(No Model.) 2 Sheets—Sheet 1.

F. W. GORDON & V. O. STROBEL.

BLAST FURNACE TOP.

No. 412,175. Patented Oct. 1, 1889.

Fig. 1.

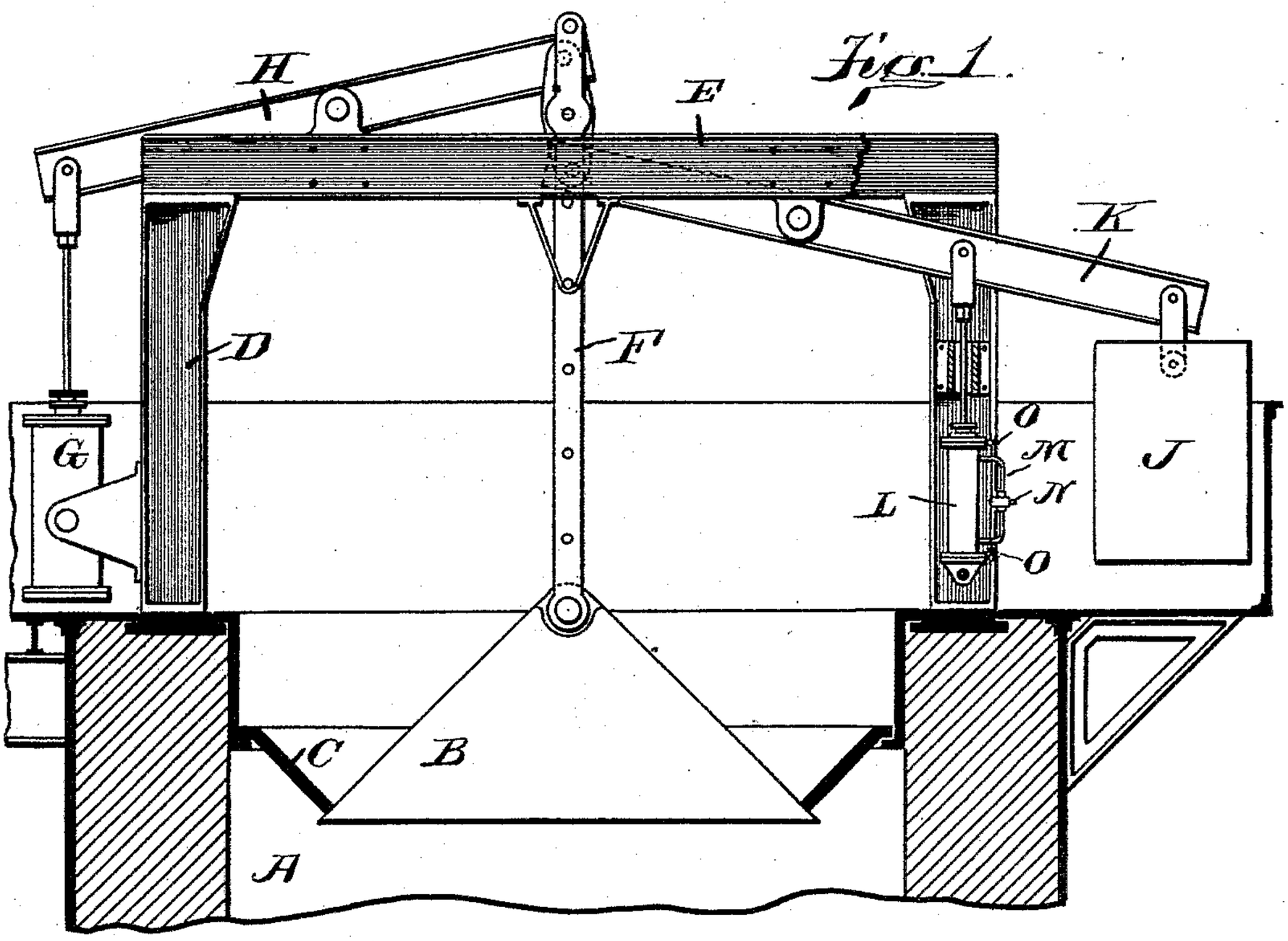
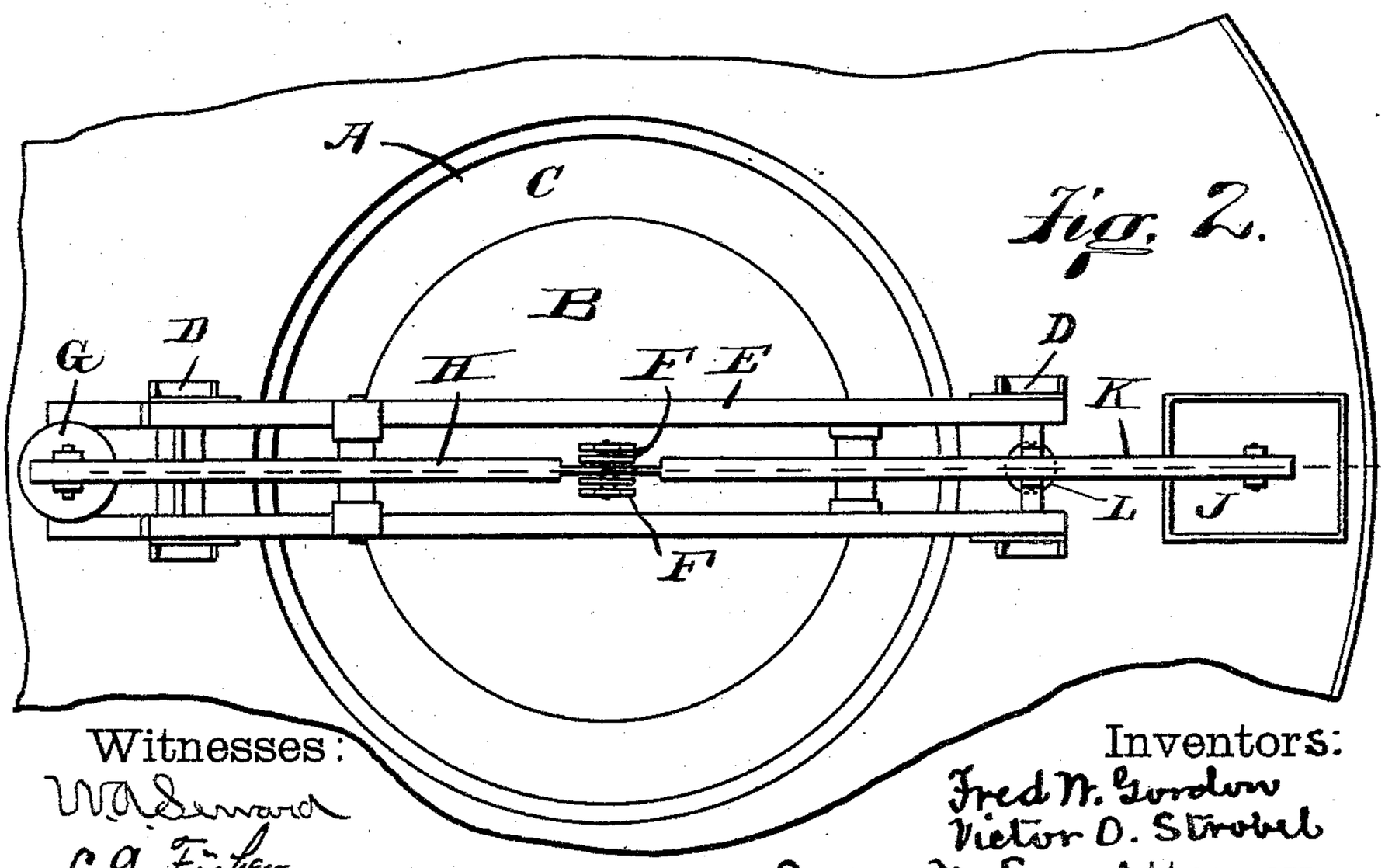


Fig. 2.



Witnesses:
W. A. Seward
C. A. Fisher

Inventors:
Fred W. Gordon
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(No Model.) 2 Sheets—Sheet 2.

F. W. GORDON & V. O. STROBEL.

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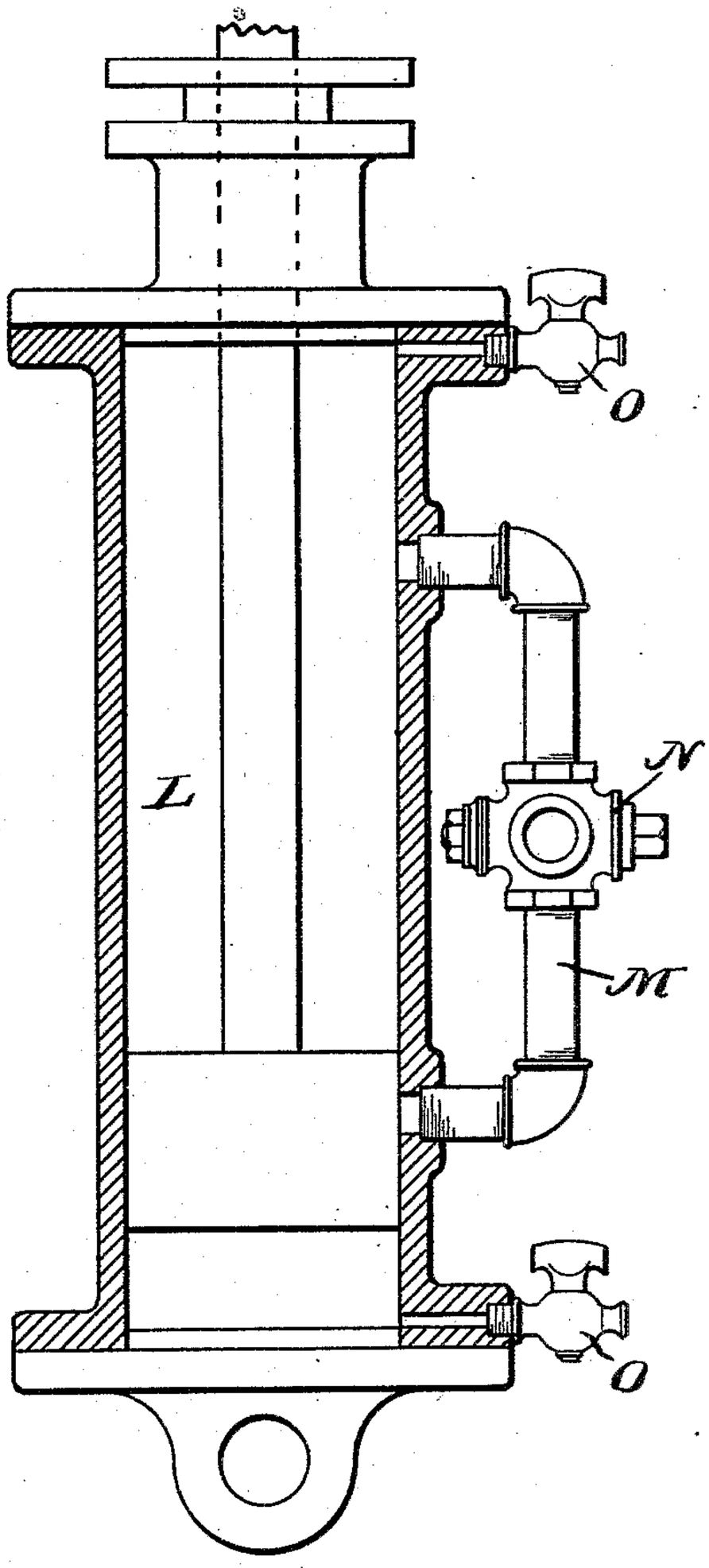

Fig. 3.

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UNITED STATES PATENT OFFICE.

FRED W. GORDON AND VICTOR O. STROBEL, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO GORDON, STROBEL & LAUREAU, OF SAME PLACE.

BLAST-FURNACE TOP.

SPECIFICATION forming part of Letters Patent No. 412,175, dated October 1, 1889.

Application filed August 1, 1887. Serial No. 245,801. (No model.)

To all whom it may concern:

Be it known that we, FRED W. GORDON and VICTOR O. STROBEL, of Philadelphia, Philadelphia county, Pennsylvania, have invented certain new and useful Improvements in Blast-Furnace Tops, of which the following is a specification.

This invention pertains to the top work of blast-furnaces, and has reference particularly to the charging mechanism.

The improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a vertical diametrical section of the top portion of the stack of a blast-furnace, showing charging mechanism, illustrating our improvements; Fig. 2, a plan of the same, and Fig. 3 a vertical diametrical section of the air-cylinder L of Fig. 1.

In the drawings, A indicates the top portion of a blast-furnace provided with the usual charging-platform; B, the bell; C, the hopper; D, two pairs of columns arranged upon diametrically-opposite sides of the throat of the furnace; E, a pair of beams reaching across over the throat of the furnace and supported by said columns; F, the bell-rod, reaching upward from the bell between the beams E, the rod in the illustration being really double, being formed of two flat bars set near each other, side by side; G, the usual motor-cylinder, by which the bell is raised and lowered; H, the motor-beam, connected at one end to the piston-rod of the motor-cylinder and at the other end to the bell-rod, the beam centers being supported by plumber-blocks attached to the beams E, the motor-beam working centrally between the beams E; J, the counterbalance-weight blocks; K, the balance-beam, connected at one end to the bell-rod and at the other end to the balance-weight block and supported by the beams E in a manner generally similar to the motor-beam; L, an air-cylinder vertically disposed between two of the columns D under the balance-beam, this cylinder being supported upon the pivot-stud at its lower end, the pivot-stud being supported by the columns, so that the cylinder is capable of oscillating upon the stud, the piston-rod of this cylinder being connected to the balance-beam; M, a side pipe at the air-cylinder, placing the two ends of the cylinder in communication, the points where this pipe communicates with the ends of the cylinder being not directly at the ends of the cylinder, but at some distance therefrom, so that the piston in its stroke may overrun these connections; N, a cock in this side pipe, serving as a means by which its conduit-area may be adjusted, and O petcocks at the extreme ends of the air-cylinder.

The bell is raised and lowered, as usual, by means of the motor-cylinder G, if employed, or by such other motor mechanism as may be preferred, and the bell is counterbalanced by means of the counter-balance J and beam K. As the bell is raised and lowered, the piston of the air-cylinder will obviously travel from one end of the cylinder to the other. In doing this the piston transfers the air in the cylinder from one end of the cylinder to the other, and the cock N may be so regulated as to produce more or less resistance to this transfer, and thereby serve in regulating the speed of the piston of the air-cylinder, and consequently the speed of the bell movement, without imposing a solid, regulative resistance to the bell movement, the elasticity of the resisting medium avoiding this. The cocks O may be entirely or partially open, and consequently when the piston moves from one end to the other of the air-cylinder part of the air will be transferred through the side pipe M and part of the air of the compression will be blown out through one of the petcocks, while air flows in at the other petcock. The communications of the side pipe with the air-cylinder being some distance from the end of the cylinder, it follows that the piston when nearing the ends of its strokes will overrun these communications and prevent further outflow of air through the side pipe. The balance of the stroke of the piston will be completed against the resistance of confined air, except as the air may escape through the petcock. The piston becomes, therefore, cushioned at each end of its stroke. When the piston starts to return at

the end of its stroke, air may flow in through the appropriate petcock, and thus destroy the vacuum. The petcocks are not essential, however, since no vacuum will be formed if the piston leaks a little, which is liable to be the case, and this same leakage will enable the confined air to restrict the motion of the piston by flow after the side pipe communications have been overrun to the atmosphere, while new air from the atmosphere flows into the other end of the cylinder. The air-cylinder thus serves, primarily, in controlling the speed of bell movement through the resistance of an elastic medium. The cushioning of the piston near the ends of its stroke serves in checking the movement of the bell and preventing shocks at the end of the bell travel when the bell is arrested at either end of its travel, and also when the bell is started in either direction.

We show a peculiar mechanism connecting the bell-rod with the two beams; but we disclaim this feature as being of our invention.

We claim as our invention—

1. In a blast-furnace, the combination, with a bell and hopper and actuating-beams, and motor mechanism for raising and lowering the bell, of a resisting air-cylinder provided with a piston having its piston-rod connected to one of said beams, a conduit connecting with the two ends of the cylinder and adapted to have its connections with the cylinder overrun by said piston, a cock in said conduit serving as a means for adjusting the effective conduit area, and cocks at the extreme ends of the cylinder, substantially as and for the purpose set forth.

2. In blast-furnaces, the combination, substantially as set forth, of the columns D, located in pairs at diametrically-opposite sides of the furnace-throat, beams E, supported by said columns, bell and hopper B C, bell-rod F, reaching from the bell upward between said beams, oscillating beams H and K, connected to said bell-rod and disposed between said first-mentioned beams and having their centers supported thereby, and motor mechanism and a counter-balance connected, respectively, with said oscillating beams.

3. In blast-furnaces, the combination, with a bell and hopper, a bell-rod, an oscillating beam connected with the bell-rod, and motor mechanism for raising and lowering the bell through the instrumentality of said beam, of a second oscillating beam connected to the bell-rod, a counter-balance attached thereto, and regulating-cylinder L, connected with said last-mentioned beam.

4. In blast-furnaces, the combination of a bell and hopper, a bell-rod, and mechanism for raising and lowering the bell, of two pairs of columns D, beam K, supported thereby and connected to the bell-rod, counter-balance J, attached to said beam, and air-cylinder L, disposed between the two columns of one of said pairs of columns and connected with said beam.

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