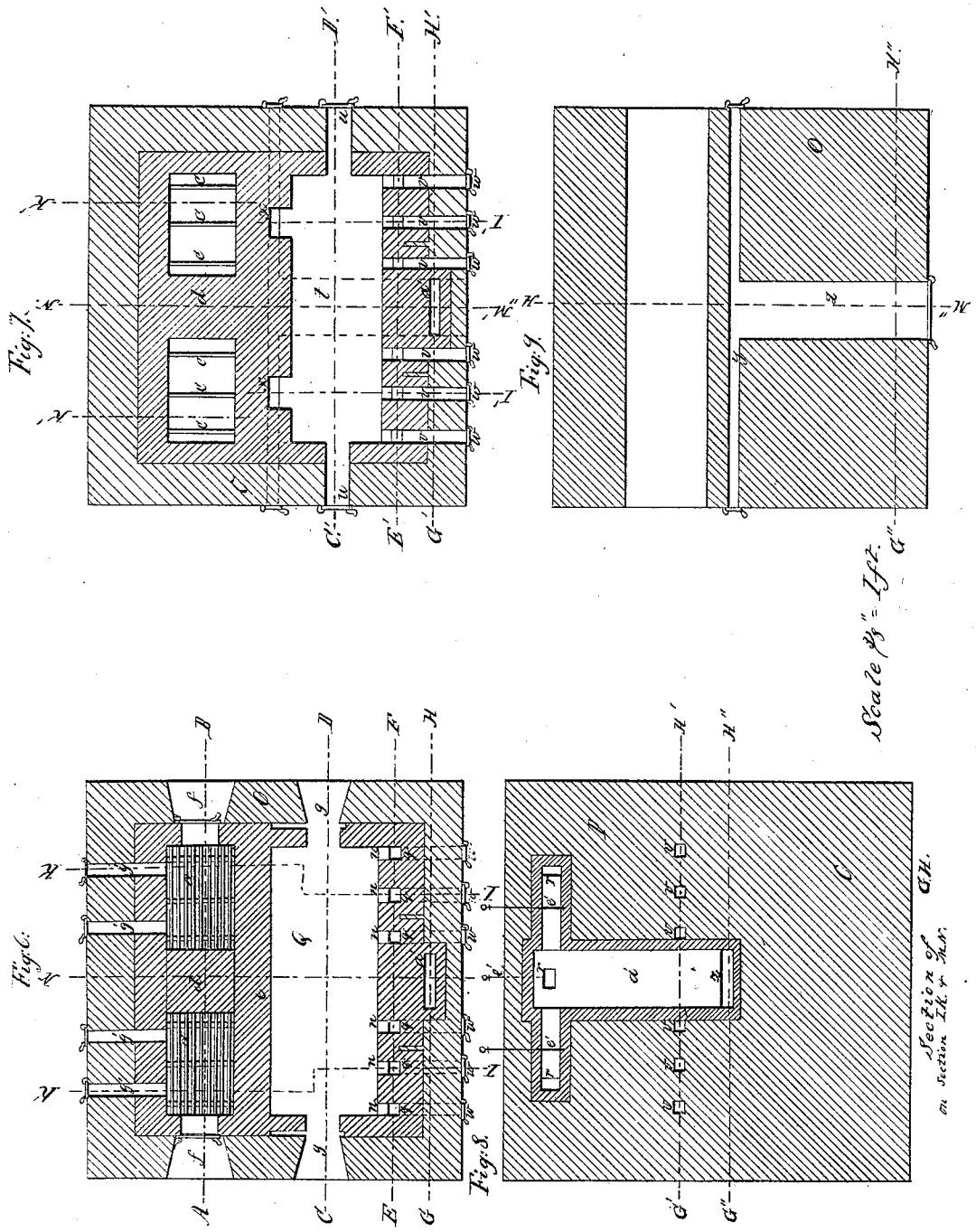

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W. Hauff
C. Kastenhuber

Inventor.

W. Kendrick.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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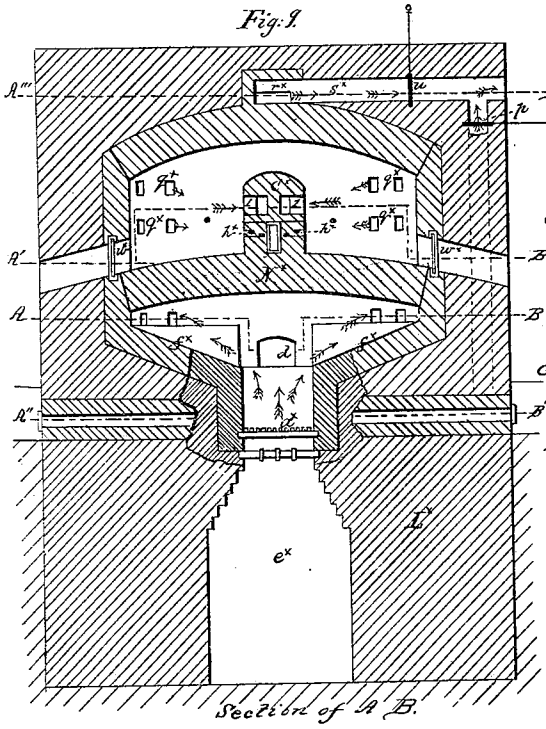
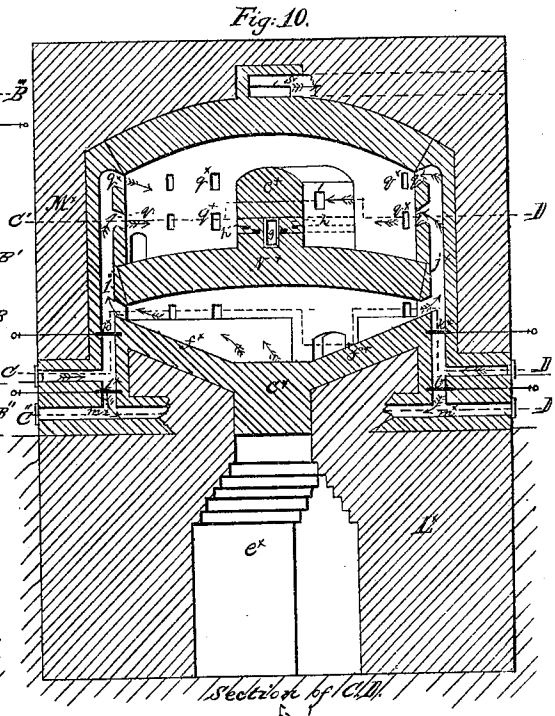
Fig. 9.



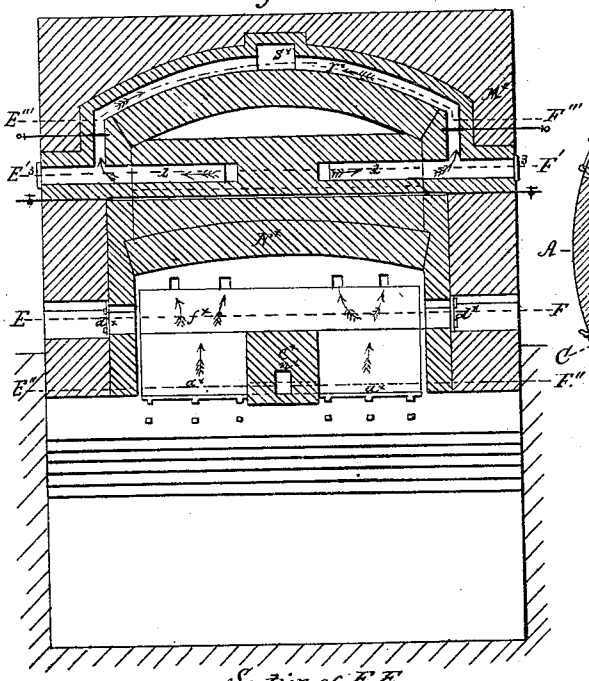
Section of A B.

Fig. 10.



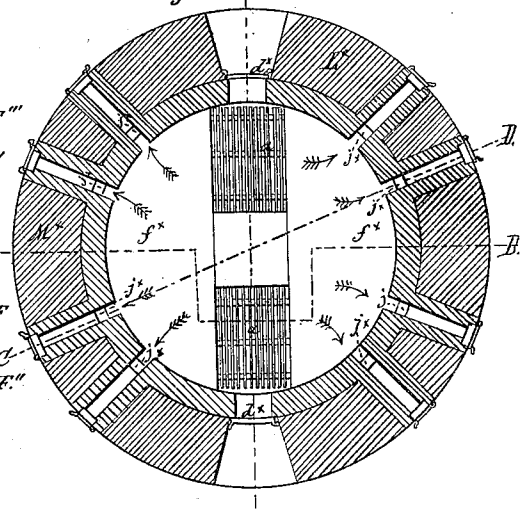
Section of C D.

Fig. 11.



Section of E. F.

Fig. 12.



Scale $\frac{3}{8}$ inch = 1 ft.

Witnesses,
W. Hauff
E. Hasenhubel.

Inventor.
W. Kendrick.

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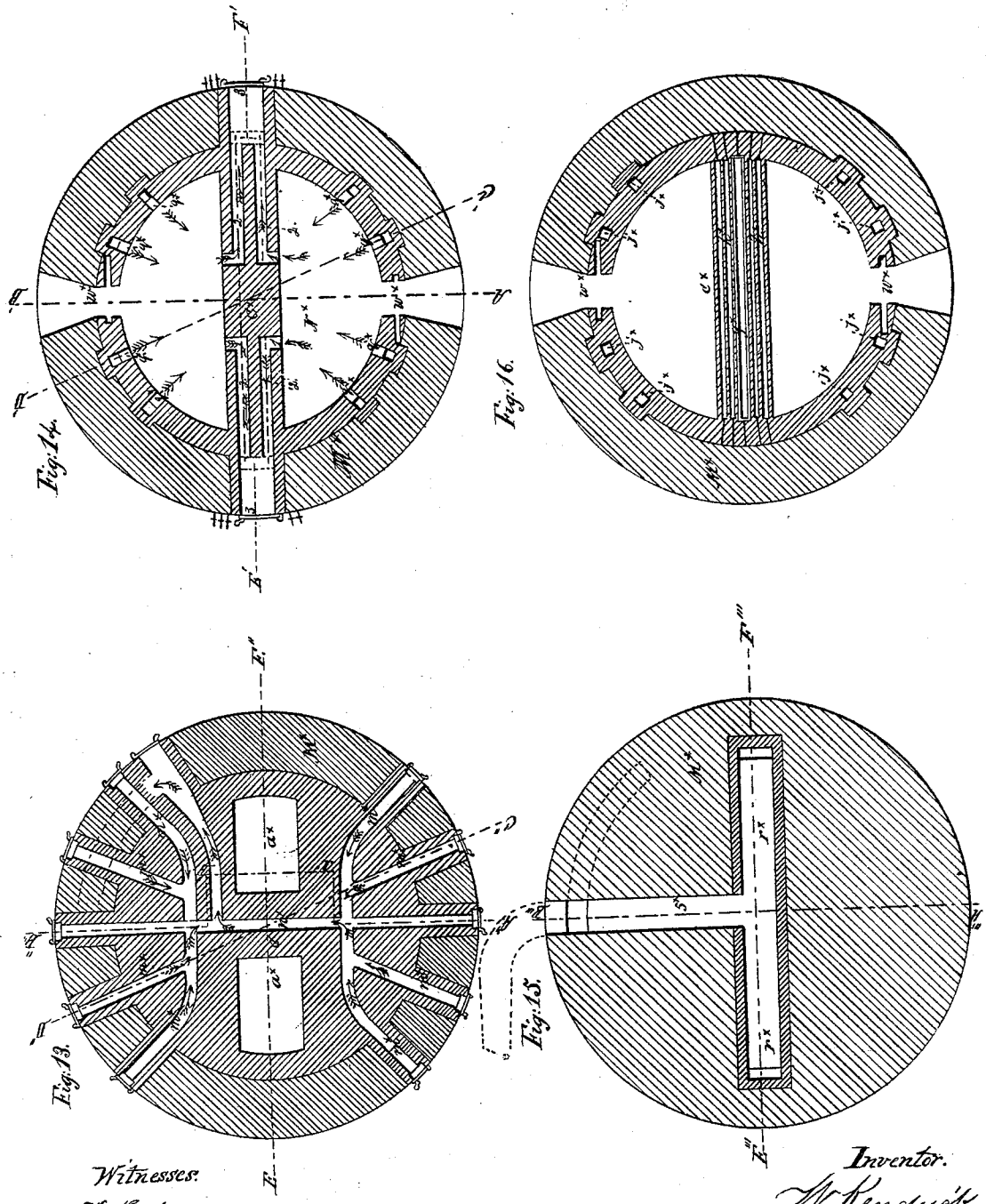

Witnesses:
W. Kauffman
E. Kartenhuber

Inventor.
W. Kendrick

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

W. KENDRICK, OF NEW YORK, N. Y.

IMPROVEMENT IN REVERBERATORY FURNACES.

Specification forming part of Letters Patent No. **50,718**, dated October 31, 1865.

To all whom it may concern:

Be it known that I, WASHINGTON KENDRICK, of the city, county, and State of New York, have invented a new and useful Improvement in Reverberatory Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the same, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a longitudinal vertical section of the invention, the line I K, Fig. 6, and I′ K, Fig. 7, indicating the plane of section. Fig. 2 is a similar section of the same, taken in the plane indicated by the line M N, Fig. 6, M′ N′, Fig. 7, and M″ N″, Fig. 9. Fig. 3 is a transverse vertical section of the same, taken in the plane of section indicated by the line A B, Fig. 6. Fig. 4 is a similar section of the same, taken in the plane indicated by the line C D, Fig. 6, and C′ D′, Fig. 7. Fig. 5 is a similar section of the same, the plane of section being indicated by the line E F, Figs. 1, 2, and 6, and E′ F′, Fig. 7. Fig. 6 is a horizontal section of the same, the line I K, Fig. 1, A B, Fig. 3, C D, Fig. 4, and G′ H′, Fig. 8, indicating the plane of section. Fig. 7 is a similar section of the same, the plane of section being indicated by the line I′ K′, Fig. 1, M′ N′, Fig. 2, C′ D′, Fig. 3, and G″ H″, Fig. 8. Fig. 8 is a transverse vertical section of the same, taken in the plane indicated by the line G H, Figs. 1, 2, and 6, and G′ H′, Fig. 7. Fig. 9 is a horizontal section of the same, the plane of section being indicated by the line M″ N″, Fig. 2.

Similar letters of reference in the several figures indicate corresponding parts.

This invention relates to certain improvements in the construction of reverberatory furnaces with one or more grates or fire-places, whereby said furnaces are rendered applicable for the purpose of roasting, oxidizing, and smelting ores of any desired description.

O represents the base of a furnace with two grates or fire-places constructed according to this invention. The grates *a* are situated over the cave *b*, which is to receive ashes and impurities discharged from the fire-places, and through which the atmospheric air has free access to the fires from below. Suitable bars, *c*, applied under the grates, are intended to facilitate the operation of poking or cleaning the fires.

Above the grates rises the furnace-wall P, and said grates are separated one from the other by a partition-wall, *d*, as seen in Figs. 3, 6, and 7, and they are situated on the side of the hearth or siege Q, being separated from the same by a bridge-wall, *e*, which rises some distance above the level of the hearth, as seen in Figs. 1 and 2. Doors *f*, in the ends of the furnace-wall, give access to the fire-places for the purpose of introducing the fuel, and other doors, *g*, serve to introduce and withdraw the charge to and from the hearth Q. Cold air may may be admitted to the flames through channels *g′*, which are closed by suitable doors.

Through the front wall of the fire-places extends a water-chamber, *h*, from which small channels *i* lead into the fire-places, as seen particularly in Figs. 1 and 3, so that jets of steam can be thrown into the flames, and another water-chamber, *j*, is built into the bridge-wall *e*, from which channels *k* serve to inject small jets of steam between the flame and the ore on the hearth.

In the bridge-wall and above the water-chamber *j* are one or more air-chambers, *l*, from which channels *m* pass out through that side of the bridge-wall facing the hearth, and by these means jets of heated air, alone or conjointly with jets of steam, can be thrown between the flame and the ore on the hearth. The heated gases and products of combustion, after passing over the ore on the hearth, together with the gases rising from the ore, enter through apertures *n* into the fire-flues *q*, which extend up and communicate with the escape-flues *r s*, and which also extend down and communicate with the chamber *t* below the hearth Q, as seen particularly in Fig. 1. The area of the chamber *t* is equal, or nearly so, to that of the hearth, as seen in Fig. 7, which represents a ground-plan of said chamber, and access to it is had through doors *u* in the ends of the furnace-wall, and channel *v*, which extend through the front of the furnace-wall and are closed by doors *w*, form the communication in between the fire-flues *q* and the chamber *t*.

From the chamber *t* extend two (more or

less) flues, x, to the ground-flue y, which extends throughout the entire width of the furnace, and which communicates by means of a horizontal flue, z, with the upright flue a', and through this with the escape-flue s. The flues y and z are closed by doors b' and c', as seen particularly in Fig. 9, so that the same can be readily swept out whenever it may be desirable.

The fire-flues q are provided with dampers d', and other dampers, e' f', are inserted into the flues r and a', as shown in Figs. 1 and 2 of the drawings. When the dampers d' and f' are closed and the dampers e' opened the heated gases are caused to rise through the fire-flues q, and to discharge through the flues r and s without being allowed to pass down into the chamber t; but when the dampers d' and f' are opened and the dampers e' closed the heated gases pass down into the chamber t, and through the flues y, z, and a' to the escape-flue s. In this latter case the hearth is exposed to the heat above and below, the temperature in the chamber t being also raised to a very high degree. This chamber is intended to be partially filled with water, so that such particles of metal which may be carried off by the draft in the heated gases and products of combustion will be retained and precipitated on its bottom, whence they can easily be recovered. A suction-blower, R, which connects with the discharge-flue S, serves to withdraw the products of combustion and to produce the requisite draft, and the products of combustion are conducted through a suitable condenser, in which the condensible gases will collect.

When the furnace is built with four or more fire-places said fire-places are equally divided on opposite sides of the hearth, and the heated gases and products of combustion may be carried off through flues similar to those above described, or through any other suitable arrangement of flues.

By the arrangement of the flues, as above described, the flames and heated gases are caused to circulate around the hearth, and a very high heat can be effected, whereas in reverberatory furnaces of the ordinary construction the principal portion of the heat creeps up through the smoke-stack; and, furthermore, in my furnace the heat can be regulated at pleasure, so that in roasting the danger of burning dead or melting a portion of the ore can be easily avoided, and through the channels k and m jets of air and steam are thrown between the ore and the flame, so that the combustible gases rising from the ores are readily consumed and carried off through the fire-flues. Suitable provision is also made to supply the requisite quantity of atmospheric air for complete oxidation or desulphurization, and, if desired, my furnace can also be used for smelting.

What I claim as new, and desire to secure by Letters Patent, is—

1. The arrangement of one or more fire-places on the same or on opposite sides of the hearth Q, in combination with said hearth and with one or more bridge-walls, e, containing steam and water-channels, by which jets of steam and of air can be thrown between the ore and the flames, substantially as and for the purpose described.

2. The chamber t below the hearth, in combination with suitable fire-flues, constructed and operating substantially as and for the purpose set forth.

3. The flues q, x, y, z, and a', in combination with the hearth Q, and with or without the chamber t, constructed and operating substantially as and for the purpose described.

4. The arrangement of a suitable suction-blower, with or without a condenser, in combination with the escape-flue s, and with the flues r, q, and n and hearth Q, constructed and operating substantially as and for the purpose set forth.

5. The arrangement of air-flues g', in com- with the fire place or places a', bridge-wall e, and hearth Q, constructed and operating substantially as and for the purpose described.

W. KENDRICK.

Witnesses:
W. HAUFF,
E. KASTENHUBER.