

W. & A. CROOKE.
 APPARATUS FOR CHARGING BLAST FURNACES.
 APPLICATION FILED OCT. 24, 1906.

939,671.

Patented Nov. 9, 1909.

Fig. 1.

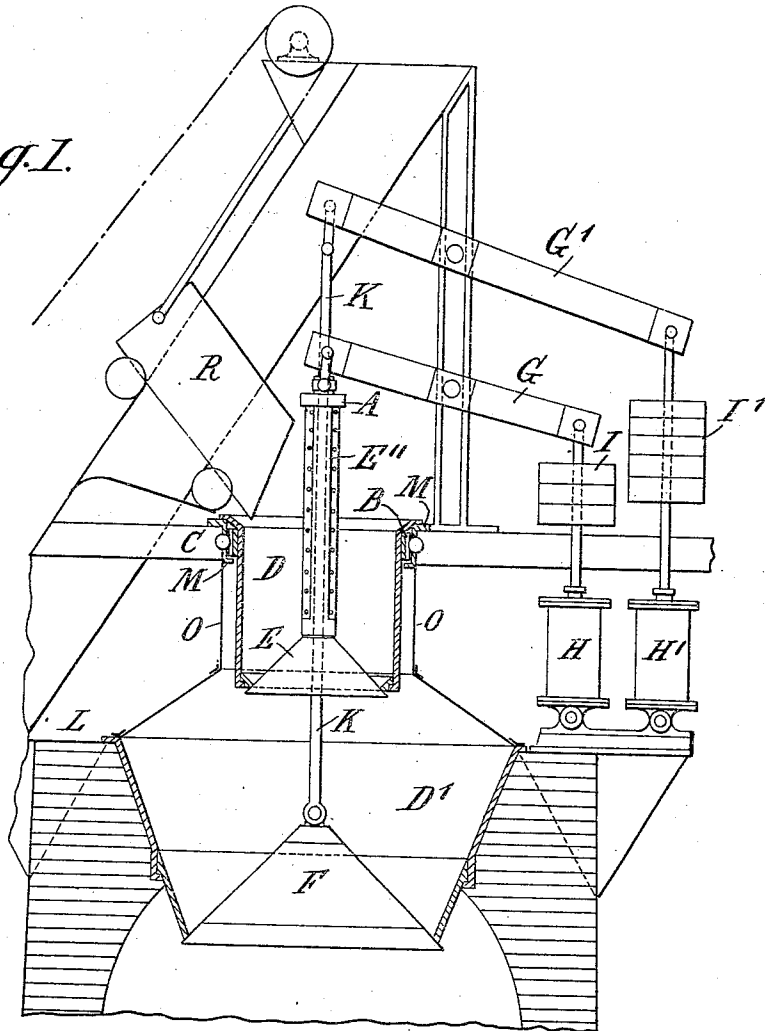
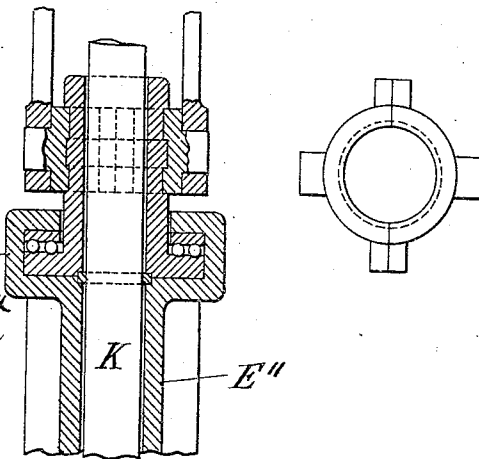


Fig. 2.



Witnesses:-
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 Walter Brooke
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 by *Arthur Brooke*
 their Attorney

UNITED STATES PATENT OFFICE.

WALTER CROOKE, OF MILLOM, AND ARTHUR CROOKE, OF FRODINGHAM, ENGLAND.

APPARATUS FOR CHARGING BLAST-FURNACES.

939,671.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed October 24, 1906. Serial No. 340,326.

To all whom it may concern:

Be it known that we, WALTER CROOKE, a subject of His Majesty the King of Great Britain and Ireland, residing at Millom, in the county of Cumberland, England, engineer, and ARTHUR CROOKE, a subject of His Majesty the King of Great Britain and Ireland, residing at Frodingham, in the county of Lincoln, England, iron and steel works manager, have invented certain new and useful Improvements in Apparatus for Charging Blast-Furnaces; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in that class or type of apparatus for charging blast furnaces which has for its object to distribute the fuel and ore charged into the furnace uniformly over the surface of the stock line, and which comprises a hopper and bell and means for rotating them with a step by step motion.

According to our invention, we employ the known arrangement of a bell suspended by a rod from an oscillating beam and closing the outlet of a hopper arranged above the top opening of the furnace. But we arrange a second bell and hopper of larger diameter beneath the hopper and bell first mentioned which receive the charge from the skip, said lower bell being suspended from another oscillating beam; it is not necessary that the lower hopper should be rotatable. A ball bearing is combined with the suspending rod of the upper bell to take the weight of the same and its hopper, and means are provided for rotating this bell and hopper at will. Preferably the suspending rod of the upper bell is of tubular construction so that the suspending rod of the lower bell may pass through it, but if preferred this lower bell may be suspended by means of two rods passing upward from it to its beam on either side of the upper bell and hopper. A succession of charges supplied to the upper hopper and bell are evenly distributed therefrom, by rotation of such upper hopper, around the larger lower hopper and bell, and from thence discharged into the furnace.

We will now fully describe a manner of performing our invention having reference to the amended drawing in which:—

Figure 1 is a sectional side elevation of

apparatus in accordance with this invention; Fig. 2 is a detail on a larger scale.

Similar letters refer to corresponding parts in both the figures.

A fixed hopper D¹ of large diameter having a bell F is arranged at the top opening of the furnace beneath the rotatable hopper D. Normally hopper D seats on its bell E and is supported thereby and its upper edge is furnished with an outwardly extending flange which seats on the girders M when the bell E is lowered; said flange may also bear a small portion of the weight of the hopper when principally supported by the bell E. The rod E¹¹ by which the latter is hung from beam G is here shown as tubular and constructed with a ball bearing A to take the weight of the suspended bell and hopper, the arrangement of said ball bearing being clearly seen in Fig. 2. The tubular rod E¹¹ is hung from end of beam G by links engaging trunnions with which said tubular rod is provided. The bell F which closes the outlet of the lower hopper D¹ is suspended from oscillating beam G¹ by means of rod K which passes up through the tubular rod E¹¹ of bell E and between the forked ends of its beam G. Surrounding hopper D is a worm ring or wheel B engaged by worms C driven in any suitable manner, as by small electric or other motors, to rotate said hopper together with its bell as desired.

H, H¹ are steam cylinders for operating beams G, G¹ respectively and I I¹ indicate balance weights.

The upper hopper D is always closed and forms the seal while the lower hopper is discharging.

The cycle of operation is as follows:— Skip R brings up the charge and tips it into hopper D in the usual manner, steam is then passed to cylinder H to cause bell E to be lowered and effect discharge into hopper D¹. Steam is then exhausted from cylinder H to raise bell E again and close hopper D which then receives another skip load, when worms C are operated to partially rotate the hopper D and its bell to the required extent, when bell E is lowered as before to cause discharge into hopper D¹, this being repeated as often as may be necessary according to capacity of hopper D¹, hopper D being partially rotated before each discharge therefrom after the first. Steam is then passed to cylinder H¹ to cause beam G¹ to lower bell F whereby the contents of hopper D¹, evenly

distributed therearound from hopper D as above described, are discharged into the furnace. Bell F is then raised and another cycle may be commenced.

5 What we claim and desire to secure by Letters Patent of the United States is:—

10 In apparatus for the purpose set forth, the combination with a hopper seated on a bell suspended by a rod, of a bell and hopper of larger size therebelow, means for rotating the upper hopper and bell independently of the lower hopper, and a ball bear-

ing of small diameter applied to the suspending rod of said upper bell and hopper to take the weight thereof, substantially as 15 described.

In testimony whereof we have hereunto set our hands in the presence of two witnesses.

WALTER CROOKE.
ARTHUR CROOKE.

Witnesses:

WM. PIERCE,
H. WATSON.