

SCOFIELD & COOPER.  
Reverberating Furnace:

2 Sheets—Sheet 1.

No. 6,279.

Patented April 3, 1849.

Fig. 1.

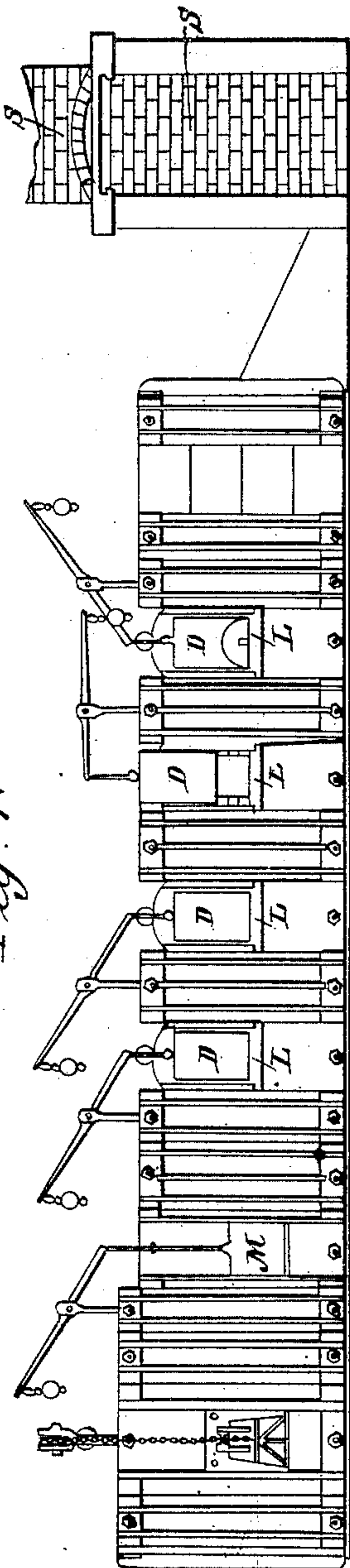


Fig. 2.

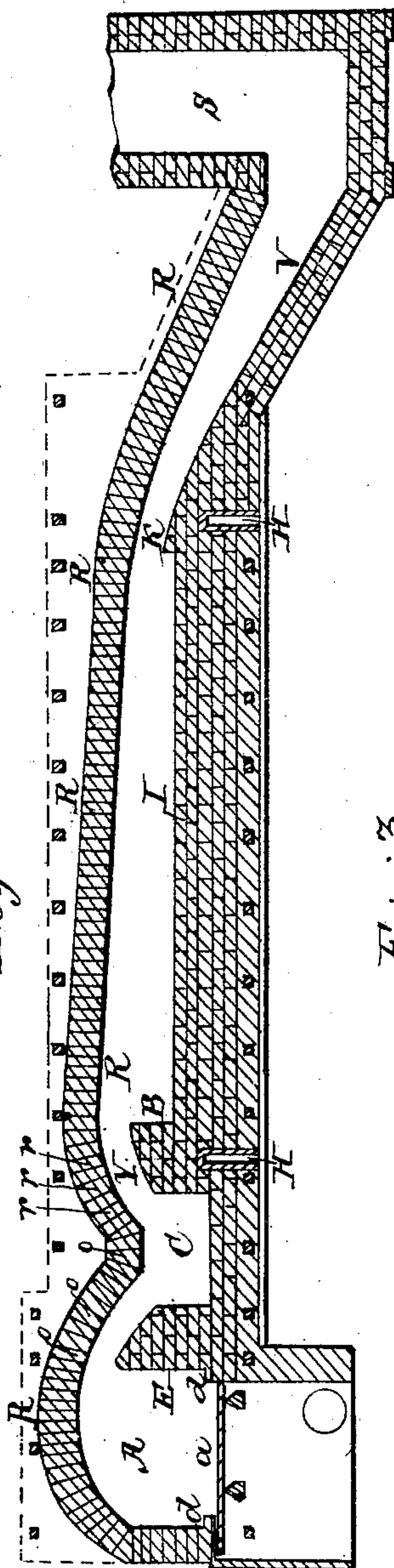
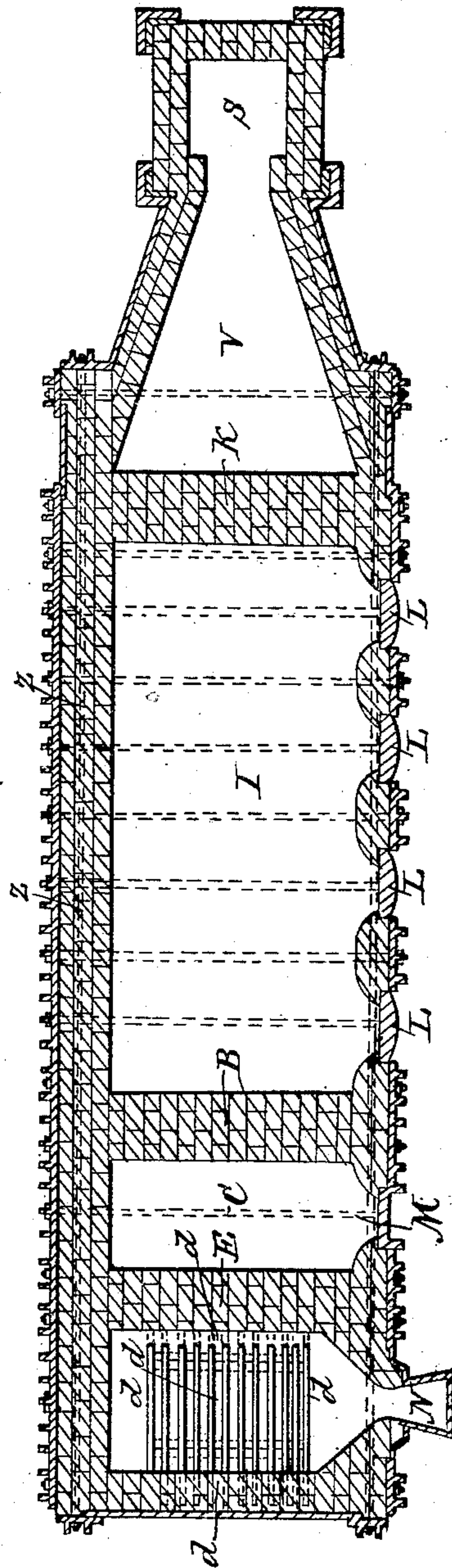


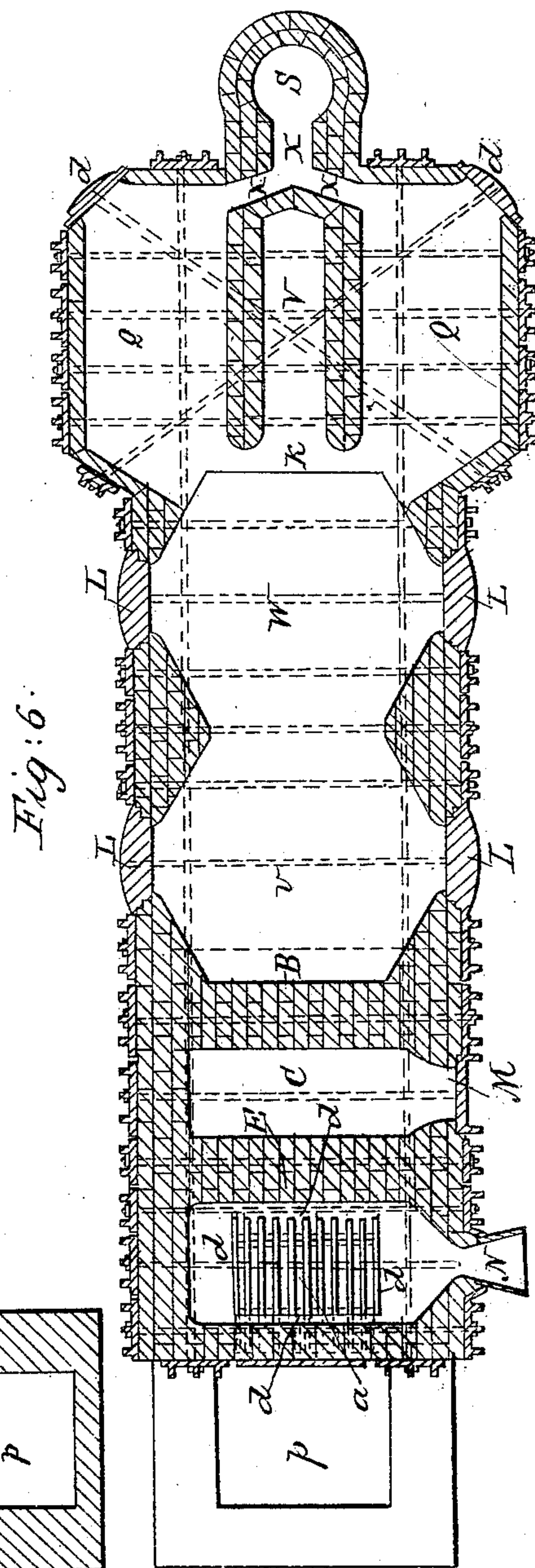
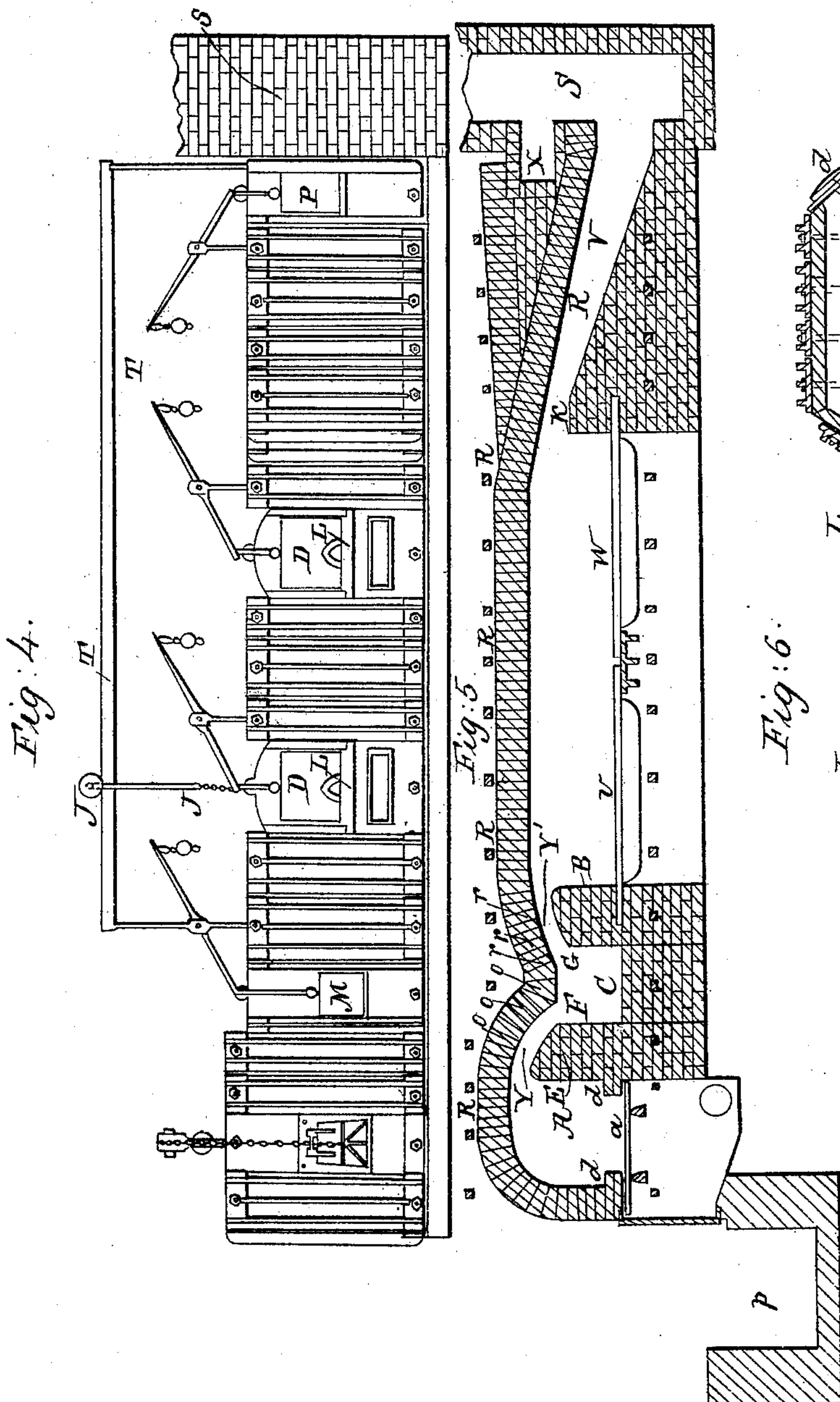
Fig. 3.





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# UNITED STATES PATENT OFFICE.

LEWIS SCOFIELD, OF SOUTH TRENTON, NEW JERSEY, AND EDWD. COOPER,  
OF NEW YORK, N. Y.

COMBINATION OF ASH-TRAP WITH PUDDLING AND REHEATING FURNACES.

Specification forming part of Letters Patent No. 6,279, dated April 3, 1849.

*To all whom it may concern:*

Be it known that we, LEWIS SCOFIELD, of South Trenton, in the county of Mercer and State of New Jersey, and EDWARD COOPER, of the city, county, and State of New York, have invented a certain new and useful Improvement in Furnaces for Puddling and Heating Iron; and we do hereby declare the following to be a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a side elevation of a furnace for reheating iron, and Figs. 2 and 3 a longitudinal vertical and a horizontal section thereof; and Figs. 4, 5, and 6 are like representations of a puddling-furnace, with two double bottoms on our improved plan.

The same letters indicate like parts in each set of figures.

In furnaces of the class to which our improvements are applied the presence of solid matter—such as ashes and particles of carbon and other impurities which are blown over the fire-bridge onto the iron by the force of the draft or blast, particularly when anthracite coal is used—has long since been recognized by iron-masters as the cause of material injury to the iron under treatment, and numerous attempts have been made to avoid an evil of such magnitude; and as it was well known that if the required heat could be obtained by the pure gaseous products of the combustion the evil would be avoided, therefore most of the improvements heretofore suggested for this purpose, as well as for increased economy of fuel, have been based on this idea; but so far as we are informed none of these attempts have met with that entire success, in view of that economy of fuel which is indispensable to the successful manufacture of iron, as to cause their introduction into general practical use.

In furnaces for reheating of iron preparatory to welding, the presence of these solid particles has the effect to prevent a perfect weld, for by the force of the draft or blast the solid particles are forced into the interstices between the bars, and prevent the surfaces of the metal from forming, under pressure, that perfect union so desirable in the production of bars of iron. Another serious injury which

iron sustains in reheating-furnaces by the presence of the solid particles referred to is in wasting it away, rendering the surface in contact with them brittle, destroying the nature of the iron, and causing the imperfections upon its surface known to workmen as “fire-cracks,” which so materially injure the wear of iron in rails and its strength and finish in other forms.

In the reheating-furnaces upon our plan now in use from four to five bushels of fine coal and other solid impurities are drawn daily from the chamber C, hereinafter described. In furnaces of the ordinary construction these impurities must pass over to the heating-bottom and come in contact with the iron thereon. So serious is this difficulty that the reason assigned by many iron-masters who have tried anthracite coal for reheating iron and have abandoned its use is that they have found the waste of iron resulting from this cause and the injury done to its finish and quality to more than counterbalance any advantage of economy derived from the use of anthracite coal, even in situations where it could otherwise be used with great advantage. The injury arising from this cause is most obvious in furnaces for heating small iron—as braziers’ rods, wire rods, &c.—the body of the iron here being small compared with the surface exposed to the injurious influence.

The process of puddling, which is to decarbonize the iron and to extract the impure solid matter contained therein, must of necessity be greatly injured and retarded by the deposit of ashes, particles of carbon, and other impurities carried over with the flame, and which of necessity must commingle with the iron and injure its quality, more particularly when coming to nature. The presence of these impurities tends to produce the very reverse of what the process of puddling is intended to effect, and therefore the less the quantity of such impurities carried over the more pure will be the iron. The presence of the impurities carried over upon the iron with the flame from anthracite coal is in our opinion the cause of the acknowledged inferiority of anthracite to bituminous coal for puddling, both in reference to the quality of the iron produced and the time required to perform the operation, each furnace yielding with bituminous coal six and



seven heats per day, while with anthracite but four and five. There are other injurious effects produced by the presence of these impurities, such as wasting and otherwise injuring the sand bottom of the reheating-furnace; but these are comparatively unimportant and need not be particularized. One of the great desiderata in puddling and heating furnaces has therefore been to prevent the passage of solid particles of coal, ashes, and other impurities onto the puddling or heating bottom of this class of furnaces, and to do this without waste of fuel; and this we have attained by our improvement, the principle of which consists in making a downward projection or curve in the roof of the furnace between the chamber of combustion and the bridge next to the heating or puddling bottom, so that the flame and other products of combustion and the solid particles carried up by the current or currents shall be reverberated downward in front of such bridge, that the solid particles may be there deposited, while the gaseous products of combustion pass over to act upon the iron.

In Figs. 1, 2, and 3 of the accompanying drawings, which exhibit a reheating-furnace, A represents the fire-chamber, and *a* the grate. Back of the grate is the usual fire-bridge, E, (which may, however, be dispensed with, if desired,) and beyond this is a chamber or space, C, for the deposit of the particles of carbon, ashes, &c., and at the rear of this chamber, and forming the back thereof, is what may be termed the "arresting-bridge" B, as the chief purpose of its introduction is to arrest and retain the solid particles of carbon, ashes, &c. The working or heating bottom I is formed in the usual manner, but may be made of greater length than heretofore used. The bottom of the chamber or space C should be some nine or ten inches below the level of the working or reheating bottom. The roof at R, over the fire-chamber, is formed in the usual manner, and is then curved down, as at *o o o*, toward the bottom of the chamber or space C, leaving a passage, Y, between it and the first bridge, E, when this is used. This curve in the roof reverberates the flame, solid particles, &c., and causes them to strike against the front face of the arresting-bridge B and the bottom of the chamber or space C, and then the flame and other gaseous products of combustion turn and pass over the top of the arresting-bridge B, to act on the metal on the working or heating bottom, the roof at *r r r* being curved upward over the bridge B to form a flue or passage, Y', for that purpose. Thence to the rear end the roof R and other parts are made as usual, or in any other suitable manner. From F to G, above the chamber C, the roof should be for a short distance horizontal, or nearly so. By this means all the solid particles of carbon, ashes, &c., carried up from the grate by the force of the blast or draft are deposited in the chamber or space C in front of the arresting-bridge B. The chamber or space

C is provided with a door at M, through which the solid particles which accumulate are to be withdrawn. This should be done several times per day. If desired, the fire-bridge E may be dispensed with, although its presence is of advantage in giving an upward direction to the products of combustion, so that when reverberated the roof may give the solid particles a more direct downward direction into the chamber or space C.

In Figs. 4, 5, and 6, which represent our improvement as applied to puddling-furnaces with two double bottoms, U and W, the improved parts are indicated by the same letters as in the preceding figures, and need no further explanation, as their application is the same to puddling as to the heating furnace. In this, as in the heating-furnace, the fire-bridge E may be dispensed with, although we prefer to use it.

In all the figures, D represents the working-doors; L, the fire-plates of the furnace; K, the bridge at the back of the working or puddling bottom, and V the escape-flue leading into the chimney S; and in Figs. 5 and 6, Q Q represent ovens, in which the pigs are heated previously to being introduced on the bottoms U and W, and X flues leading therefrom into the chimney; and in Fig. 4, T and J represent a railway and crane to facilitate the moving the pigs from the oven to the puddling-bottoms U and W.

So far from our improvement increasing the consumption of fuel, we have found in practice that with a slightly increased fire the heating-bottoms can be greatly increased in size, and in the puddling-furnace we are enabled to work with two double bottoms, which greatly facilitates and economizes the process, while at the same time we are enabled to produce iron of much purer quality. Instead of increasing the size of the heating or puddling bottoms to meet the economy of fuel, the fire may be reduced.

What we claim as our invention, and desire to secure by Letters Patent, is—

Making a depression in the roof of reheating or puddling furnaces in front of the arresting-bridge—that is, between the fire and a bridge next to the heating or the puddling bottom—for the purpose of throwing down and arresting the solid particles of coal, ashes, and other matter upon a space or chamber provided for the purpose, substantially as described, in combination with the heating or puddling bottom or bottoms of reheating or puddling furnaces, whereby the iron under treatment is protected from the injurious effects of the solid matters carried up from the grate by the draft or blast, as described.

LEWIS SCOFIELD.  
EDWD. COOPER.

In presence of—

O. P. BROWNE,  
O. E. PETERS.