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METHOD OF CENTERING THE DISTRIBUTOR HOPPER WITH RESPECT TO THE SMALL BELL OF A BLAST FURNACE AND A GAGE FOR USE THEREWITH

Filed Sept. 26, 1957 2 Sheets-Sheet 1

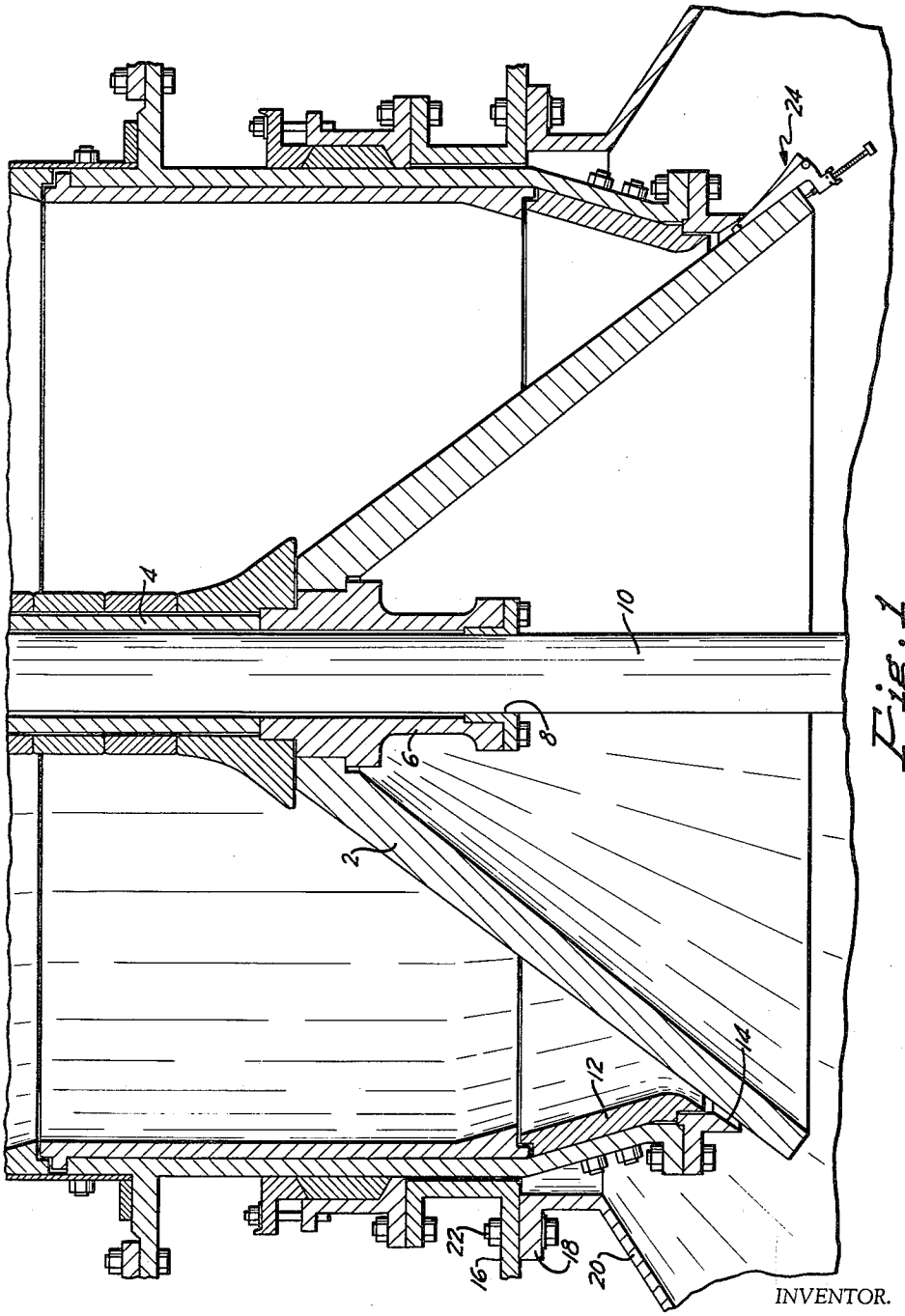


Fig. 1

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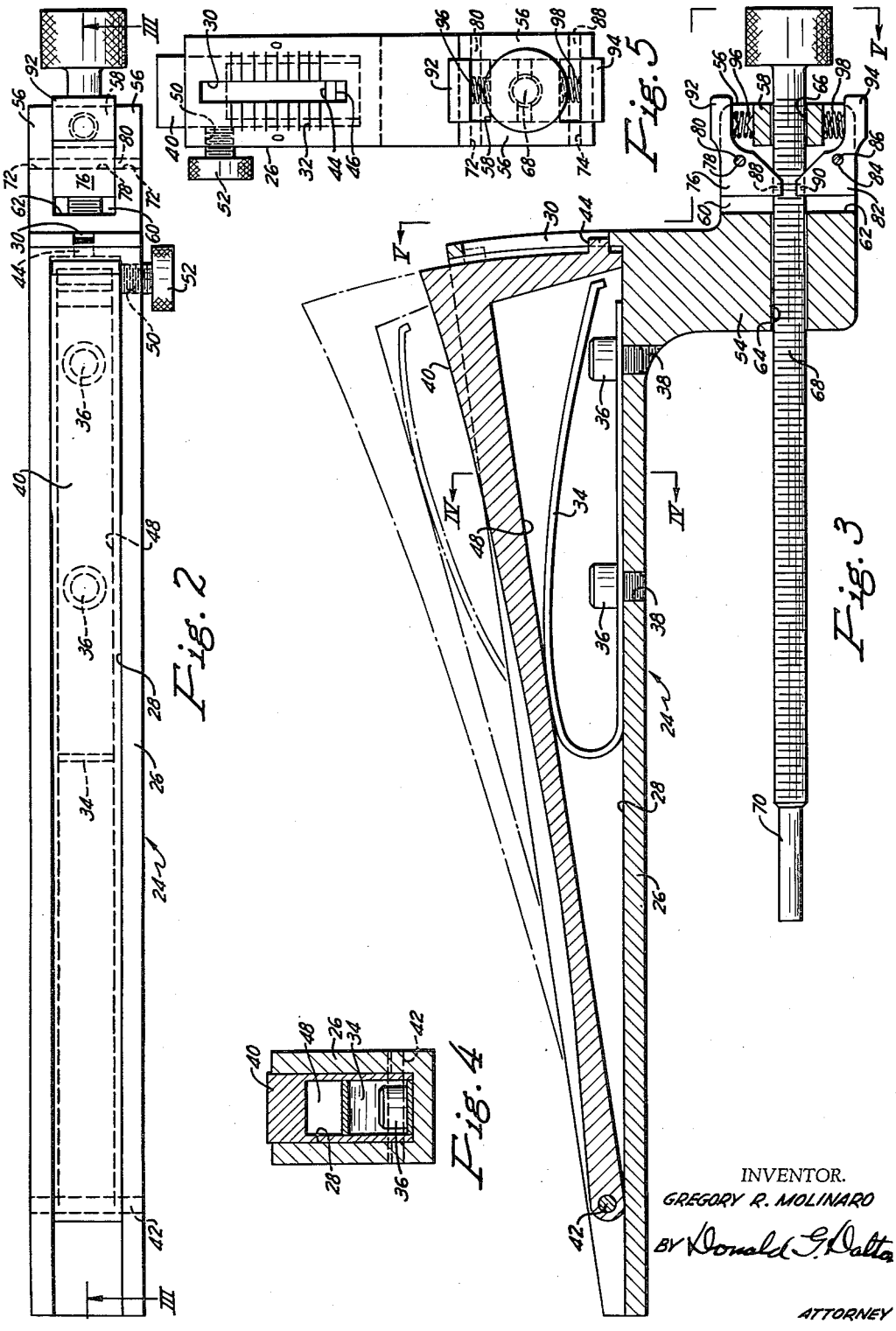


Fig. 2

Fig. 5

Fig. 3

Fig. 4

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METHOD OF CENTERING THE DISTRIBUTOR HOPPER WITH RESPECT TO THE SMALL BELL OF A BLAST FURNACE AND A GAGE FOR USE THEREWITH

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This invention relates to a method of centering the distributor hopper with respect to the small bell of a blast furnace and a gage for use therewith. The small bell closes the bottom of the distributor hopper which discharges into the large bell hopper. When closed the small bell holds the burden materials in the distributor hopper while the hopper is angularly positioned for even distribution of the material in the large bell hopper. The small bell also prevents gas escape when the large bell charges the burden material into the furnace. If the small bell is not centered with respect to the distributor hopper gases will escape to the atmosphere. Prior to my invention it was difficult and dangerous to center the small bell with respect to the distributor hopper. The manner in which this was commonly done was for a workman to insert a filler gage between the large bell rod and the bushing which attached the small bell to its bell rod. The hopper was then adjusted until uniform clearance was obtained. This procedure was slow and inaccurate and resulted in a wearing action on the inner wall of the bushing from its contact with the large bell rod so that gas escaped therebetween.

It is therefore an object of my invention to provide a method of centering the distributor hopper with respect to the small bell of a blast furnace quickly and accurately.

Another object is to provide a gage which is particularly adapted for determining the space between the distributor hopper and the small bell.

These and other objects will be more apparent after referring to the following specification and attached drawings, in which:

FIGURE 1 is a sectional view showing the distributor hopper and small bell with the gage of my invention in place for taking a measurement;

FIGURE 2 is a top plan view of the gage of my invention;

FIGURE 3 is a longitudinal sectional view taken on the line III—III of FIGURE 2;

FIGURE 4 is a view taken on the line IV—IV of FIGURE 3; and

FIGURE 5 is a view taken on the line V—V of FIGURE 3.

Referring more particularly to the drawings, the reference numeral 2 indicates the small bell of a blast furnace. The small bell 2 is secured to a hollow bell rod 4 by means of a bushing 6 which has an opening 8 therein for receiving large bell rod 10. A distributor hopper 12 surrounds the small bell 2 and has a beveled bearing surface 14 at its lower end for receiving the outer surface of the bell 2. The distributor hopper 12 has a flange 16 attached thereto which rests on top ring 18 of a gas seal 20 which is mounted on the top ring of the large bell hopper (not shown). Bolts 22 pass through holes in the flange 16 and top ring 18 to hold the distributor hopper in place. Sufficient clearance is provided in the holes to permit adjustment of the distributor hopper 12 with respect to the bell 2. The structure so far described is conventional.

Gage 24 of my invention is adapted to be received in the space between the surface 14 of the hopper 12 and the outer wall of the small bell 2. The gage 24 includes

a sector shaped housing 26 having a longitudinal recess 28 therein. The large end of the housing 26 has a slot 30 therein which communicates with the recess 28. A scale 32 is provided on the end of the housing 26 adjacent the slot 30. A spring 34 is fastened in the bottom of the recess 28 in any suitable manner such as by means of cap screws 36 threaded into threaded openings 38 in the bottom wall of the housing. A sector shaped gage element 40 is received in recess 28 and its small end is attached to the small end of the housing 26 by means of a pin 42 which passes through aligned holes in the housing 26 and gage element 40. The large end of the gage element 40 has an extension 44 thereon which extends through the slot 30. A line 46 is provided on the extension 44 for cooperation with the scale 32. The gage element 40 is provided with a longitudinal recess 48 into which the spring 34 extends. The spring 34 bears against the bottom of recess 48, thus urging the gage element 40 outwardly. A threaded opening 50 is provided in the wall of the housing 26 adjacent the large end thereof and a thumb screw 52 is threaded therein. A bracket 54 extends from the housing 26 at the large end thereof on the side opposite the recess 28. Bracket 54 is preferably integral with the housing 26. The bracket 54 includes a pair of spaced flanges 56 which are connected at their outer ends by means of a cross member 58. A space 60 is provided in bracket 54 between the cross member 58 and wall 62 at the base of the flanges 56. Aligned holes 64 and 66 are provided in the bracket 54 and cross member 58, respectively, for slidably receiving a threaded screw 68. End 70 of the screw 68 is preferably unthreaded. Aligned holes 72 are provided in flanges 56 above the cross member 58. Similar aligned holes 74 are provided in the flanges 56 below the member 58. A half nut 76 having a hole 78 therein is pivotally connected to the bracket 54 by means of a pin 80 which passes through holes 72 and 78. A similar half nut 82 has a hole 84 therein and is attached to the bracket 54 by means of a pin 86 passing through holes 74 and 84. Half nuts 76 and 82 have cooperating threaded openings 88 and 90 for receiving the threads of screw 68. Ears 92 and 94 are provided on the half nuts 76 and 82, respectively, and extend from the recess 60 between the flanges 56 on each side of the cross member 58. Springs 96 and 98 are inserted between the cross member 58 and the ears 92 and 94, respectively.

My method is carried out as follows:

The small bell 2 is positioned adjacent the hopper 12 with a small space between the outer surface of the small bell and the inner bearing surface 14 of the hopper. The gage 24 is then inserted into this space as shown in FIGURE 1 until the end 70 of screw 68 abuts against the bottom end of the small bell 2. Thus the end of the screw 68 functions as a stop to position the gage 24. The space between the small bell and the hopper is such that the gage element 40 will contact the hopper and as the gage is inserted the gage element 40 is forced inwardly against the pressure of the spring 34. The lock screw 52 is then tightened against the gage element 40 and the gage removed. The operator then determined from the scale 32 the width of the space between the bell and the hopper at that particular point. The lock nut 52 is then loosened and the gage again inserted into the space between the bell and hopper, this time at a point diametrically opposed from the point of the first insertion. When speaking of a point diametrically opposed from the first point of insertion it will be understood that the position need not be exactly on the same diameter as the first point but only reasonably close to such point. When inserting the gage it is again moved until the end 70 of the screw 68 abuts the bottom end of the small bell 2. The screw 52 is then threaded

against the gage element **40** to hold it in place and the reading again determined. The difference between the scale readings of the first and second points indicates the amount and direction that the distributor hopper **12** is off center relative to the small bell **2** on that particular diameter. The bolts **22** are then loosened and the hopper moved one-half the distance indicated by the gage reading difference in the direction of the largest clearance. This operation is then repeated by inserting the gage at a point between the first two points, preferably 90° therefrom and at a point diametrically opposed from the third point. For each pair of readings the reference setting screw **68** remains fixed relative to the housing **26**. If a different reference setting is required to position the gage between the small bell and the distributor hopper so that the gage element **40** will contact one side of the space between the hopper and small bell and the housing **26** to contact the other side the screw **68** is rotated. If a large adjustment is necessary the release nut formed by the two halves **76** and **82** is threadably disengaged from the screw **68** by manually pressing the ears **92** and **94** toward each other and then axially moving the screw **68** to the desired position.

While one embodiment of my invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. The method of centering the distributor hopper with respect to the small bell of a blast furnace which comprises positioning the small bell adjacent the hopper with a space between the outer surface of the small bell and the inner bearing surface of the hopper, inserting a gage having a housing, a spring pressed gage element pivotally mounted on the housing and a stop on said housing into the said space with the stop bearing against the end of the small bell, observing the reading on said gage with the stop so positioned, inserting the gage into said space at a point diametrically opposed to the point of the first reading with the stop bearing against the end of the small bell, observing the reading on said gage with the stop so positioned at said second point, comparing the two readings and moving the hopper one-half the distance indicated by the gage reading difference in a direction to decrease the larger clearance, inserting the gage into said space at a point between the first two points with the stop bearing against the end of the small bell, observing the reading on said gage with the stop so positioned, inserting the gage into said space at a point diametrically opposed to the point of the third reading, observing the reading on said gage with the stop so positioned at said third point, comparing the last two mentioned readings and moving the hopper one-half the distance indicated by the difference in reading of the gage at a third and fourth points in the direction to decrease the larger clearance.

2. A gage for use in determining the space between the distributor hopper and small bell of a blast furnace which comprises an elongated housing, a gage element pivotally mounted on the inner end of said housing, means in said housing resiliently urging said gage element outwardly, and a stop on said housing extending in a direction from the outer end of said housing toward the pivotal mounting adapted to bear against said small bell.

3. A gage for use in determining the space between the distributor hopper and small bell of a blast furnace which comprises a sector shaped housing, a sector shaped gage element, means pivotally connecting the small end of said gage element to the small end of said housing, a spring in said housing urging said gage element outwardly, and a stop on the large end of said housing extending in a direction generally toward the small end of the housing and adapted to bear against said small bell.

4. A gage for use in determining the space between the distributor hopper and small bell of a blast furnace which comprises a sector shaped housing, said housing having a longitudinal recess therein, a sector shaped gage element in said recess, means pivotally connecting the small end of said gage element to the small end of said housing, a spring in said housing urging said gauge element outwardly, and a stop on the large end of said housing extending toward the small end of said housing and adapted to bear against said small bell.

5. A gage for use in determining the space between the distributor hopper and small bell of a blast furnace which comprises a sector shaped housing, said housing having a longitudinal recess therein, a sector shaped gage element in said recess, means pivotally connecting the small end of said gage element to the small end of said housing, a spring in said recess urging said gage element outwardly, a bracket extending from said housing at the large end thereof on the side opposite said recess, and a stop on said bracket extending toward the small end of said housing and adapted to bear against said small bell.

6. A gage comprising a sector shaped housing, said housing having a longitudinal recess therein, a sector shaped gage element in said recess, means pivotally connecting the small end of said gage element to the small end of said housing, a spring in said recess urging said gage element outwardly, the large end of said housing having a slot therein communicating with said recess, an extension on the large end of said gage element extending into said slot, and a scale on the end of said housing adjacent said slot.

7. A gage for use in determining the space between the distributor hopper and small bell of a blast furnace which comprises a sector shaped housing, said housing having a longitudinal recess therein, a sector shaped gage element in said recess, means pivotally connecting the small end of said gage element to the small end of said housing, a spring in said recess urging said gage element outwardly, the large end of said housing having a slot therein, communicating with said recess, an extension on the large end of said gage element extending into said slot, a scale on the end of said housing adjacent said slot, and a stop on said housing adapted to bear against said small bell.

8. A gage for use in determining the space between the distributor hopper and small bell of a blast furnace which comprises a sector shaped housing, said housing having a longitudinal recess therein, a sector shaped gage element in said recess, means pivotally connecting the small end of said gage element to the small end of said housing, a spring in said recess urging said gage element outwardly, the large end of said housing having a slot therein communicating with said recess, an extension on the large end of said gage element extending into said slot, a scale on the end of said housing adjacent said slot, a bracket extending from said housing at the large end thereof on the side opposite said recess, and a stop on said bracket adapted to bear against said small bell.

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