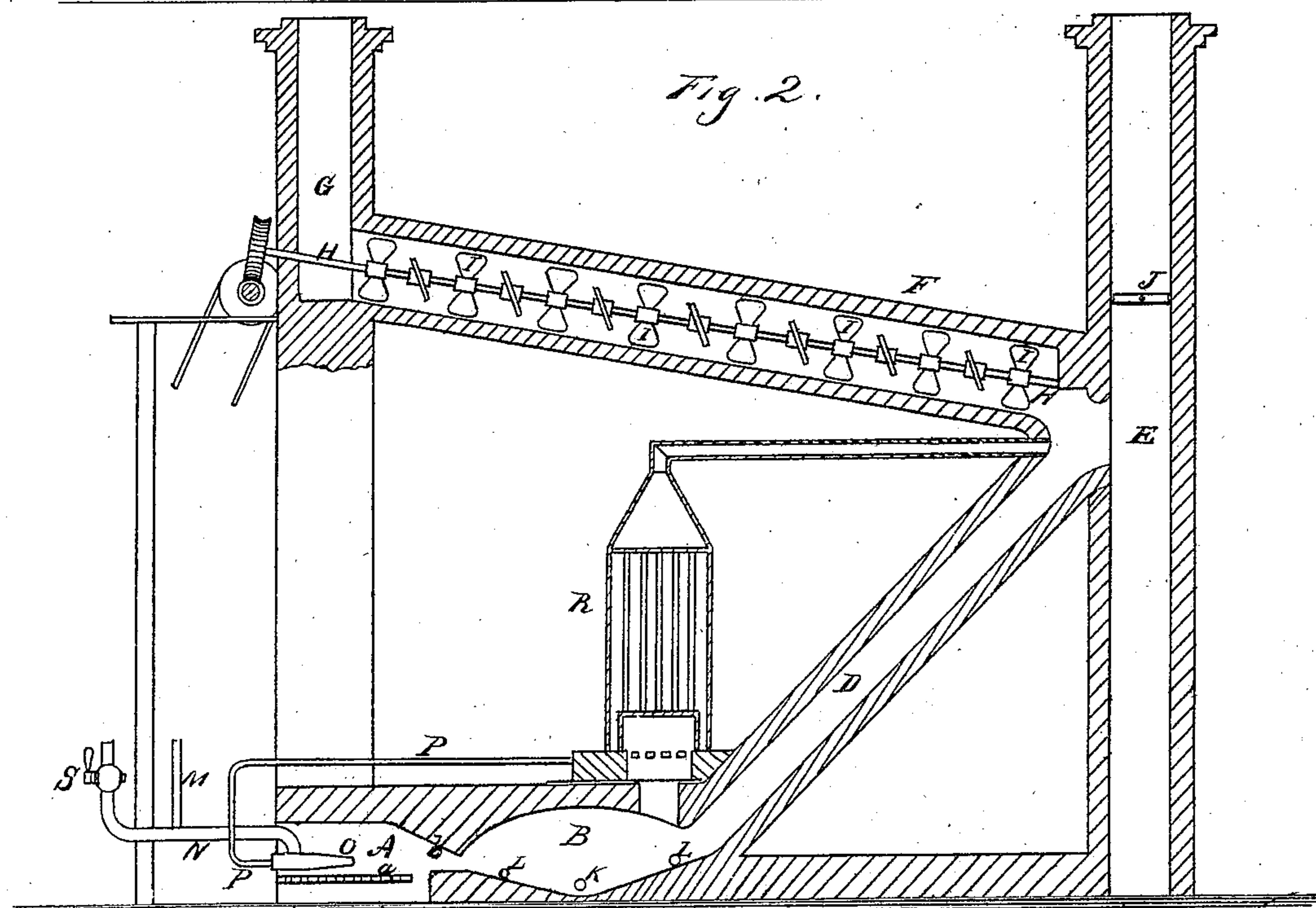
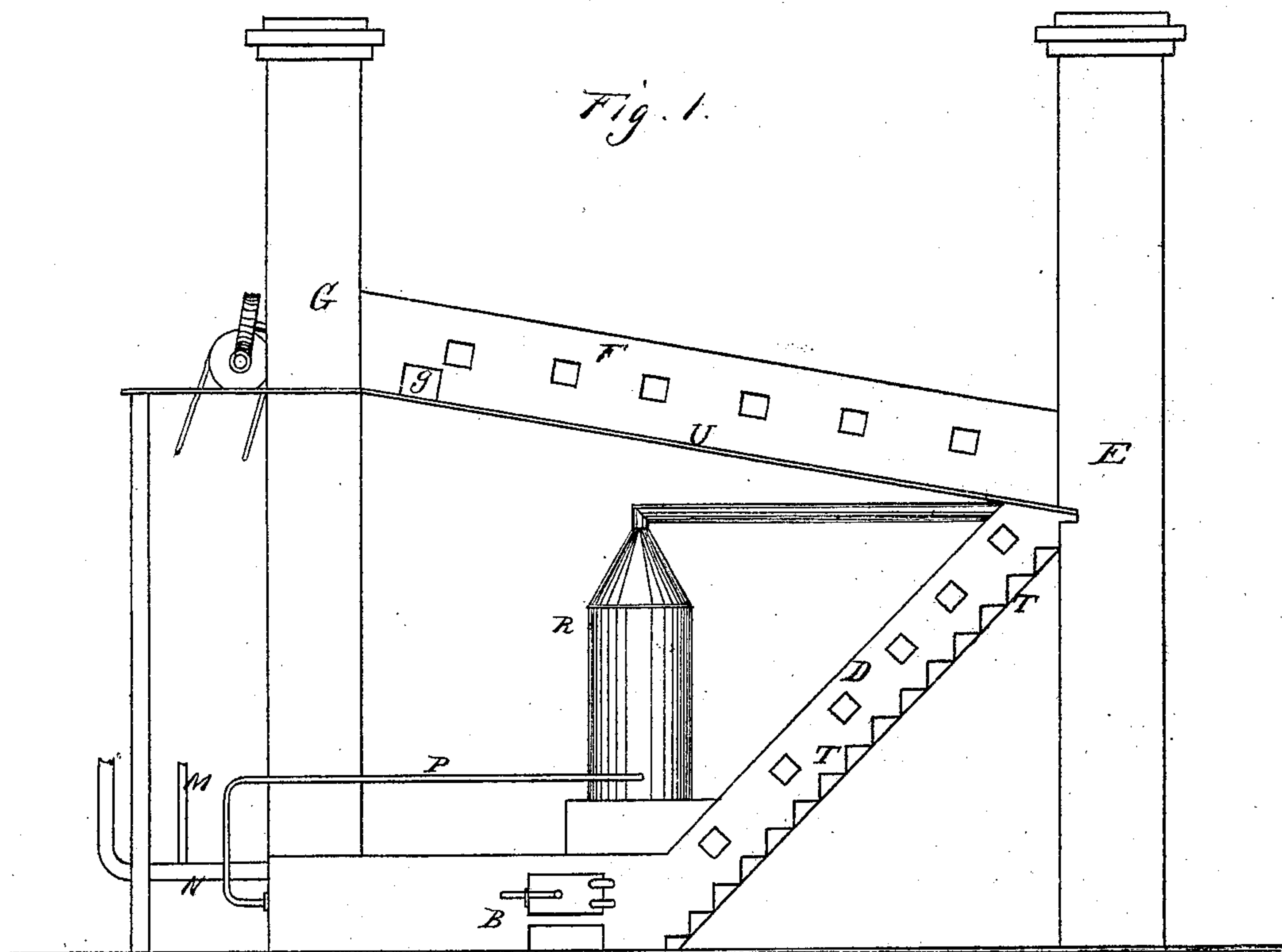


L. STEVENS.
Furnaces for Roasting and Smelting Ores.
 No. 141,181. Patented July 22, 1873.



Witnesses
John L. Boone
C. M. Richardson

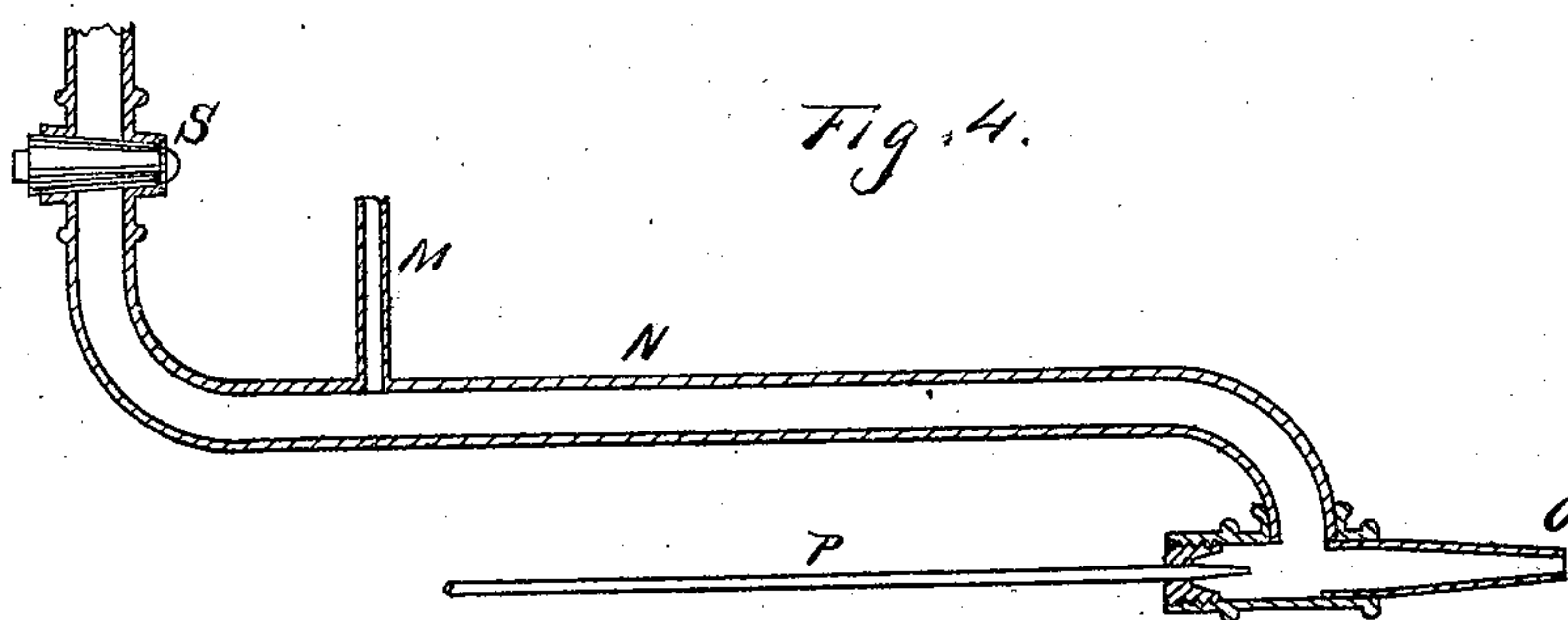
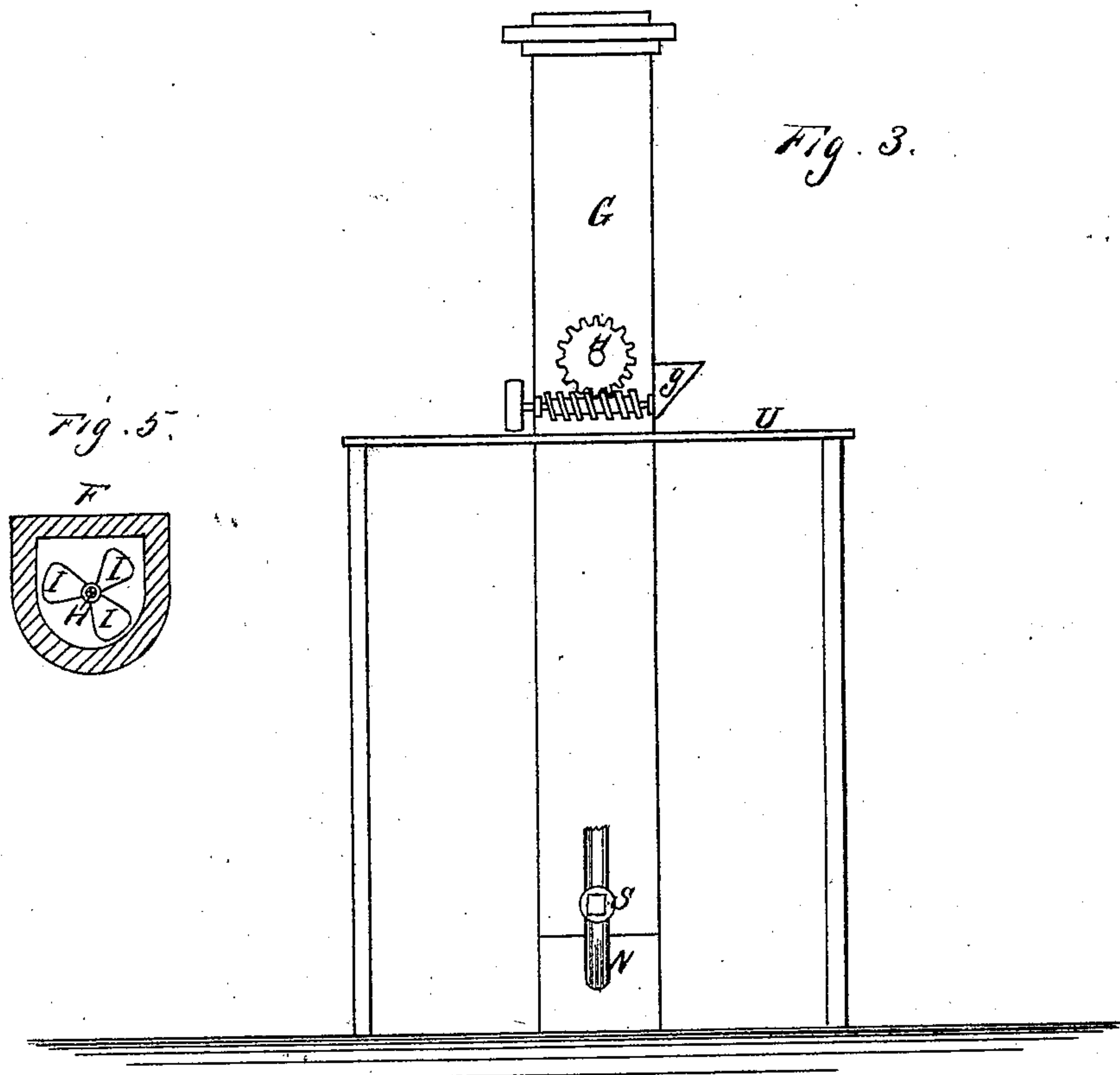
Levi Stevens
per Seward & Co.
Attys

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Witnesses

John L. Borne
C. W. Richardson

Levi Stevens
per Sewey & Co
Attys

UNITED STATES PATENT OFFICE.

LEVI STEVENS, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN FURNACES FOR ROASTING AND SMELTING ORES.

Specification forming part of Letters Patent No. **141,181**, dated July 22, 1873; application filed January 17, 1873.

To all whom it may concern:

Be it known that I, LEVI STEVENS, of Washington, District of Columbia, have invented a Combined Roasting and Smelting Furnace; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention without further invention or experiment.

My invention relates to an improved furnace for roasting and smelting ores; and it consists, mainly, in a novel combination of a roasting or desulphurizing flue, having a suitable feeding device, with an inclined smelting-flue, having at its base a suitable chamber for receiving and separating the slag and metal and discharging the same. My invention further consists in a peculiarly-constructed furnace for burning, and a device for introducing, carbonic oxide, which is formed by processes for which United States Letters Patent were granted to me February 21, 1871, and numbered 112,088, and also October 15, 1872, and numbered 132,331. The heat from this furnace passes successively through the smelting-flue and the roasting-flue, and a superheater is so placed that it is also heated by the same fire. Steam from this superheater is introduced to the furnace with the combustible gases by my apparatus, and a pipe is so arranged as to lead a part of the steam to the roasting-flue, where it is used when desired. Dampers are so arranged that the heat is directed into either flue or chimney, as desired, and the supply of air to the furnace is regulated by a cock.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a side elevation of my furnace. Fig. 2 is a sectional elevation, showing the interior arrangement. Fig. 3 is an end view. Fig. 4 is an enlarged view of the supply apparatus for the furnace. Fig. 5 is a cross-section of the roasting-flue.

A is a chamber, into which the inflammable gases and vapors are first received from the supply apparatus, and from this chamber they pass into the combustion-chamber, where they unite and are burned. The chamber A is closed tightly at the front where the gas en-

ters, and has a diaphragm, *a*, extending horizontally across, just beneath the induction-pipe. This diaphragm is constructed with a passage from its lower to its upper side, the passage being at its rear end, as shown. This passage admits air, when desired. Between the chamber A and the combustion-chamber B a deflector, *b*, is formed. This deflector may stand at right angles, or it may incline upward or downward at such an angle as shall be found most suitable. Its office is to partially arrest the current of combustible gas which is discharged from the nozzle of the supply apparatus with immense velocity, and thus insure its being ignited at the instant of entering the chamber B, and, further, to deflect the current and direct it as may be desired in a reverberatory or other form of furnace. From the chamber B the heat and products of combustion pass up the inclined flue D. The upper end of this flue opens into a chimney, E, and has also a passage connecting it with the inclined flue F, having a cross-section as shown in Fig. 5. The upper end of the flue F opens into a second chimney, G, and at this point is the feed-opening *g*, from which the ore is discharged, by any suitable device, into the flue F. A shaft, H, passes longitudinally through this flue, and propeller-vanes I are secured upon the shaft, so that when it is rotated the propellers gradually force the ore down the incline, stirring it thoroughly at the same time until it reaches the lower end, when it will be thoroughly roasted and desulphurized. The shaft H may be driven by a worm-wheel and belt from the source of power, or by any suitable mechanical device. A damper, J, serves to turn all or part of the heat into the flue E, as may be desired. The ore, being thus prepared in the flue F for smelting, is discharged from its lower end into the flue D, which stands at an inclination considerably greater than that of the flue F. Down this flue the ore passes, the heat becoming more and more intense, and it is thus smelted, and by the motion the metal is separated from the slag and all the particles are brought together so that they will unite by their attraction. This allows the body of metal to fall to the bottom of the chamber B, from which it can be drawn off by a suitable opening, K. Other

openings, L, are arranged for the discharge of the slag. The furnace will be heated wholly or in part by my improvement in heating-furnaces, the apparatus for which is shown at Fig. 4. M is a pipe, which brings the gases (protoxide of carbon and hydrogen) to the furnace from the retorts. The pipe M discharges into the air-pipe N, which in turn opens into the furnace through the nozzle O. A pipe, P, brings steam from the superheater R, and this pipe opens into the rear end of the nozzle in a live with its discharge-opening, so that steam from the pipe mingles with the gases before mentioned and gives additional force to the discharge. The air-pipe N is provided with a regulating-cock, S, which I place, preferably, behind the point at which the pipe M enters the air-pipe, and by means of this cock the supply of oxygen from the air is regulated, and I am thus enabled to govern the heat of the furnace exactly and to suit it to the needs of the particular class of ore under treatment. The superheater R is so placed that a portion of the heat from the combustion-chamber can be utilized for superheating the steam, and a pipe from the superheater opens into the flue F, where steam can sometimes be used to assist the process. The whole arrangement is simple and economical.

Stairs T serve to give access to a platform, U, by the side of the flue F, and from the stairs and platform the progress of the work

can be examined from time to time through suitable openings in the flues D and F.

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

1. The combination, in a roasting and smelting furnace, of the inclined flues F and D with a single heating-furnace and regulating-dampers, when constructed and arranged to operate substantially as described.

2. The inclined flue F, provided with the revolving worm or screw I, arranged to feed the ore gradually to the inclined flue D, substantially as set forth.

3. The combustion-chamber A and the smelting-chamber B, in combination with the flues D and F, all arranged to operate substantially as and for the purpose set forth.

4. The arrangement of the gas-pipe M, air-pipe N with its regulating-cock S, and steam-pipe P with the nozzle O, the latter being arranged to deliver the combined gases against the deflecting-breast b, located between the combustion and smelting chambers, as shown and described.

In witness whereof I hereunto set my hand and seal.

LEVI STEVENS. [L. S.]

Witnesses:

GEO. H. STRONG,

C. M. RICHARDSON.