No. 669,012.

Patented Feb. 26, 1901.

J. KENNEDY.

BLAST FURNACE.

(Application filed Dec. 17, 1900.)

(No Model.)

2 Sheets—Sheet 1.

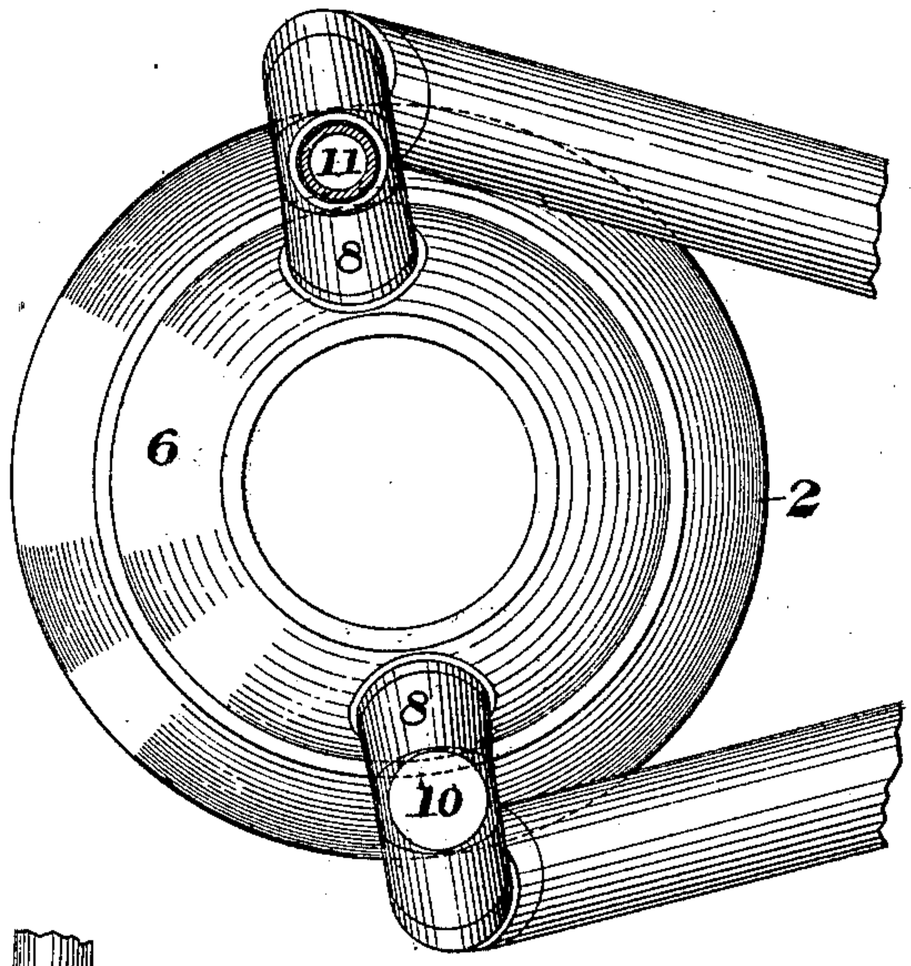


Fig. 1.

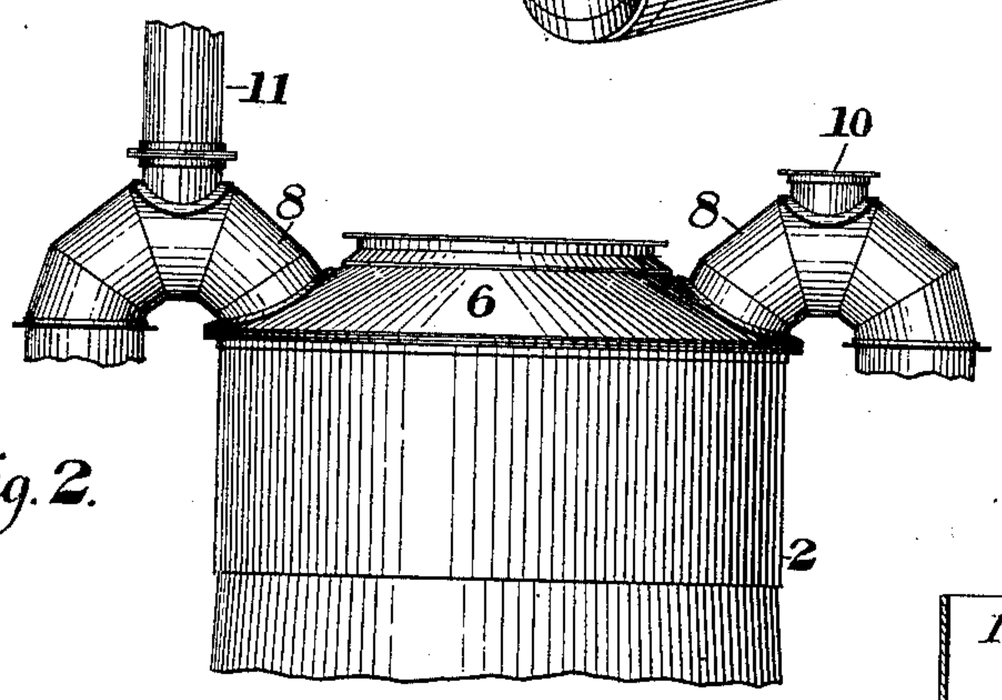
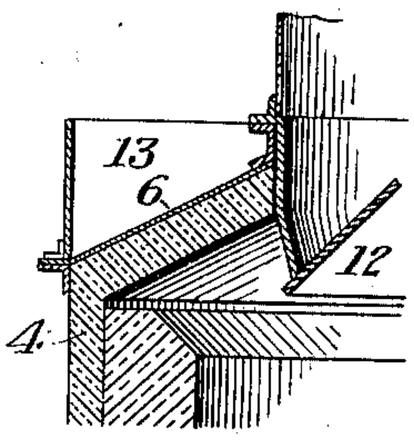


Fig. 2.

Fig. 6.



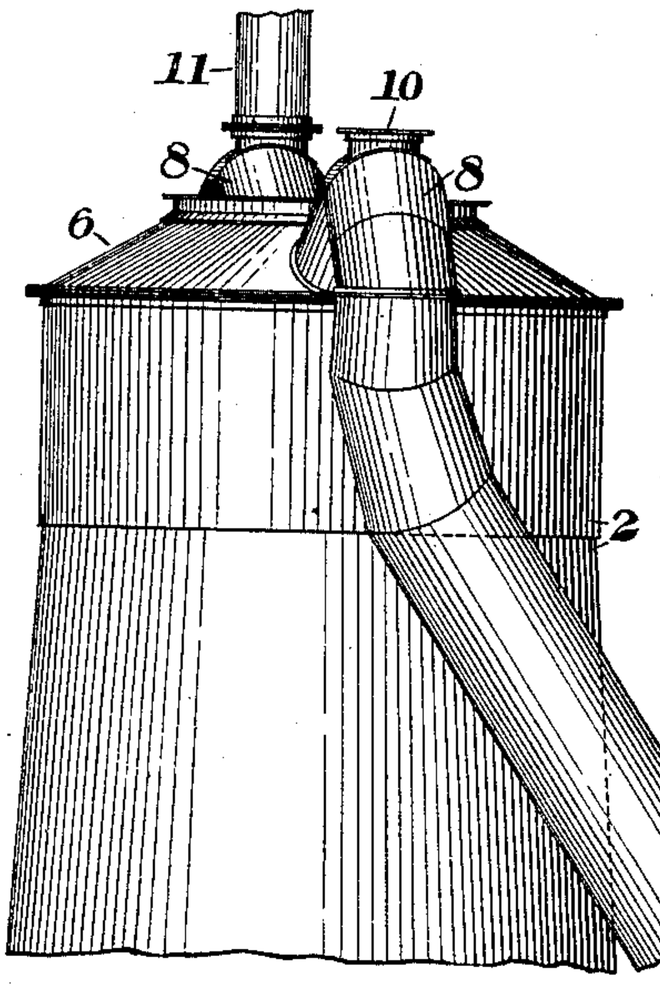


Fig. 3.

WITNESSES

Warren W. Swartz

H. M. Corwin

INVENTOR

Julian Kennedy

by Baldwin & Baldwin

his atty's.

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2 Sheets—Sheet 2.

Fig. 4.

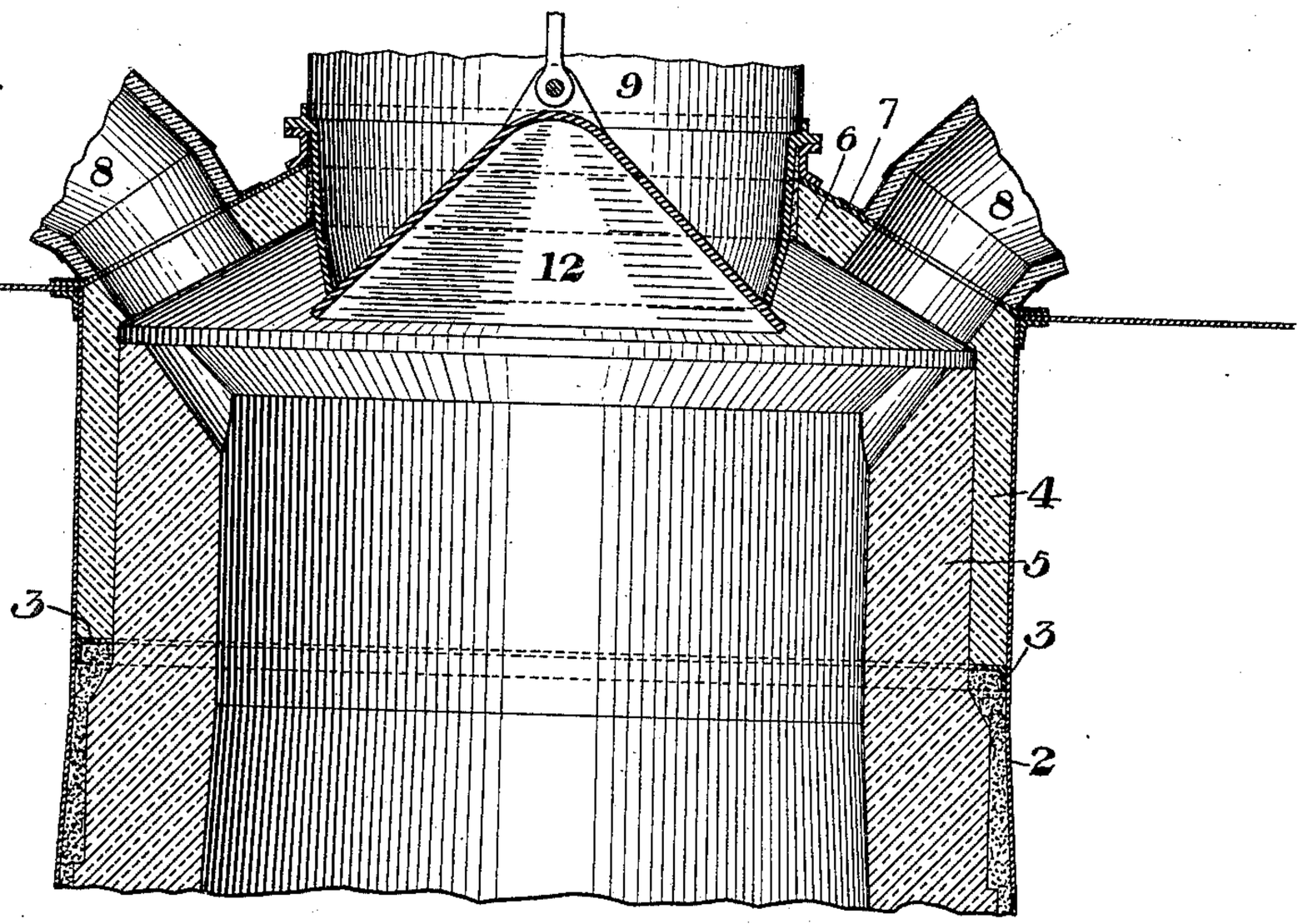
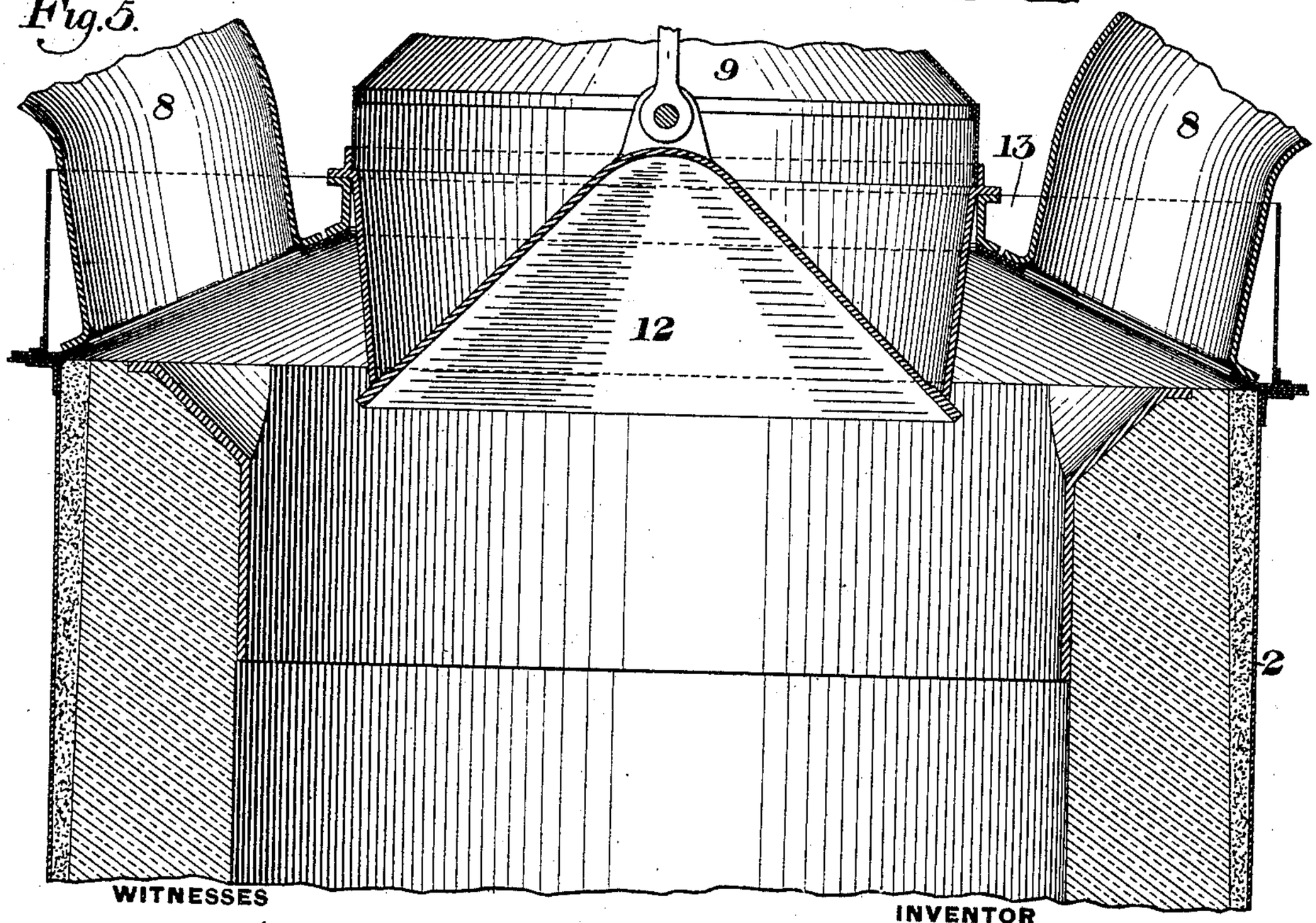


Fig. 5.



WITNESSES

Warren W. Swartz.

P. M. Corwine

INVENTOR

Julian Kennedy

by Bakewell & Bakewell

his attys.

UNITED STATES PATENT OFFICE.

JULIAN KENNEDY, OF PITTSBURG, PENNSYLVANIA.

BLAST-FURNACE.

SPECIFICATION forming part of Letters Patent No. 669,012, dated February 26, 1901.

Application filed December 17, 1900. Serial No. 40,103. (No model.)

To all whom it may concern:

Be it known that I, JULIAN KENNEDY, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Blast-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a top plan view of a blast-furnace top constructed in accordance with my invention. Fig. 2 is a broken side elevation, of the same. Fig. 3 is a partial side elevation taken at right angles to that of Fig. 2. Fig. 4 is a partial vertical section on a larger scale. Fig. 5 is a view similar to Fig. 4, showing a modified construction; and Fig. 6 is a detail sectional view showing the top with both the water-cooling holder and the lining.

My invention relates to the construction of blast-furnace tops, and is designed to strengthen and improve this portion of the furnace, to lengthen its life, and to decrease the amount of ore carried up by the gases.

Heretofore in blast-furnaces as built in practice the gas-outlet port connected to the downcomer extended outwardly through the upper portion of the side wall of the furnace and weakened the wall in this portion. The abrading action of the charges entering the furnace and striking the corners of the ports cut away the columns or brickwork between the ports and made this part of the furnace short-lived. The metal-plate top of these blast-furnaces has not been strong and was not securely fastened to the furnace structure, so that slight excess pressure in the furnace-chamber would lift the top and necessitate frequent repairs. The gases being taken out through the side walls would sweep away a considerable amount of the fine ore, and the constructing of the ports and the arches about them necessitated highly-skilled labor and a considerable amount of time. My invention is designed to overcome these difficulties and to provide a simple and long-lived construction of great strength.

In the drawings, 2 represents the outer shell of a blast-furnace, having near its upper end an inner supporting ring or flange 3, secured thereto, and upon which rests an annular wall 4, which is formed separately from the furnace-shaft 5. The annulus 4 extends upwardly above the top of the shaft 5 a sufficient distance to allow for the expansion of the shaft and joins with the dome-shaped top 6, having a shell 7 secured to the outer shell of the furnace. The wall 4 thus supports the brick lining for the dome.

Each downcomer 8, of which I have shown two, though any desired number may be used, connects with a port leading through the dome top at a point between the hopper 9 and the outer shell 2, and each downcomer in this portion has a reverse-bend form, extending upwardly from the port and thence downwardly to the dust-catcher. At the apex of the reverse bend in one or more of the downcomers I may provide a connection 10, by which a bleeder-pipe 11 may be secured to one downtake or to all, if desired. This bleeding-pipe extends upwardly, may be of any usual construction, and in its new location acts as a relief-valve for excess pressure.

Any usual bell-and-hopper mechanism may be employed, and I have shown a single bell 12, closing upwardly against the bottom of the hopper, which bell may be actuated by any desired mechanism.

If it is desired to water-cool the top of the furnace, my construction lends itself readily to this feature, and in Fig. 5 I show the furnace as having an upwardly-extending annular plate 13, surrounding the outer part of dome top and providing an annular chamber which may contain water, the downcomers extending upwardly through this chamber. The dome-shaped top may also be arranged, as in Fig. 6, with both the water-holder plate 13 and the refractory lining 6.

The advantages of my invention will be obvious to those skilled in blast-furnace construction.

The trouble, expense, and delay in building the upper part of the usual shaft, with its ports, are largely reduced, as this plain solid wall can be quickly and easily laid by the ordinary bricklayer. As this upper part of the shaft-wall is solid and presents a smooth inner face, it is not abraded rapidly by any entering charges and is much stronger than the arched constructions before employed. The separate annular wall surrounding the upper part of the shaft is of special impor-

tance, as it allows expansion and contraction between the shaft and the top, while keeping a tight joint by means of the telescopic action between the annular wall and the shaft. The dome shape of the top is of great strength, and the top may be rigidly secured, so as to prevent upheaval by any excess pressures which are ordinarily generated in a blast-furnace. The connecting of the gas-offtake between the hopper and the outer shell does away with the ports through the shaft, cheapens the cost, and owing to the upward directing of the outlet-port decreases the amount of ore carried out. The position of the bleeder-pipe enables it to act as a safety device and does away with the necessity for explosion-doors.

Many changes may be made in the form and arrangement of the top and its connections without departing from my invention.

I claim—

1. A blast-furnace having a masonry shaft with a surrounding metal shell, a hopper, and a dome-shaped metal top springing from said metal shell and connected to the hopper, substantially as described.

2. A blast-furnace having a masonry shaft, a metal shell around said shaft, a central hopper, a dome-shaped metal top secured to and supported by the outer shell, and extending inwardly from said shell to the central hopper, and a refractory lining for said top, substantially as described.

3. A blast-furnace having a masonry shaft, a metal shell around said shaft, a hopper, a dome-shaped metal top springing from the outer metal shell and connected to the hopper, and a holder for retaining a pool of liquid on the dome-shaped top, substantially as described.

4. A blast-furnace having a masonry shaft, a metal shell around said shaft, a hopper, a dome-shaped metal top springing from the outer shell and extending inwardly from it to the hopper, and a projecting platform secured at or near the juncture of the outer shell and the dome-shaped top, substantially as described.

5. A blast-furnace having a refractory shaft, a metal shell around said shaft, a dome-shaped metal top springing from said shell, a refractory lining for said top, and means for supporting the top and its lining independently of the masonry shaft, substantially as described.

6. A blast-furnace having a masonry shaft, a metal casing for the shaft, a dome-shaped metal top springing from said casing and a refractory lining for said top, supported by the outer metallic casing independently of the shaft, substantially as described.

7. A blast-furnace having a refractory shaft, and a metallic outer shell with inwardly-projecting supports in its upper portion, and an annular wall carried on said supports and surrounding the upper part of the masonry shaft, said shaft and wall being movable relatively to each other, substantially as described.

8. A blast-furnace having a masonry shaft, a metallic shell around said shaft, a dome-shaped top, an annular wall surrounding the top of the shaft, and supported upon the outer shell independently of said shaft, and a lining for the dome supported on said annular wall, substantially as described.

9. A blast-furnace having a masonry shaft, a metallic shell around said shaft, a hopper, a dome-shaped top comprising a metal shell and a refractory lining therefor, said top being secured to the furnace shell and hopper and having a gas-port leading through its lining and shell at a point between the hopper and the furnace-shell, and a downcomer connected to said port, substantially as described.

10. A blast-furnace having a dome-shaped metal top, a holder for retaining a pool of water on said top, a port in said top within the holder, and an offtake leading from said port upwardly through the holder, substantially as described.

In testimony whereof I have hereunto set my hand.

JULIAN KENNEDY.

Witnesses:

Y. L. PHILLIPS,

C. P. BYNES.