(No Model.)

J. MAHONY.

STEAM BOILER FURNACE.

No. 259,325. Patented June 13, 1882.

Fig: 2.

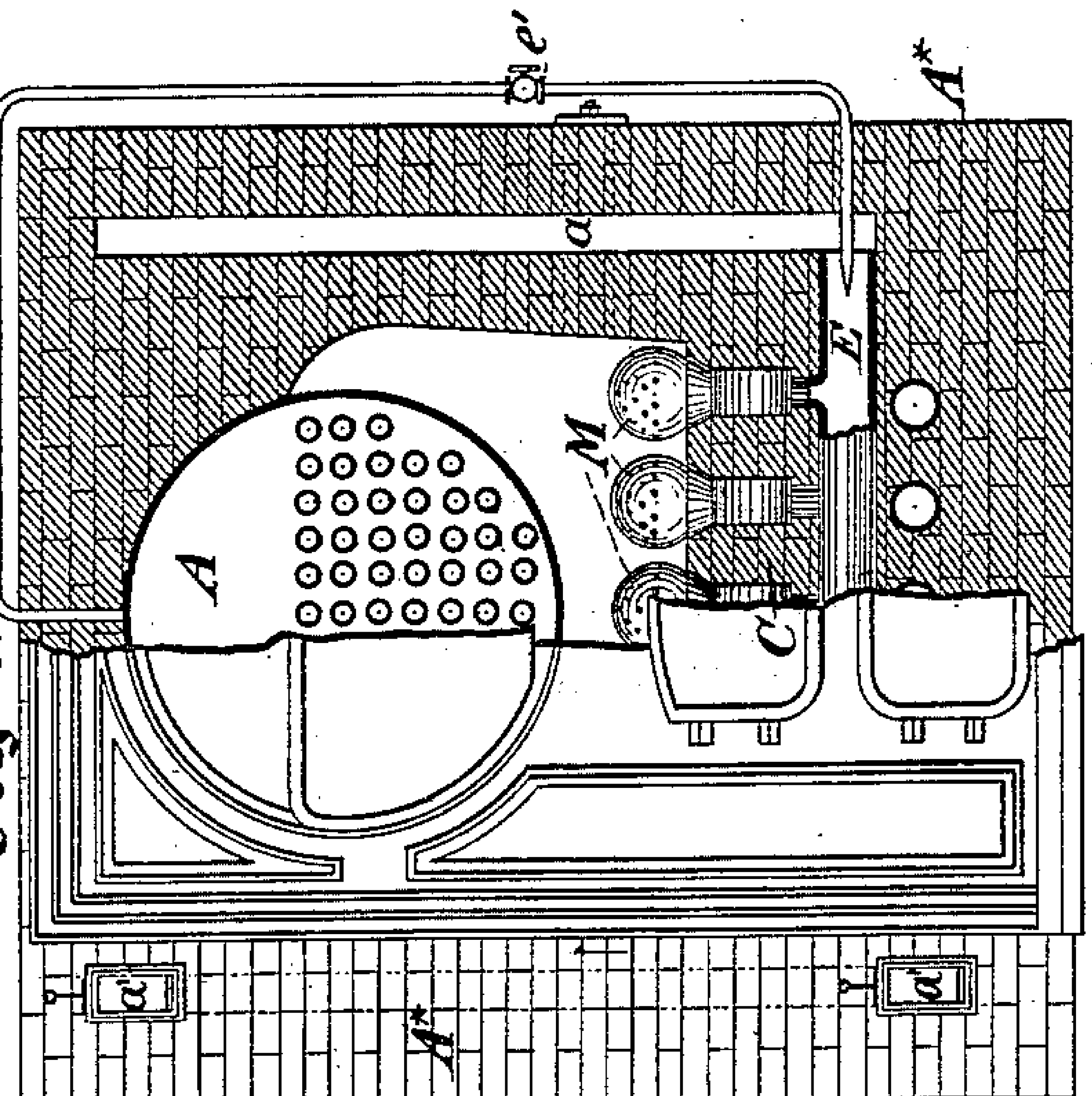


Fig: 1.

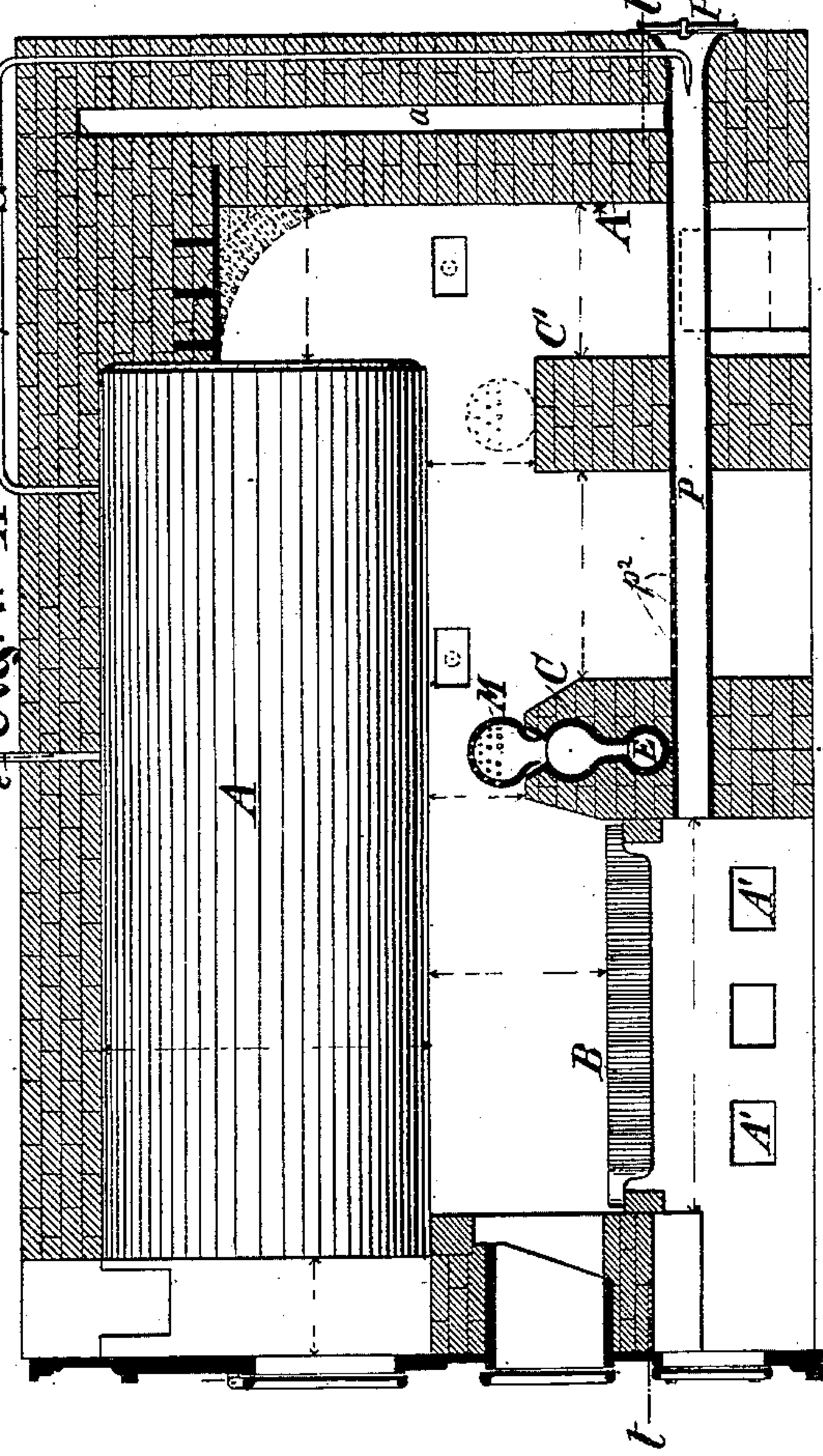
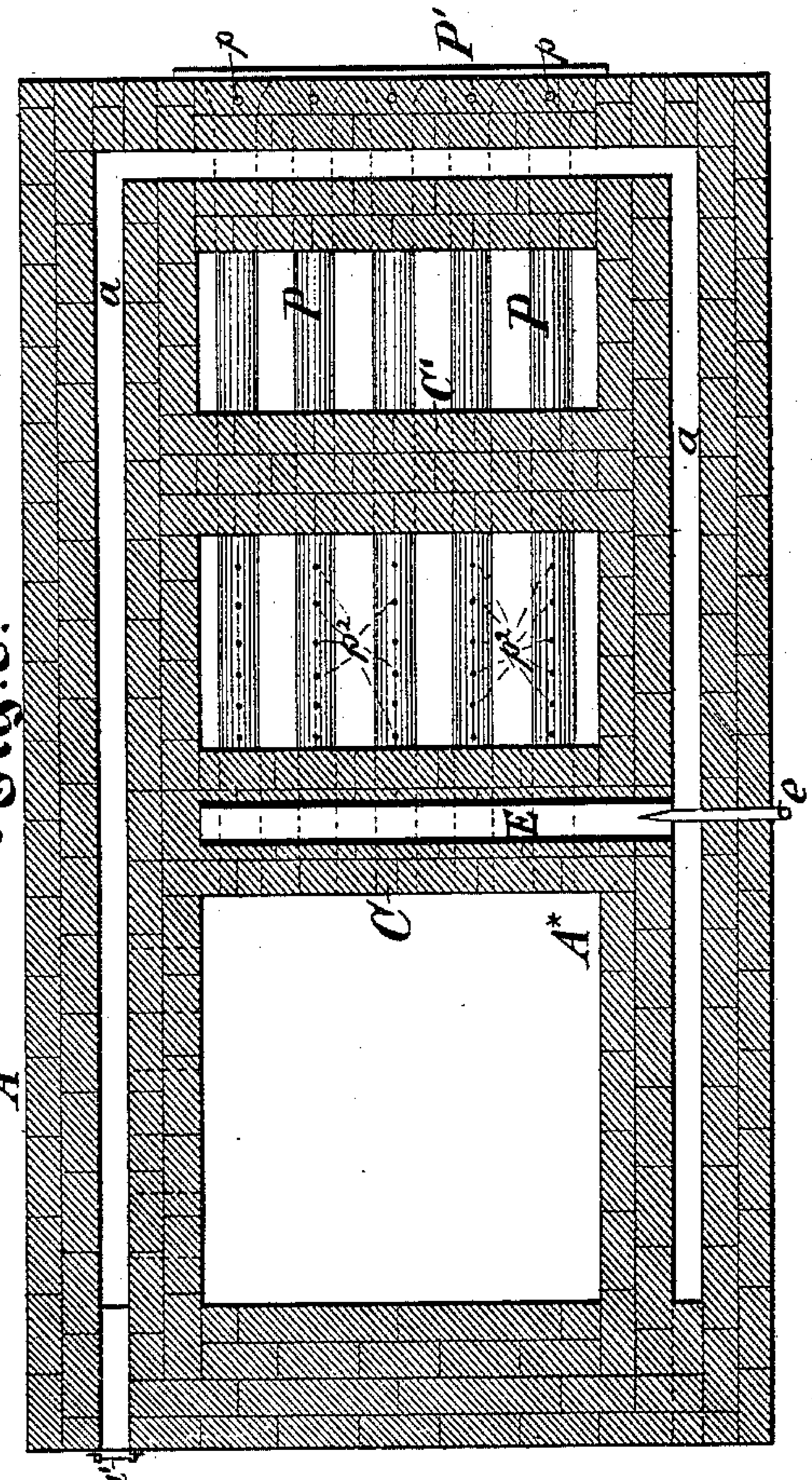


Fig: 3.



Witnesses:
Charles R. Searle,
Charles C. Stetson

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UNITED STATES PATENT OFFICE.

JAMES MAHONY, OF NEW YORK, N. Y.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 259,325, dated June 13, 1882.

Application filed December 29, 1881. (No model.)

To all whom it may concern:

Be it known that I, JAMES MAHONY, of New York city, in the county and State of New York, have invented certain new and useful Improvements relating to Steam-Boiler Furnaces, of which the following is a specification.

The object of the invention is to promote the complete combustion of the fuel and of the gaseous products emanating therefrom by the judicious introduction of steam and of atmospheric air at a high temperature. I have devised efficient and conveniently-controllable means for attaining these ends.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a central longitudinal vertical section. Fig. 2 is a front elevation, partly in cross-section. The section is on the line *s s* in Fig. 1. Fig. 3 is a horizontal section on the line *t t* in Fig. 1.

Similar letters of reference indicate like parts in all the figures.

A* is the brick-work or other substantial material which constitutes the inclosing walls or masonry of the furnace.

The boiler A is represented as of that class in which the shell is a plane cylinder, the heat being applied to the contained water through the shell from the outside, and also through a series of small tubes which traverse the boiler longitudinally. The exhaust products of combustion generated from the fuel on the grate B traverse backward under the shell, rise at the back, and then traverse forward through the tubes, rising after their escape from the front ends of the tubes, and flowing away through a suitable uptake and chimney. (Not represented.)

M M, &c., are a series of hollow spheroidal shells, perforated, and connected by passages below with channels, through which air is received at a considerably-elevated temperature. It is discharged, mingled with a small quantity of steam, through the perforations in the shells, and is favorably conditioned to combine with the unconsumed gases flowing over and between them. I propose to employ two series of such shells M. One is mounted on and receives its air and steam through passages in the ordinary fire-bridge, (marked C.) The other is mounted on and will be understood to similarly receive its hot air and steam through passages in a second bridge or corresponding wall located in rear of the first. A considerable space is allowed for the circulation of the hot gases between the fire-bridge proper and the second bridge or corresponding low wall of masonry, C′. There is also a space for the gases to circulate in rear of the second bridge, C′, and between that and the extreme rear of the furnace.

The transverse tubes and passages through which the hot air and steam are received are marked E. Steam at full pressure is taken from the upper portion of the boiler through a pipe, *e*, controlled by a valve, *e′*, and is injected through a contracted nozzle into the pipe E in the manner shown in Fig. 2. The force of this jet of strong steam is expended in blowing or forcibly moving along the air and causing it to be discharged with the small increment of steam thus received into the gases. The air thus received is not cold air from the outside, but is raised in temperature by being caused to traverse through a passage or air-space, *a*, formed in the walls or masonry of the furnace. This passage extends along three sides of the furnace, as plainly shown in Fig. 3. The air is inducted at the point *a′* through registers, which may be opened more or less by the attendant or by automatic devices not shown. The effect of closing both these registers is to entirely shut off the induction of air through the perforations in the shells M. The steam from the pipe *e* should be usually shut off at the same time by closing the valve *e′*. By opening and closing the registers at *a′* and the steam-valve *e′* more or less, the conditions may be varied within wide limits. The induction of sufficient air through this space *a* exercises a slight cooling influence on the masonry A*. I esteem this rather an advantage than otherwise. The cooling is not so great as to materially change the temperature of the inner walls of the brick-work—that which is presented toward the furnace. My furnace involves the advantage that its walls become heated and reflect heat upon the boiler-shell in the same manner as ordinary solid brick walls.

A′ represents openings from the air-space *a* into the sides of the ash-pit. These allow a limited circulation between these important members of the apparatus. When there is a surplus of hot air in the space *a*, it can flow through the apertures A′ directly into the ash-pit, and thus supply warm air to the latter. The elevation of temperature by this means promotes economy of combustion. The conditions prevent the rise from ever being so high as to endanger the melting of the grate.

A series of tubes, P, extend horizontally from the back of the furnace to the ash-pit, traversing on its way the space referred to behind the fire-bridge C and behind the second wall or bridge, C′. A register, P′, controls the induction of air through these pipes. A steam-pipe, *p*, leading from the upper portion of the boiler, and controlled by a valve, *p′*, supplies jets of steam properly conditioned to force the air rapidly through these pipes. The air is heated by the gases flowing from the furnace and circulating more or less downward in the spaces provided around the pipes P. A series of small orifices, p^2, are provided in the upper sides of the pipes P, through which the hot air, mingled with a small quantity of steam received from the blowing jet, flows out and mingles with the gases. This further promotes combustion of the gases. Provisions may be made for partially or entirely closing these holes at will, if desired. I prefer to employ them, as shown, always open, but to make them of such diameter that but little air is thus delivered. The air escapes more freely into the combustion-chamber than under the grate by reason of the partial vacuum induced by the draft in the combustion-chamber. When the register P′ is nearly closed all the air will flow out through the apertures p^2; but when the register is liberally opened much of the hot air received through the pipes P is delivered into the ash-pit. It rises through the grates and supplies hot air for the support of the combustion at that point. The warming of the air in this manner is sufficient to materially promote economy without under any conditions melting down the grate.

The registers P′ may be all connected together and operated as a unit. The attendant, by opening and closing this register and the valve *p′*, can graduate the quantity of air and steam received through the pipe P.

Modifications may be made in the forms and proportions within wide limits.

I can vary the forms and kinds of boiler indefinitely. Two or more shells may be mounted side by side in a single furnace.

The registers P′ at the back may be united into a single slide with transverse openings, coinciding or not with corresponding openings in the fixed plate. I have shown them as ordinary revolving registers having radial openings which correspondingly coincide. The arrangement allows the delivery of hot air through one or more of the pipes P, and blowing the same by steam through one or more of the pipes *p* without the rest. When a single register is employed to control all the pipes P, I can employ a single pipe, *p*, and a single controlling-valve, *p′*, properly branched to blow with the proper number of jets corresponding to the number of pipes P.

Parts of the invention may be used with advantage without the whole.

I claim as my invention—

1. The tubes P, extending into the ash-pit, and having perforations p^2, register P′, live-steam pipe *p*, and valve *p′*, combined as shown, and arranged to deliver air and steam in controllable quantities into the combustion-chamber in small jets, with the certainty that the surplus beyond what is drawn thus divided into the combustion-chamber will be delivered into the ash-pit under the grate, all substantially as herein specified.

2. The combination of the masonry A*, having the air-space *a*, and the openings A′ into the ash-pit, the two fire-bridges C C′, each with the shells M, connections for delivering hot air and steam therein, and the perforated pipes P p^2, with the steam-blowers and controlling means, arranged for joint operation relatively to each other and to the grate B and boiler A as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, this 24th day of December, 1881, in the presence of two subscribing witnesses.

JAMES MAHONY.

Witnesses:
S. F. MAHONY,
CHARLES C. STETSON.