

M. McMURRAY.
BLAST FURNACE.
APPLICATION FILED NOV. 16, 1911.

1,024,801.

Patented Apr. 30, 1912.

4 SHEETS—SHEET 1.

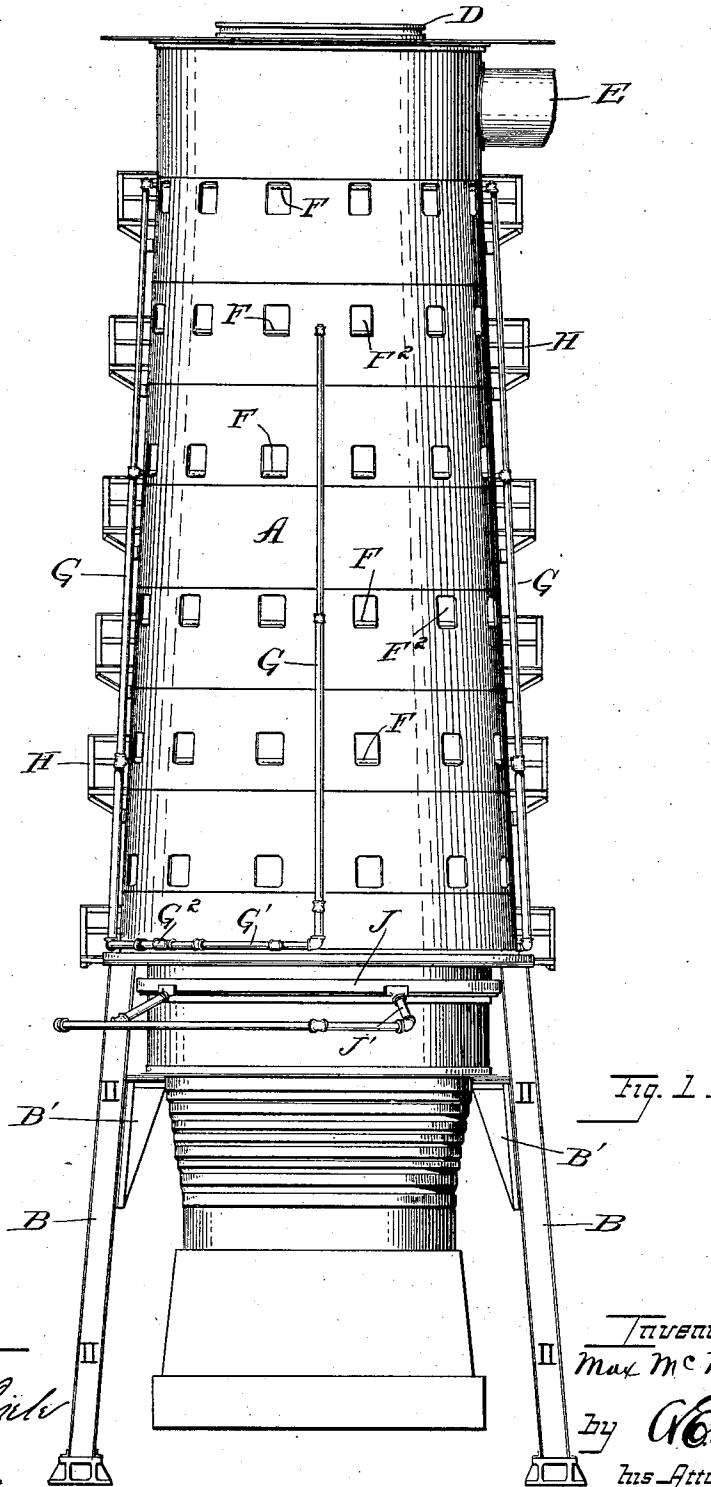


Fig. 1.

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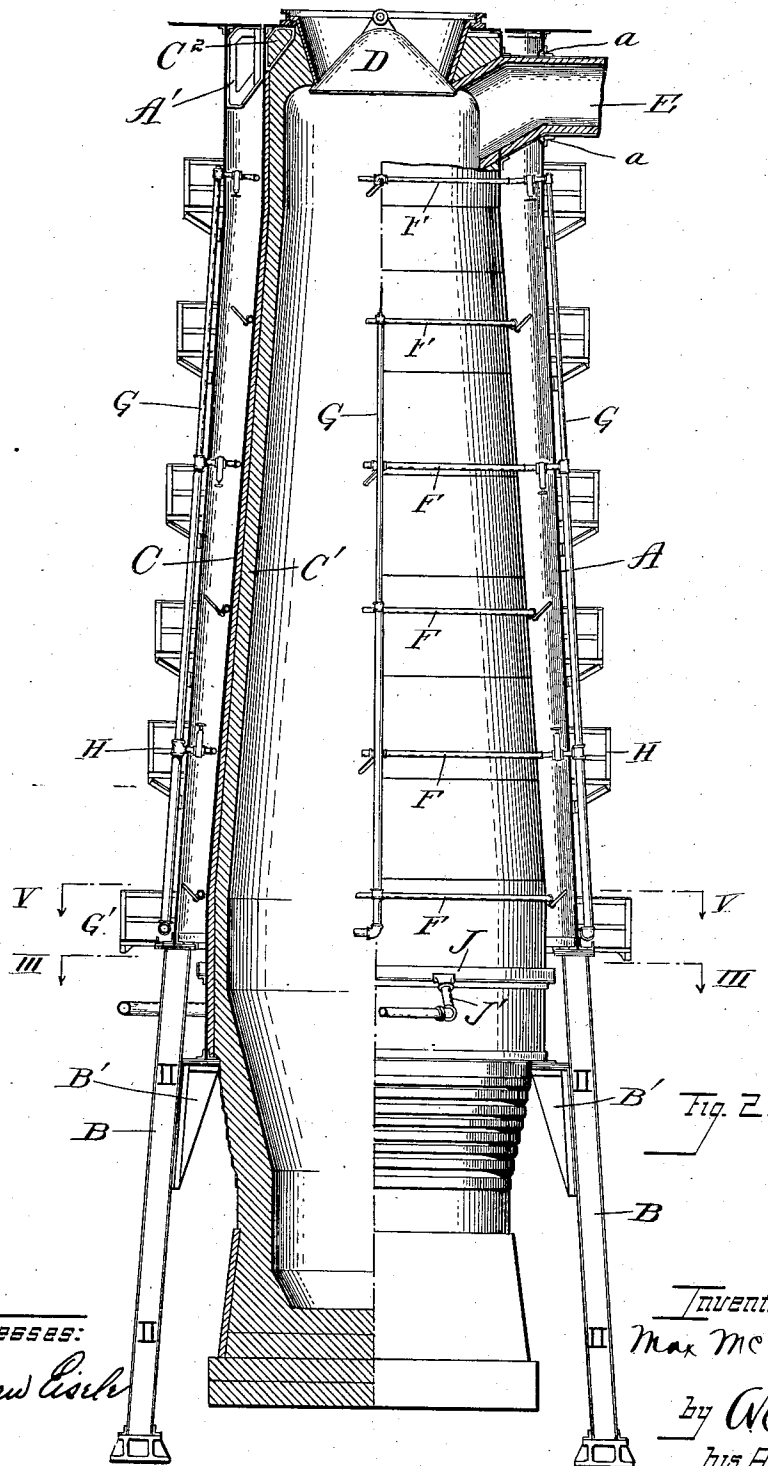
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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

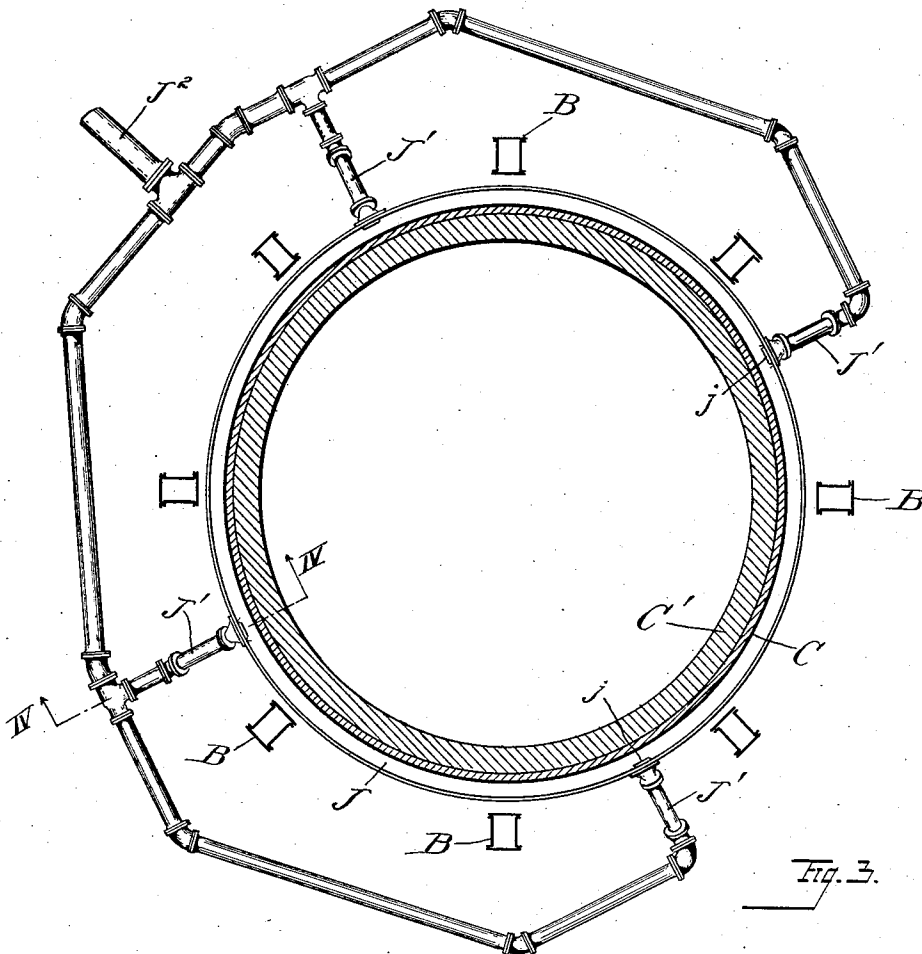


Fig. 3.

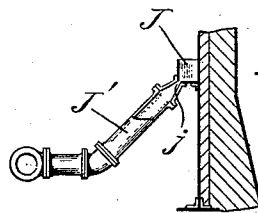


Fig. 4.

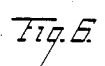
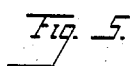
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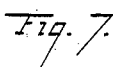
BLAST FURNACE.

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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

MAX McMURRAY, OF CLEVELAND, OHIO.

BLAST-FURNACE.

1,024,801.

Specification of Letters Patent.

Patented Apr. 30, 1912.

Application filed November 16, 1911. Serial No. 660,676.

To all whom it may concern:

Be it known that I, MAX McMURRAY, a citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Blast-Furnaces, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to blast-furnaces, and has for its object the provision of a blast-furnace construction which will be simple and economical in its construction and operation. The latest advance in furnace construction embodies the use of a thin lining protected by effective means.

A specific object of the invention is to provide an improved structure into which blast-furnaces of the old or common type of construction may be converted economically, embodying these recent improvements. By old or common type of blast-furnace, I mean blast-furnaces which include the ordinary outer steel shell supported on pillars, and have a thick interior lining of the usual construction, such lining as a whole being placed immediately adjacent to and in contact with said outer shell.

Heretofore in the most recent type of blast-furnace construction commonly known as thin-lined furnaces, it has been the universal practice to provide a complete and heavy column structure completely surrounding the furnace and extending to and supporting the top-platform, furnace-top and hoist-bridge. A furnace-shell with suitable cooling means was then built inside of this column structure and entirely free from it except at the points of support near the bottom. Cooling means for preventing the wasting away of the very thin brick lining has been provided, and, where this cooling means has been in the nature of a spray, the entire outer structure has been surrounded with a sheet iron-shield to prevent the wind from blowing the water flowing on the outside of the shell into spray and distributing it about the premises in a manner quite undesirable in ordinary weather and seriously obstructive in freezing weather.

The said invention consists of means hereinafter fully described and particularly set forth in the claims.

In the annexed drawings:—Figure 1 is a side elevation, with parts in section, of a blast-furnace, not including the superstructure or top, embodying my invention. Fig. 2 is a vertical section of one-half of the furnace, the other half being shown with the outer shell removed, thereby disclosing a part of the inner shell in elevation. Fig. 3 is a horizontal section taken upon the plane indicated by line III—III of Fig. 2. Fig. 4 is a detail section partly in elevation, taken upon the plane indicated by line IV—IV in Fig. 3. Fig. 5 is a horizontal section taken upon the plane indicated by line V—V in Fig. 2. Fig. 6 is a detail section taken upon an enlarged scale, on the plane indicated by line VI—VI in Fig. 5. Fig. 7 is a detail section on an enlarged scale.

In the drawings, I have illustrated the embodiment of my invention in connection with a reconstruction of a furnace of the old or common type, in which—

A represents the old outer shell, made of steel plates riveted together, as has been the common practice. This shell rests upon the pillars B B, which also form a part of such old construction. The lining of the old furnace is completely removed, and there is substituted therefor an inner shell C also of steel plates, which is provided with a comparatively thin lining C' which extends from the top of the furnace down to the bosh thereof, the latter being lined in the usual manner, said inner shell being spaced from the outer, as shown. This inner shell C rests upon brackets B', which are provided for this specific purpose, and suitably secured to the pillars B B, as shown in Fig. 2.

Upon the inside of the extreme upper portion of the shell C are provided brackets C² C², which support the structure D forming the charging opening of the furnace. Secured to the inside of the upper portion of the old shell A, and adjacent to the brackets C² C², are brackets A', which extend across the space formed between the inner and outer shells. The inner ends of these brackets may frictionally engage the outside of the adjacent portion of the inner shell C, but are not connected therewith, so that said inner shell and lining may move upwardly or downwardly as a result of expansion or contraction, independently of said brackets A', and therefore independ-

ently of the outer shell A. Where the outlets E leading to the downcomers, pass through the outer shell, the latter is cut away immediately surrounding these outlet
 5 ducts, as at *a a*, to provide a free space wherein said outlet ducts may freely move also as a result of such expansion and contraction.

In the space formed between the two
 10 shells is provided a system of piping for spraying the outside of the shell C. This system of piping includes a series of pipe rings F F, whose walls are provided with perforations *f* inclining downwardly and inwardly as shown in Figs. 6 and 7, whereby
 15 the water may be sprayed therefrom, as will be understood. These pipe rings are connected with a suitable water supply by means of risers G which are connected at
 20 the bottom with pipes G', which in turn are connected with pipes G² communicating with a main supply pipe G³. This latter pipe may be connected either to a stand pipe by means of a pipe G⁴, or to a power-operated pump by means of a pipe G⁵, suitable
 25 valves *g* and *g'* being provided to effect the connection of the pipe G³ with either the stand pipe or the power-operated pump, as may be desired. The rings are supported
 30 by means of rods *g*², Fig. 7, which are hooked around these rings, and are secured to the outer shell A, as shown. Each ring is furthermore provided with two T connections *g*³ *g*³, each of which is provided with
 35 a three-way valve *g*⁴ by means of which a large discharge opening *g*⁵ may be caused to communicate with the interior of the pipe ring so that a copious discharge of water therethrough may be effected for the
 40 purpose of flushing out the interior of the rings when such flushing may be desirable or expedient, as will be readily understood by those skilled in the art.

In order to have ready access to the spraying system, man-holes F² are cut through
 45 the outer shell and adjacent to the pipe rings F, as shown clearly in Fig. 1. Platforms H are secured upon the outside of the shell A adjacent to the man-holes, these platforms
 50 extending circularly around the shell, as shown in Fig. 5. Means for collecting the water sprayed upon the exterior of the shell C after it has run down the outer surface thereof, are provided, and include an annular trough J, Figs. 1 and 3, secured to
 55 the lower portion of the shell C, and provided with outlets *j*, Fig. 4, communicating with pipes J', all of which communicate with the main drain-pipe J², as also shown in Fig. 3.
 60

By means of this method of reconstruction, it will be seen that the old blast-furnace, or a blast-furnace of the old or common type, may readily be provided with a
 65 new shell provided with a thin lining and

special water-cooling equipment without the necessity for removing and reconstructing the hoist-bridge or furnace-top, and the old furnace-shell serves as an ample permanent support for these parts of the equipment in
 70 lieu of columns which have been heretofore provided in the thin-lined type of construction, for the purpose of supporting these parts, and as previously herein pointed out. At the same time, the old shell
 75 serves to prevent the wind from carrying the water from the surface of the inner furnace shell and spraying it about the premises in a manner which is, as before noted, objectionable under ordinary conditions and
 80 seriously obstructive in freezing weather.

While I have described my invention in connection with the reconstruction of a furnace of the old or common type, it is obvious that an entirely new furnace may be
 85 designed and constructed in accordance with my above described invention.

Having fully described my invention, what I claim and desire to secure by Letters Patent is:—

1. In a blast-furnace, the combination of
 90 an outer shell forming the support for the superstructure or furnace-top; an inner shell forming with said outer shell, an intervening free space; and means in said
 95 space for distributing water upon the inner shell; said outer shell adapted to protect the water so distributed from the action of air currents.

2. In a blast-furnace, the combination
 100 with an outer shell; of an inner shell arranged so as to be capable of movement vertically relatively to and independently of said outer shell.

3. In a blast-furnace, the combination
 105 with an outer shell forming the direct support for the superstructure or furnace-top; of an inner shell arranged so as to be capable of movement vertically relatively to and independently of said outer shell.
 110

4. In a blast-furnace, the combination
 115 with an outer shell composed of plates suitably secured to each other, and forming the direct supporting element for the furnace-top or superstructure; of an inner shell arranged so as to be capable of vertical movement relatively to said outer shell.

5. In a blast-furnace, the combination
 120 of an outer shell; an inner shell and lining therefor, spaced from said outer shell; a series of pipes surrounding said inner shell connected with a water supply and provided with discharge openings; and supports for such pipes secured to said outer shell.

6. In a blast-furnace, the combination of
 125 an outer shell forming the support for the superstructure or furnace-top; an inner shell forming, with the outer shell, an intervening free space; pipes in said space connected with a water supply and provided
 130

with outlets adapted to distribute water upon the outside of said inner shell; and supports for said pipes; said outer shell being provided with man-holes adjacent to
5 said pipes; and platforms secured to the said outer shell and adjacent to said man-holes.

7. In a blast-furnace, the combination of an outer shell; pillars forming the support
10 for such shell; an inner shell and lining therefor spaced from said outer shell and supported by said pillars; said inner shell being free from the outer at its upper portion, whereby it may expand and move ver-
15 tically independently of said outer shell.

8. In a blast-furnace, the combination of

an outer shell forming the direct support for the superstructure or furnace-top; an inner shell spaced from the outer shell; pillars acting as a common support for both
20 said inner and outer shells; said two shells being free to move relatively to each other at the top of the furnace; and a water cooling system between said two shells and adapted to distribute water upon the out-
25 side of said inner shell.

Signed by me, this 26 day of October, 1911.

MAX McMURRAY.

Attested by—

WM. R. MILLER,

WINIFRED FLEMING.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."