

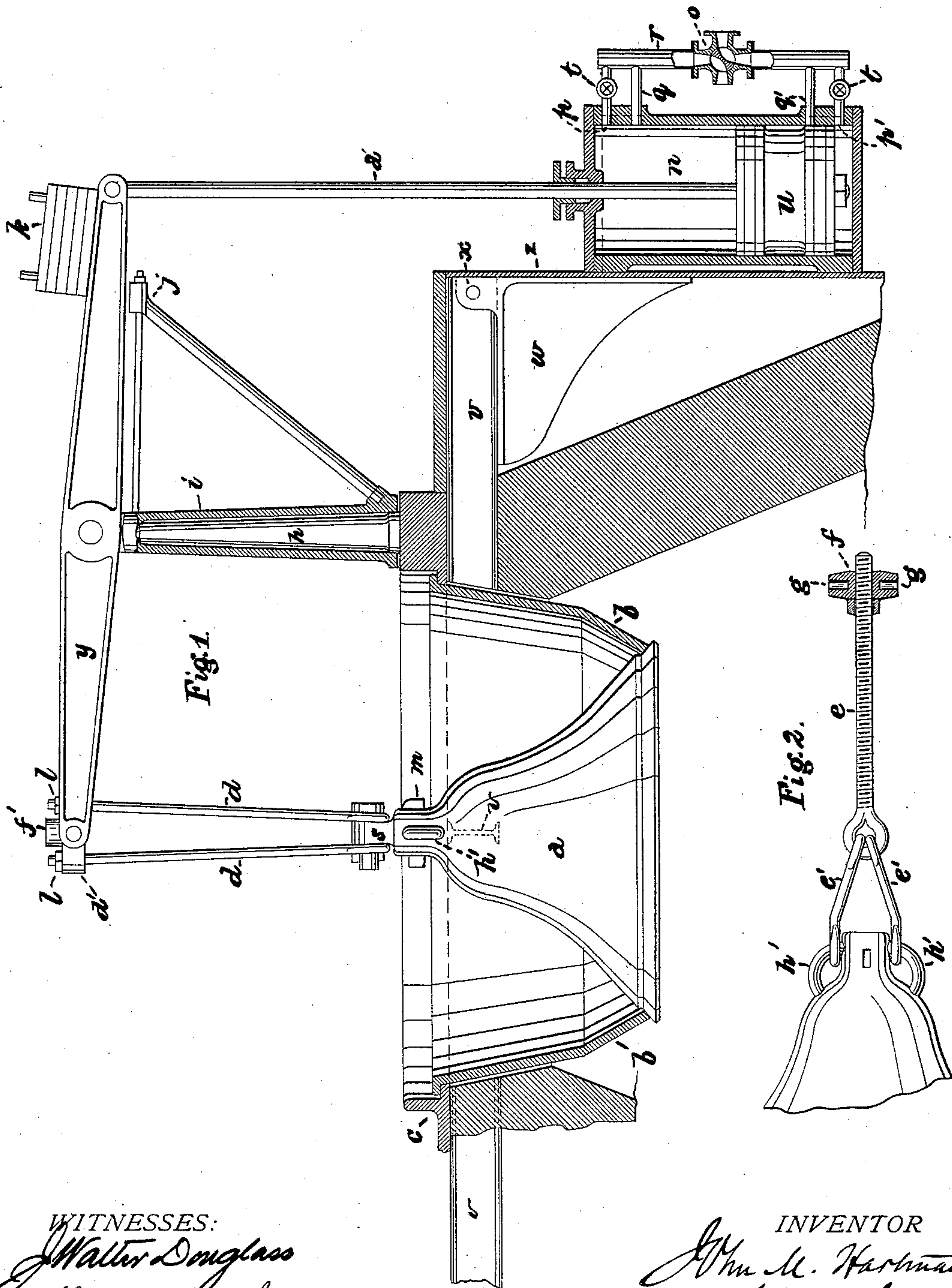
(No Model.)

J. M. HARTMAN.

BLAST FURNACE BELL AND APPARATUS FOR WORKING THE SAME.

No. 321,966.

Patented July 14, 1885.



WITNESSES:
Walter Douglass
Thos M. Smith.

INVENTOR
John M. Hartman
My Atty: C. H. Haly
ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN M. HARTMAN, OF PHILADELPHIA, PENNSYLVANIA.

BLAST-FURNACE BELL AND APPARATUS FOR WORKING THE SAME.

SPECIFICATION forming part of Letters Patent No. 321,966, dated July 14, 1885

Application filed August 20, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. HARTMAN, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain
5 new and useful Improvements in Blast-Furnace Bells and Apparatus for Working the Same.

The following is a specification of said improvements, reference being had to the accompanying drawings, wherein Figure 1 is a central vertical section through the tunnel-head of a furnace embodying my invention; and Fig. 2 is a detailed view, partly in section,
10 of the bell and its lifting device.

The principal objects of my improvements are to afford a proper support for the hopper; to facilitate the removal and replacement of the bell and hopper; to permit the bell to be raised and lowered with rapidity, and to accomplish a better distribution of the stock discharged from the bell.
20

In the drawings, *a* represents the bell, and *b* the hopper, which rests by means of its projecting annular flange upon a flanged ring, *c*. This ring *c* is supported upon beams *v*, preferably four in number, arranged radially at equal distances apart, and hinged at their outer ends to the shell of the furnace, as shown at *x*. A rigid bracket, *w*, also secured to the
30 shell *z* of the furnace, is placed immediately beneath each beam, so as to support it in a horizontal position. The object of so supporting the hopper is to permit the rise and fall thereof under the expansion and contraction of the furnace-walls.
35

Heretofore the supports for the hopper have usually been bolted rigidly to the shell of the furnace, and when the latter was put in operation the walls, expanding upward, were liable to break and tear away the supports. In my improvements this cannot occur, as the hinged beams *v* rise freely with the expansion of the furnace-wall, and upon its contraction fall until they rest upon the brackets *w*.
40

The bell is suspended from the walking-beam *y* by rods *d d*, attached at their upper ends to the pivoted cross-head *d'* by means of nuts *l l*, and having eyes at their lower ends which engage with the projecting ends of a removable T-shaped piece, *s*, secured in the
50 top of the bell by a key, *m*. In the center of

the cross-head is a cylindrical socket, *f'*, having a vertical opening extending through the cross head. The fulcrum of the walking-beam *y* is supported upon a hollow sleeve, *i*, which fits over a post, *h*, mounted upon the top of the furnace-shell. Removable counter-weights
5 *k* are provided at that end of the walking-beam which is farthest from the bell attachment. A bracket, *j*, projects from the sleeve *i* beneath the counter-weight *k* of the walking-beam. The object of these devices is as follows:

Heretofore when it has been desired to remove the bell and hopper from the furnace for repairs or other purposes it has been customary to do so by means of a tripod of poles to which an ordinary block and fall was attached. The escaping gas from the furnace frequently set fire to the rope or fall, making
65 the work difficult and dangerous.

To remove the bell and hopper by my improved device, a screw, *e*, Fig. 2, is attached by means of hooks *e' e'* to the eyes *h'* upon the top of the bell, the upper end of the screw passing through the hole in the vertical socket
70 *f'*. A nut, *f*, is run onto the top of the screw *e* above the socket *f'* until the weight of the bell rests thereon. The nuts *l l* are then run off from the rods *d d* and the latter are removed. Poles or bars being then inserted in the radial sockets *g* of the nut *f*, (see Fig. 2,) the workmen walk around the furnace-top, turning said bars until, by the action of the screw and nut, the bell and hopper have been
85 raised clear of the ring *c*. The piston-rod *a'* having been detached from the walking-beam *y*, the latter can be swung around upon the post *h* in either direction, the counter-weights *k* balancing the weight of the bell and hopper.
90

The object of the bracket *j* is to support the counterweighted end when the bell and hopper have been landed upon the scaffolding or platform alongside of the furnace.

By a reversal of these operations the bell and hopper can be replaced in position.
95

To raise and lower the bell itself when in position upon the hopper, I use the piston-rod *a'*, piston *u*, and cylinder *n*, with steam or other motive power. The cylinder has two ports, *p q* and *p' q'*, at each end, arranged longitudinally a short distance apart, the combined area
100

of each pair being equal to that of the steam-pipe *r*. Regulating-valves *t t* are placed in the ports *p p'*, which are nearest the respective ends of the cylinder, and the admission and
5 discharge of steam is effected by an ordinary four-way cock, *o*, in the steam-pipe *r*.

The object of this arrangement is as follows: When it is desired to lower the bell, (the parts being then in the position shown in Fig. 1.)
10 the four-way cock *o* is turned as then indicated, so as to admit steam to the lower end of the cylinder. The port *q'* being, however, closed by contact with the side of the piston *u*, the only entrance for the steam is by the port *p'*,
15 the area of which being small the piston is started by a comparatively slight steam-pressure, and therefore commences its upward movement slowly and without a jerk. As soon, however, as the ascent of the piston causes it
20 to open the port *q'*, the full head of steam is admitted and the piston rises with great rapidity, the exhaust from the other end of the cylinder taking place through the ports *p q*. As soon, however, as the top of the piston passes the
25 port *q* the area of exhaust is diminished by one-half or more, the result being that the air in the upper end of the cylinder cushions the piston and prevents the bell from being stopped with a sudden jerk or the parts from striking,
30 the exhaust being completed slowly through the single port *p*. The reverse of these operations takes place when the bell is to be raised.

The valves *t t* enable the operator to regulate the admission and exhaust of steam through
35 the ports *p p'*.

Heretofore it has been usual to construct furnace bells with straight inclined sides, the form being nearly that of a true cone. The tendency
40 of this form is to deliver the stock but a short distance beyond the periphery of the bell and to cause the fine and coarse ores to drop in nearly the same circle.

It is found in practice that furnaces work
45 better with the fine ore near the center and the coarse portions farthest therefrom. I there-

fore construct the bell *a*, as shown in Fig. 1, with concave or inwardly-curved inclined sides, which shoot the coarse ore farthest from the center, permitting the fine to drop near to
50 the periphery of the bell. By this means I obtain a much better distribution of the stock than where the surface of the bell is made in the usual conical form or with a convex incline.

Having thus described the nature and objects
55 of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the hopper, of the hinged supporting-beams *v* and subjacent
60 brackets *w*, substantially as set forth.

2. The combination of the walking-beam *y*, having removable supports *d*, by which the bell is suspended, the socket *f'*, the screw *e*, passing freely through said socket and provided with a suitable attachment to the bell, and the
65 nut *f*, engaging with said screw and supported upon said socket *f'* so as to turn freely thereon, substantially as set forth.

3. The combination of the flanged ring *e*, the hopper *b'*, having a flange adapted to rest upon
70 said ring, the bell *a*, whose lower end is of greater diameter than the opening in the lower end of said hopper, the post *h*, the sleeve *i*, adapted to revolve upon said post, and the walking-beam *y*, pivoted to said sleeve, and
75 provided with a device for suspending the bell *a* and with suitable actuating mechanism, substantially as set forth.

4. The combination, with the furnace, of the bell *a*, having concave or inwardly-curved in-
80 clined sides, whereby the deposit of the fine stock at the center of the furnace and the coarse stock around its sides is effected.

5. The combination, with the walking-beam *y*, having its fulcrum supported upon a verti-
85 cal pivot, of the counter-weight *k* and bracket *j*, substantially as and for the purposes set forth.

JOHN M. HARTMAN.

Witnesses:

J. WALTER DOUGLASS,
THOS. M. SMITH.