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G. WEHR

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BLAST FURNACE CHARGING BELL

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2 Sheets-Sheet 1

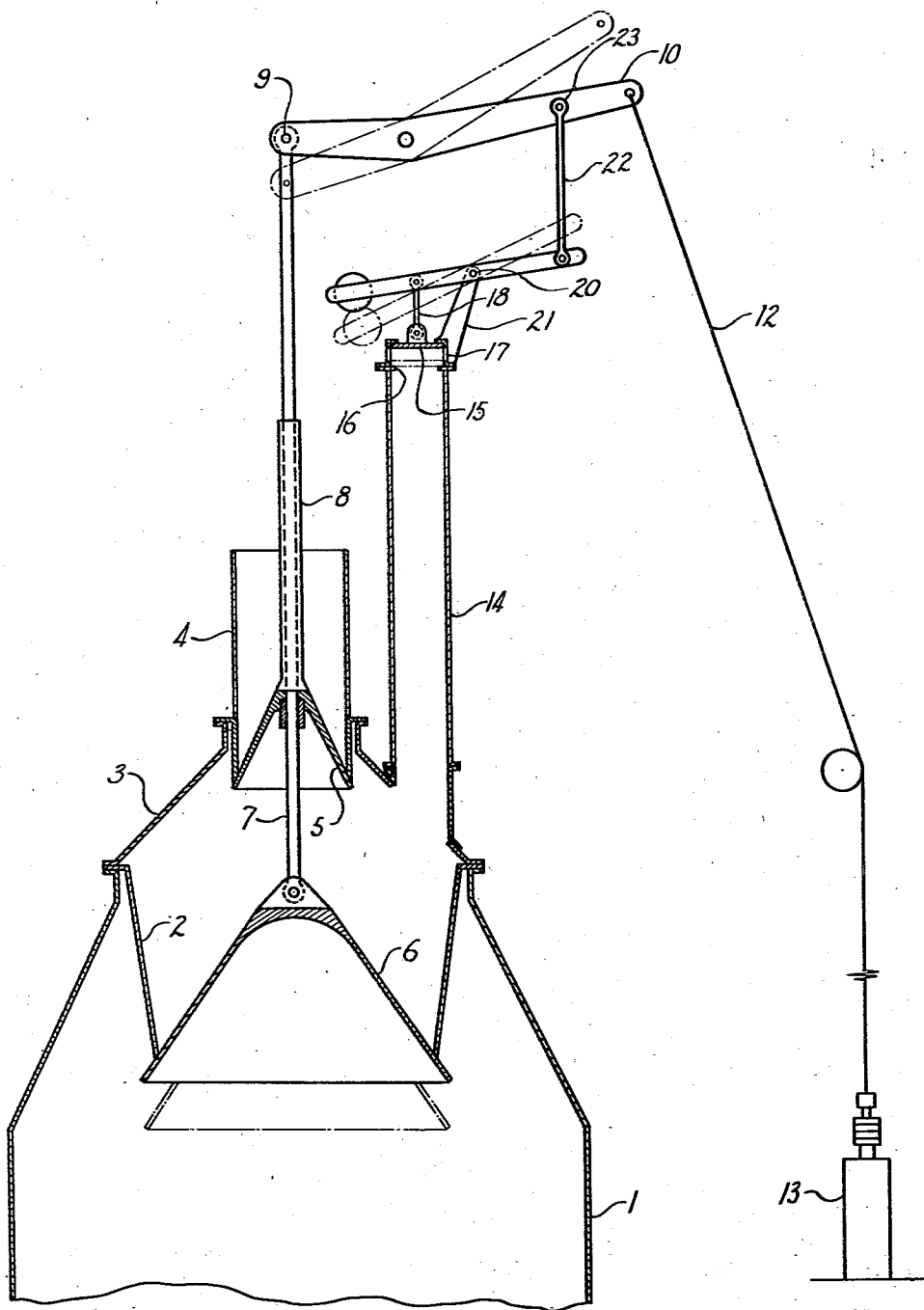


Fig. 1

INVENTOR

Gary Wehr

BY *William B. Jaspert*

ATTORNEY

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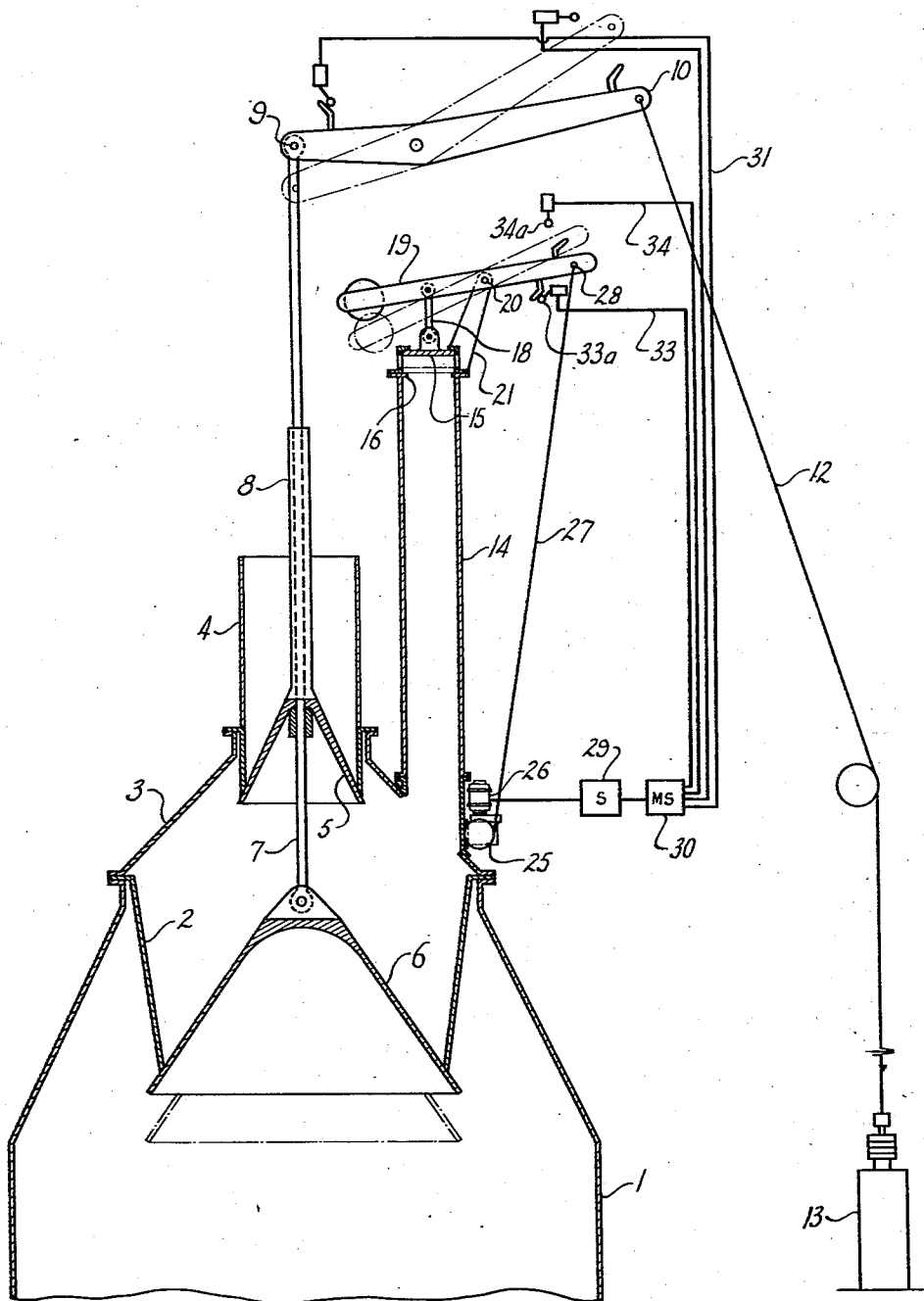


Fig. 2

INVENTOR

Guy Wehr

BY *William B. Jaspert*

ATTORNEY

UNITED STATES PATENT OFFICE

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BLAST FURNACE CHARGING BELL

Guy Wehr, Steubenville, Ohio

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4 Claims. (Cl. 266—27)

This invention relates to blast furnace charging mechanism and more particularly to a ventilating system for preventing the accumulation of explosive gas mixtures in the charging chamber.

Blast furnaces are charged at the top, there being a large charging bell constituting the base of the charging chamber and a small bell constituting a portion of the roof of the charging chamber, the furnace burden, consisting of iron ore, limestone and coke, being dumped above the small bell which is lowered to drop the charge into the charging chamber at the time the large bell is in closed position, and the latter is lowered to drop the charge into the furnace when the small upper bell is in closed position.

When the large bell is open the gases of the furnace pass upwardly into the charging chamber and when the large bell is closed and the small charging bell is opened the inrushing air will produce an explosive mixture which may be ignited by a spark produced from charging of a metal object through the upper bell.

It is among the objects of the present invention to maintain atmospheric pressure when the charging bells are closed and prevent the accumulation of explosive mixtures in the charging chamber at the time the small bell is lowered by continuously venting the charging chamber to the atmosphere when the lower bell is closed.

It is a further object of the invention to provide means for coordinating the charging chamber vent with the movements of the large charging bell.

These and other objects of the invention will become more apparent from a consideration of the accompanying drawings constituting a part hereof, in which like reference characters designate like parts, and in which

Fig. 1 is a vertical cross-sectional view of the top of a blast furnace diagrammatically illustrating the bell operating and charging chamber ventilating mechanism embodying the principles of this invention; and

Fig. 2 is a similar view of a modified form of ventilating mechanism and control therefor.

With reference to Fig. 1 of the drawings, the numeral 1 designates the top of the blast furnace housing, 2 the side walls of a charging chamber, 3 the top wall of the charging chamber which supports a hopper 4 controlled by a small bell 5 to periodically feed measured charges of ore, limestone and coke into the charging chamber. The mechanism for operating the bell 5 is not shown. A large charging bell 6 constitutes the bottom of the charging chamber and

is supported by a rod 7 extending through the hollow shank 8 of the small bell 5, rod 7 being pivoted at 9 to a lever 10 fulcrumed at 11 and operated by a cable 12 which is actuated by an operating cylinder 13. A ventilating stack 14 extends from the top wall 3 of the charging chamber and is provided with a valve 15 at the top thereof which seats against an annular flange 16 when closed, it being shown in the open position with the vent holes 17 establishing communication of the vent stack and charging chamber with the atmosphere. Valve 16 is connected by a link 18 to a counterweighted lever 19 that is fulcrumed at 20 to a bracket 21 mounted on the vent stack 14, the lever 19 being further connected by a link 22 to the bell operating lever 10 at 23. Movement of lever 10 produces corresponding movement of the counterweighted lever 19 so that when the large charging bell 6 is lowered, valve 15 is likewise lowered against its seat 16 to seal the charging chamber, thus preventing the escape of the blast furnace gases through the vent stack 14. When the large bell 6 is closed by lifting the same, vent valve 15 is raised to the position to vent the charging chamber to the atmosphere through openings 17 to maintain atmospheric pressure when both bells are closed. Upon subsequent lowering of the small charging bell 5, there can be no explosion as there is no explosive gas mixture in the charging chamber.

In the form of the invention shown in Fig. 2, the counterweighted venting lever 19 is operated independently of the bell operating lever 10 by means of a drum 25 that is operated by a motor 26, a cable 27 wound on the drum 25 being connected to valve operating lever 19 at 28. The motor 26 is controlled by a starter 29 connected to a master switch 30 which has conduit connections 31, 32, 33 and 34 with switches 31a, 32a, 33a and 34a, respectively. In operation, when the operating cylinder 13 lowers the large bell 6, the lever 10 will effect closing contact of switch 31a which starts motor 26 to drop valve 15 on its seat. When lever 19 effects contact of switch 34a, motor 26 will stop. When the bell 6 is raised, contact of switch 31a is broken and when switch 32a is closed motor 26 will be energized to actuate lever 19 to raise valve 15, and when switch 34a is closed motor 26 will be de-energized. By means of the switch controlled motor operated valve 15 the charging chamber will be vented at all times when bell 6 is in closed position, and will close the vent to prevent the escape of the blast furnace gas when the charging bell 6 is lowered to open position.

It is evident from the foregoing description of the invention that no explosive gas mixtures will accumulate or be available in the charging chamber when the charge is dumped by the opening of the small charging bell 5 and no gas can escape from the furnace through the charging chamber when the large bell is lowered to open position. Also, by relieving the gas pressure in the charging chamber, escaping gas and flue dust is eliminated at the top of the furnace which has been a hazard to workmen and detrimental to operating parts.

Although several embodiments of the invention have been illustrated and described, it will be evident to those skilled in the art that various modifications may be made in the details of construction without departing from the principles herein set forth.

I claim:

1. In a blast furnace, a charging chamber having a small bell in the top for charging said chamber and a large bell in the bottom for discharging said chamber, a vent for said chamber communicating with the atmosphere to at all times maintain atmospheric pressure between the bells when both are in their closed position, a valve controlling said vent operatively connected to be movable coordinately with the movement of the discharge bell to close the vent when the bell is in open position and open said vent when the bell is in closed position.

2. In a blast furnace, a charging chamber having a small bell in the top for charging said chamber and a large bell in the bottom for discharging said chamber, a vent for said chamber communicating with the atmosphere to at all times maintain atmospheric pressure between the bells when both are in their closed position, said vent comprising a conduit extending from said charging chamber, a valve in said conduit, an operating mechanism for said discharge bell and an operating mechanism for said valve connected to said bell operating mechanism to be operable thereby for moving the valve to open position

when the discharge bell is closed and for closing said vent when the discharge bell is moved to open position.

3. In a blast furnace, a charging chamber having a small bell in the top for charging said chamber and a large bell in the bottom for discharging said chamber, a vent for said chamber communicating with the atmosphere to at all times maintain atmospheric pressure between the bells when both are in their closed position, a vent stack extending from said charging chamber having an opening to the atmosphere at the top thereof, a valve controlling said opening, operating mechanism for said discharge bell and operating mechanism for said valve including a motor for actuating said bell, and means responsive to the movement of said bell operating mechanism for energizing the motor circuit of the valve operating mechanism to coordinate the opening and closing of said valve with the opening and closing of the discharge bell.

4. In a blast furnace, a charging chamber having a small bell in the top for charging said chamber and a large bell in the bottom for discharging said chamber, a vent for said chamber communicating with the atmosphere to at all times maintain atmospheric pressure between the bells when both are in their closed position, a vent stack extending from said charging chamber having an opening in the top thereof, a valve controlling said opening, a lever for actuating the discharge bell and a lever for actuating the vent valve, an operating cylinder connected to said first-named lever and a motor for actuating the second-named lever, said first-named lever having switch terminals connected to the operating motor of the second-named lever, whereby the motor circuit is energized and deenergized in response to movement of said bell operating lever to vent the charging chamber to the atmosphere when the discharge bell is closed and to close said vent when the discharge bell is open.

GUY WEHR.