

(No Model.)

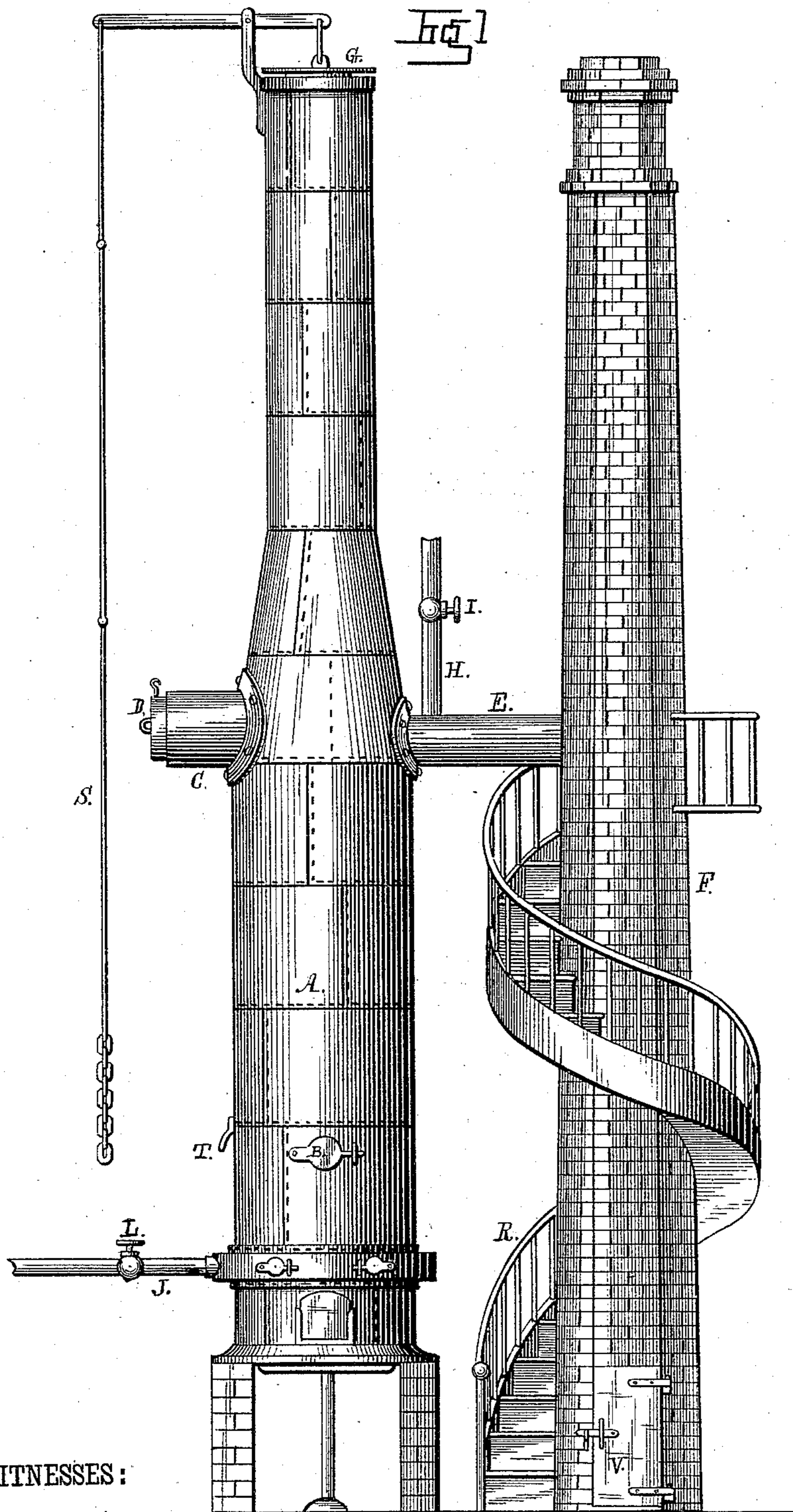
2 Sheets—Sheet 1.

J. J. JOHNSTON.

CUPOLA FURNACE.

No. 312,727.

Patented Feb. 24, 1885.



WITNESSES:

Adm. S. Dieterich
Wm. E. Dyre

INVENTOR.

James J. Johnston

(No Model.)

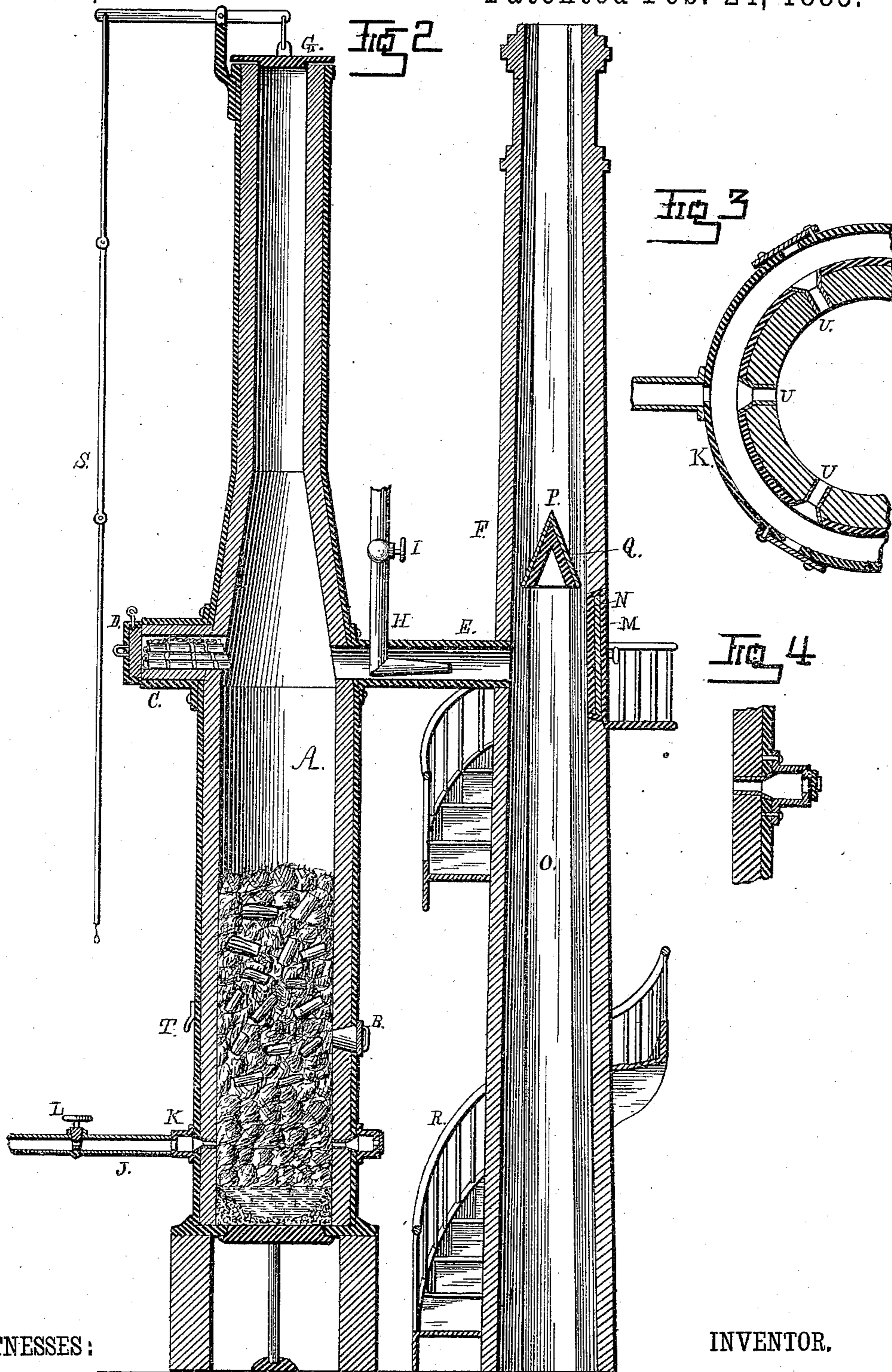
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UNITED STATES PATENT OFFICE.

JAMES J. JOHNSTON, OF COLUMBIANA, OHIO, ASSIGNOR OF SEVEN-EIGHTHS
TO WILLIAM W. GIBBS, OF PHILADELPHIA, AND ALBERT C. ELLIS, OF
PITTSBURG, PENNSYLVANIA.

CUPOLA-FURNACE.

SPECIFICATION forming part of Letters Patent No. 312,727, dated February 24, 1885.

Application filed December 13, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. JOHNSTON, of Columbiana, in the county of Columbiana and State of Ohio, have invented a certain new and
5 useful Improvement in Cupola or Melting Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked
10 thereon.

To enable others skilled in the art with which my invention is most nearly connected to make and use it, I will proceed to describe its construction and operation.

15 In the accompanying drawings, which form part of this specification, Figure 1 is a side elevation of my improvement in cupola or melting furnaces. Fig. 2 is a vertical section of the same. Figs. 3 and 4 are detail views.

20 Reference being had to the accompanying drawings, A represents the cupola or melting furnace, which is of ordinary construction, with the exception that it is provided with three or more "teasing-openings," B, arranged around the circumference of the cupola
25 in the same horizontal plane, and a charging-chamber, C, having a door, D, and a pipe, E, communicating with the bore of a stack, F, and provided with a damper or cap, G, and
30 the pipe E, provided with a steam-jet pipe, H, having a valve, I. The blast-pipe J, connected to the air-jacket K, is provided with a valve, L, for regulating the flow of air into the jacket K. The stack F is provided with a
35 door, M, having a fire-brick lining, N. Above the door in the bore O of the stack F is arranged a coniform spark-arrester, P, which is arranged concentric to the bore of the stack, leaving a narrow annular space around its
40 base, for the escape of gases and waste heat, and is furnished with a fire-brick lining, Q. The stack F is provided with a pair of winding stairs, for ready and easy access to the door M of the stack. The construction of the
45 air-jacket K and the openings communicating between it and the bore of the cupola are clearly shown in Figs. 3 and 4. It is frequently the case that the cupola becomes clogged—that is to say, the burden becomes arched by

the lower portion of the charge dropping down, 50 leaving a portion of the burden arched above it, and experience has demonstrated that this clogging or arching is formed a short distance above the air-jacket, or at about the point where I have placed the teasing-openings B, 55 which openings are used for the purpose of loosening up the clogged and arched portions of the burden, the advantage of which will be apparent to the skilled "cupola-man." The charging-chamber C is of such construction and size that a charge of pig-iron may be placed in it and the door D closed. By this arrangement of the charging-chamber the disadvantage attendant upon the charging of the cupola with cold pig-iron after it has received its burden may be entirely avoided. The stack F is provided at its base with a door, V, for the purpose of access to the interior for the removal of cinders and other refuse that may accumulate therein. The steam-jet being op- 60
posite to and on the same horizontal plane with the charging-chamber C, it will relieve the cupola-man from the intense heat during the operation of charging the coke and metal.

The foregoing description will enable the skillful mechanic to construct my improvement in cupola or melting furnaces. I will therefore proceed to describe the operation. The pipe J being connected to any known air-pressure device, and the pipe H communicating with a steam-generator, and the cupola A prepared in the ordinary manner and charged with its burden, the operator places an additional charge of pig-iron in the chamber C and closes the door D. The cap or 85
damper is elevated and held in that position by the damper-rod S being hooked on the catch T. The cap or damper is held up during the "heating up" of the cupola, and is closed down and kept closed before the blast 90
is put on. The valve I is then opened, thereby starting the steam-jet, which will draw off and force the deleterious gases and refuse of combustion into the stack, and at the same time cause an intense heat in the cupola. After 95
the steam-jet has been in operation for about five or ten minutes the valve L is opened, which will allow the desired flow and pressure

of air to pass into the jacket K, and from it will be distributed by means of the openings U into and through the burden of coke, iron, and fluxing material constituting said burden or "charge." By the combination of the steam and air blast under pressure the melting power or capacity of the cupola is at least increased twofold, and the burning coke and melting and melted iron are kept free from the injurious effects of the deleterious gases evolved from said burning coke and the iron in process of melting.

The advantage of carrying off the sulphur, phosphorus and deleterious gases evolved during the operation of melting and in advance of the air acting upon the burning coke and iron will be apparent to the metallurgist and skilled cupola-man. The deleterious gases carried off and the oxygen of the air under pressure acting upon the burning coke and the melting and downward-flowing iron comparatively free from said deleterious gases, the melting process will be greatly facilitated, the fluidity of the iron increased, and a stronger and purer metal produced.

By the combination of the stack F, constructed as hereinbefore described, with the cupola having a damper or cap, G, the danger incident to the constant flow of red-hot cinders, sparks, and flame from the top of the cupola is entirely avoided, and the buildings adjacent to the foundry will be free from nuisance occasioned by said cinders, sparks, and the other refuse of combustion common to the ordinary cupola.

I am aware that it has been heretofore proposed to use a steam-jet in combination with a cupola-furnace for the purpose of entrain-

ing air through openings in the base of the latter, and in connection with other furnaces, for facilitating the discharge of the products of combustion.

I am also aware that in connection with a blast under pressure at the base of other furnaces fans and like means have been employed for carrying off such products. Steam-jets have heretofore been located above the charging-opening and in proximity thereto; but the arrangement has been such that the hot gases were drawn past the opening and not to one side and away from it, as in my device.

I am also aware that an auxiliary stack has been heretofore used for receiving the products of combustion, and do not claim, broadly, such construction.

Having thus described my improvement, what I claim as of my invention is—

1. In a cupola or melting furnace, the combination, with the stack, of an exit-flue leading therefrom and provided with a central steam-jet pipe and a charging-chamber, the steam-jet pipe and charging-chamber being arranged opposite each other in the same horizontal plane, whereby outflow of heat and gaseous products during the charging operation is obviated, substantially as shown and described.

2. The combination of the cupola A, having a charging-chamber, C, cap or damper G, pipe E, steam-jet pipe H, and stack F, having spark-arrester P, substantially as herein described, and for the purpose set forth.

JAMES J. JOHNSTON.

Witnesses:

E. JOHNSTON,
WM. E. DYRE.