

(No Model.)

3 Sheets—Sheet 2.

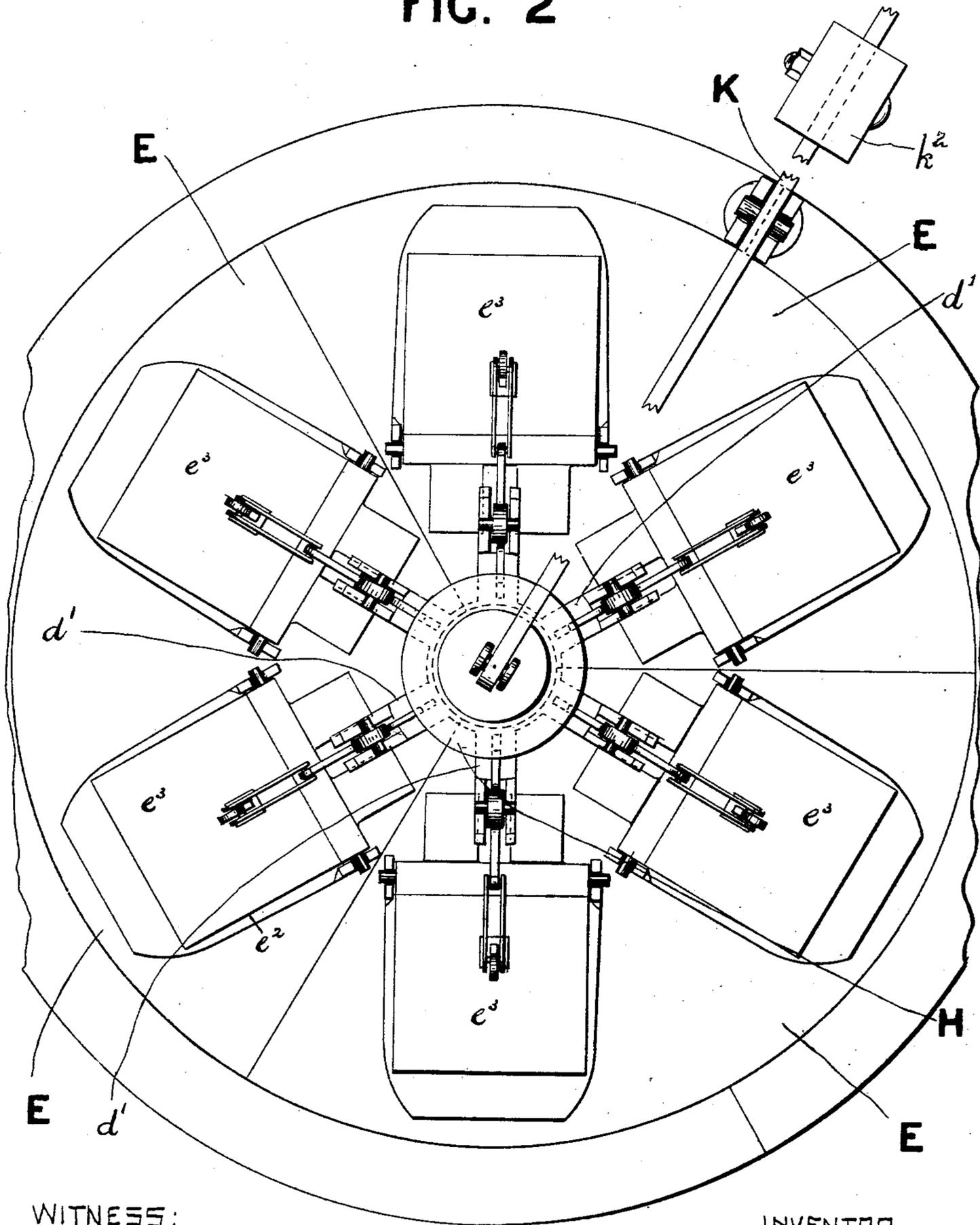
T. LEWIS.

BLAST FURNACE AND MEANS FOR CHARGING SAME.

No. 593,358.

Patented Nov. 9, 1897.

FIG. 2



WITNESS:
Richard Weber
Otto Munk

INVENTOR
Thomas Lewis
by
Richard Weber Attys

(No Model.)

3 Sheets—Sheet 3.

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FIG. 4

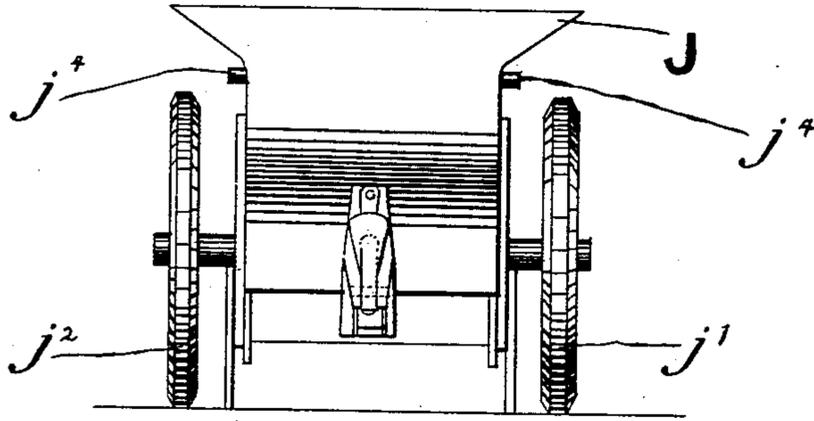
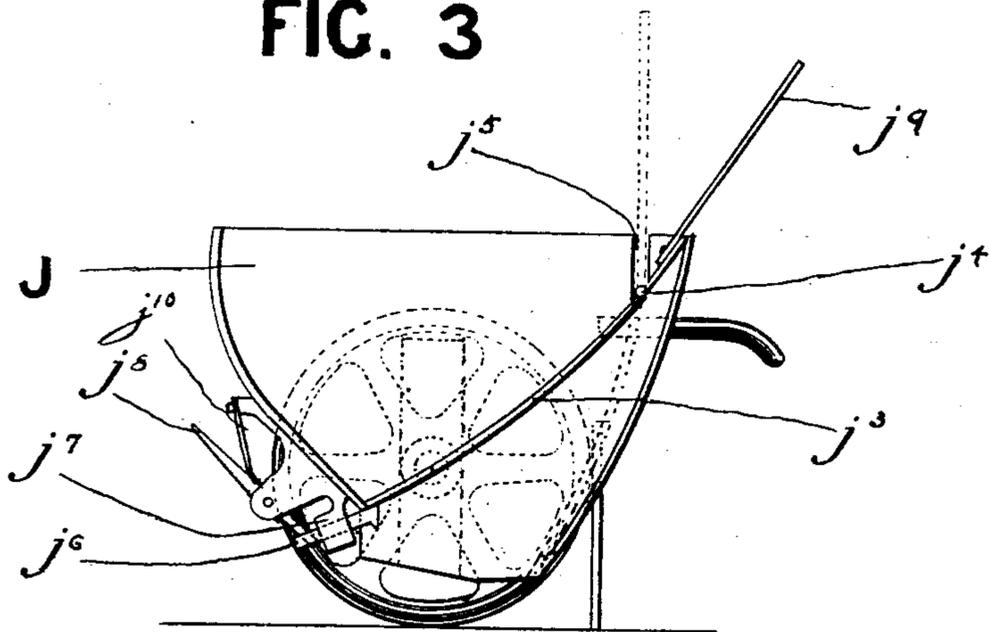


FIG. 3



WITNESS:
Richard W. He
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Thomas Lewis

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UNITED STATES PATENT OFFICE.

THOMAS LEWIS, OF PRIORS LEE, ENGLAND.

BLAST-FURNACE AND MEANS FOR CHARGING SAME.

SPECIFICATION forming part of Letters Patent No. 593,358, dated November 9, 1897.

Application filed January 6, 1897. Serial No. 618,147. (No model.) Patented in England May 12, 1896, No. 10,061.

To all whom it may concern:

Be it known that I, THOMAS LEWIS, blast-furnace manager, a subject of the Queen of Great Britain, residing at Stone House, Priors Lee, near Shiffnal, in the county of Salop, England, have invented certain new and useful Improvements in Blast-Furnaces and in the Mode of and Means for Charging the Same, of which the following is a specification.

The invention has been patented in England, No. 10,061, dated May 12, 1896.

My invention has for its object improvements in blast-furnaces and in the mode and means for charging the same which enable me to effect considerable economy in regard not only to the escape of the gases or heat which should pass down the "down-carrier" discharge-pipe and convey such gases or heat to the hot-air ovens, boilers, and other parts where the gases are used, but I am also able by my invention at the same time to prevent cold air from entering while the cover-bell is lowered during the charging operation. This loss is considerable where only one furnace is operated, but where a series are connected the loss is still more, as the opportunity for the entrance of cold air is increased. Besides this in the case of a series of furnaces two or more bells may sometimes be lowered at or about the same time, which changes the current of the gas and deprives the stoves, boilers, &c., of their regular supply, and much inconvenience and loss are thus occasioned. Besides the above inconveniences and loss the exposure occasioned is liable to produce explosions.

My invention also obviates the swaying of the bell and consequent injury to the furnace-lining and bell and ring, as well as irregular charging.

Though my invention may be applied to furnaces with their existing bells, I prefer to fit around the mouth of the case in which the bell works a removable mouthpiece or ring which fits onto a projection, the inner part of the ring having also a beveled projection, against which the edge of the bell fits as a stop. Upon the top of the bell I fix firmly a vertical plunger or guide of considerable stiffness by means of a flange bolted to the top of the bell. This plunger works in a cham-

bered socket-piece which is fixed upon a frame or covering mounted over and upon the mouth of the furnace. This covering may be made in any number of segments or plates and is supplied with any desired number of charging-holes, according to the size of the furnace, but generally from four to six holes will meet the requirements. Upon each charging-hole I fix a frame formed to receive the doors to shut down thereupon, the doors when closed tapering toward the sides of the furnace upon the tapered door frames or seats. The plunger-casing is fitted with brackets or arms over each door, upon which levers are hung for operating the doors. The levers or series of levers are hung from the brackets or arms and passed down to a projecting eye or attachment upon the door, and the door is constructed with a back balance-weight, which makes the door easily operated, and the cover-plates may be recessed to allow the balance-weight to pass sufficiently low to allow the door when open to take a vertical or nearly vertical position. Also projecting from the top of the lever is a catch, which passes inwardly toward the plunger. Now the plunger passes upward past the catch and has upon it an annular balance-weight, which covers the catch or all the catches, for there is one catch and lever to each door. Then a rod passes down or partly down the plunger and is hinged to the bottom or other part of the plunger, forming a trunk. This rod is connected to one end of a beam mounted upon a column or stand, the other end of the beam being fitted with a balance-weight, and this end may also be attached to a winch or gearing or other means for raising and lowering the bell, as is usual. When the bell is up and the furnace closed, the doors are also maintained in their open position; but immediately the bell is commenced to be lowered and before it has passed through the ring at the mouth of the furnace the weight above the plunger or trunk presses upon the catches and closes all the doors down upon their seatings, so that while the material is discharged and spread by the bell the mouth of the furnace is sealed. Now when the doors are open and the bell closes the mouth of the furnace the charging is accomplished by barrows which are specially con-

constructed for the purpose, as follows: The barrow has two wheels mounted upon each side, and the inner back portion is hung upon a pivot, the bottom edge of which is secured by a sliding bolt or its equivalent hung in a case at the front of the barrow. This bolt is operated by a lever the end of which projects upward, so as to strike against the door of the furnace when the barrow is pushed over the charging-hole. This draws the bolt back, and the weight of the material forces the door down, and the barrow is discharged and drawn back and the bolt replaced for refilling.

In order that my invention may be clearly understood and carried into practical effect, I have appended hereunto the accompanying two sheets of drawings, which clearly illustrate the same.

Figure 1 is a part sectional elevation of my improved arrangements for charging a blast-furnace fixed to the mouth of the furnace. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a part sectional side elevation of my specially-constructed charging-barrow. Fig. 4 is a front end elevation of Fig. 3.

A is the furnace, in the top of which the case a' is fixed, and although my invention may be applied to furnaces with existing cases I prefer to fit around the mouth in which the bell B works the removable mouthpiece or ring a^2 , which rests on the projection a^3 . The inner face of the ring has also a beveled projection a^4 , which forms a stop for the bell, the bottom edge of which fits against the same. I firmly fix on the top of the bell the vertical hollow plunger or guide b' by means of the flange b^2 , which is bolted to the top of the bell. This plunger works in the chambered socket-piece D, fixed upon the frame or covering E, mounted over and upon the mouth of the furnace. The covering E may be made in any number of segments or plates and provided with any desired number of charging-holes e' , according to the size of the furnace, but preferably six, as shown at Fig. 2, Sheet 2. I fix around each charging-hole the frame e^2 , tapering toward the sides of the furnace, which forms a seating for each of the doors e^3 when closed, or the frames e^2 may be cast or formed out of the same piece of metal as the segments which form the covering E.

The plunger-casing D is provided with arms or brackets d' over the center of each door e^3 , having the slots d^2 formed on the top thereof, in which the levers d^3 d^4 for operating the doors are pivoted. These levers, which are hung from the brackets or arms, pass down to the attachment e^4 on the top of the door, and each door is constructed with a balance-weight e^5 at the back, which enables the door to be easily operated, the covering E being recessed at e^6 to allow the balance-weight to pass sufficiently low to allow the door to assume a vertical or nearly vertical position when open. Also projecting from the top of each lever d^2 is a catch d^5 , passing inward toward the plunger b' . This catch has a

crooked end in order to afford a bearing-point for the weight H to rest on. The top end of the said plunger extends above the plunger-socket D, and the balance-weight H fits loosely over the top and covers all the catches d^4 . Passing down the interior of the plunger is a rod h' , one end of which is hinged to the bottom, or the rod may only pass partly down the plunger and be hinged to any other part, the other end, which extends beyond the top of the balance-weight H, being hinged to one end of the beam K, mounted upon a column or stand k' , and the other end of the said beam is fitted with a balance-weight k^2 . This end may also be attached to a winch or gearing or their equivalent for raising and lowering the bell, as is usual.

The charging of the furnace is accomplished by barrows specially constructed for the purpose, but these barrows are equally applicable for other purposes. The barrow J, which may or may not be corrugated, has two wheels j^1 j^2 , mounted upon an axle at each side. The back end j^3 of the barrow is hung upon the pivot j^4 , mounted in the slots j^5 , formed in the sides of the barrow. The bottom edge of the back end is secured in its closed position by the bolt j^6 or its equivalent working in the slot j^7 , connected to the front end of the barrow. This bolt is operated by the lever j^8 , the top end of which projects upward and is forced back by the spring j^{10} . The part j^9 is provided for closing the end after the contents have been discharged. This part j^9 acts as a lever-arm by which the operator may normally close the bottom j^3 .

The *modus operandi* is as follows: When the bell is up and the furnace closed, as shown at Fig. 1, the doors e^3 are open ready for the furnace to be charged. The barrow is then wheeled over the charging-hole. The lever j^8 at the front of the barrow, coming in contact with the door, draws the bolt back, and the end j^3 swings open, discharging the contents into the furnace. When the furnace has been charged, the beam is operated and the bell lowered, but before it passes through the ring a^2 at the mouth of the furnace the weight on the top of the plunger presses upon the catches d^4 , which operates the levers d^3 and closes all the doors down upon their seatings, so that while the material is being discharged and spread by the bell the mouth of the furnace is sealed, thereby preventing any gases from escaping.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In combination, the furnace, the bell, the cover at the top of the furnace, charging-door therein, the plunger extending up from the bell with means for operating the same, the means for opening the charging-door when the bell and plunger are up, and the weight H sliding loosely on the plunger with connections between said weight and the charging-

door to receive said weight and close the door as the bell opens, substantially as described.

2. In combination, the furnace, the bell with its plunger, the cover for the furnace above the bell, the charging-door in the cover with the counterbalance-weight for opening it, the weight sliding loosely on the plunger and the lever connections between the weight and the door to receive said weight and thus operate the door to close the top of the furnace as the bell opens, substantially as described.

3. In combination, the furnace, the vertically-movable bell for closing and opening the same, the cover over the bell, the charging-door in the cover to close the furnace when the bell is open and means controlled by the vertical movement of the bell for opening and closing the charging-door as the bell is closed and opened, said means being in direct engagement with the bell-plunger, substantially as described.

4. In combination with a blast-furnace, the cover, the charging-door in the cover and a charging apparatus consisting of a barrow

having a movable bottom with releasing means therefor arranged to contact with the charging-door when the said door is in its open or upright position and thus release the bottom of the barrow to discharge its load into the furnace-top said releasing means extending forwardly from the barrow.

5. In combination with a furnace and its charging-opening, a cover, a charging-door in said cover, a charging device consisting of a barrow having a movable bottom, a catch-bolt j^6 , and a lever j^8 for operating the same through contact with the open door when the barrow arrives over the furnace-opening, the said lever j^8 projecting forwardly from the barrow to contact directly with the uplifted door, substantially as described.

In testimony that I claim the foregoing as my own I affix my name in the presence of two witnesses.

THOMAS LEWIS.

Witnesses:

JOHN A. DARBY,
HARRY LANGSLOW.