

H. G. LIVERMORE.  
OAR-ROASTING FURNACE.

No. 191,351.

Patented May 29, 1877.

Fig. 1.

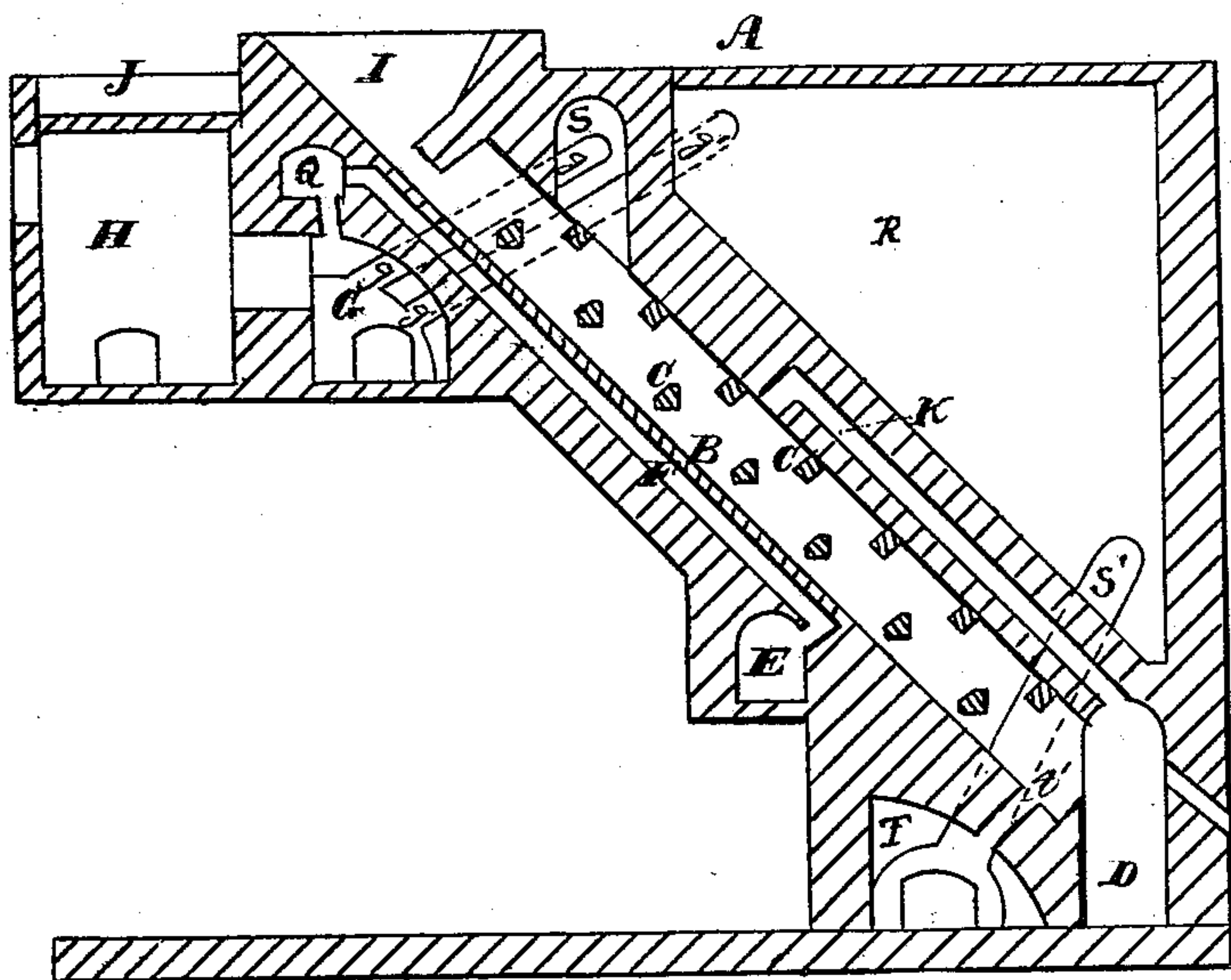


Fig. 2.

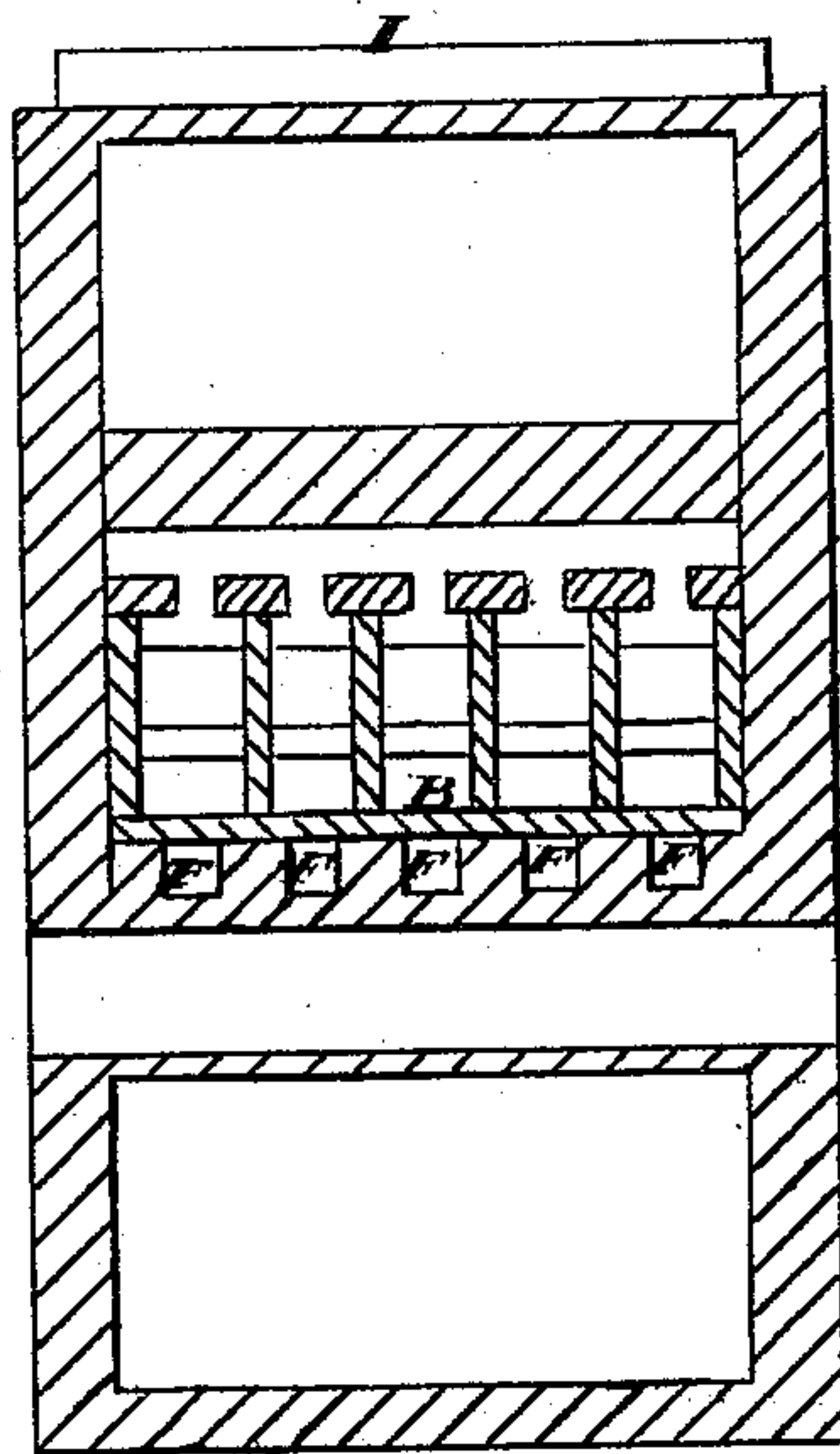
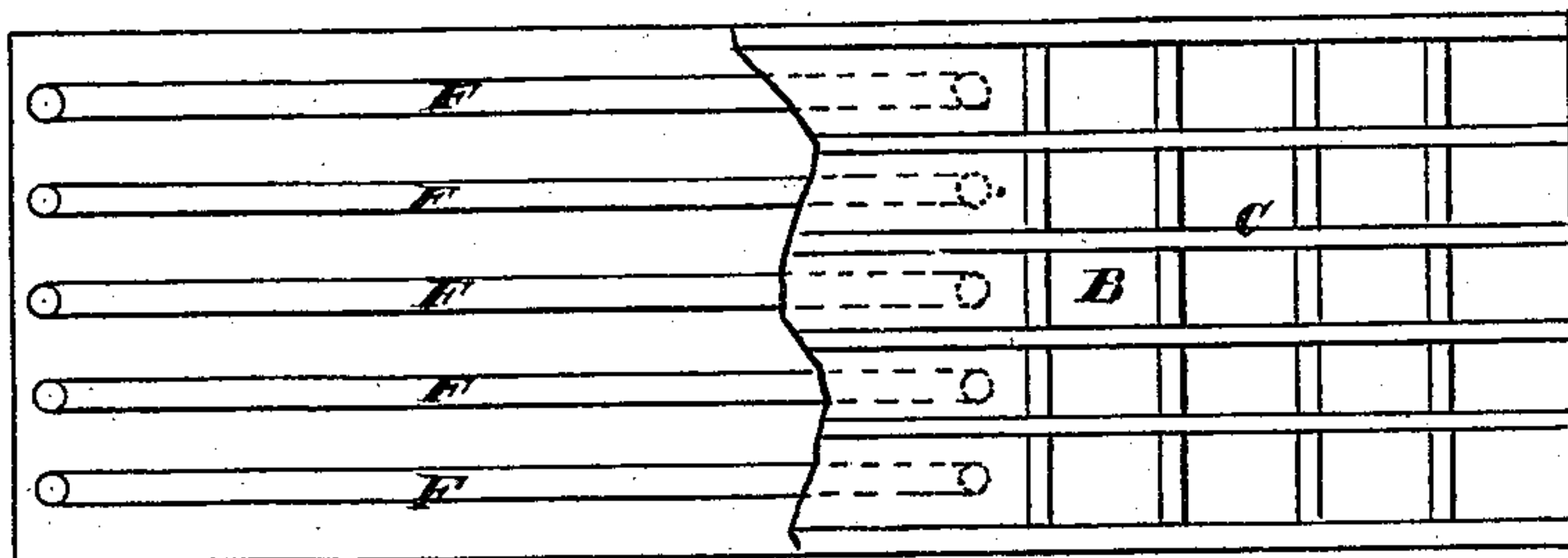


Fig. 3.



Witnesses

Geo. H. Strong  
Jno. L. Bone

Inventor

Horatio G. Livermore  
by Deputy  
Atty



# UNITED STATES PATENT OFFICE

HORATIO G. LIVERMORE, OF SAN FRANCISCO, CALIFORNIA.

## IMPROVEMENT IN ORE-ROASTING FURNACES.

Specification forming part of Letters Patent No. **191,351**, dated May 29, 1877; application filed May 23, 1876.

*To all whom it may concern:*

Be it known that I, HORATIO G. LIVERMORE, of the city and county of San Francisco, State of California, have invented an Improved Ore-Roasting 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 certain improvements in furnaces for roasting ores. It is especially useful in connection with furnaces which are intended to extract quicksilver from its ores, and I have shown it as applied to a furnace for which Letters Patent were issued to me November 9, 1875, No. 169,713. It consists in the employment of a secondary or supplemental fire, which heats the ore from below the floor, over which it passes.

Referring to the accompanying drawing, Figure 1 is a longitudinal vertical section of my furnace. Fig. 2 is a transverse vertical section; and Fig. 3 shows a portion of the ore-floor with the fire-space beneath.

A represents the body of my furnace, which is usually built, for convenience and economy, upon a hill-side, so as to save the expense of a large body of masonry. This furnace has its floor B built at any incline which will allow the ore to flow by gravitation, if not interrupted, as described in my former patent. The floor may be made of iron plate, fire-tile, fire-brick, or any suitable substance, and interrupting dams or abutments C may be placed across the floor, which, for convenience in handling the ore, is divided by longitudinal partitions into channels. The fire-place D furnishes the heat, which passes up through the ore-chamber and roasts the ore, as described in my former patent.

In order to assist in the roasting and expedite the process, I have found it desirable to admit heat beneath the floor B from a supplemental fire-place, E, as shown in the figures. This is most economically done by forming a series of channels, F, beneath the floor, corresponding in position to the longitudinal channels above the floor. The heat is admitted to these channels by passages from

the fire-place E, and is allowed to pass out at the upper end into an escape-flue, Q, from which it is conveyed into chamber G, to dry the ore in trays before this latter is fed to the furnace proper. Suitable openings and dampers (not shown) are made opposite, or in a line with, these lower fire-flues, for the purpose of regulating the heat and cleaning the passages. A current of fresh furnace-flame is introduced into the ore-chamber about half-way between the fire-place and the escape-flue, through a flue, K, to increase the heat and expedite the roasting by adding new flame to assist in burning any gases or carbon which may have become reduced in temperature. The mercury-vapors that are evolved by the action of the furnace flames and gases upon the exposed ore pass to the dome-chamber S, situated above the upper part of the inclined floor, and thence through the side passages g, made in the side walls of the furnace, into the fume-chamber G. The waste-heat of the calcined ore is utilized, and any remaining fumes it may contain are collected by side flues S', which convey them from chamber T into chamber R, and thence by the passage g' into the fume-chamber G''. From the fume-chamber G the mercurial vapors and hot air pass directly to the condensers H, of which as many are employed as may be needed.

From my method of building my furnace, the condensers will be built upon a level with, or above, the feed-hopper I, and, as most of the ore is more or less wet, I utilize the heat of the fumes in the condensers by spreading the ore upon their tops J and that of the furnace to dry, after which it can be readily fed into the hopper of the furnace.

As the construction of my furnace necessitates the pulverizing or breaking of all the ore into small pieces, it will only be necessary to provide machinery for this purpose; but most of the cinnabar mines produce from one-half to two-thirds, and often more, of the ore in this fine condition, so that the expense will be comparatively small, and I am thus enabled to avoid all the expense of mechanical means of elevating devices for bringing the ore to the furnace, and even the vacuum or blast apparatus generally necessary can be dispensed with.

The calcined ore, after reaching the bottom of the roasting-sole, passes through suitable openings *t'* into the chamber T, from which it may be withdrawn, when desired.

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

1. The inclined floor B, allowing the ore to move over its surface by gravitation, and provided with the interrupting dams or abutments C, in combination with the channels F and the supplemental fire-place E, substantially as described.

2. In combination with the inclined floor B, provided with the interrupting-dams C, of the channels or chambers F, fire-place E, and fire-

place D, substantially as and for the purpose specified.

3. The combination, with the chamber B and fire-place D, of the flue K, whereby a current of fresh furnace-flame is introduced into the roasting-chamber midway of its length, substantially as and for the purpose specified.

4. The combination, with the inclined floor B and channels or chambers F, of the fire-place D, fire-place E, and flue K, substantially as and for the purpose set forth.

HORATIO G. LIVERMORE.

Witnesses:

GEO. H. STRONG,  
CHAS. G. PAGE.