

No. 680,490.

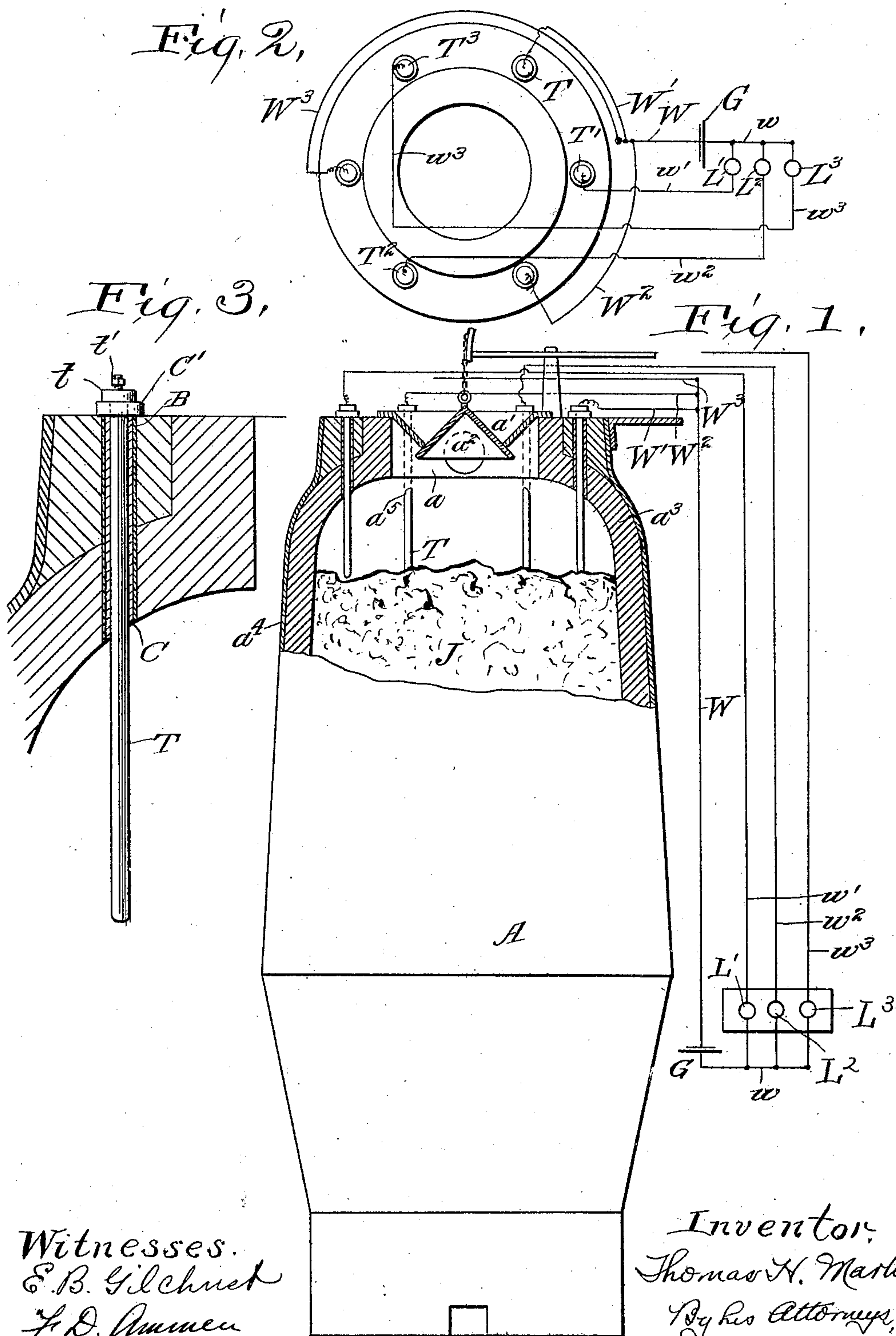
Patented Aug. 13, 1901.

T. H. MARTIN.

APPARATUS FOR INDICATING THE LEVEL OF CHARGES IN FURNACES.

(Application filed Mar. 2, 1901.)

(No Model.)



Witnesses.
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UNITED STATES PATENT OFFICE.

THOMAS H. MARTIN, OF CLEVELAND, OHIO, ASSIGNOR OF TWO-THIRDS
TO FREDERICK L. GROMMER AND ALBERT T. DE FOREST, OF SAME
PLACE.

APPARATUS FOR INDICATING THE LEVEL OF CHARGES IN FURNACES.

SPECIFICATION forming part of Letters Patent No. 680,490, dated August 13, 1901.

Application filed March 2, 1901. Serial No. 49,531. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MARTIN, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Apparatus for Indicating the Level of Charges in Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of this invention is to provide simple and efficient means for indicating the level of the charge in a furnace.

The invention is especially applicable to blast-furnaces.

In the older blast-furnaces the charge is sent up in barrows on an elevator and the workmen at the top wheel it to the mouth of the furnace and dump it in. Sometimes they dump more on one side than on the other, and it is a difficult matter when the bell drops to open the mouth to tell from observation as to the level of the load on account of the gases and smoke which rise. In the most modern blast-furnaces the elevator is done away with and the charge is elevated and dumped by mechanical means governed from the ground; but in order that the furnace may not be too full and that the charge may be approximately regular it has been customary to keep a man at the top of the furnace, who inserts a pole periodically into the furnace, and thus ascertains the approximate level. This not only requires the services of an extra employee on each turn, but it is a dangerous occupation for him, as he is liable to be overcome by the gases and sometimes falls to the ground or into the hopper. In either style of furnace, however, the best that has been done is to ascertain a rough approximation of the general height of the load, and the result has not been entirely satisfactory, as in order to obviate the danger of overcharging the furnace, thus choking the gas-hole or preventing the bell reseating, the furnace has been uniformly undercharged, and hence its efficiency decreased.

My invention consists of applying to the furnace an electrically-operated signal and such

circuits and terminals that the circuit is governed by the charge when it reaches a certain point. In applying this to a blast-furnace, as the material of the charge is more or less lumpy and is only approximately level, I provide a plurality of electrodes around the furnace operating in independent pairs, whereby the general level of the charge may be observed by the signals.

The invention consists of such an arrangement and operation, broadly, as above explained and more specifically as shown in the drawings and hereinafter described in detail, all of which is fully set out in the claims.

In the drawings, which fully illustrate the preferred form of my invention, Figure 1 represents a blast-furnace in elevation, its upper part being in section and showing my invention as applied to the same, but with some of the circuits incomplete, as will appear. Fig. 2 is a plan of the same, showing said circuits complete. Fig. 3 is an enlarged section showing the construction of the terminals and the means for insulating the same from the furnace-body.

Referring to the parts by letters, A represents a blast-furnace of any common form, having, however, a contracted throat a , which may be provided with the usual hopper a' and bell a^2 . The furnace, as is usual, is provided with a fire-brick lining a^3 and a retaining outer wall a^4 , of sheet-steel.

In applying my invention to such a furnace as I have described I provide a plurality of openings a^5 in the furnace-top, which may be vertical, and within each is fixed an iron pipe B. This pipe carries within its bore a projecting rod T, which may be of steel, and packing C, of suitable non-conducting fireproof material, such as asbestos, serves to insulate this rod from the pipe B. A large washer C', of non-conducting material, may support the head t of the rod T. Each of the rods T may be provided with a binding-post t' , to which electric wires attach, so that these rods may form electric terminals. These rods are connected in pairs in a circuit including a source of current and a signal, such as an incandescent lamp. Now when the charge in the fur-

nace reaches the maximum height the coke or the ore will bridge the distance across the pairs of electrodes and complete the circuit, thus causing the lamp to light, and the height of the charge at the point will be known. If one or more of the signals require a material charge to cause their lighting after others have lighted, it will indicate that the charge is not being properly apportioned to the various parts of the furnace. The electrodes T, being uncovered for a considerable distance from their lower ends, do not require the contact at their extreme ends, wherefore if there should happen to be limestone in the charge at the extreme end of the electrode the contact will soon be made by coke or ore at the side of it, and this will be a close enough approximation for all practical purposes.

With the circuits as arranged in the drawings, G represents a battery or generator, from which run main conductors W w. The mains have, respectively, the branches W' W² W³ and w' w² w³. The branches w', w², and w³ run, respectively, to alternate terminal rods T', T², and T³, and they carry, respectively, the electric lights L', L², and L³. Evidently if any one of the intermediate terminal rods T is in contact with the charge J and one of the terminal rods T', T², or T³ contacts with the charge also the corresponding light will become incandescent. Thus suppose the terminal rod T³ and the one immediately to its right make contact with the charge. The light L³ will become incandescent immediately, the circuit being as follows: by branch W', main W, generator G, main w, branch w³, light L³, terminal rod T³, to the charge J, to first terminal.

What I claim is—

1. The combination of a furnace, a pair of electric terminals in the interior thereof, an electric circuit leading from said terminals and including a source of current and a signal the same being arranged so that the circuit is closed by the conductive charge in the furnace bridging from one of said terminals to the other, substantially as described.

2. The combination of a furnace having an

opening near its throat, a pair of insulated rods mounted therein, an electric circuit including a source of current and a signal connected to said rods and arranged so that the circuit is closed when the conductive charge bridges said rods, substantially as described.

3. The combination with a blast-furnace of a plurality of electrodes extending thereinto and arranged approximately regularly around the upper part thereof, electric circuits leading therefrom including a source of current, and signals whereby the approximate general level of the load across the furnace may be determined, substantially as described.

4. The combination with a blast-furnace having at its upper end a central charge-opening, a plurality of rods arranged around said charge-opening and projecting downward into the interior, means for insulating said rods from the metallic part of the furnace, a series of signals, and a source of current, and suitable electric connections whereby when the conductive charge bridges pairs of electrodes the signal is operated.

5. The combination of a blast-furnace, a plurality of insulated rods extending thereinto and arranged approximately regularly thereabout, a source of current, a system of branch conductors from said source leading to alternate members of said rods, electric signals on said branches, the intermediate rods being connected with the other side of the source of current, substantially as described.

6. In combination with a blast-furnace having openings near its top, pipes mounted in said openings, projecting rods carried in said pipes respectively, insulated packing around said rods, electric circuits, said rods forming terminals for the same, and electric signals in said circuits, substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

THOMAS H. MARTIN.

Witnesses:

ALBERT H. BATES,
H. M. WISE.

It is hereby certified that the name of the first-mentioned assignee in Letters Patent No. 680,490, granted August 13, 1901, upon the application of Thomas H. Martin, of Cleveland, Ohio, for an improvement in "Apparatus for Indicating the Level of Charges in Furnaces," was erroneously written and printed "Frederick L. Grommer," whereas said name should have been written and printed *Frederick L. Grammer*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 3d day of September, A. D., 1901.

[SEAL.]

F. L. CAMPBELL,
Assistant Secretary of the Interior.

Countersigned:

E. B. MOORE,
• *Acting Commissioner of Patents.*