

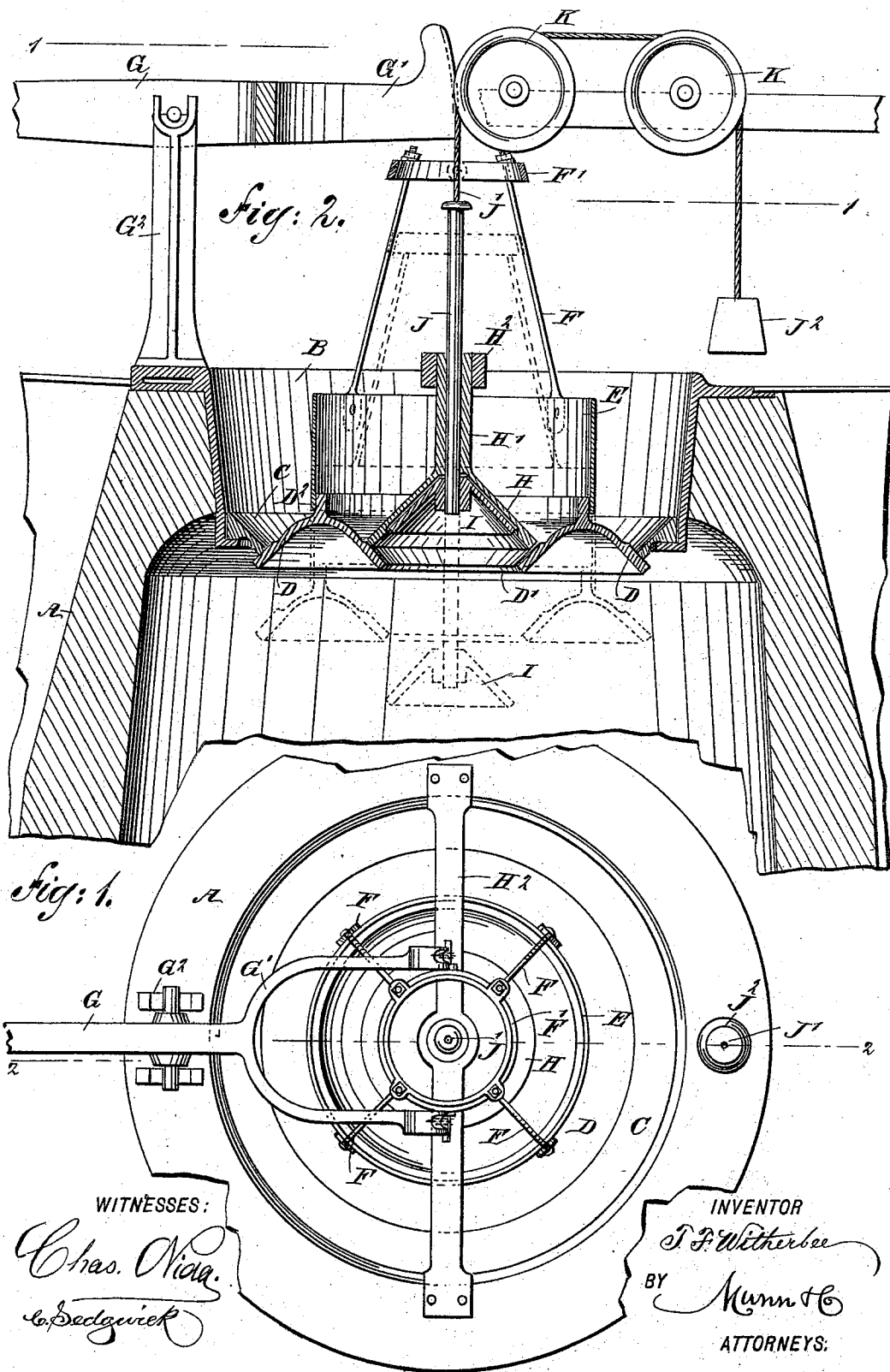
(No Model.)

T. F. WITHERBEE.

CHARGING APPARATUS FOR FILLING BLAST FURNACES.

No. 518,769.

Patented Apr. 24, 1894.



UNITED STATES PATENT OFFICE.

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CHARGING APPARATUS FOR FILLING BLAST-FURNACES.

SPECIFICATION forming part of Letters Patent No. 518,769, dated April 24, 1894.

Application filed June 27, 1893. Serial No. 478,963. (No model.)

To all whom it may concern:

Be it known that I, THOMAS F. WITHERBEE, of Port Henry, in the county of Essex and State of New York, have invented a new and Improved Charging Apparatus for Filling Blast-Furnaces, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved charging apparatus for filling blast furnaces, which is simple and durable in construction, very effective in operation and arranged to properly fill the stack even if a very finely divided ore is to be treated.

The invention consists of certain parts and details, and combinations of the same, as will be hereinafter described, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in both the figures.

Figure 1 is a sectional plan view of the improvement on the line 1—1 of Fig. 2; and Fig. 2 is a sectional side elevation of the same on the line 2—2 of Fig. 1.

My improvement is more especially designed for use on blast furnaces in which extremely fine ores, such as magnetically concentrated iron ores are to be treated; the said ores from their fine and dusty condition have heretofore caused considerable trouble in properly filling the furnace, when charged in the usual manner by the usual single or a common double bell. For instance, when a single bell is used, the ore, fuel and flux are put in an annular ring next to the lining, where the ore and other fine material remains and only the coarse part of the charge, that is, the fuel and flux, rolls to the center, thus forming an open and free channel for the ascending gases, thereby causing center circulation, so that the reducing gases in effect are not brought in contact with the ore and reduction is imperfectly performed. This leads to a great waste of fuel, irregular working of the furnace, and varying quality of iron, also frequently to the burning of a hole up through the center of the materials, thereby reducing the size and capacity of the furnace and at the same time forming a scaffold to be followed by slipping, clogging up of the tuyeres, and finally, loss of

the furnace, unless the latter is rescued by the use of dynamite and a kerosene blow pipe, at a great loss of time and money. The above difficulties are entirely overcome by the charging apparatus presently to be described in detail.

On the upper end of the stack A, of the furnace is secured the usual hopper B, formed in its contracted bottom with a seat C, on the under side of which is adapted to be seated the bell D, made in the shape of a ring having an inverted V-shaped cross section, as plainly illustrated in Fig. 2. The bell D has a central opening D', and is provided on its ridge with an annular flange D², on which is secured a band extending upwardly and forming a hopper E, for that part of the bell inclosed by the band. The upper end of the hopper E is provided with rods F, connected with a ring F' supported from the forked end G' of a lever G, fulcrumed on a suitable bracket G², supported on the upper end of the stack A, the said lever G being under the control of the operator to impart a swinging motion to the same, so that the bell D with its hopper E is lowered or raised to move the bell either downward into the furnace or upward onto its seat C, secured to the hopper B; see Fig. 2. The central opening D' of the bell D is adapted to be closed by a fixed bell H, provided with an upwardly-extending hollow stem H' fastened to a cross beam H², supported on the upper end of the stack A. On the under side of this bell H is adapted to be seated a spreading bell I, fastened on an upwardly-extending rod J, passing through and guided in the hollow stem H', the upper end of the said rod J being connected with one end of a rope J', which passes over suitable idlers K, to carry at its other end, a weight J², for counterbalancing the said spreading bell I. By moving the weight J² upward the spreading bell I is caused to descend to the position shown in dotted lines in Fig. 2 and by moving the weight J² downward, the said spreading bell is seated within the fixed bell H.

The operation is as follows: When the several parts are in the position as illustrated in full lines in Fig. 2, then part of the charge can be placed in the hopper B and part can be placed in the hopper E, so that whenever

the operator imparts a swinging motion to the lever G to lower the forked end thereof, then the bell D descends and the charge contained in the hopper B is deposited within the stack A in an annular ring next to the lining of the stack. That part of the charge within the hopper E will be deposited in an annular ring within the stack A, the said annular ring being, however, of a less diameter than the annular ring of the charge coming from the hopper B, it being understood that the spreading bell I had previously been lowered to the position shown in Fig. 2 in dotted lines. If, however, the said spreading bell I has not previously been lowered, then the charge contained in the hopper E will be deposited in a pile in the center of the stack at the time the bell D is lowered. Thus, it is optional with the operator to divide the charge as he deems necessary, into the hoppers B and E, and to deposit the charge contained in the hopper E nearer the lining of the stack or in the center of the same as the case may require.

It is obvious that by using such a charging apparatus, a great variety of charging combinations can be formed to permit of placing the materials in any one of the localities within the stack as indicated above.

As a further illustration of the practical use of this charging device, supposing that the furnace from any cause is "ringed" up on the sides or incipiently scaffolded, by charging entirely or mainly, around the fixed bell H with the spreading bell I raised, the circulation would be forced to the sides and the scaffold or ring would be removed, probably without slipping, as the center of the stack would be filled and no cavity would be left in which the sides could slip. Furthermore, when a mixed charge of coke or anthracite coal is used, then in order to control or change the current of the gases, the coke and anthracite could be separately deposited in the furnace in whole or in part, as might be best to suit conditions, and in a like manner the coarse or fine ores could be deposited at will in the desired place within the stack. The movable bell D can be suspended in any way desired, either by the usual lever G, as shown and described above or by some other device operated either by hand or power. The spreading bell I is shown as counterbalanced and is to be shifted by hand, but it may be arranged to be shifted

by power. Furthermore the spreading bell may be shifted by any mechanical arrangement automatically and in any desired sequence, that is, alternately raised or lowered or in any combination, by suitable means provided, simply by operating the main movable bell D, which in turn can be made to shift the spreading bell I.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A charging apparatus for blast furnaces, which comprises an annular movable bell having a central aperture, the spreading bell, I, which is of less diameter than said aperture and thereby adapted to pass through it so as to occupy a position either above or below the annular bell, and means for raising and lowering the said spreading bell, as shown and described.

2. A charging apparatus for filling blast furnaces, comprising a movable bell having a central aperture, and a spreading bell adapted to pass through the said central aperture below the said movable bell and centrally thereof, and a fixed bell adapted to close the said central aperture of the movable bell and also adapted to receive the said spreading bell, substantially as shown and described.

3. A charging apparatus for blast furnaces, which comprises an annular bell arranged within a hopper, and having a vertical, circular extension, E, constituting a supplemental inner hopper, a bell for closing such inner hopper, and means for raising and lowering the annular bell and its hopper, as and for the purpose specified.

4. A charging apparatus for filling blast furnaces, comprising a hopper secured to the stack of the blast furnace, an annular movable bell adapted to be seated on the contracted end of the said hopper, the said movable bell having a central aperture, a second hopper secured on the crest of the said movable bell, a fixed bell adapted to close the said central aperture of the said movable bell, and a spreading bell adapted to be seated within the said fixed bell and adapted to pass through the said central aperture of the movable bell, substantially as shown and described.

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Witnesses:

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