E. J. Hall.

Melting Metals.

No. 41,989. Patented Mar. 22, 1864.

Fig. 3

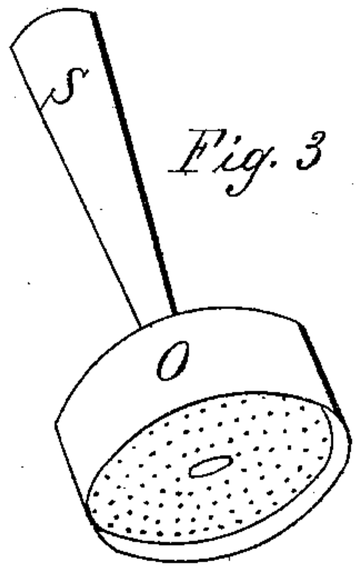

Fig. 1

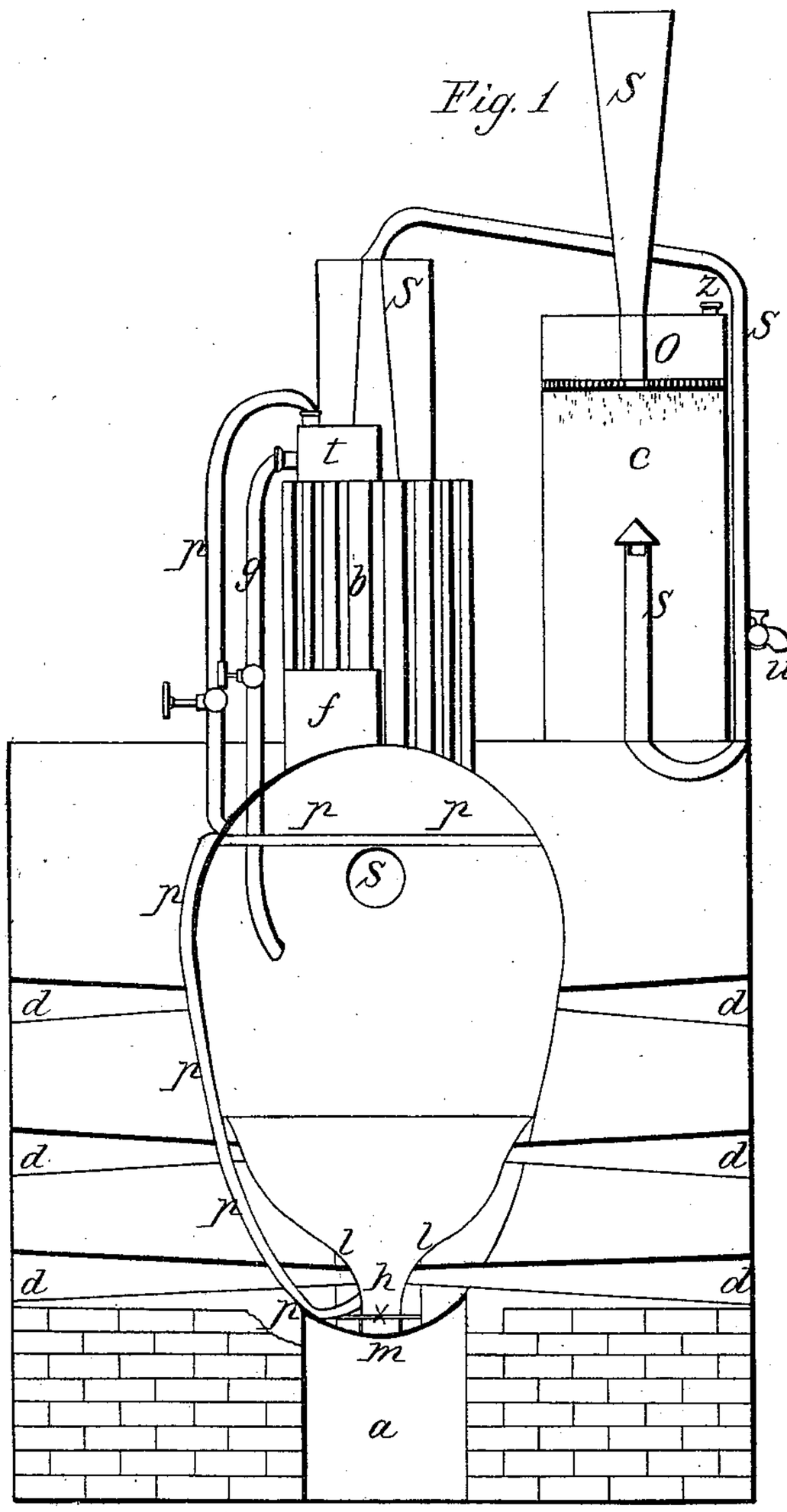

Fig. 2

Witnesses;
E. P. Peckham
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Inventor;
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UNITED STATES PATENT OFFICE.

ELIZA JANE HALL, OF SAN FRANCISCO, CALIFORNIA.

IMPROVED FURNACE FOR SMELTING ORES.

Specification forming part of Letters Patent No. **41,989**, dated March 22, 1864.

To all whom it may concern:

Be it known that I, ELIZA JANE HALL, of the city and county of San Francisco, State of California, have invented a new and useful Improvement in Smelting-Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification.

The form of the furnace, as will be seen in the drawings, is elliptical or egg-shaped. The introduction of the draft is at several different and opposite points, (marked *d d d d d d d d d d*,) so as to concentrate the same at once toward the middle of the fire, and thus relieve the sides of the furnace of a great proportion of the heat, and intensify the same where it is most wanted—namely, in the mass of ore to be smelted.

The design of the furnace is so to combine ample arrangements for a powerful draft with a condensing apparatus for saving volatile portions of various metals and a form of furnace most suitable for retaining an intense heat that a greater economy of fuel and time may be realized than has heretofore been the case. For this purpose I construct this furnace upon the plan represented in the accompanying drawings, of which—

No. 1 is a vertical section, and No. 2 a perspective view. No. 3 is a perspective interior view of the sieve *o*.

S is the flue, which is continued into the interior of the condenser *c* until it reaches half the height of the same, where it is surmounted by a conical cap supported by columns at a sufficient height to allow the fumes to escape into the body of the condenser.

The sieve *o* is for the purpose of discharging a continuous shower of cold water into the conductor, by which the volatile metals in the fumes are precipitated to the bottom of the same, and thus saved for reduction.

z is the point at which the cold water is to enter the sieve *o*.

w is a waste-pipe, through which the surplus water is to run, after passing through the fumes from the flue, in order to keep the water at a level below the top of the flue.

The boiler *b* is for the purpose of furnishing steam as an oxidizing agent, both above and below the fire, by means of the pipes *p* and *q*.

f is a small fire-box in the boiler, to be supplied with a small amount of fuel for the purpose of heating the water in the same while the fire in the furnace is igniting.

The tuyeres or draft-tubes (marked *d*) may be increased or diminished in number at pleasure. These tuyeres are to be supplied with air by means of one or more fan-blowers, worked by any power that is available.

The principal fluxes made use of in this furnace are limestone, carbonate of soda, salt, carbonate of potash, and glass. The fuel used is exclusively charcoal, of which two bushels are required to one bushel of ore. The ore is to be thoroughly mixed with the charcoal.

The desulphurizing and oxidation of the metals and reduction of the rock by this furnace is completed in a period of from three to eight hours, and the metal is then ready for refining. The fuel and ore are supplied to the furnace by the door *y* in front near the top, and the melted slag and metals are drawn off at the openings at the bottom *x* and *m*. The boshes or supports forming contractions at the sides near the bottom of the furnace *l l* are the points of greatest heat, and are intended to keep the slag at the melting-point all the time. The circular arrangement of the draft-holes concentrates the greatest heat at the center, thus protecting the sides of the furnace. The melted mass is hurried toward the center, and sent down much like an eddy in water. It is best to set the draft-tubes at an angle of thirty or thirty-five degrees, first, that the ends of the tubes may not be stopped by the melting mass; second, to direct the greatest heat toward the bottom of the furnace, in order to prevent the metal from chilling on its way out. That fuel is the best which contains the most carbon and the least sulphur. Charcoal having a great affinity for sulphur absorbs it from the melting ore, and leaves the metal free. Not less than nine tuyeres should be used in a furnace of the capacity of five tons at a charge. The jet of steam which is introduced at the bottom of the furnace for oxidation becomes superheated by passing around the inside of the top of the furnace.

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

1. The combination of parts herein described for the reduction and saving of ores, viz: first, the arrangement for a powerful draft;

second, the peculiar egg-shaped form of the furnace; third, the gradually-contracting flue, going out from the back of the furnace; fourth, the peculiar construction of the condensing apparatus; fifth, the boiler on top of the furnace for economy of fuel; sixth, introduction of steam above and near the bottom of the fire for oxidation; seventh, small fire-box in the boiler; eighth, fan-blower or other power to supply the draft; ninth, simple and cheap fluxes named; tenth, charcoal for fuel; eleventh, the peculiar construction of the bottom of the furnace herein described.

2. The condenser with the sieve at its top, through which a continuous shower of cold water is kept pouring for the purpose of condensing and precipitating the volatile portions of the metals escaping with the draft, arranged and operating substantially as set forth.

3. The flue *s* within the condenser, and surmounted with the conical cap, to secure the condensation and precipitation of the volatile portions of the metals escaping with the draft.

ELIZA JANE HALL.

Witnesses:
F. I. THIBAULT,
C. P. DUANE.