No. 785,311. PATENTED MAR. 21, 1905.

J. B. LADD & D. BAKER.

DISTRIBUTING BELL.

APPLICATION FILED JUNE 15, 1904.

2 SHEETS—SHEET 1.

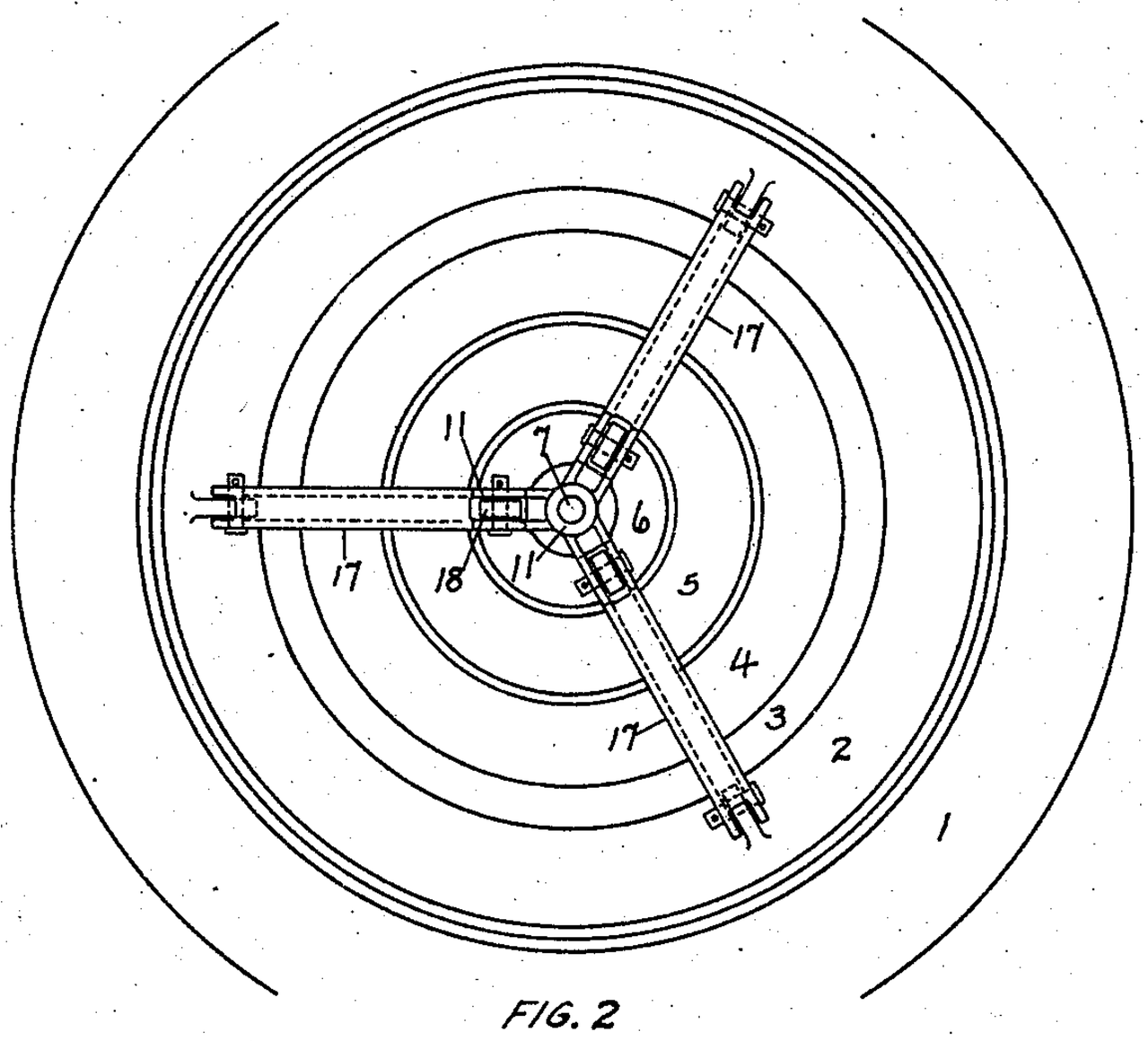

FIG. 2

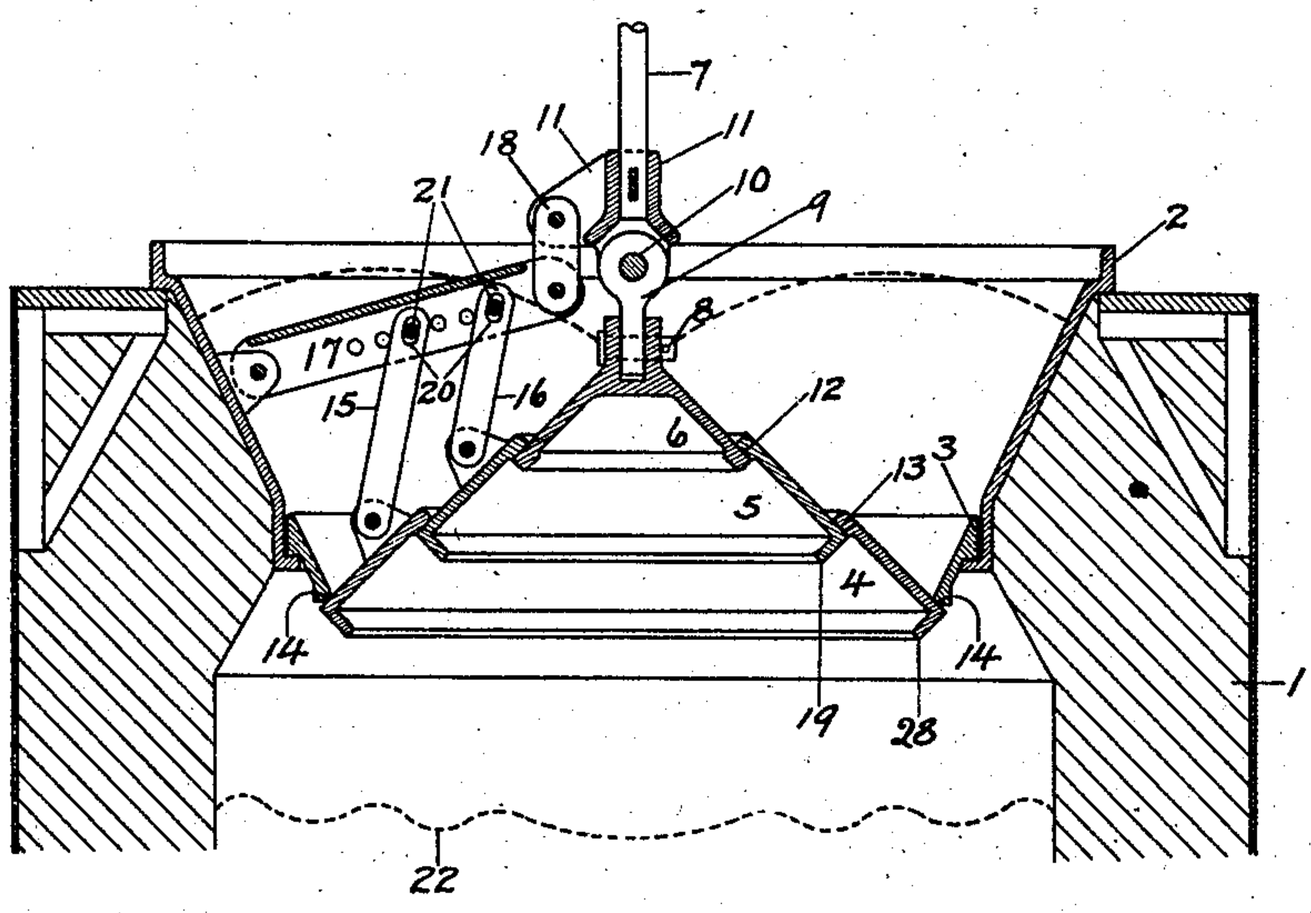

FIG. 1

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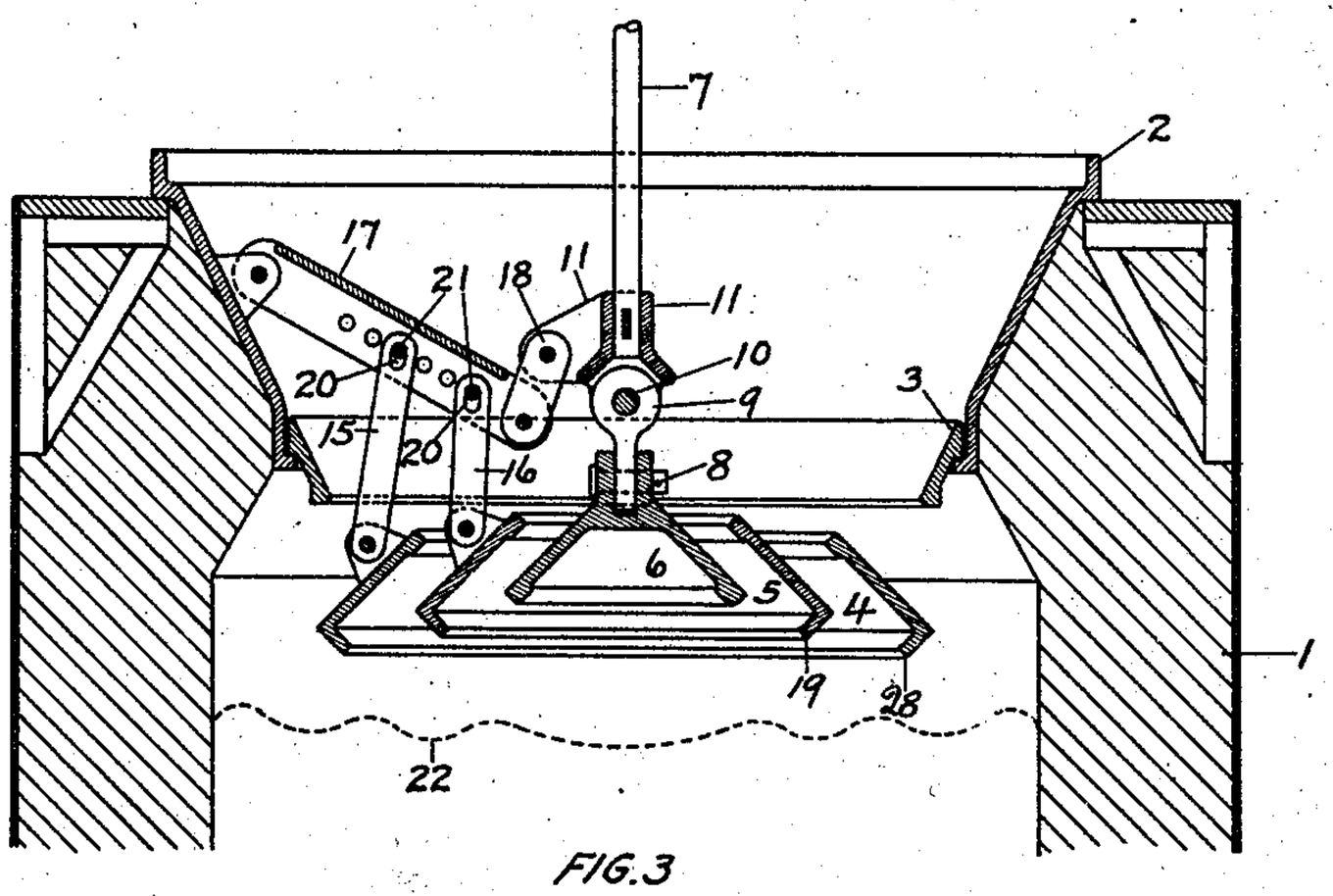

FIG. 3

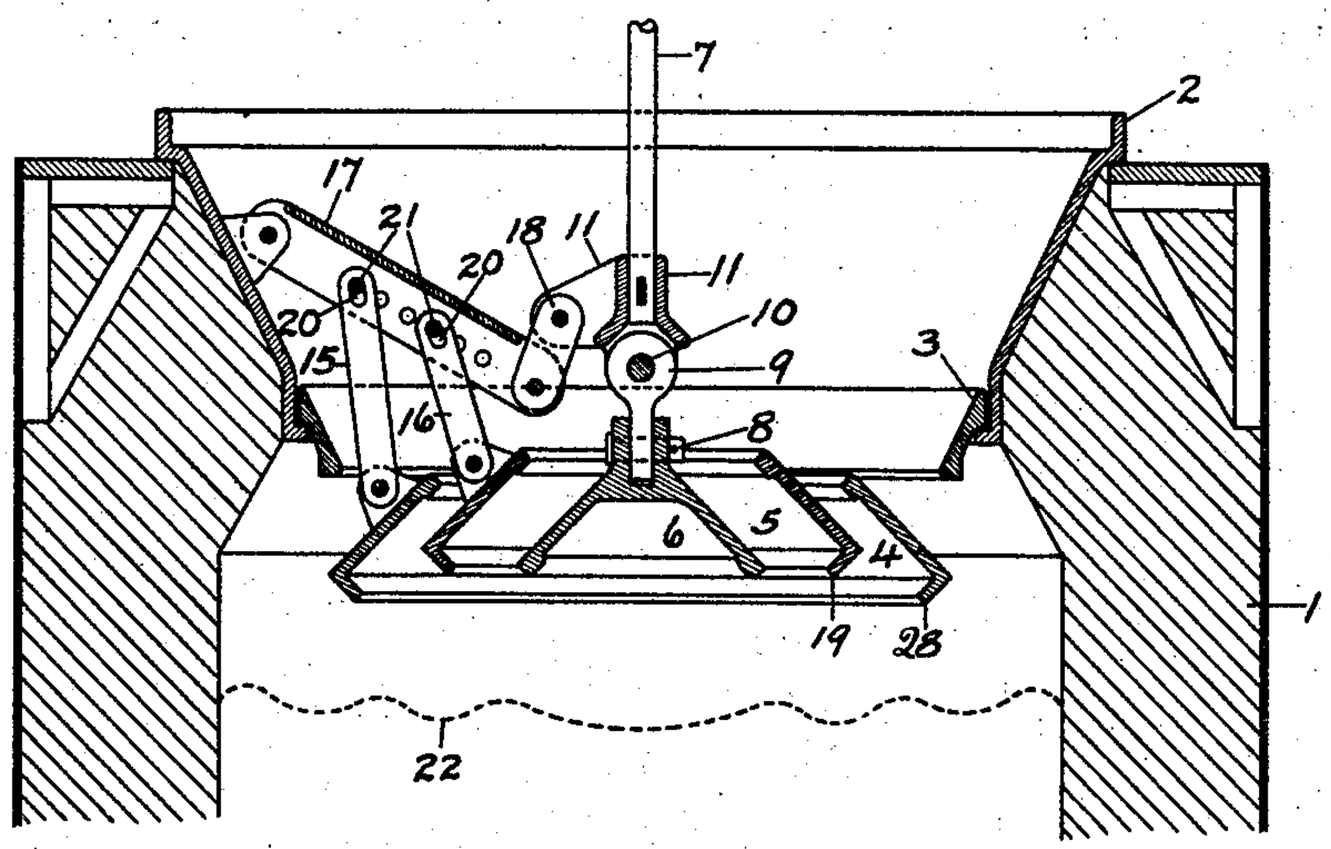

FIG. 4

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No. 785,311. Patented March 21, 1905.

UNITED STATES PATENT OFFICE.

JAMES B. LADD, OF WAYNE, PENNSYLVANIA, AND DAVID BAKER, OF NEWTON, MASSACHUSETTS.

DISTRIBUTING-BELL.

SPECIFICATION forming part of Letters Patent No. 785,311, dated March 21, 1905.

Application filed June 15, 1904. Serial No. 212,659.

To all whom it may concern:

Be it known that we, JAMES B. LADD, a resident of Wayne, Delaware county, State of Pennsylvania, and DAVID BAKER, a resident of Newton, Middlesex county, State of Massachusetts, citizens of the United States, have invented a new and useful Distributing-Bell, of which the following is a specification.

Our invention relates to improvements in distributing-bells for use in connection with blast-furnaces or similar purposes.

The object of our invention is to provide an improved bell that shall secure an even or required distribution of stock.

The bells in general use in connection with blast-furnaces are made in the form of an inverted cone and are provided with means for raising and lowering the same, so as alternately to form a seal and bottom to the charging-hopper into which the stock for the furnace is delivered and then to form means for delivering the stock into the top of the furnace below. When such bells are lowered, the stock on them is deflected by the surface of the bell toward the exterior of the furnace. As the charge usually is made up of several different materials—such as coke, ore, and limestone—some of which are in the form of lumps and some granulated or powdered, the actual distribution of the stock in a furnace using a bell of the ordinary construction depends largely on the relative velocities which the different materials acquire in sliding down the bell into the furnace, and in practice it has been found that for a given size of furnace the size of the diameter of the bell influences largely the distribution of the stock within the furnace. In order to avoid delivering all the charge toward the exterior of the furnace and to provide means for delivering some of the charge, both lump and fines, nearer the center of the furnace, we provide a bell comprising a plurality of sections, preferably in the form of conical rings, so arranged that their exterior surfaces form in combination one with the other approximately a continuous cone, and we provide means for the relative movement of each section, so as to secure the passage of the material between the different sections, and thus secure an evener or required distribution of the stock in the furnace.

Referring to the accompanying drawings, Figure 1 is a vertical section through the center of our improved form of bell in the closed position. Fig. 2 is a plan view of same. Fig. 3 is a similar view to Fig. 1, showing the bell in the open position. Fig. 4 is a similar view showing a different adjustment of the supporting means for the several sections.

Similar numerals refer to similar parts throughout the several views.

In the drawings we have shown the upper portion of an ordinary blast-furnace, the walls of which are indicated by 1, fitted with a hopper 2 and hopper-ring 3 of usual form.

Our improved bell comprises the centrally-located member 6, with a plurality of surrounding sections—such, for example, as 4 and 5. When these various parts are in the closed position, as shown in Fig. 1, they present an exterior surface in form approximate that of the ordinary furnace-bell. The upper or central piece 6 is suspended from the bell-rod 7 in the usual way by means of a pin 8, link 9, pin 10, and clevis 11. Section 5 is supported upon the lower margin of section 6, with which it forms an approximately gas-tight joint at the surfaces 12, which are preferably machined, so as to fit together. The lower section 4 is similarly supported upon the lower margin of section 5 and forms with it an approximately gas-tight joint at the surfaces 13. Section 4 also forms an approximately gas-tight joint with the lower edge of the hopper-ring 3 at the surfaces 14. Sections 4 and 5 are also operatively connected with the bell-rod 7 by means of links 15 and 16, levers 17 and links 18, and their respective pin connections. The upper ends of the links 15 and 16 are slotted, as shown at 20, in the direction of their length, so as to permit a

limited play or lost motion of pins 21 therein. When the lifting-rod 7 is raised to bring the several sections of the bell into the closed position, (shown in Fig. 1,) the links 15 and 16 do not support sections 4 and 5, respectively, section 5 being entirely supported by engagement with section 6, while 4 is similarly supported by section 5. It results from this construction that the upward pull on rod 7 in its final position (shown in Fig. 1) forces the several pairs of contact-surfaces 12, 13, and 14 together, so that the weight of the several sections one upon the other and also the weight of the charge resting thereon is held directly by rod 7 in the same manner as though the bell were of the ordinary form—that is, in single piece. When, however, the rod 7 is lowered, sections 4 and 5 remain supported by the upper section 6 until the lost motion in slots 20 of links 15 and 16 is taken up by the downward movement of said links. When this lost motion has been taken up, the weight of these sections is transferred to the lever 17, one end of which is operatively connected by links 18 and clevis 11 to rod 7. When rod 7 has reached the limit of its downward travel, sections 4, 5, and 6 assume the relative positions shown in Figs. 3 and 4, which results in three annular openings or passage-ways for the stock from the funnel to the interior of the furnace—namely, between the hopper-ring 3 and bell-section 4, between sections 4 and 5, and between sections 5 and 6. This will result in a distribution of the stock somewhat as indicated by the dotted line 22 in said figures. The relative separations are due to the relative vertical distances traveled thereby, which is controlled by the levers 17 and connecting-links 15 and 16. Said control may be adjusted by changing the points of attachment of links 15 and 16 to levers 17. One adjustment is shown in Fig. 3, while another is shown in Fig. 4. In Fig. 4 it will be seen that the lower sections 4 and 5 of the bell have been brought nearer together and the space between sections 5 and 6 has been increased by moving the point of attachment of links 15 and 16 farther from the bell-rod 7. In a similar manner the opening between the lower section of the bell 14 and the hopper-ring 3 may be diminished or increased to allow more or less of the stock to pass therebetween.

In practice the operation of a bell of our design is practically the same as that of an ordinary solid bell, with the exception that during its downward motion and when it is in the lowest position some of the stock is allowed to pass between the sections of the bell and enter the central part of the furnace. The direction of the stock passing down between the sections of the bell proper may be altered by deflecting rings, flanges, or projections, such as 28 and 19, near the lower edges of such sections, and it is obvious that these deflecting-rings may be proportioned so as to cause the stock to flow directly toward the center of the furnace.

While we have shown our device as suitable for use in connection with blast-furnaces, it may obviously be applicable to feeding stock into other kinds of furnaces, heaters, driers, mills, or the like where an even or desired distribution is to be secured.

While we have shown a specific construction of rod, levers, and links for the relative movements of the sections of the bell, it is obvious that other mechanism may be employed for the same purpose without departing from the spirit of our invention, and while our improved means provides for the positive movement of each section and while in many cases we consider this the preferable means we do not wish to limit ourselves thereto, since it is obvious that force of gravity may be employed in connection with such downward movement. It is also obvious that a bell embodying our invention may also be made of sections differing in shape from those shown in the drawings. For instance, the various sections may have different slopes or curvatures without necessarily departing from the spirit of our invention. While excellent results may be obtained from a bell made in three sections, as shown in the drawings, it will also be obvious that a different number of sections may be employed with satisfactory results. We therefore do not wish to confine ourselves to the specific mechanism, number, or form of bell-sections.

What we claim is—

1. In combination with a chamber, a distributing-bell comprising a plurality of sections and means for causing the simultaneous movement of said sections relatively to the chamber and to each other.

2. In combination with a chamber, a distributing-bell comprising a plurality of concentric sections, one of which is supported by a surrounded section and supports a surrounding section, and means for causing the simultaneous movement of said sections relatively to the chamber and to each other.

3. In combination with a chamber, a distributing-bell comprising a plurality of concentric sections, one of which is supported by a surrounded section and supports a surrounding section when the bell is in the closed position, and means for causing the simultaneous movement of said sections relatively to the chamber and to each other.

4. A furnace-bell comprising a plurality of concentric sections, means for supporting the central section, and a lever having a pivotal connection with a stationary support at one end, link engagement with the support of the

central section at the other end, and lost-motion link engagement with the other sections.

5. A furnace-bell comprising a plurality of concentric sections, means for supporting the central section, and a lever having a pivotal connection with a stationary support at one end, link engagement with the support of the central section at the other end and adjustable lost-motion link engagment with the other sections.

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