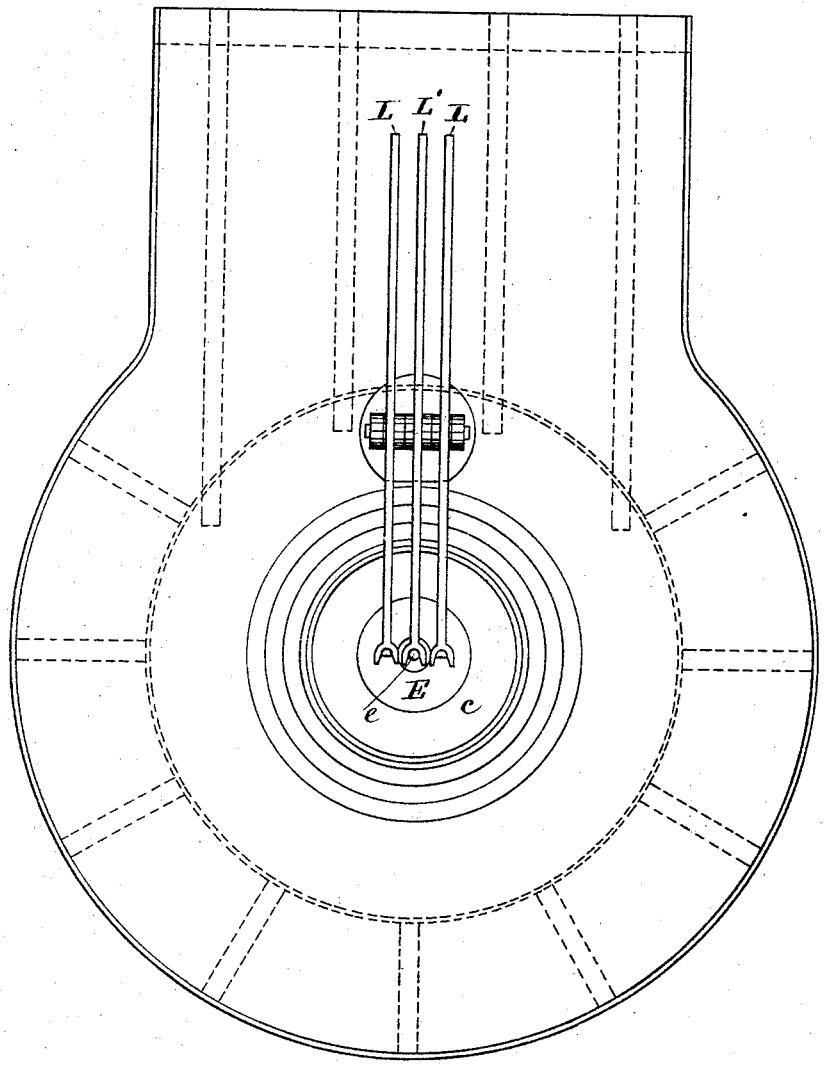
(No Model.) 5 Sheets—Sheet 1.

W. H. ROSEWARNE.

BLAST FURNACE.

No. 342,466. Patented May 25, 1886.

Fig. 1.



Attest.

Jas. C. Baker

Abram May

Inventor.

William H. Rosewarne

per

L. McLeod Pennstrom

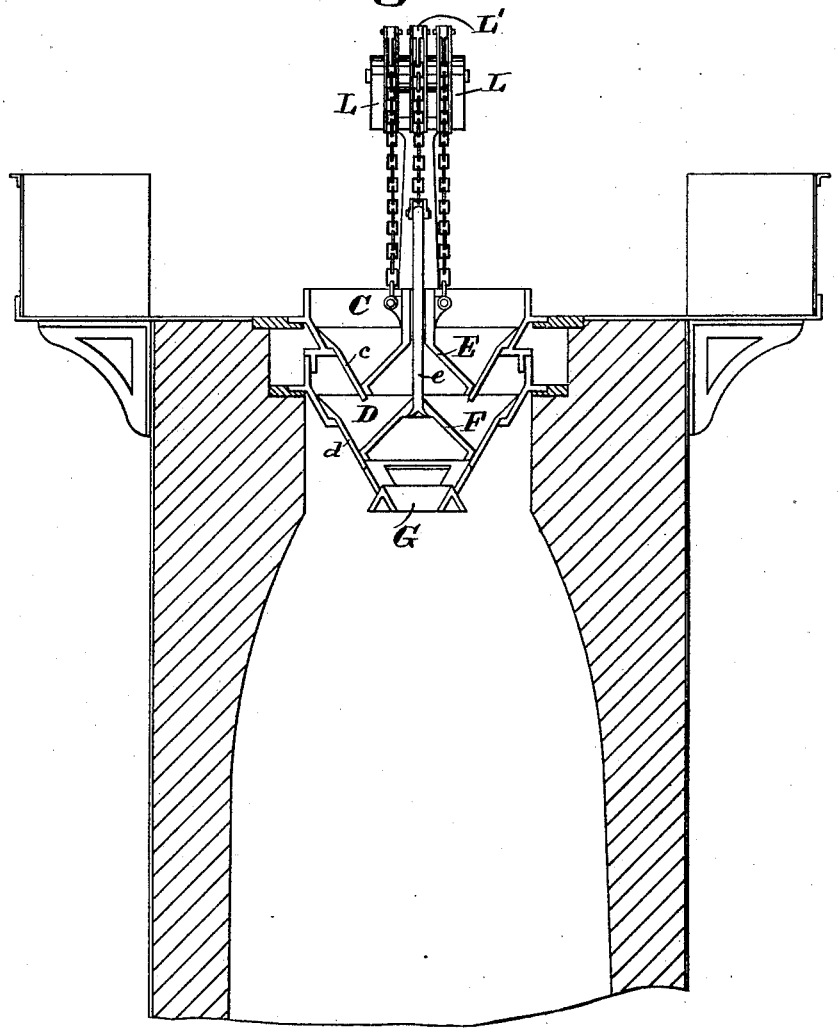
(No Model.) 5 Sheets—Sheet 2.

W. H. ROSEWARNE.

BLAST FURNACE.

No. 342,466. Patented May 25, 1886.

Fig. 2.



Attest.

Jas. W. Baker

Abram May

Inventor.

William H. Rosewarne

per

L. McAnd P. McStocker

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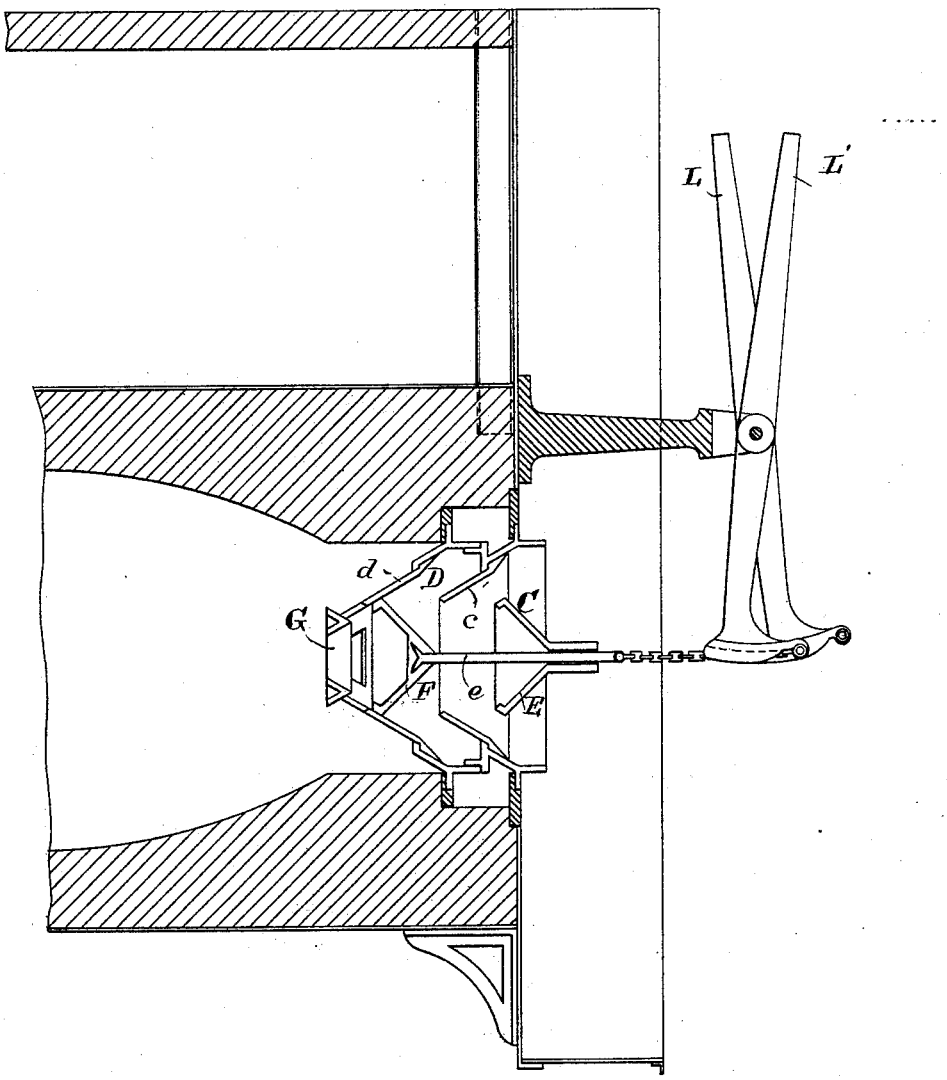
W. H. ROSEWARNE.

BLAST FURNACE.

No. 342,466. Patented May 25, 1886.

Fig. 3.



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Jas. W. Baker

Abram May

Inventor.

William H. Rosewarne

per

L. M. and P. M. Hosea

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W. H. ROSEWARNE.

BLAST FURNACE.

No. 342,466. Patented May 25, 1886.

Fig. 4.

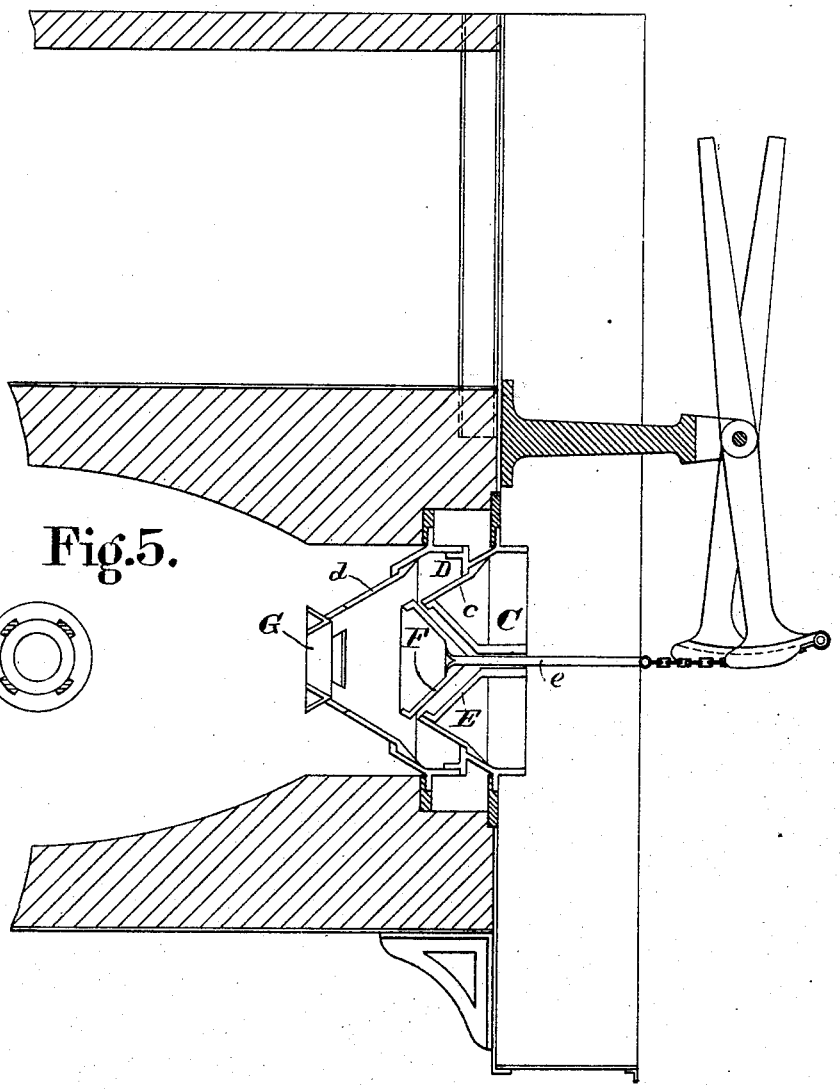
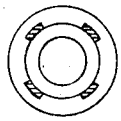


Fig. 5.



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Jas. W. Baker
Abram May

Inventor.

William H. Rosewarne
per
L. McLeod Ramstead

(No Model.) 5 Sheets—Sheet 5.

W. H. ROSEWARNE.

BLAST FURNACE.

No. 342,466. Patented May 25, 1886.

Fig. 6.

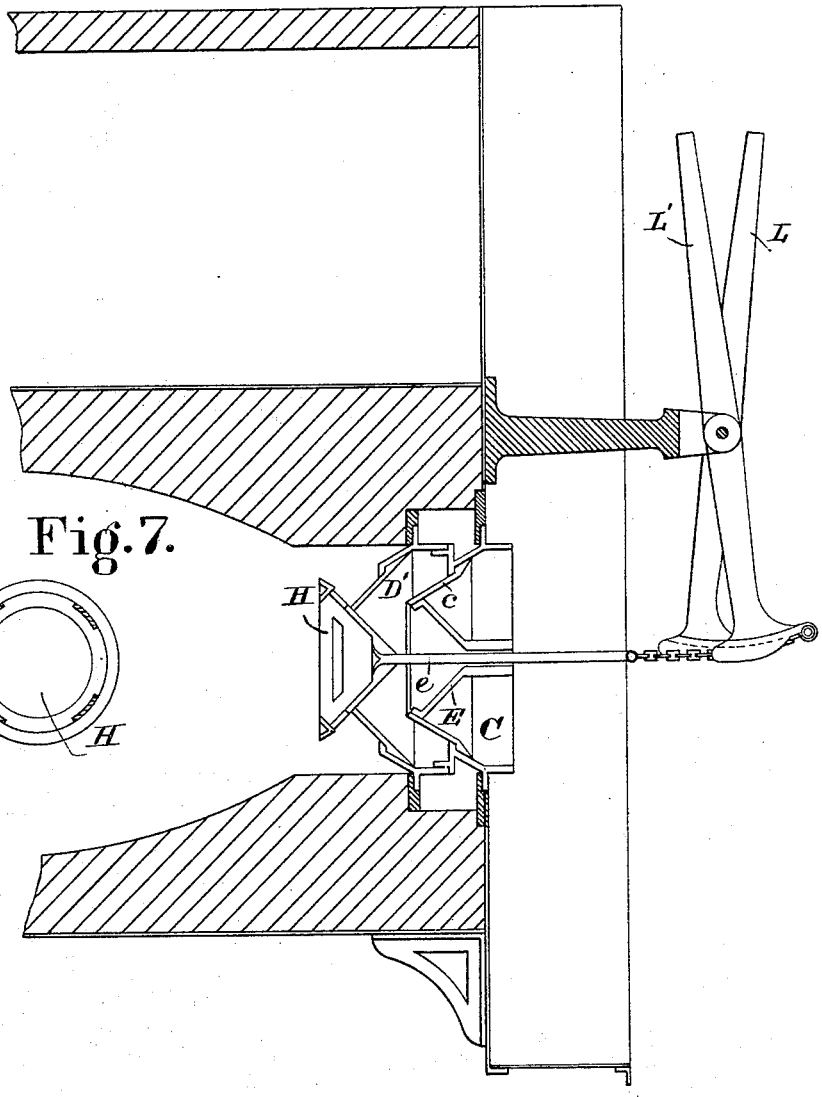
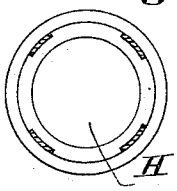


Fig. 7.



Attest.

Jas. W. Baker

Abram Ivay

Inventor.

William H. Rosewarne

per

L. M. and P. M. Rosewarne

UNITED STATES PATENT OFFICE.

WILLIAM H. ROSEWARNE, OF CINCINNATI, OHIO.

BLAST-FURNACE.

SPECIFICATION forming part of Letters Patent No. 342,466, dated May 25, 1886.

Application filed October 6, 1884. Serial No. 144,871. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. ROSEWARNE, a citizen of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Blast-Furnaces, of which the following is a specification.

My invention relates to improvements in blast-furnaces, its object being to secure a more safe, economical, and efficient charging of the same while in blast; and it consists in the provision and arrangement of double feeding-hoppers and closing valves or "bells," and the combination therewith of a distributing device arranged to properly scatter and distribute the charges uniformly in the furnace, all as hereinafter set forth.

In the ordinary construction and operation of blast-furnaces, the charges are fed to the furnace through an opening at the top by means of a funnel-mouth or "hopper," closed below by a conical valve or bell, opening downward directly into the body of the furnace. This arrangement necessitates a slackening of the blast when charging, which involves loss of time and danger of chilling the furnace; or, if the blast is maintained, the incandescent gases escape through the hopper-opening while charges are being introduced, causing great annoyance and danger to the workmen employed in charging. Moreover, by this arrangement the charges are dumped toward and around the side walls of the furnace, where they often chill and form "scaffolds," requiring a stoppage of the entire operation of the furnace for their removal, at great outlay, and loss of time and labor.

Still another objection to existing constructions is the liability of the bell-supporting chains to break and allow the valve to drop into the furnace, which also requires a stoppage of the furnace and replacing of the bell at great inconvenience and loss.

My invention seeks to remedy these objections and render the operations of the furnace continuous, without stoppage or loss from any of the above-enumerated causes, thereby facilitating and economizing the furnace operations in a material degree.

Mechanism embodying my invention is illustrated in the accompanying drawings, in which Figure 1 is a top plan of a blast-furnace to which my improvements are applied; Fig. 2, a central vertical section of the same, showing the bells closed; Fig. 3, a central vertical section of the same, showing the upper bell open and the lower bell closed; Fig. 4, a central vertical section of the same, showing the lower bell open and the upper one closed; Fig. 5, a sectional plan of the charge-distributer; Fig. 6, a central vertical section of an ordinary blast-furnace, showing my improvements applied in connection with the ordinary hopper. Fig. 7 is a detail view of the bell or valve shown in Fig. 6.

Referring now to the drawings for a more explicit illustration of the parts specified in the following description, A designates the blast-furnace, having an opening, B, at the top, through which the charges are introduced. In this opening I place two funnel-shaped hoppers, C D, arranged one above the other, and provided each with an intermediate shell, *c d*, constituting at the same time a guide for the charge and seat for the closing valves or bells E F.

To the lower shell, *d*, is attached a distributing device, G, consisting of a conical ring whose annular apex is set within the lower hopper as an offset in such relation to the inner wall of the shell *d* as to divert a portion of the down-passing charge outward, while a portion passes within the central opening of the distributer.

The two bells E F are each of conical form above and terminate below in a shallow partial cone adapted to form a seat against the inner wall of the shell in which it rests. To the lower bell, F, is secured a stem or rod, *e*, extending upward through a central sleeve at the apex of the upper bell, E, so that, as the bells are to be elevated and depressed alternately, one acts as a guide to the other by means of the stem and sleeve.

Suitable means are to be provided for elevating the bells as required. A convenient apparatus for this purpose is constructed as follows: A two-pronged lever, L, is arranged in suitable bearings above the furnace-opening, having its bifurcated ends connected by chains, with lugs *g* at opposite sides of the sleeve of the upper bell, while a similar lever, L′, mounted and operating between the prongs

of the bifurcated lever, is connected by a chain with the free end of the stem *e*. Thus each bell has an independent motion and operation by means of its levers.

Steam, water, or air pressure may be employed as the motive power for operating the levers.

In operating the bells as thus constructed the necessary charges of iron ore, coke, and limestone are first separately placed in the upper hopper, C, the bell E of which is then lifted into the position shown in Fig. 3, allowing the entire charge to fall into the lower hopper, D. The upper bell is then closed and another charge placed in the upper hopper, after which the lower bell is raised to the position shown in Fig. 4, allowing the charge to fall into the furnace over the distributing-ring, by which it is divided, as before indicated, part being diverted outward and part inward.

It will be observed that the opening into the body of the furnace is always closed, the alternate action of the bells at no time permitting the gases to escape. It will be obvious, therefore, that the charging of the furnace requires no slackening of the blast. Moreover, as the bells have their seats upon the upward-flaring walls or shells of the hoppers, it is obvious that in case of breakage of the supporting-chains the bells could not fall into the furnace, and hence all danger from that source is avoided, and, besides, any such break can be repaired without stoppage of the blast.

While in the foregoing description I have shown what I conceive to be the best mode of applying my invention, it may be applied as an addition merely to the existing construction, and secure in a useful degree many of the advantages referred to. Thus, in Fig. 6 the lower hopper there shown may be considered as the ordinary filling-hopper, D′, and H, the ordinary bell or valve, opening downward. Above these I arrange the additional hopper, C, and bell E, constructed and operating as hereinbefore described, and attach to the bell H a stem, *e*, extending upward through the sleeve of the bell E, and provide the lever-connections, as before set forth.

To the bell H, I attach a distributing-ring, such as before described, in such relation that its annular apex offsets a little outside of the curved outer surface of bell projected downward, so that the charge passing down from the hopper D′ upon the outside of the bell H is divided, part diverted inward through the opening of the ring and part outward in the usual manner.

The distributing device may be separately employed without the double hoppers and valves, and the hoppers and valves without the distributer, but the best results are attained with both together.

Heretofore provision has been made for charging a hopper with coal, said hopper being provided with an inner cone and a distributing-ring, whereby, upon lowering the cone and ring, an annular space is formed, through which the coal passes and is directed outwardly on all sides. Provision is also made for raising the inner cone only, for the purpose of directing the coal as it is discharged toward the center of the furnace; also, a double hopper has been used, having an upper and lower cone-valve, the former being lowered to charge the feed-hopper and the latter valve being opened to discharge the load into the furnace. I make no claim to such a construction.

I claim as new, and desire to secure by Letters Patent of the United States—

1. In a blast-furnace, the combination, with two hoppers, one arranged above another, of independently-operating valves, having an alternate upward lift in charging the furnace, substantially as described.

2. In a blast-furnace, the combination, with two feed-hoppers, placed one above another, of two independent valves closing said hoppers, levers connected with said valves and having alternate action, and a conical distributing-ring located in the lower hopper, substantially as described.

3. In a blast-furnace, the combination of two hoppers arranged one above the other, with closing valves or bells seated within the same and opening by lifting upward, the lower bell having a stem extended upward through a sleeve of the upper bell, thereby guiding each other in their alternate action, substantially as and for the purpose set forth.

4. In a blast-furnace, the combination, with the filling-hopper, of a distributing-annulus, having a dividing apex or ridge located above the mouth of the hopper and a broad base located below the same, whereby the charge may be distributed by passing over and being divided by the ridge of the annulus, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM H. ROSEWARNE.

Witnesses:
L. M. HOSEA,
R. M. HOSEA.