

No. 770,171.

PATENTED SEPT. 13, 1904.

R. O. DOBBIN.  
SMOKE CONSUMER.

APPLICATION FILED OCT. 22, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 1.

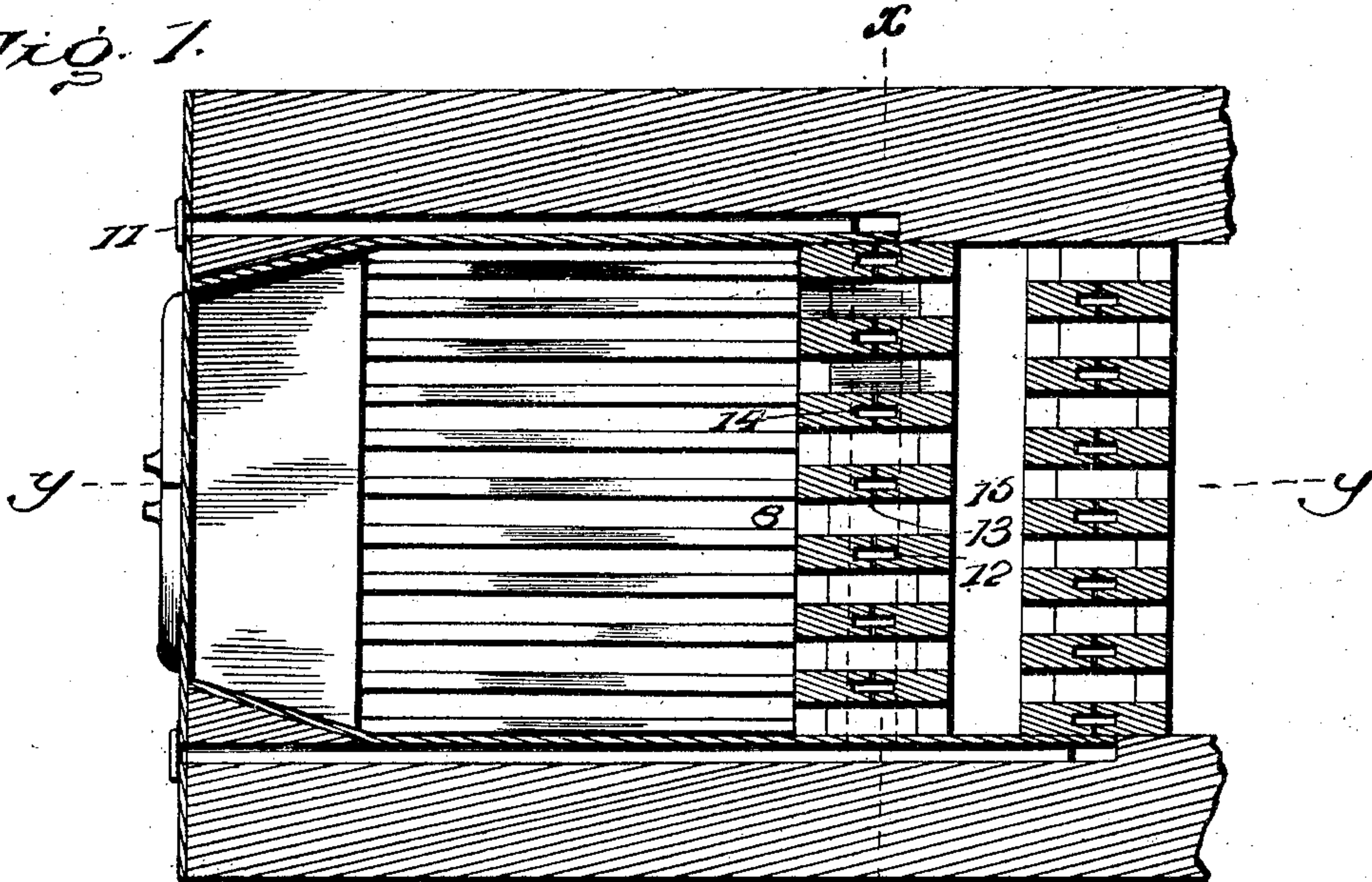
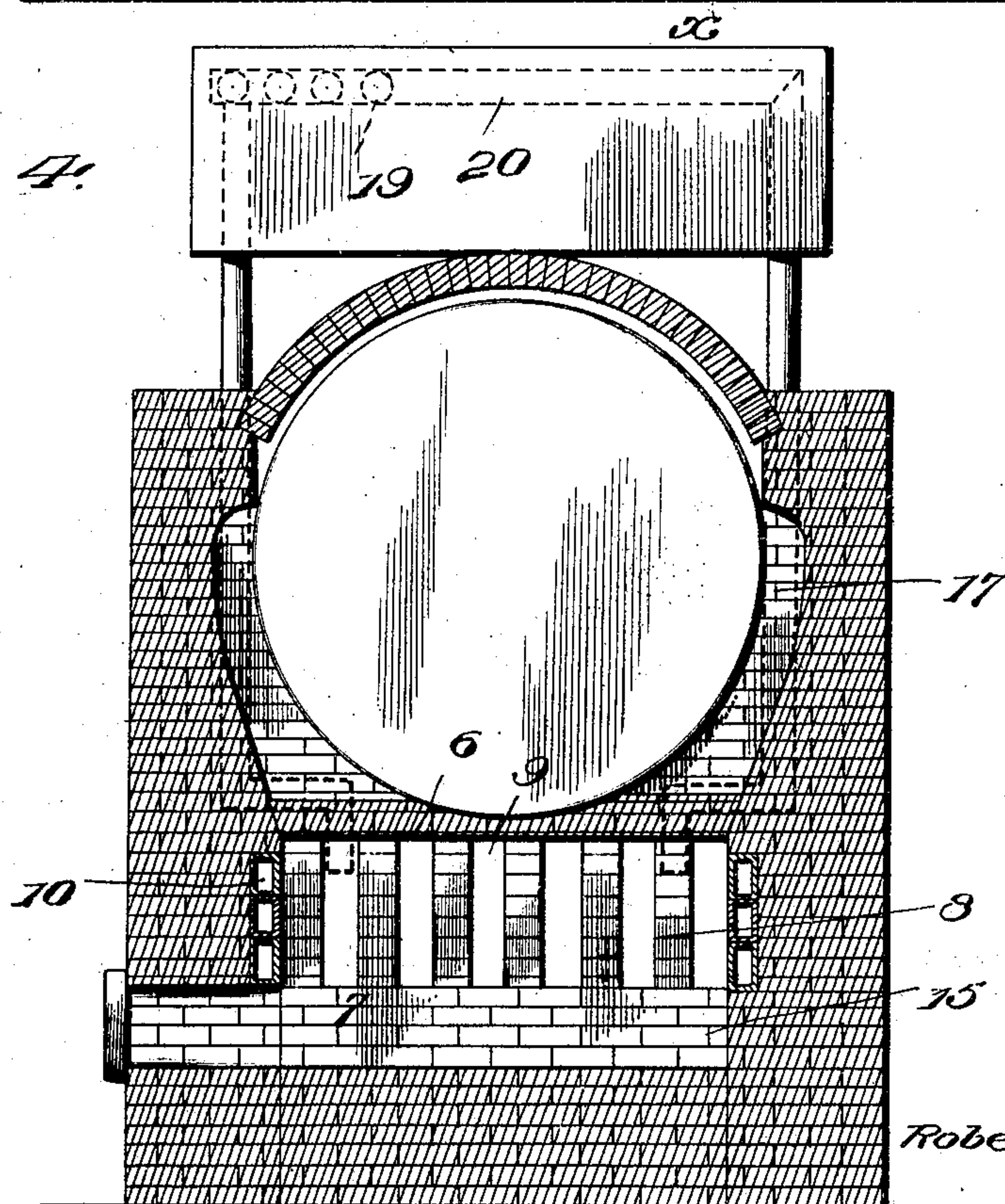


Fig. 4.



Inventor

Robert O. Dobbin

Witnesses

*Wm. H. H. H. H.*  
E. R. Peck

By

*Hubert C. Peck*

Attorney



No. 770,171.

PATENTED SEPT. 13, 1904.

R. O. DOBBIN.  
SMOKE CONSUMER.

APPLICATION FILED OCT. 22, 1903.

NO MODEL.

3 SHEETS—SHEET 2.

Fig. 2.

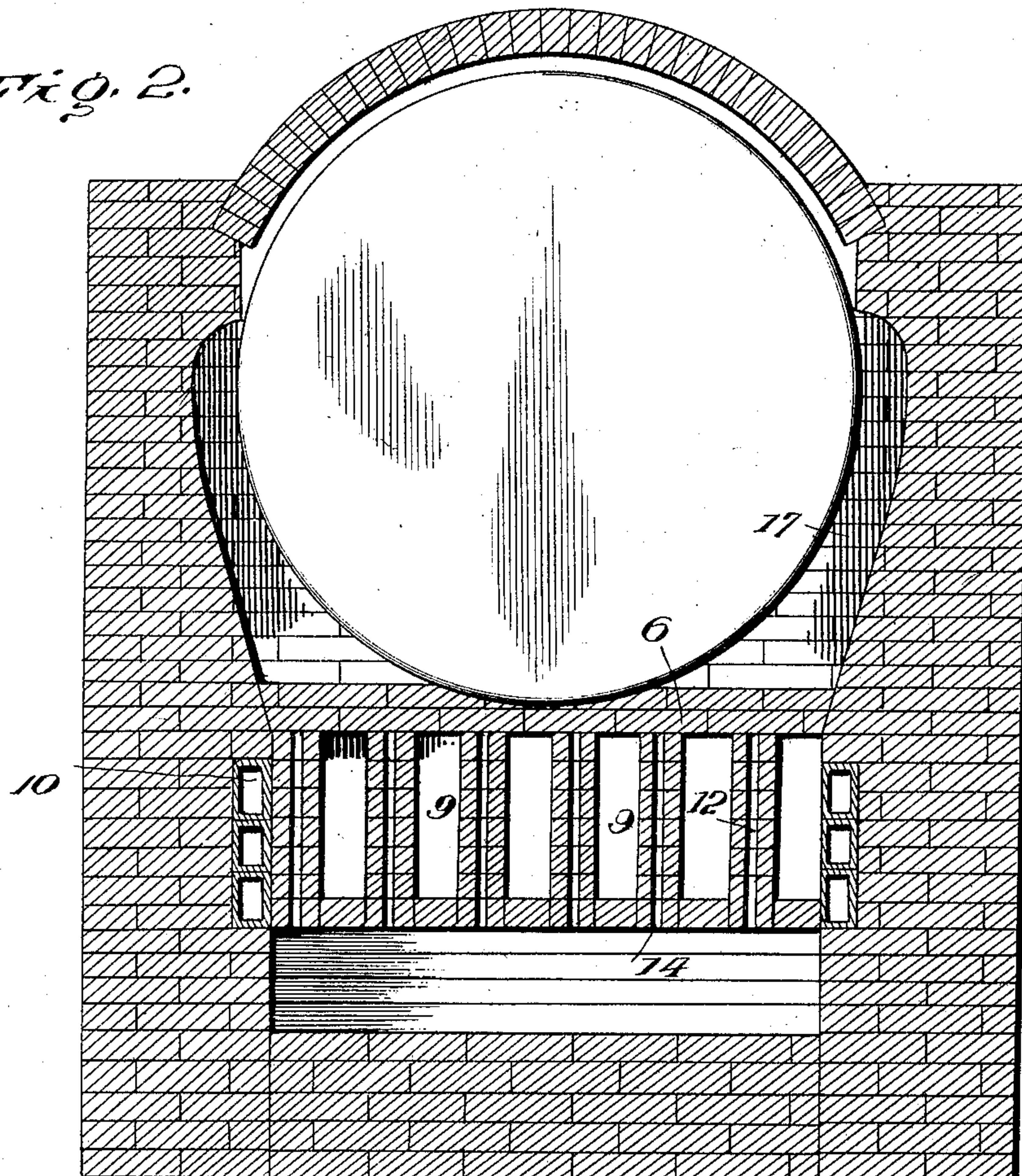
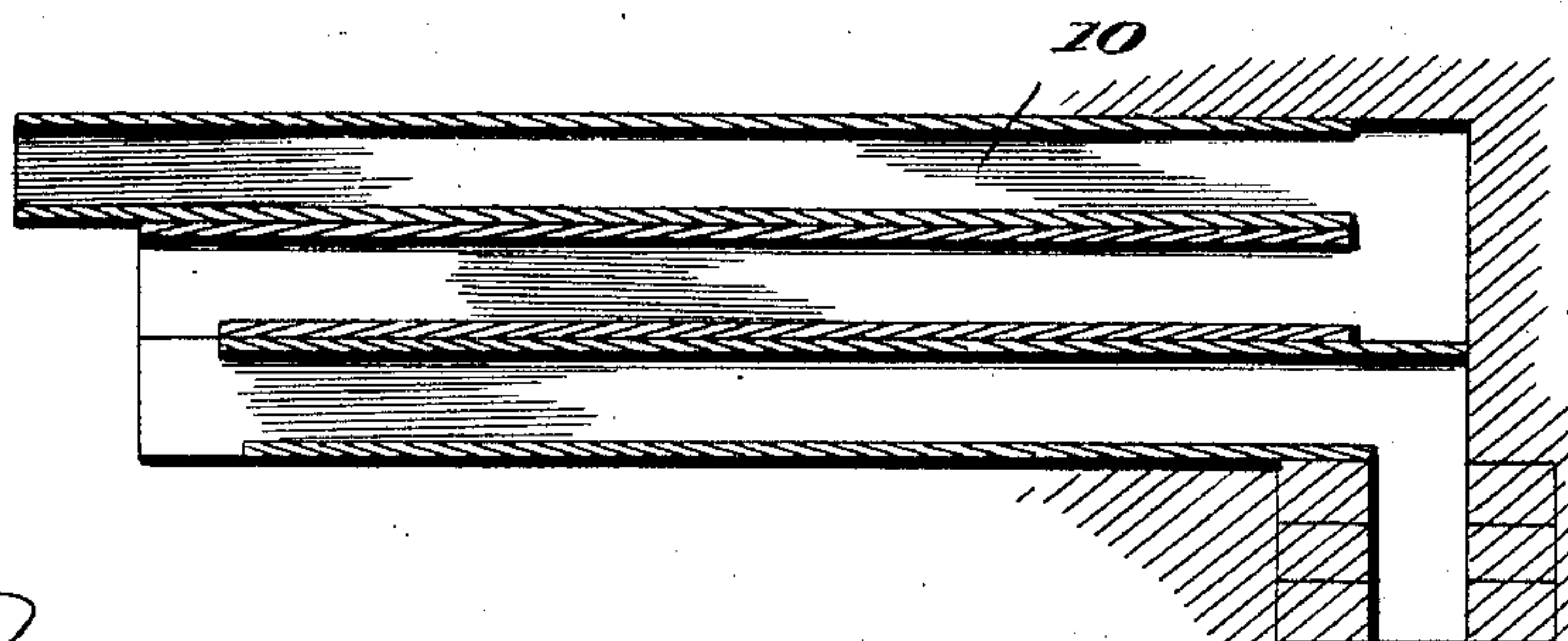


Fig. 5.



Witnesses

*John J. ...*  
E. R. Peck

By

Robert O. Dobbin

*Hubert Peck* Attorney

Inventor



No. 770,171.

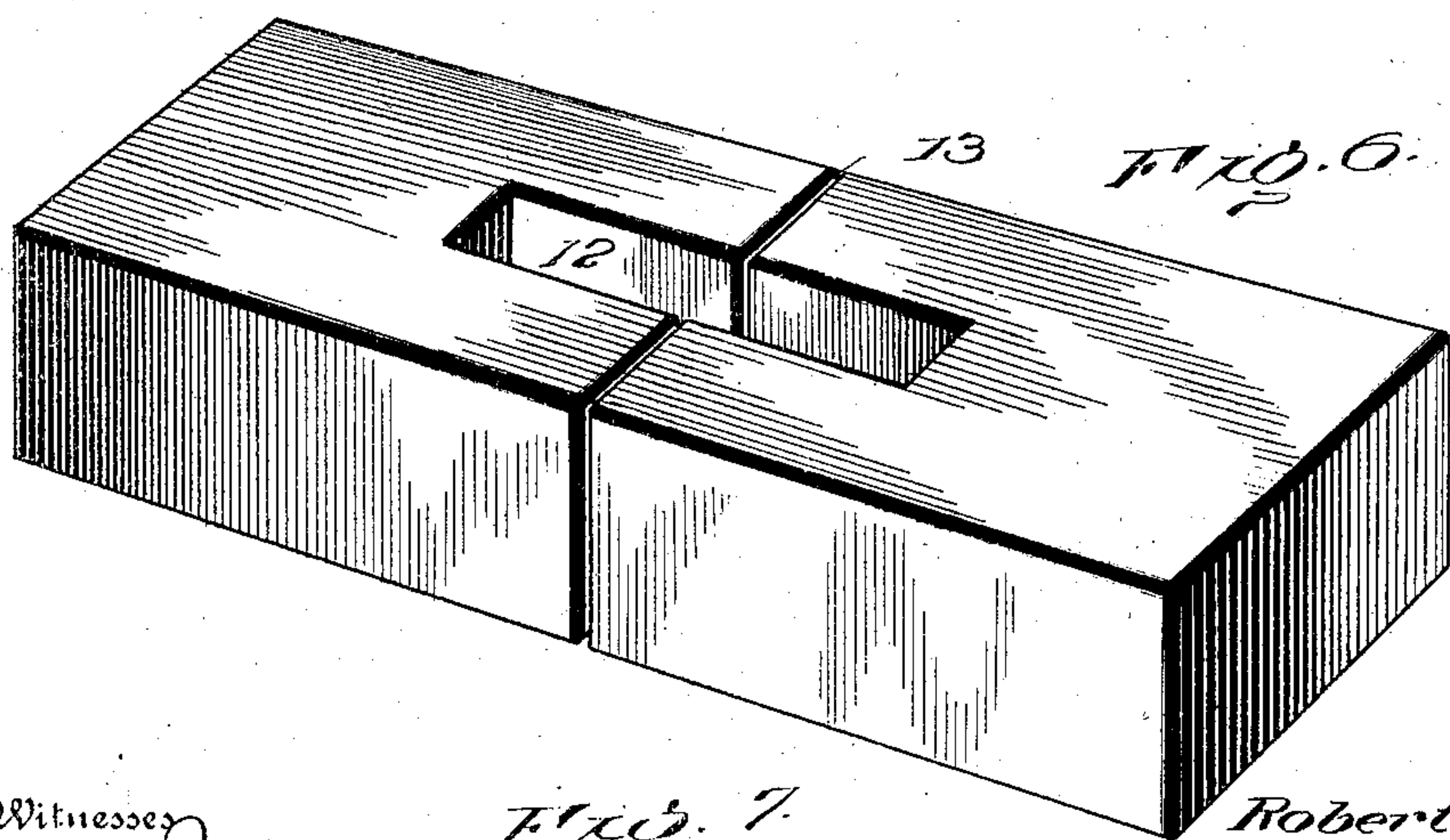
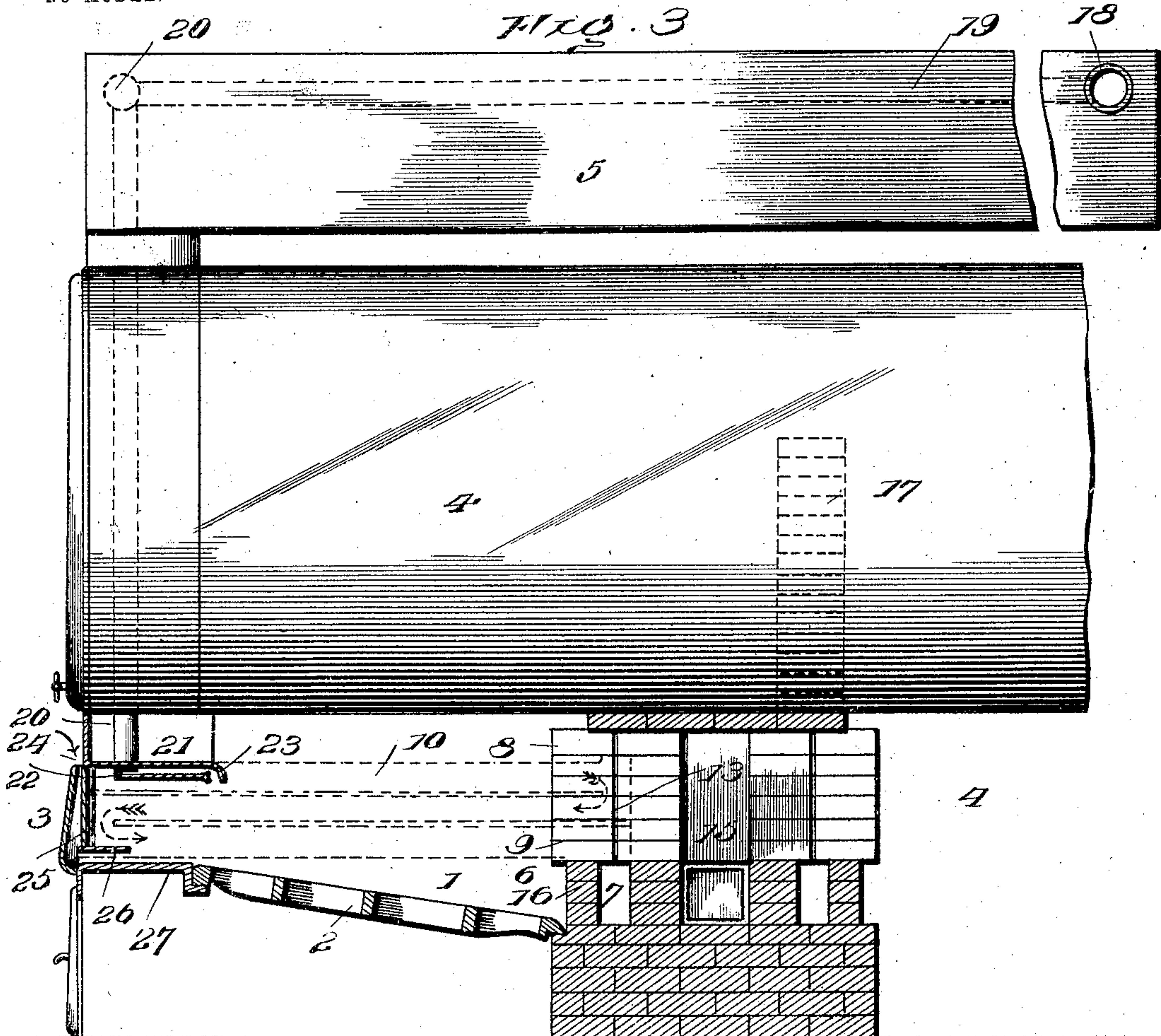
PATENTED SEPT. 13, 1904.

R. O. DOBBIN.  
SMOKE CONSUMER.

APPLICATION FILED OCT. 22, 1903.

NO MODEL.

3 SHEETS—SHEET 3.



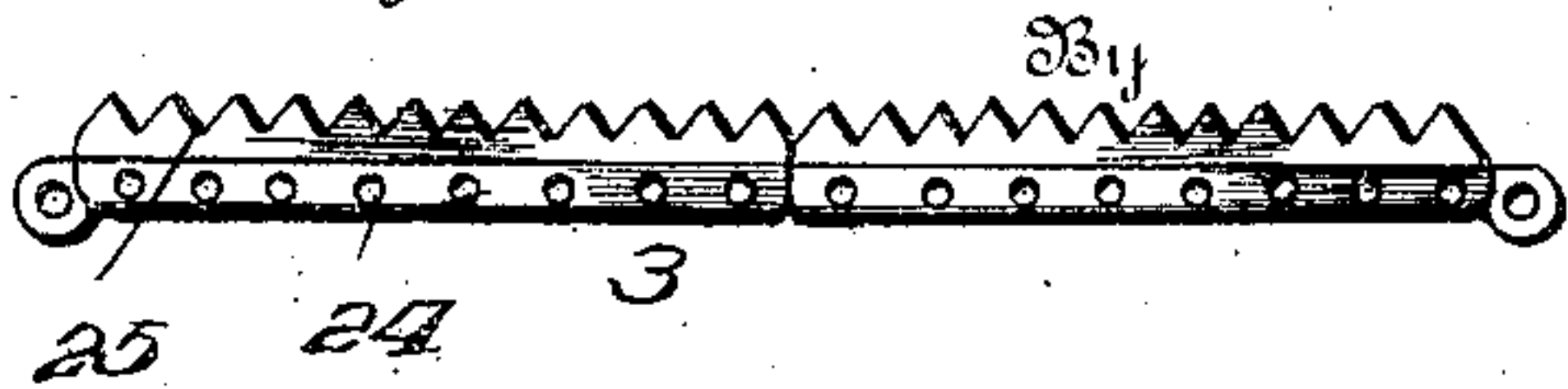
Inventor

*Robert O. Dobbin*

Witnesses

E. R. Peck

Fixo. 7.



Hubert E. Rok

Attorney



# UNITED STATES PATENT OFFICE.

ROBERT ORME DOBBIN, OF WATERLOO, CANADA.

## SMOKE-CONSUMER.

SPECIFICATION forming part of Letters Patent No. 770,171, dated September 13, 1904.

Application filed October 22, 1903. Serial No. 178,124. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT ORME DOBBIN, a subject of the King of Great Britain, residing at Waterloo, Province of Ontario, Dominion of  
5 Canada, have invented certain new and useful Improvements in Smoke-Consumers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as  
10 appertains to make and use the same.

This invention relates to improvements in boiler-furnaces.

The main object of the invention resides in the production of means for mixing with the  
15 escaping products of combustion superheated air delivered in a manner to thoroughly commingle and associate such gases and air to promote combustion of the latter, tending to prevent the usual smoke.

20 With this object in view the invention consists in forming a superheater in the usual bridge-wall of the furnace, to which superheater air previously heated is delivered and in which superheater the air is further heated  
25 to a high degree and delivered directly to the smoke-flues, the latter being formed to divide the escaping gases into a plurality of currents to further insure a complete and intimate association of the gases and superheated air.

30 A further object of the invention resides in means for utilizing the heat of the escaping products of combustion to heat a current of air to be delivered directly onto the fuel to further promote the combustion. It is absolutely essential to the practical success of a  
35 device of this character that the air be heated to the maximum degree before contact with the escaping gases and be delivered in a manner to thoroughly mix and search every atom  
40 of such gases, as otherwise there is a partial escape of the gases and the requirement and heating of a large volume of unused air, thereby wasting rather than economizing in the heat units of the furnace.

45 The specific construction to be described in detail tends to the formation of a simple, cheap, and effective apparatus in which just sufficient superheated air is used and delivered in a

manner to commingle and associate with practically every atom of the escaping gas, tending to almost complete combustion. 50

The invention in its preferred form will now be described in detail in connection with the accompanying drawings, in which—

Figure 1 is a horizontal sectional view of my improved furnace, taken just above the  
55 superheater. Fig. 2 is a cross-section of the furnace on the line *xx*, Fig. 1. Fig. 3 is a longitudinal sectional view of the furnace on the line *yy*, Fig. 1. Fig. 4 is a vertical sectional view through the superheater. Fig. 5  
60 is a view in section, showing a portion of the furnace-wall and the air-inlet duct therein. Fig. 6 is a perspective view of one layer of the bricks forming the piers of the superheater. Fig. 7 is a detail top plan view of the  
65 fire-doors.

Referring to the accompanying drawings, wherein like reference characters represent like parts throughout the several views, my  
70 invention is illustrated in connection with a boiler-furnace of the usual type, in which—

1 represents the fire-box; 2, the grate therein; 3, the fire-doors; 4, the boiler, and 5 the smoke conductor or flue for the escaping prod-  
75 ucts of combustion.

The superheater is formed in the bridge-wall, being preferably built in the formation of the wall. In the drawings I have illustrated two bridge-walls, in each of which a  
80 superheater is built; but as these superheaters are identical in construction and operation a detail description of one is equally applicable to the other.

The bridge-wall 6 is hollow at its base to  
85 provide an air-chamber 7, the upper wall of which supports a plurality of hollow piers 8, spaced a slight distance apart to form smoke-flues 9 for the gases escaping from the fuel.

An air-inlet duct 10 is formed in the side  
90 wall of the fire-box 1, opening at its front end to the atmosphere, which opening is controlled by an ordinary damper 11 and communicating at the rear end with the air-chamber 7. This air-duct comprises a closed passage built  
95 into the wall of the fire-box and may be ar-



ranged to lead the air direct to the chamber 7 or compel the air to take a tortuous passage to reach said chamber. The latter arrangement is preferable and is the one illustrated, 5 being gained by forming the duct in a three-channel form, as shown, compelling the air to travel three times back and forth in the heated wall before delivery to the chamber, whereby the air is heated to a considerable 10 degree before delivery to the superheater.

The superheater is, as described, built in the bridge-wall and of the usual fire-brick; but to provide the most effective and economical heating and perfect distribution of 15 the air I have constructed the hollow piers in a peculiar manner, the arrangement of which I regard as one of the important features of my invention. Each pier 8 is built up of layers of fire-brick, two bricks to each layer, the 20 contiguous edges of the brick being notched or cut out for a portion of its depth, as at 12. In assembling the bricks the cut-out edges are placed to leave a slight space, as 13, between them, the notches 12 being of course 25 in alinement. The successive layers are similarly placed one above the other, keeping the notches 12 and spaces 13 in vertical alinement. This arrangement affords an air-flue 14, 30 formed by the cut-out portions 12, centrally of the pier and in open communication with the chamber 7, while the spaces 13 form narrow unbroken vertical ways leading from the air-flue 14 to the smoke-flues 9. The chamber 15 immediately in rear of the superheater 35 forms a combustion-chamber for the consumption of the escaping gases.

The second or rearward bridge-wall is formed with a superheater identical with the one just described and is supplied with air 40 from an air-duct similar to duct 10.

As an additional means for heating the air in the superheater I tilt or depress the rear end of grate 2 to leave a wall or fireback 16, forming the front wall of chamber 7. The 45 body of the fuel rests against this fireback, and the highly-heated bricks of such fireback communicate the heat directly to the air in chamber 7.

The plurality of piers of the superheater 50 renders the smoke-flues comparatively narrow, so that the flame and escaping products of combustion are divided into comparatively thin streams through the smoke-flues and play directly against the fire-bricks forming the 55 piers of the superheater, heating the air in the air-flues 14 to a high degree, as will be evident.

In order to positively direct all escaping products through the flues 9, I extend the furnace-walls in the form of arched abutments 60 17 to surround or partially surround the boiler, it being understood that such abutments are placed one on each side the boiler immediately above the rear superheater. This pre-

vents the escape of the products alongside the boiler and compels some to pass through the smoke-flues, as is desirable. 65

To utilize the heat from the escaping products as a forced blast to the fuel, I position a pipe 18 transversely of the smoke-box of the 70 smoke-conductor 5 and connect therewith several longitudinal pipes 19, which extend lengthwise of the smoke-conductor to a point above the forward end of the boiler, where they communicate with a transverse pipe 20, 75 the ends of which extend downwardly through the smoke-head of the boiler and through the fire-door arch and discharge the heated air into the air-chamber 21, formed by said arch and the plate 22, beneath the same. This air- 80 chamber 21 at its inner portion opens into the fire-pot above the fire, and the deflector 23 directs the hot-air blast down onto the fire. The downwardly-extending ends of pipe 20 are usually provided with dampers. By this 85 construction cooled air is taken into pipe 18 through its end or ends at a point of least heat of the escaping products and gradually heated and delivered as a hot blast directly onto the fuel, serving to mix the air and prod- 90 ucts of combustion and aiding in promoting the consumption of the escaping gases.

The fire-doors 3 are perforated, as at 24, to admit air, and a vertically-corrugated plate 25, secured to the inside of the doors, but 95 spaced therefrom, forms an air-heating chamber and directs the air downwardly and onto the fuel between an intumed end 26 of such plate and the usual dead-plate 27 of the furnace. The plates 25 are of course highly heated 100 by the fire, and the chambers formed thereby at the inner faces of the doors serve to highly heat the incoming air and also act as a protector to minimize the heat radiated through the doors into the furnace-room. The 105 usual ash-pit doors serve to admit air to promote combustion of the fuel, and the usual damper (not shown) controls the pull or draft through the stack.

The operation of the furnace arrangement 110 will be fully apparent from the above description, read in connection with the accompanying drawings, it being noted that the air passing through ducts 10 is highly heated therein and passes therefrom to the chamber 115 7, is more highly heated by the radiation from the fireback 16 and passes upward through the air-flues 14, and is still more highly heated through direct play of flames and escaping products against the piers 8 and is delivered 120 in this highly-heated condition in a vertical unbroken stream directly into the smoke-flues and forced to intimately associate with the escaping atoms of gas and promote their complete combustion. The escaping products are 125 previously mixed in some degree with heated air through the doors 3 and pipe 20, as before described, rendering more effective a mini-



5 mum supply of air from the superheater. The damper controlling the draft of the fire also regulates the delivery of air through the superheater, thus permitting a perfect regulation with a single operation.

10 I am aware that it has been heretofore proposed to heat air and direct same into contact with the escaping products of combustion; but no such construction with which I am familiar will heat the air to the degree obtained by my device, nor does any such construction direct the heated air from the superheater into the smoke-flues in a thin unbroken stream approximately extending the entire height of the smoke-flue, and this peculiar delivery is of advantage, as it searches every part of the smoke-flue and thoroughly commingles the air and gases, and hence is to be distinguished from an air-delivery in small jets, as the latter arrangement leaves some portion of the smoke-flue unaffected by the heated air in direct play, hence requiring a greater quantity of heated air than my device to gain the same result.

25 It is an essential point in all constructions of this character that economy of construction and supply of the proper amount of air be the first consideration. These I gain through the peculiar manner of constructing the piers 8 to afford the air-flues and escape-spaces and the continual heating of the air through firing all parts of fire-brick. The escaping products of combustion are naturally divided into thin streams in forcing through the smoke-flues 9 and are there met by vertical transversely-moving streams of heated air, insuring the thorough mixing necessary to practically complete combustion.

40 It is understood that the air-inlet ducts 10, as well as the smoke-flues 9 and air-flues 12, may be of any desired sectional shape or in any number best adapted for the particular use.

45 Having thus fully described my invention, what I claim is—

1. In a furnace for steam-boilers, a superheater built in the bridge-wall, said superheater comprising an air-chamber, and vertical hollow piers arranged above the chamber, the piers being built of layers of two brick each, each brick of a layer being cut out for a portion of its depth and arranged with said cut-out portions contiguous and with a space between the contiguous faces.

55 2. In a furnace for steam-boilers, a superheater built in the bridge-wall thereof, said superheater comprising layers of brick, centrally cut out and having a vertically-arranged space between the adjacent edges of the contiguous brick of each layer.

60 3. In a furnace for steam-boilers, a grate, means for delivering a blast of heated air onto the grate, and a superheater in rear of the grate to receive heated air from an independent source, said superheater comprising hol-

low piers arranged to form smoke-flues between them and to direct the heated air centrally into the smoke-flues, in a thin unbroken vertical stream coextensive with the height of the smoke-flues.

70 4. In a furnace for steam-boilers, a fire-box, a grate therein depressed at its rear end to form a fireback at rear of the grate, a superheater built of brick in rear of the grate, an air-chamber receiving heated air through channels in the walls of the fire-box and delivering same to the superheater, said chamber being located in rear of the fireback to receive heat therefrom, and a vertical channel leading from the superheater to the smoke-flues formed by spacing the contiguous bricks of the superheater.

85 5. In a furnace for steam-boilers, a fire-box, a grate therein depressed at its rear end to form a fireback at rear of the grate, a superheater built of brick in rear of the grate, an air-chamber receiving heated air through channels in the walls of the fire-box and delivering same to the superheater, said chamber being located in rear of the fireback to receive the heat therefrom, and a channel lengthwise of the superheater and coextensive with the height and centrally of the smoke-flues, said channel being formed by spacing the contiguous faces of the brick in setting the superheater.

100 6. In a steam-boiler furnace, in combination, a fire-box, a pair of air-superheaters immediately in rear of the fire-box and having the smoke-flues therethrough, a combustion-chamber between said superheaters and into which said flues open, and means for discharging air into the superheaters and distributing the same in a single vertical unbroken stream centrally into said flues.

105 7. In a steam-boiler furnace, in combination, a fire-box, a boiler, a pair of air-superheaters in rear of the fire-box and having smoke-flues therethrough, abutments extending up along the boiler from the rear superheater, said superheaters formed with unbroken vertical air-passages opening centrally into said flues, means supplying air to said passages, the front superheater forming the fireback.

115 8. In a steam-boiler furnace, in combination, a fire-box, a wall in rear thereof formed with a multiplicity of horizontal smoke-flues, the walls thereof having elongated vertical narrow central air-discharge slits, and means supplying air thereto.

120 9. In a furnace, in combination, a fire-box and its grate, a bridge-wall formed with an air-superheater and a transverse air-chamber, means to supply heated air to said chamber, the front wall of said air-chamber forming the fireback and said grate inclining downwardly and rearwardly to said fireback, said superheater comprising vertical spaced piers forming intervening horizontal smoke-flues, said

70

75

80

85

90

95

100

105

110

115

120

125

130



piers composed of brick spaced to form vertical air-passages from said air-chamber and side air-discharge slots or slits into said smoke-flues.

5 10. In a furnace, in combination, a fire-box and its grate, a bridge-wall formed with a pair of adjacent air-superheaters, transverse air-chambers below the superheaters, and the vertical abutments extending up from the rear  
10 superheater, said superheaters forming an intervening transverse combustion-chamber, tortuous air-supplying passages arranged at the side walls of the fire-box and at their inner ends communicating with said air-cham-  
15 bers, said air-passages being closed against communication with the interior of the fire-box, said superheaters comprising spaced vertical piers forming intervening horizontal smoke-flues opening into said combustion-

chamber, each pier comprising bricks forming 20 a vertical air-passage from a transverse air-chamber and lateral air-discharge slots into adjacent smoke-flues.

11. In a boiler-furnace, in combination, a fire-box, and an air-superheater comprising 25 vertical spaced piers forming horizontal smoke-flues from the fire-box, each pier comprising spaced recessed bricks forming a vertical air-passage and lateral air-discharge slits from the air-passage to an adjacent smoke- 30 flue.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT ORME DOBBIN.

Witnesses:

A. WERNER,  
JAMES C. HAIGHT.