Aug. 2, 1932. A. LENZ 1,869,571

CUPOLA CHARGING EQUIPMENT

Filed June 10, 1929 2 Sheets-Sheet 1

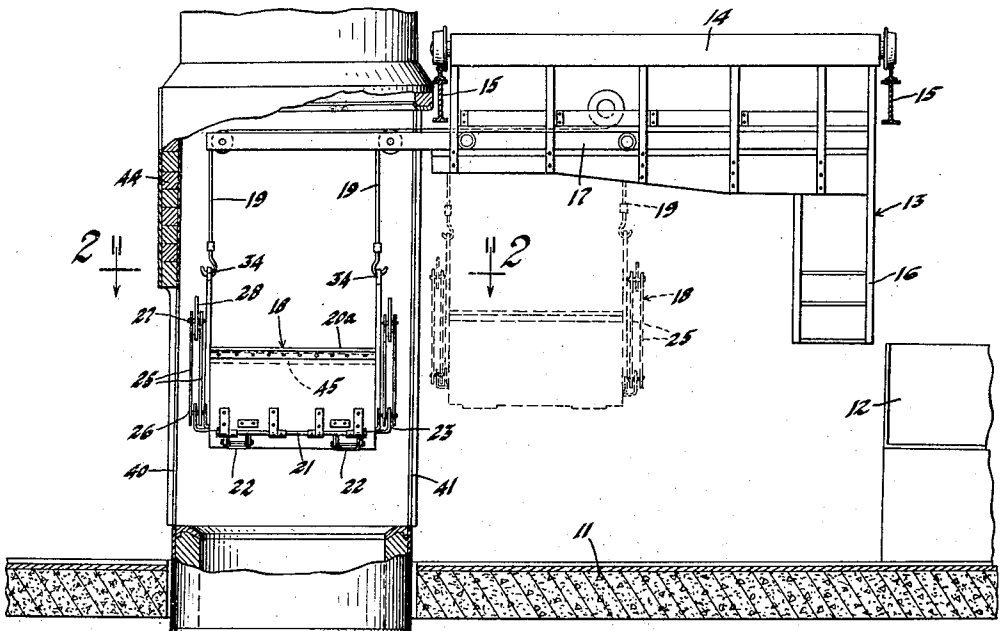
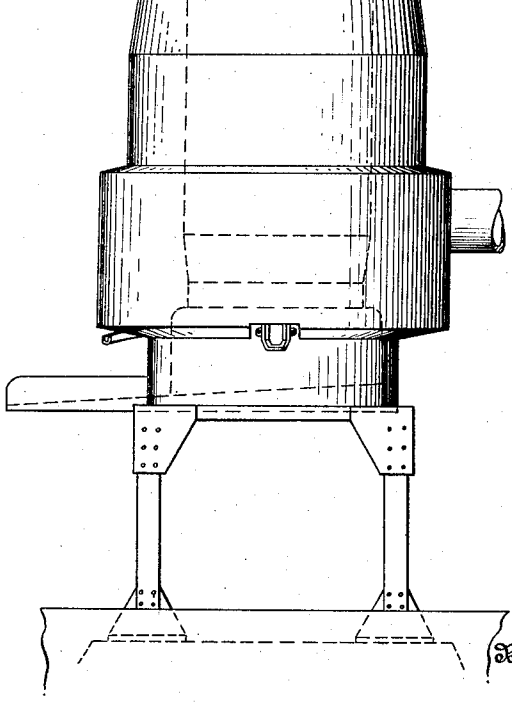


Fig. 1



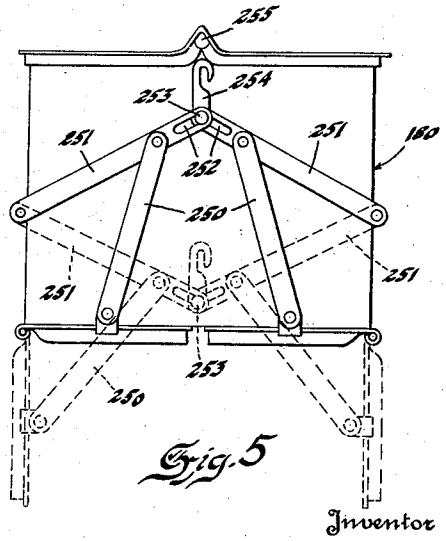


Fig. 5

Inventor

Arnold Lenz

By Blackwood, Spencer & Hirsch.

Attorneys

Aug. 2, 1932. A. LENZ 1,869,571

CUPOLA CHARGING EQUIPMENT

Filed June 10, 1929 2 Sheets-Sheet 2

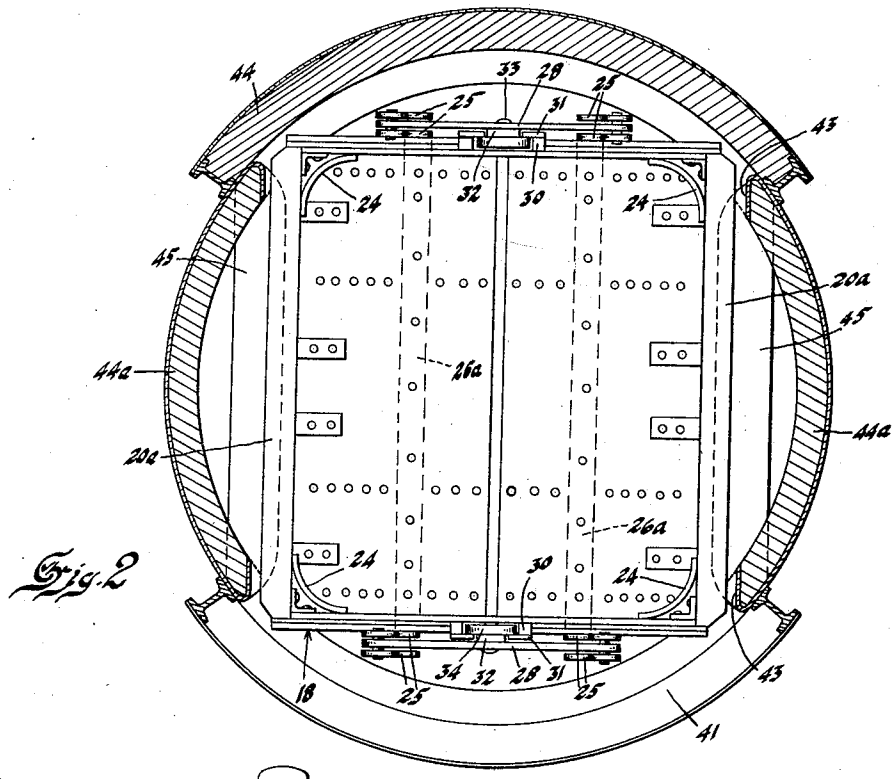


Fig. 2

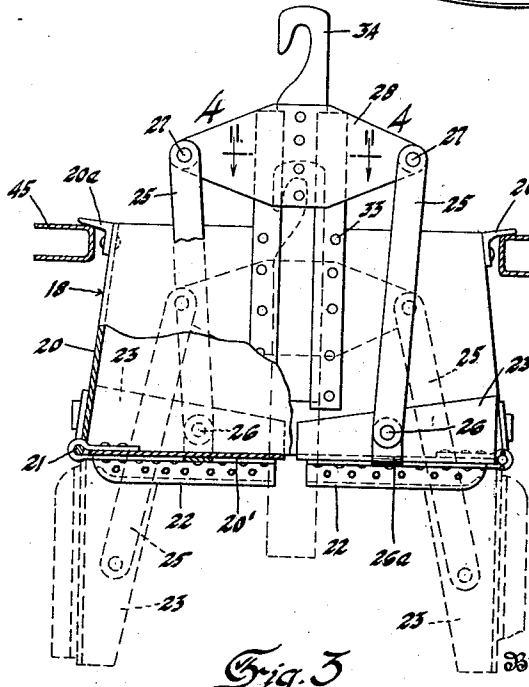


Fig. 3

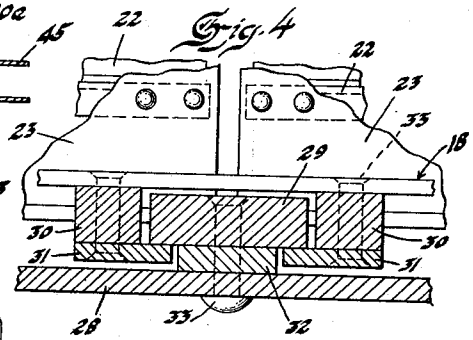


Fig. 4

Inventor
Arnold Lenz

By Blackmore, Spencer & Hicks

Attorneys

Patented Aug. 2, 1932 1,869,571

UNITED STATES PATENT OFFICE

ARNOLD LENZ, OF SAGINAW, MICHIGAN, ASSIGNOR TO GENERAL MOTORS CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE

CUPOLA CHARGING EQUIPMENT

Application filed June 10, 1929. Serial No. 369,543.

This invention relates to cupola furnaces for melting metal and particularly to apparatus for introducing thereinto the metallic ingredients of a charge.

The usual cupola-charging buckets or like containers, which open at the bottom to release their contents, have some internal obstruction such as a center operating cable, center post, or cross bar, with which irregular fragments of metal scrap are likely to become entangled when the bottom is opened, so that the contents, if composed of flashings and similar scrap, are discharged with difficulty if at all. Furthermore, owing to the presence in the bucket of internal obstructions, materials emerging from the bucket become mixed or rearranged during their exit, rendering it impracticable to arrange the metal scrap or other material in the bucket in the stratified order desired for the charge in the cupola. For these reasons it has been necessary to select costly materials of regular form for charging these buckets.

It is an object of this invention to reduce the costs of steel or other metal to be melted in cupolas by utilizing steel flashings and other irregular scrap of high quality which by reason of their irregular formations are likely to hook on to the internal mechanism of the usual charging buckets, and which constitute an available high grade material of much lower cost than steel rails or other more regular forms of material suitable for the purpose.

The invention therefore consists of a charging apparatus comprising a bottom opening bucket having no interior obstructions to the discharge of its contents when the bottom is opened, and in a cupola modified to cooperate therewith, whereby pieces of any form may be freely discharged and will be deposited in the cupola in substantially the same arrangement that existed in the bucket.

In the accompanying drawings wherein like parts are designated by like reference characters:

Fig. 1 is an elevation, partly in section, of a cupola associated with an improved charging mechanism embodying my invention;

Fig. 2 is a cross section on the line 2—2 of Fig. 1, illustrating modifications in a cupola functioning to facilitate charging;

Fig. 3 is an elevation partly in section of an improved charging bucket shown in discharging position within the cupola;

Fig. 4 is a horizontal section on the line 4—4 of Fig. 3;

Fig. 5 is an elevation of a modified form of charging bucket.

In Fig. 1, which illustrates a preferred embodiment of the invention, 10 indicates a cupola; 11 the charging floor; 12 an elevated bin from which metal to be charged into the cupola is loaded into a charging bucket. Numeral 13 indicates the container handling apparatus as a whole comprising a car or other carrier 14 travelling on tracks 15 and provided with an operator's cab 16. A charging ram 17 is movable on the carrier 14 at right angles to the track. The charging container or bucket 18 is suspended by hoisting and controlling elements such as cables 19 from the charging ram, said cables passing over pulleys on the ram and extending to the hoist mechanism, controlled by an operator in the cab 16. The carrier, ram and controls are shown diagrammatically only, as these parts are well known in the art.

The charging bucket 18, in the embodiment illustrated in Fig. 3, has opposite sides 20 to the upper edges of which are secured flanges 20^a and to the lower parallel edges of which are hinged bottom doors 20′. The pintles 21 of the hinges are so positioned at the exterior, as illustrated, that the hinge parts do not obstruct the discharge of material from the bucket when the doors are opened. Skids 22 are fastened to the lower surfaces of the doors to support the bucket and enable it to be readily slid over the floor when detached from the handling mechanism. The bucket as shown in Figs. 2 and 4 is approximately rectangular in plan although the particular form is not material provided the bottom doors may be hinged thereto without offering obstruction to the discharge of material when they are opened. The ends of each door are preferably provided with flanges 23 disposed exteriorly of the end walls of the bucket when the doors

are closed. The internal corners of the bucket are occupied by concave pieces 24 which extend from bottom to top in order to eliminate sharp corners within the bucket that might interfere with the free discharge of irregular pieces of metal scrap contained in it.

In order to control and support the bottom doors 20′ a link 25 is pivoted at 26 at each end of each door; the links are shown of the same length and connected to the bottom doors outside of the bucket at corresponding points by means of a metal strap 26ª. The upper end of each link is connected at 27, symmetrically with respect to each other, to a cross-head 28 secured to a sliding member 29 which is guided between ways formed by the parallel members 30 and 31 bolted to the end walls of the bucket. Each member 31 extends inward beyond the inner surface of the member 30 and the slide 29 is held in place by the inward projecting portions of the members 31. An intermediate member 32 spaces the slide 29 from the cross-head 28, while rivets or bolts 33 secure said slide, cross-head and spacing member together. A hook or eye 34, integral with or secured to the upper end of each guide 29 serves as a means for connecting the bucket to the cables or other hoisting elements 19 whereby both bucket and load are sustained by the hoisting elements and the opening and closing of the doors controlled. If the sides 20 converge slightly upward, as illustrated, free discharge of the contents is facilitated.

Above the level of charging floor 11 cupola 10 is provided with two charging openings 40 and 41. The openings 40 is for the purpose of admitting coke or other fuel into the cupola and the opening 41 for the purpose of admitting the metal fragments to be melted. Opening 41 is of greater vertical extent than the opening 40 in order to admit the charging ram, the suspending cables and the metal-laden bucket. The vertical edges of the cupola walls forming the boundaries of these openings are in parallel planes as shown at 43 to afford ample space and free entrance for the described charging bucket; also the wall segment 44 above opening 40 has its inner curved surface continuous with the outer surface of the main wall segments 44ª (Fig. 2) to give increased space for the apparatus. Parallel bucket supporting members 45 extend from the edges of the charging opening 41 to the edges of the charging opening 40 and project toward each other so that the space between said parallel members 45 is less than the distance between the open edges of said openings and less than the distance between the outer edges of flanges 20ª on the bucket, but greater than the distance between the upper portions of the walls 20. The members 45 serve to support the bucket 18 when the hoist and door controlling cables 19 are lowered far enough to allow the flanges 20ª to rest on said members 45. When the bucket is supported on said members 45 slackening of the cables 19 allows the bottom leaves to drop to discharge the metal scrap or other material therein. Members 45, therefore, function somewhat as trips to discharge the load of the bucket into the cupola. In practice the loaded bucket is moved horizontally into the cupola at such a level that the plane of members 45 intersects the bucket below the flanges 20ª but well above the bottom.

Fig. 5 discloses a modified form of bucket 180 having bottom doors similar to those shown in Figs. 1 and 3, and external operating means connected to each end of the bottom doors, said operating means comprising links 250, the lower ends of which are attached to the ends of the doors outside of the bucket while the upper ends are attached symmetrically to pivoted levers 251, serving as guide members, the inner ends of which are slotted as at 252 to receive a pin 253 attached to the hook 254 or equivalent cable on other hoisting element attaching means. This form of bucket is supported by cables attached to opposite sides as at 255 while a cable or cables for sustaining the bottom doors and bucket is attached to the hook 254 and released to discharge the load.

Buckets or metal fragment containers of either form illustrated and described may be filled with metal pieces of any form arranged or stratified as it is desired to have them rest above a layer of fuel within the cupola. When the container is moved into the cupola and the bottom opened the charge will pass freely from the container and fall as a mass into place in the cupola where it will rest with the parts of the charge in substantially the same order and arrangement in which they were loaded into the container.

While the drawings show one cupola and a charging apparatus, it will be understood that in practice a battery of cupolas are arranged side by side and that the container handling apparatus 13 travels along the rails 15 into position opposite any cupola to be charged.

What I claim and desire to secure by Letters Patent of the United States is:

1. In cupola charging equipment the combination of a cupola having a lower combustion portion, an upper charging portion of greater cross sectional area than the combustion portion, a side charging opening and an opposite recess; a substantially rectangular charging container having a bottom door hinged to the exterior of the container; flanges on two opposite sides of the container in a plane above the hinges of the door; means for charging the container through the opening into the cupola, movable means for controlling the opening and closing of the door disposed exteriorly of the other two sides of

the container and means fixed to the cupola wall on which said flanges rest for supporting the container while the door controlling means moves relative thereto to discharge the contents of the container.

2. In cupola charging equipment the combination of a cupola having a side charging portion provided with a charging opening, parallel container supporting members fixed therein, a charging container having external flanges adapted to rest on the parallel supporting members, a bottom door hinged to the exterior of said container, and hoisting means attached to each end of said door outside the container for controlling the opening and closing thereof.

3. In cupola charging equipment the combination of a cupola having a lower combustion portion, an upper charging portion, both circular in transverse section, opposite side charging openings of substantially equal width, a substantially rectangular charging container having bottom doors hinged to the exterior of the container; controlling means for the doors disposed exteriorly of the container, a pair of parallel supporting members fixed in the cupola, flanges on the container adapted to support it on said supporting members, and a charging device arranged to suspend and move the container by attachment to the means for controlling the opening and closing of the doors.

4. A cupola having a lower combustion portion, an upper charging portion, both circular in transverse section, said charging portion having opposite openings of equal width, and parallel supporting members fixed at the bottom of the charging portions extending into said openings.

5. In cupola charging equipment, the combination of a cupola having a lower combustion portion, an upper charging portion, both circular in transverse section, a charging opening in the wall of the charging portion, a rectangular container having bottom doors hinged to the exterior of the container, controlling means for the doors disposed exteriorly of the container, opposite flanges on the exterior of the container, a charging mechanism including a ram adapted to enter the charging opening, and hoisting cables adapted to be attached to the means for controlling the bottom doors of the container, a recess in the wall of the charging portion of the cupola opposite the charging opening of a size to receive the end of the container entered thru the charging opening, and parallel supporting members fixed in the cupola wall to receive the flanges on the container, the ends of said supporting members extending into the charging opening and opposite recess adjacent their side edges.

In testimony whereof I affix my signature.

ARNOLD LENZ.