(No Model.) 5 Sheets—Sheet 1.

S. B. DEXTER.

ORE ROASTING FURNACE.

No. 436,340. Patented Sept. 16, 1890.

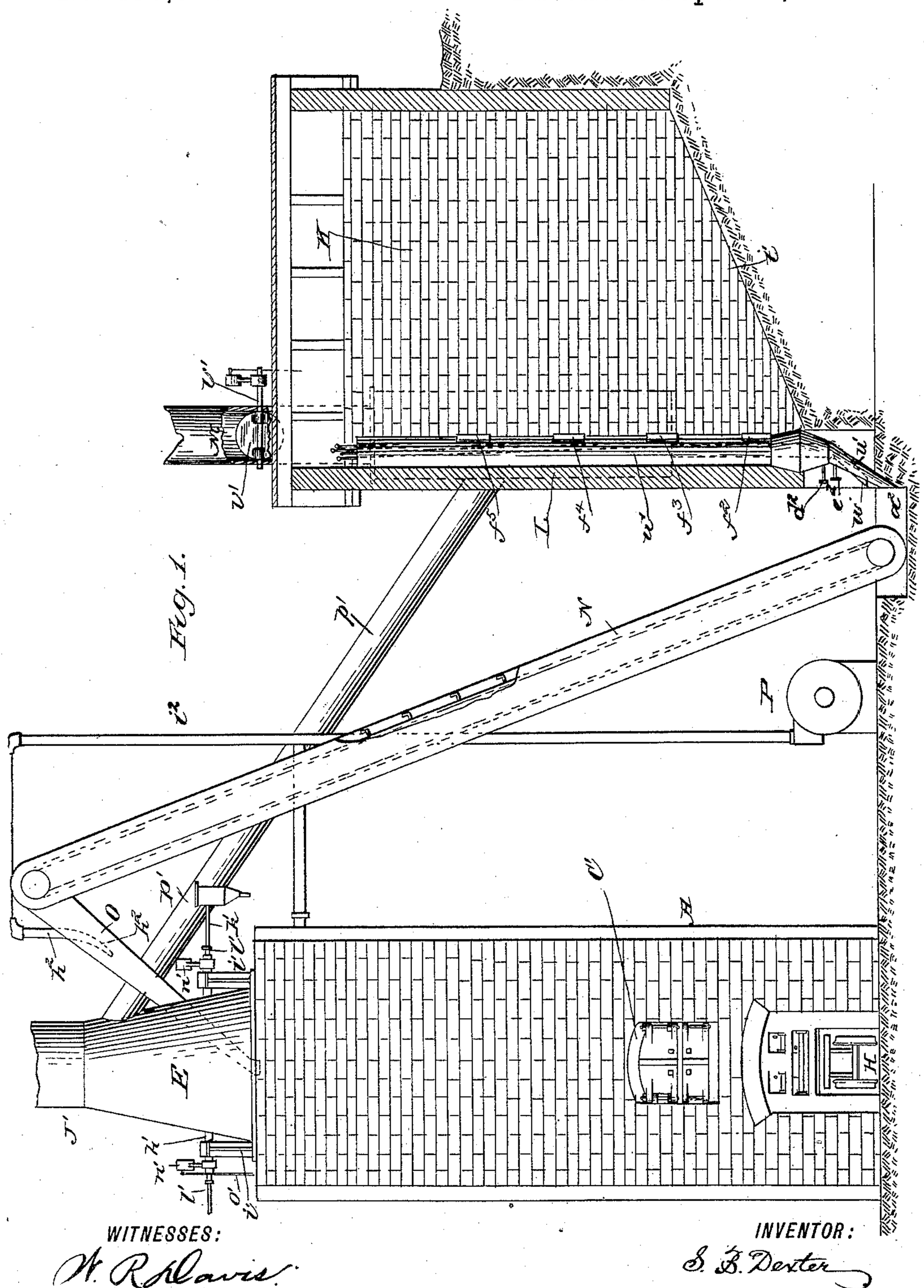


Fig. 1.

WITNESSES:

H. R. Davis.

C. Sedgwick

INVENTOR:

S. B. Dexter

BY Munn & Co

ATTORNEYS.

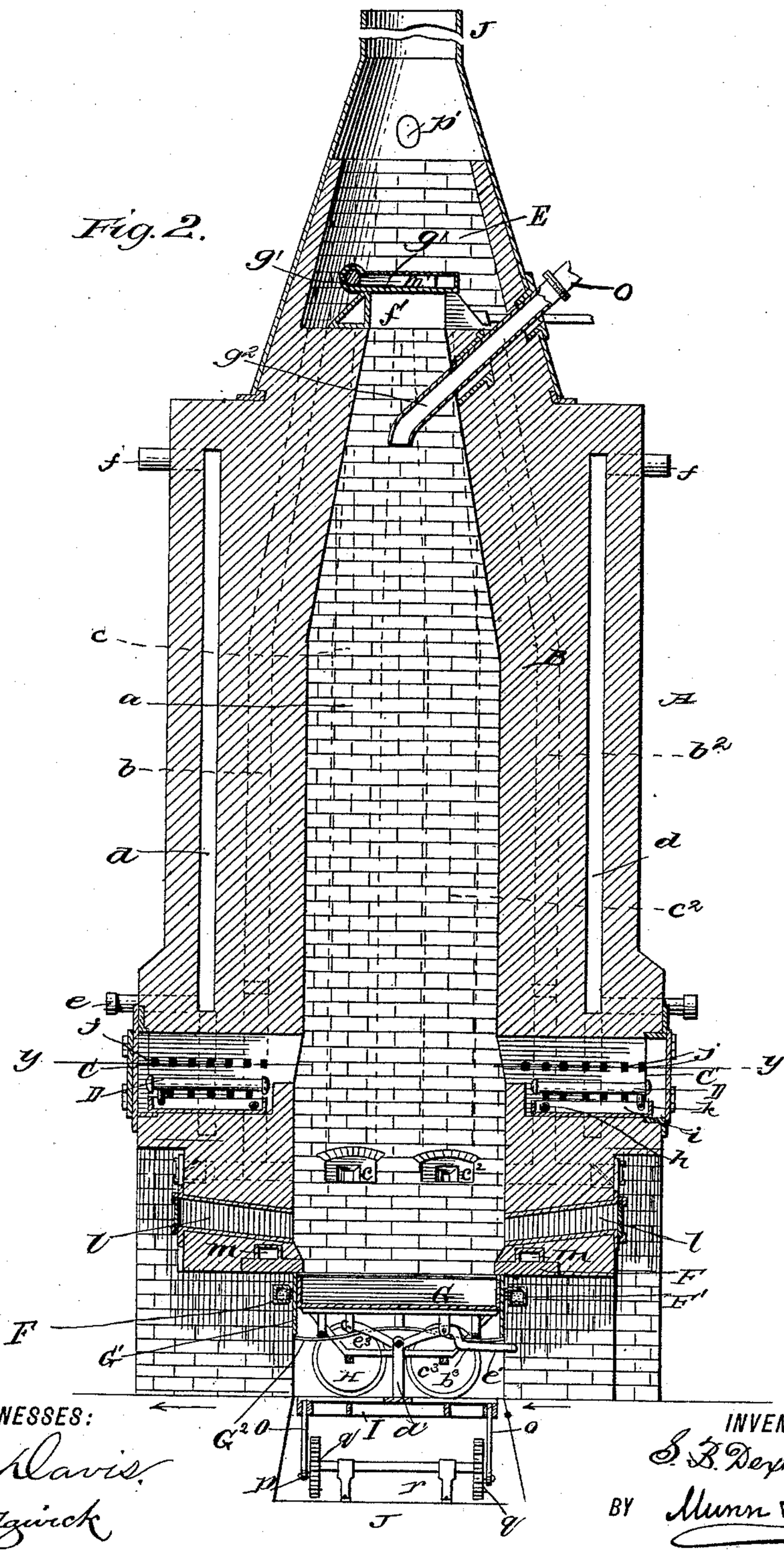
(No Model.) 5 Sheets—Sheet 2.

S. B. DEXTER.

ORE ROASTING FURNACE.

No. 436,340. Patented Sept. 16, 1890.

Fig. 2.



WITNESSES:

H. R. Harris.

C. Sedgwick

INVENTOR:

S. B. Dexter

BY Munn & Co

ATTORNEYS.

(No Model.)

5 Sheets—Sheet 3.

S. B. DEXTER.

ORE ROASTING FURNACE.

No. 436,340. Patented Sept. 16, 1890.

Fig. 3.

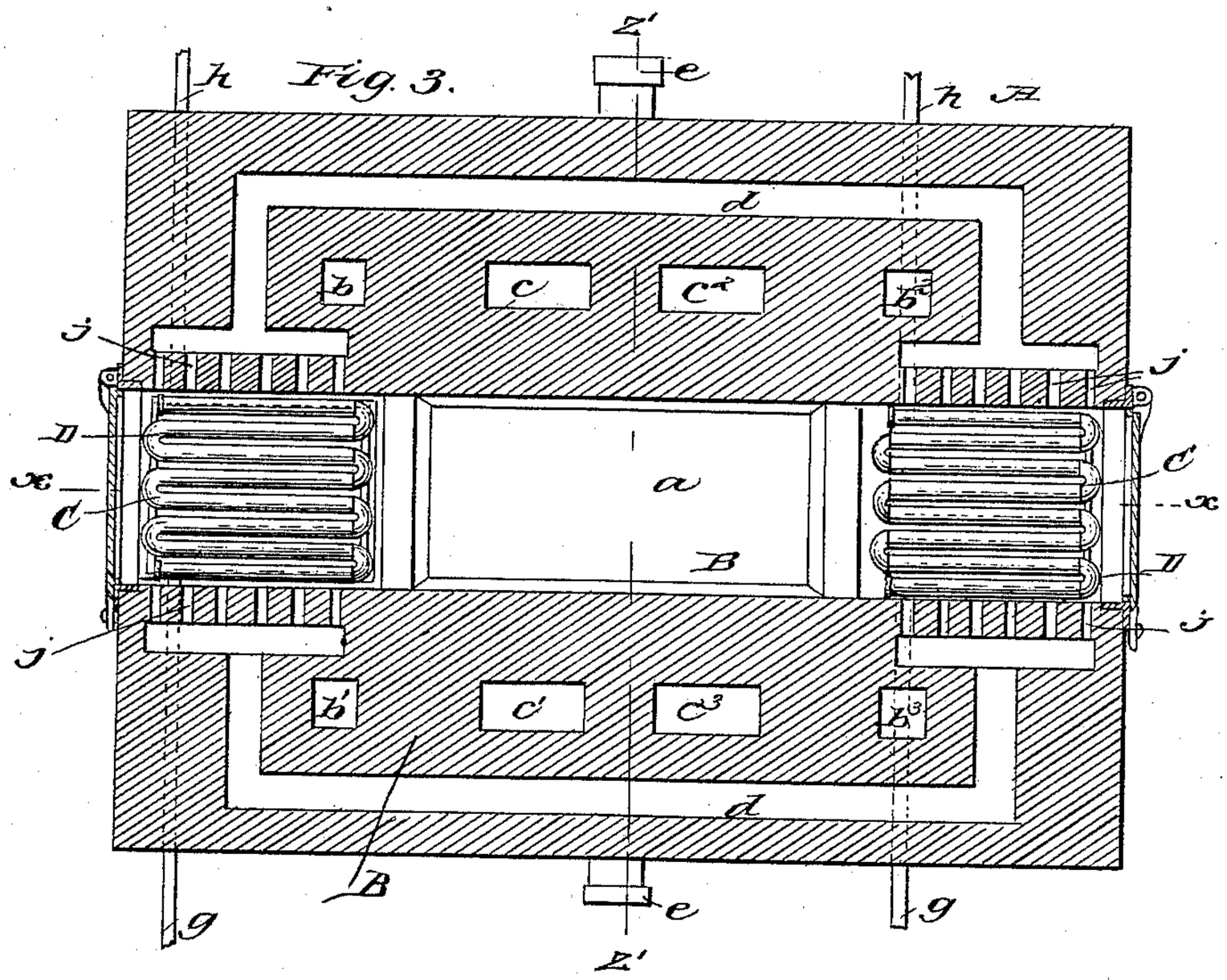
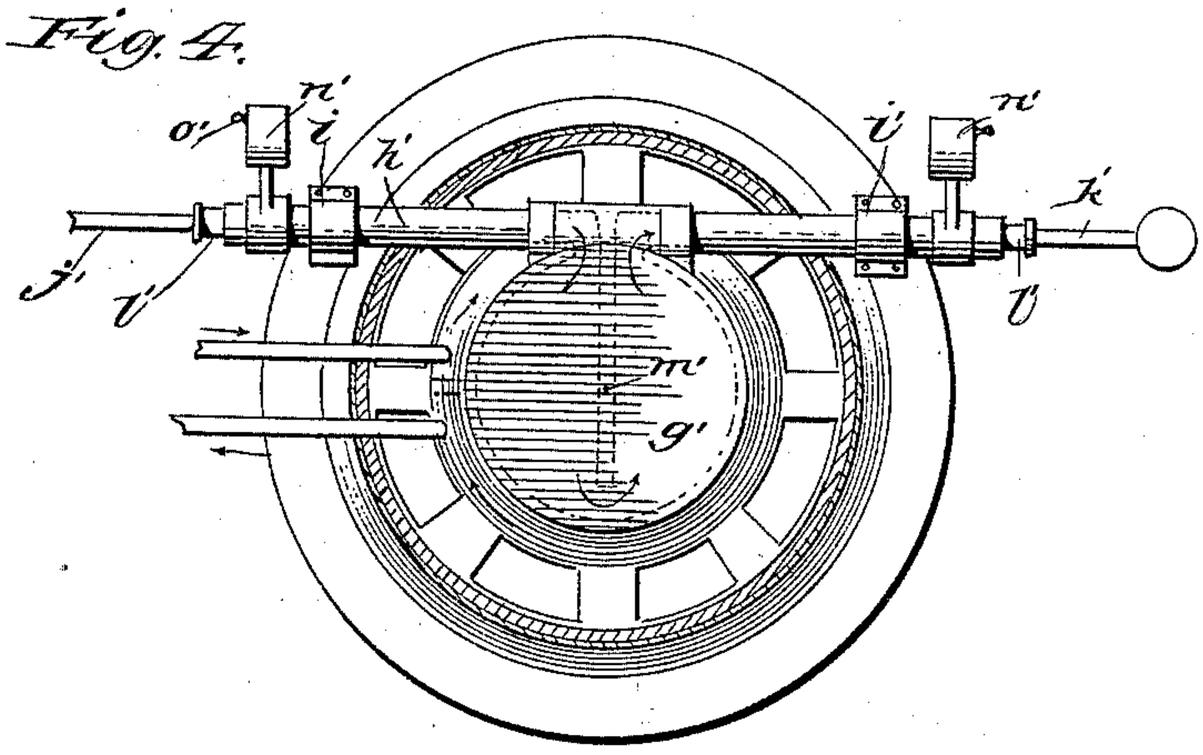


Fig. 4.



WITNESSES:

W. R. Harris.

C. Sedgwick

INVENTOR:

S. B. Dexter

BY Munn & Co

ATTORNEYS.

(No Model.)

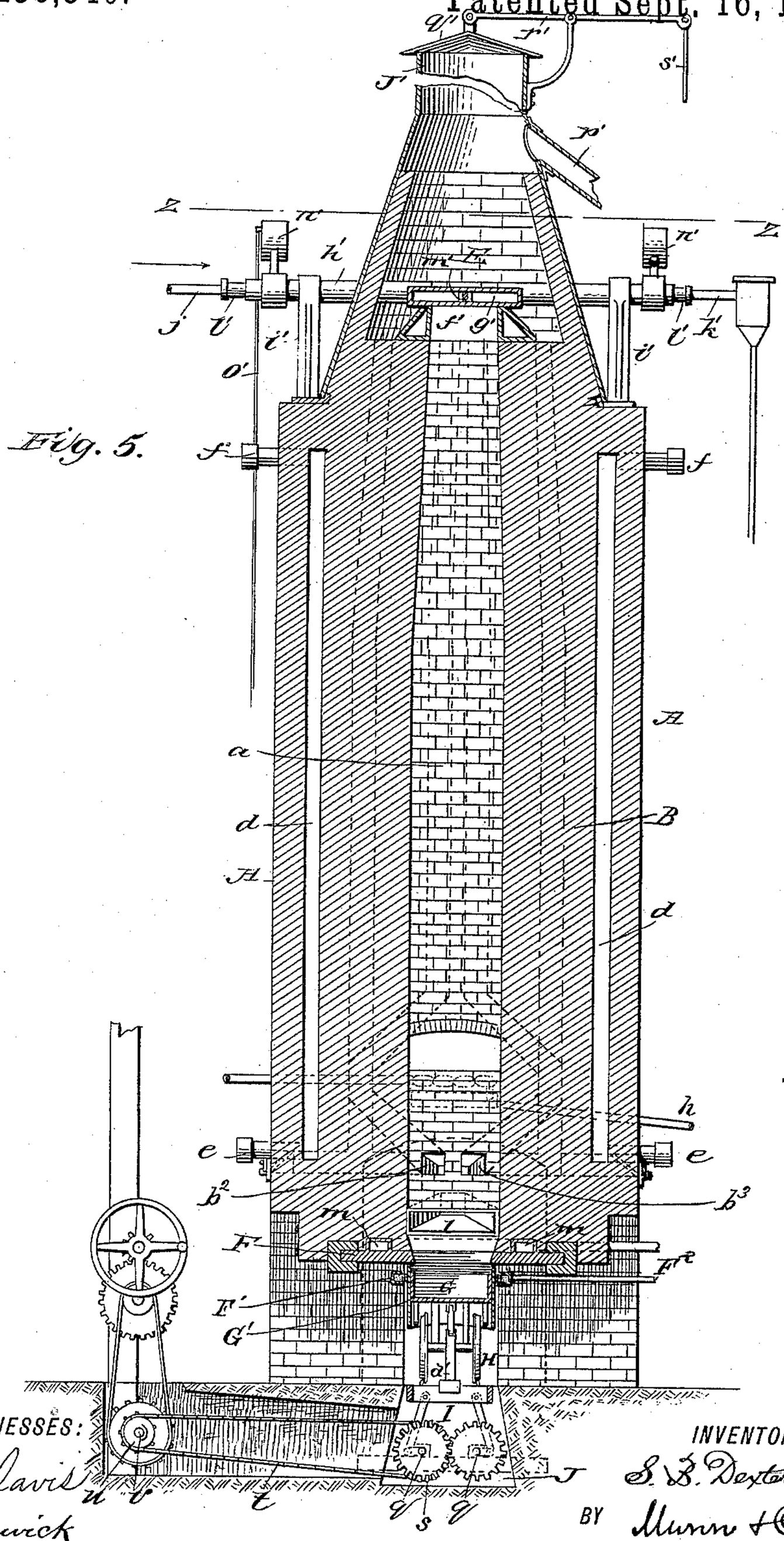
5 Sheets—Sheet 4.

S. B. DEXTER.

ORE ROASTING FURNACE.

No. 436,340. Patented Sept. 16, 1890.

Fig. 5.



WITNESSES:

W. R. Davis

C. Sedgwick

INVENTOR:

S. B. Dexter

BY Munn & Co.

ATTORNEYS.

(No Model.) 5 Sheets—Sheet 5.

S. B. DEXTER.

ORE ROASTING FURNACE.

No. 436,340. Patented Sept. 16, 1890.

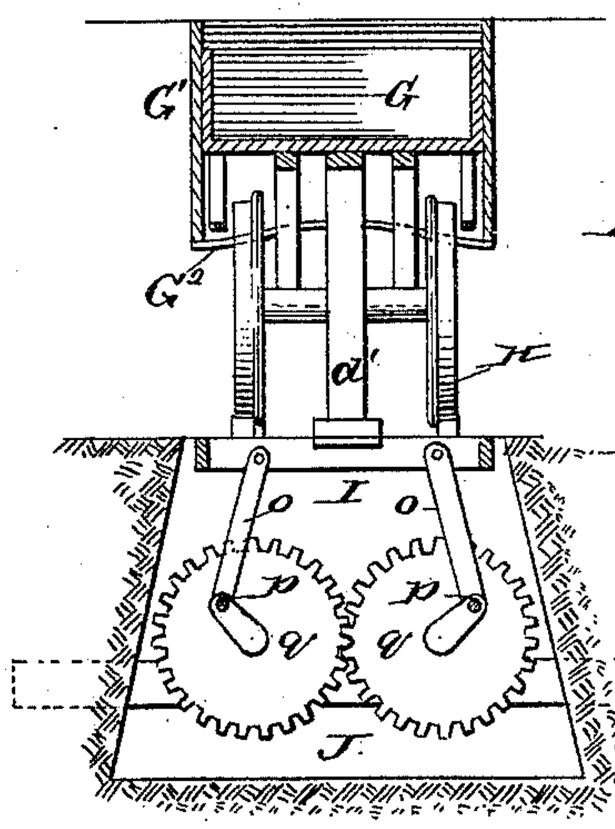


Fig. 6.

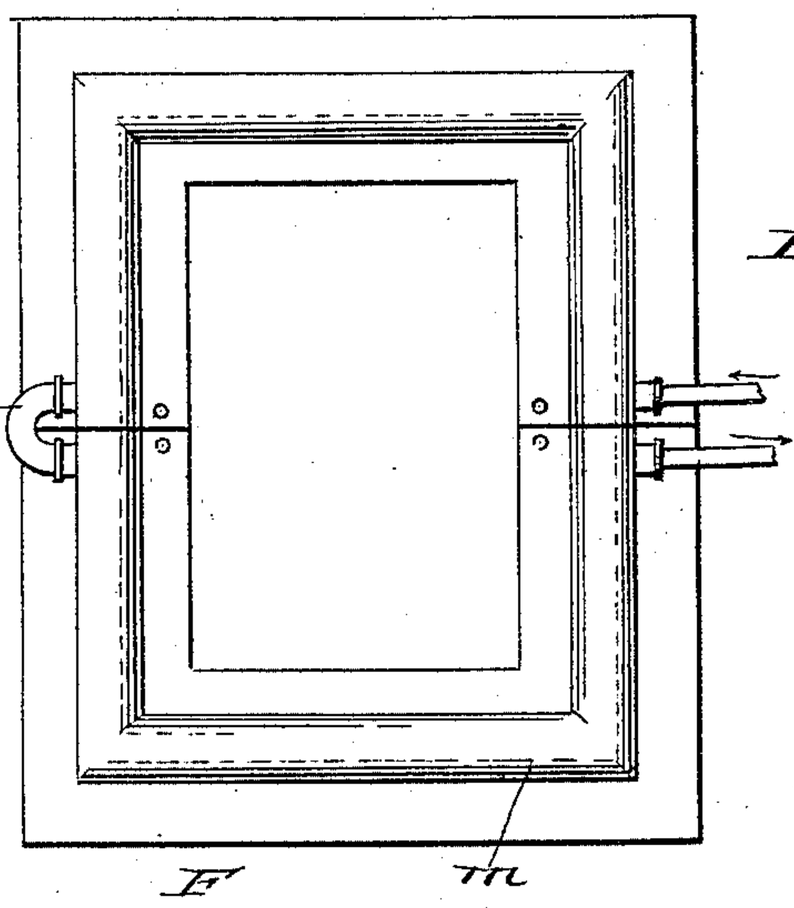
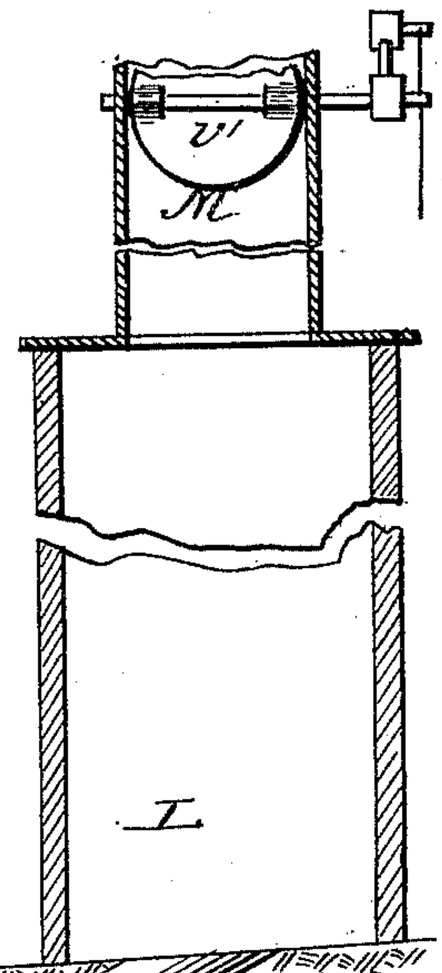


Fig. 7.



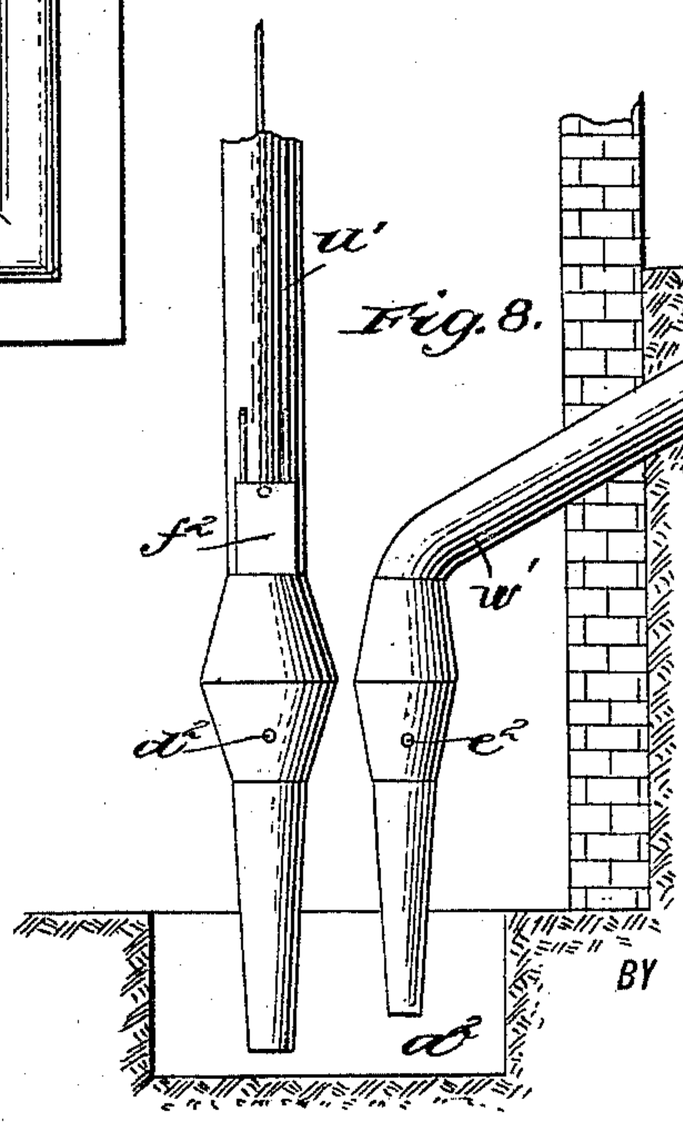


Fig. 8.

WITNESSES:

W. R. Davis.

C. Sedgwick

INVENTOR:

S. B. Dexter

BY Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

SIMON B. DEXTER, OF GLENDALE, MONTANA.

ORE-ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 436,340, dated September 16, 1890.

Application filed October 6, 1888. Serial No. 287,374. (No model.)

To all whom it may concern:

Be it known that I, SIMON B. DEXTER, of Glendale, in the county of Beaver Head and Territory of Montana, have invented a new and Improved Ore-Roasting Furnace, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a side elevation, partly in section, of the furnace and collecting-chamber. Fig. 2 is a vertical transverse section of the furnace, taken on line *x x* in Fig. 3. Fig. 3 is a horizontal section taken on line *y y* in Fig. 2. Fig. 4 is a horizontal section taken on line *z z* in Fig. 5. Fig. 5 is a vertical transverse section taken on line *z' z'* in Fig. 3. Fig. 6 is an enlarged sectional end elevation of the receiving-car. Fig. 7 is a plan view of the bottom plate of the furnace; and Fig. 8 is an enlarged detail side elevation of the ore-feeding pipes, showing the dust-receiver in section.

Similar letters of reference indicate corresponding parts in all the views.

The object of my invention is to construct an ore-roasting furnace in which the ore-dust may be treated by passing it through the furnace in the direction of the draft of the fires of the furnace, thereby insuring a thorough treatment of the ore without appreciable waste of material.

My invention consists in the construction and arrangement of parts hereinafter described and claimed.

The furnace A is provided with a central vertical chamber *a*, which is surrounded by a double wall B, in which are formed the flues *b b' b² b³ c c' c² c³*, which will be hereinafter more fully described. Outside of the flues is formed an air-space *d*, which extends entirely around the body of the furnace and reaches from a point near the bottom of the furnace to a point near the top thereof.

In the side walls of the furnace are inserted pipes *e f*, which communicate with the space *d* and serve to supply air to the said space, the air taking up heat in its passage through the space, thereby effecting two important results—viz., the heating of the air supplied to the fire-chambers C C' at opposite ends of the furnace and reducing the escape of heat through the outer portion of the wall. The fire-chambers C C' are built in the wall of the furnace and open into the chamber *a* near its lower end. In each fire-chamber is placed a water-grate D, formed of tubes and return-bends and communicating with the water supply and discharge pipes *g h*. Below the water-grate D there is an ash-pit *i*, and above and below the grate, upon opposite sides thereof, are air-blast apertures *j k*, which communicate with the air-space *d*. The water entering the water-grate D through the pipe *g* is discharged after its passage through the grate into the ash-pit *i*, whence it flows, together with the ashes, through the discharge-pipe *h*.

The flues *b b'* at one end of the furnace and *b² b³* at the opposite end of the furnace are bowed outward away from each other to allow them to pass around the fire-chambers C and C', the lower ends of the flues communicating with the chamber *a* below the fire-chambers, and the upper ends being arranged to discharge into the dust-receiving chamber E at the top of the furnace. The flues *c c' c² c³* communicate with the chamber *a* at a point below the fire-chambers, and also extend upward to the dust-receiving chamber E. Below the fire-chambers and below the openings in the flues *b b' b² b³* are formed passages *l* for the insertion of bars or tools for working the mass melted in the furnace.

In the lower part of the furnace-wall is arranged an apertured divided plate F, which rests upon the foundation of the furnace and serves as an abutment for the receptacle G, carried by the car H. The plate F is provided with a water-passage *m*, which extends entirely around the plate upon its upper surface, the halves of the water-passages being connected by return-bends *n*. The plate F is made in halves for convenience in removing it from the furnace when injured by heat. Water is allowed to flow continuously through the passage *m* to prevent the rapid deterioration of the plate. To remove the plate F, a portion of the masonry is first removed, and after repairs have been made and the plate again inserted the masonry is rebuilt.

The car H is supported by a platform I, which rests upon rods *o*, pivotally connected with the platform, and received upon cranks *p*, carried by gear-wheels *q*, mounted on shafts *r*. The platform I and gearing connected therewith are placed in a pit J, formed under

the furnace, and the shafts r are made to rotate together, but in opposite directions, by the engagement of the two pairs of gear-wheels q. One of the shafts r is provided with a sprocket-wheel s, which receives a chain t, driven by a small sprocket-wheel u, mounted on a shaft v, which receives motion from any convenient power. An iron casing G′, surrounding the receptacle G, is supported by springs G^2, attached to the body of the car, so that when the car is pushed upward the casing G′ will be first brought into contact with the plate F, after which the receptacle G may be carried upward until it strikes the said plate F. In the brick-work supporting the plate F is arranged a water-pipe F′, having sprinkler-openings on the side facing the casing G′. The said pipe is supplied with water through the feed-pipe F^2. The sprinkler is designed to prevent the adhesion of fused ore to the inner surface of the casing G′ and the receptacle G.

The platform I is provided with a standard d', which is engaged by the catch-lever e' e^3, carried by the car H. The car moves in the direction indicated by the arrows in Fig. 2, and when the standard d' is reached by the catch-lever e^3 the said catch-lever drops behind the standard d', while the catch-lever e' serves as a stop for arresting the motion of the car. When it is desired to remove the car from the furnace the catch-lever e' is lifted, when the car may be moved on.

The chamber a is surrounded at its upper end with a water-jacketed frame f', in which is hinged a hollow cover g', the said cover being provided with a hollow shaft h', by which it may be opened or closed. The hollow shaft h' is journaled in standards i', resting on the top of the body of the furnace. Water is introduced into the hollow shaft h' through the pipe j' and is discharged through the pipe k', the shaft h' being provided at opposite ends with stuffing-boxes l'. The hollow cover g' is provided with a central partition m', which extends from the hollow shaft h' to a point near the free end of the cover, the hollow shaft being stopped also at a corresponding point and provided with apertures on opposite sides of the partition. By this arrangement the water is made to flow through the hollow shaft into one side of the cover g' and around the partition m', thence outwardly through the hollow shaft. The cover g' is counterbalanced by weighted levers n' attached to the shaft near opposite ends. To one of the levers n' is pivoted a rod o' for turning the shaft h' and operating the cover g'. By thus having a cold surface closing the upper end of the chamber a the rising heat-current contacting therewith is suddenly cooled and precipitated downwardly, thereby assisting the downward draft of the furnace as well as protecting the damper from injury.

At the top of the chamber E is a vertical pipe J′, provided at its lower end with an inclined dust-carrying pipe p' and furnished at its top with a cover q', pivoted to one end of the lever r', the opposite end of the said lever being provided with the rod s', by which the cover may be raised or lowered.

Adjoining the furnace A is a chamber K, having an inclined bottom t', and furnished with a discharge-pipe u', located at the front of the chamber. In the said chamber K are deposited the finely-powdered ores or dust from the mill, and at the side of the chamber K is arranged a collector L for receiving the dust and fine particles of ore discharged from the dust-chamber E through the pipe p', which communicates with the said collector L at a point near its middle. The collector L is provided with a smoke-pipe M, having a damper v', and is also furnished with a discharge-pipe w', which empties into a receiver a^2, the said discharge-pipe being provided with a valve e^2, by which the flow of dust to the receiver a^2 may be regulated or stopped altogether. The discharge-pipe u' is provided at its lower end with a nozzle extending into the receiver a^2 and furnished with a valve d^2.

In the side of the discharge-pipe u' are arranged gate-valves f^2 f^3 f^4 f^5, which permit of taking the dust from any level of the chamber K. An ordinary endless-belt elevator N takes the dust from the receiver a^2, carries it to a point above the top of the furnace A, and discharges it into a chute O, which terminates in a pipe g^2, which reaches into the center of the chamber a. In the upper portion of the chute O is inserted an air-blast nozzle h^2, which communicates by the pipe i^2 with the blower P, the air from the said nozzle being employed to drive the dust through the chute O and pipe g^2 into the chamber a. It will be understood that the force of this blast is not to drive the dust through the furnace, but is just sufficient to overcome the force of the rising heat and permit the dust to fall by gravity only through the roasting or fusing chamber. If a blast were used, it would cause much of the ore-dust to pass through the draft-flues unacted upon; but as I only use a natural draft and the dust falls from the top of the chamber through all of the heated space and nears the intensest heat as it falls it follows that it will be thoroughly roasted or fused, as the case may be. The blast in the feed-pipe is also to prevent the draft from passing through the feed-pipe when the damper is opened to reverse the draft when a car is to be removed.

When the furnace is in operation, the ore discharged through the pipe g^2 into the chamber a is heated to the required degree in the said chamber and drops into the receptacle G of the car H, the movement of the ore being in the same direction as the draft of the furnace. Any very fine particles which do not find their way to the receptacle G are carried up the flues b b' b^2 b^3 c c' c^2 c^3 and delivered by the pipe p' to the collector L. When a sufficient quantity of roasted ore has been collected in the receptacle G, the car H is low-

ered after stopping off the supply of ore by closing the valves d^2 e^2 and opening the covers g' q'. The filled car is replaced by an empty one, and the process is carried forward as before. Should any of the roasted ore or fused metal adhere to the side of the chamber a it may be loosened by inserting proper implements in the passages l. The height of the furnace may be extended with advantage to a point where the heat of the fire is ineffectual in melting the ore.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An ore-roasting furnace comprising the vertical roasting-chamber having an outlet on top for the waste gases and products of combustion, side fire-chambers near its lower end, vertical updraft-flues through its walls from below the fire-chambers and discharging into said outlet, an outlet for the treated ore at the bottom of the roasting-chamber, a dust-feeder at the upper end below the said outlet for the waste gases, and a blast-pipe discharging into the dust-feed pipe to prevent the draft from entering said pipe and also to distribute and discharge the dust against the force of the ascending heat, substantially as set forth.

2. An ore-roasting furnace comprising the vertical roasting-chamber having side fire-chambers in its lower end, a damper at its upper end, draft-flues leading from its lower end below the fire-chambers, an ore-dust feeder discharging into the upper end of the roasting-chamber below its damper, and an outlet for the fused or agglomerated ore at the bottom of the roasting-chamber, whereby when the ore is being removed from the bottom of the chamber the damper may be opened to reverse the draft, substantially as set forth.

3. An ore-roasting furnace comprising the vertical roasting-chamber having side fire-chambers in its lower end, a chamber above the roasting-chamber provided with an upper and a lower damper, a pipe leading from the space between said two dampers, a dust-collector into which said pipe discharges, a chimney leading from said collector and provided with a damper, and flues leading from the roasting-chamber below the fire-chambers upwardly into the chamber between the two dampers, substantially as set forth.

4. An ore-roasting furnace comprising a vertical double-walled chamber a, having an outlet at its lower end, a space d being formed between the two walls and provided with air-inlets, the side fire-chambers C C′ at the lower end of the chamber a, horizontal grates within said chambers, air-blast apertures j k above and below the grates at opposite sides thereof communicating with the space d, draft-flues leading from the chamber a below the fire-chambers, and an ore-feeder discharging into the upper end of the chamber a, substantially as set forth.

5. The combination, with the roasting-chamber having side fire-chambers in its lower end, draft-flues leading from the chamber below the fire-chambers, and an ore-dust feeder discharging into the upper end of the roasting-chamber, of a dust-receiving chamber on top of the furnace and into which said draft-flues discharge, a dust-collector, a pipe leading from the dust-receiver thereto, an outlet for the said collector, and a conveyer for returning the dust to the upper end of the roasting-chamber, substantially as set forth.

6. The combination, with the roasting-chamber having a dust-feeding pipe discharging into its upper end, side fire-chambers in its lower end, draft-flues leading from the roasting-chamber below the fire-chamber, and a dust-receiver on top of the furnace into which said flues discharge, of a dust-collector, a pipe connecting it with the receiver, a receptacle into which the collector discharges, an ore-dust chamber also having an outlet discharging into said receptacle, and mechanism for conveying the dust from the said receptacle to the dust-feeding pipe of the roasting-chamber, substantially as set forth.

7. The combination, in a downdraft ore-roasting furnace, with the vertical roasting-chamber having an open upper end, side fire-chambers, draft-flues below said chambers, and an ore-feeder discharging into the chamber above the fire-chambers, of a cooled damper at the upper open end of the chamber, and provided with an inlet and outlet for the cooling medium, whereby the ascending hot gases will be chilled and assist the downward draft of the furnace, substantially as set forth.

8. An ore-roasting furnace consisting in the roasting-chamber having side fire-chambers in its lower end, draft-flues leading from the roasting-chamber below the fire-chambers to the top of the furnace, a removable receptacle in the bottom of the roasting-chamber, a damper at the upper end of the said chamber, a receiver on top of the furnace, into which said draft-flues and damper open, a pipe J′ extending from said receiver and provided with a cover, a dust-collector having a chimney leading from its upper end and a dust-outlet at its lower end, a pipe leading from the receiver to the collector, an ore-dust feeder entering the upper end of the roasting-chamber, and a conveyer supplying said feeder with ore-dust and furnace-dust from the collector, substantially as set forth.

9. The combination, with the roasting-chamber and its feeder, of an elevator discharging into the feeder, and an ore-receptacle K, having a vertical pipe u', delivering to the elevator, and having a series of gate-valves at different heights, substantially as set forth.

S. B. DEXTER.

Witnesses:
GEO. M. HOPKINS,
C. SEDGWICK.