

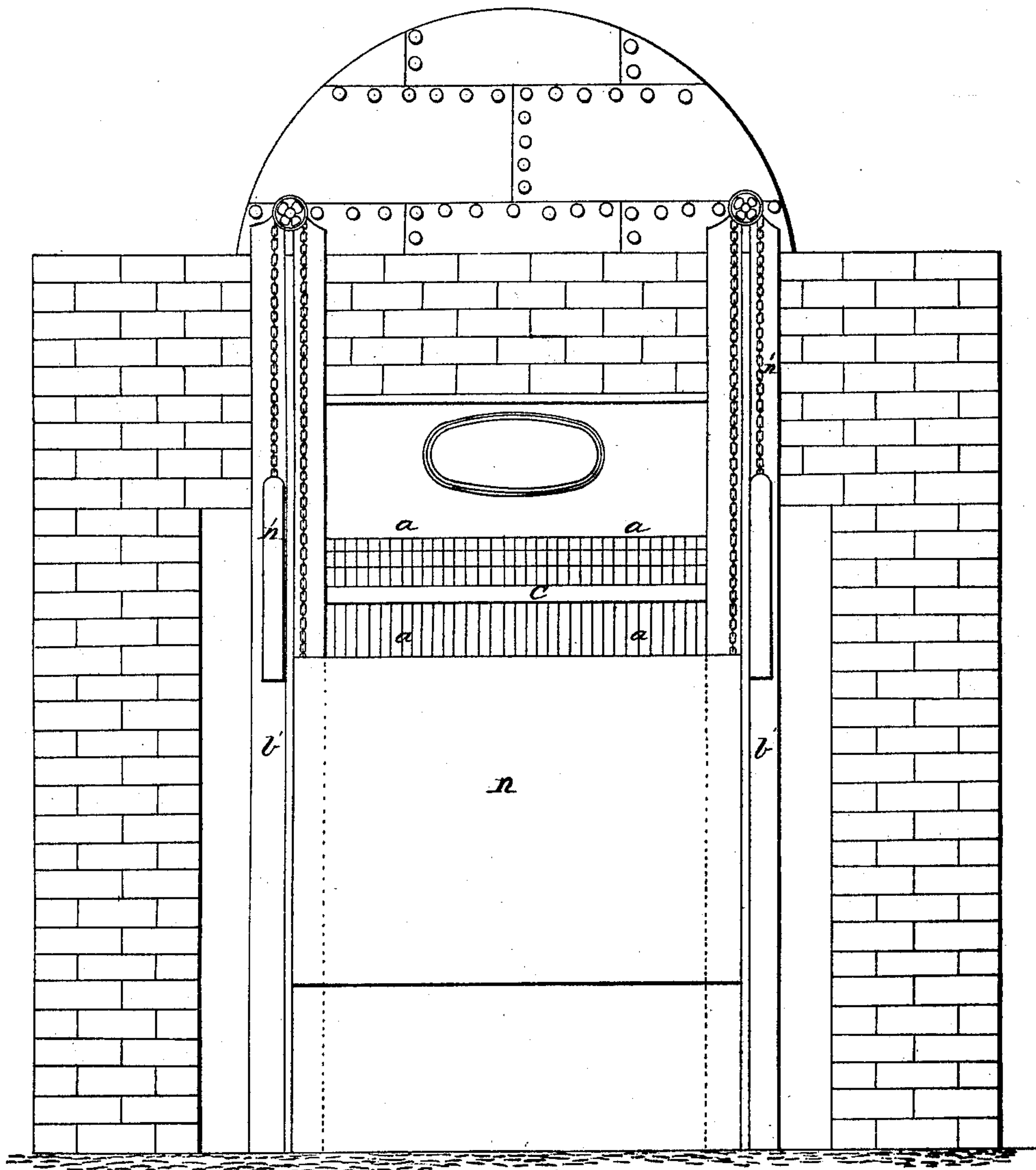
*Tildesley & Bird.*

*Furnace for Steam Boiler.*

*N<sup>o</sup> 94,793.*

*Patented Sept. 14, 1869.*

*Fig. 1.*



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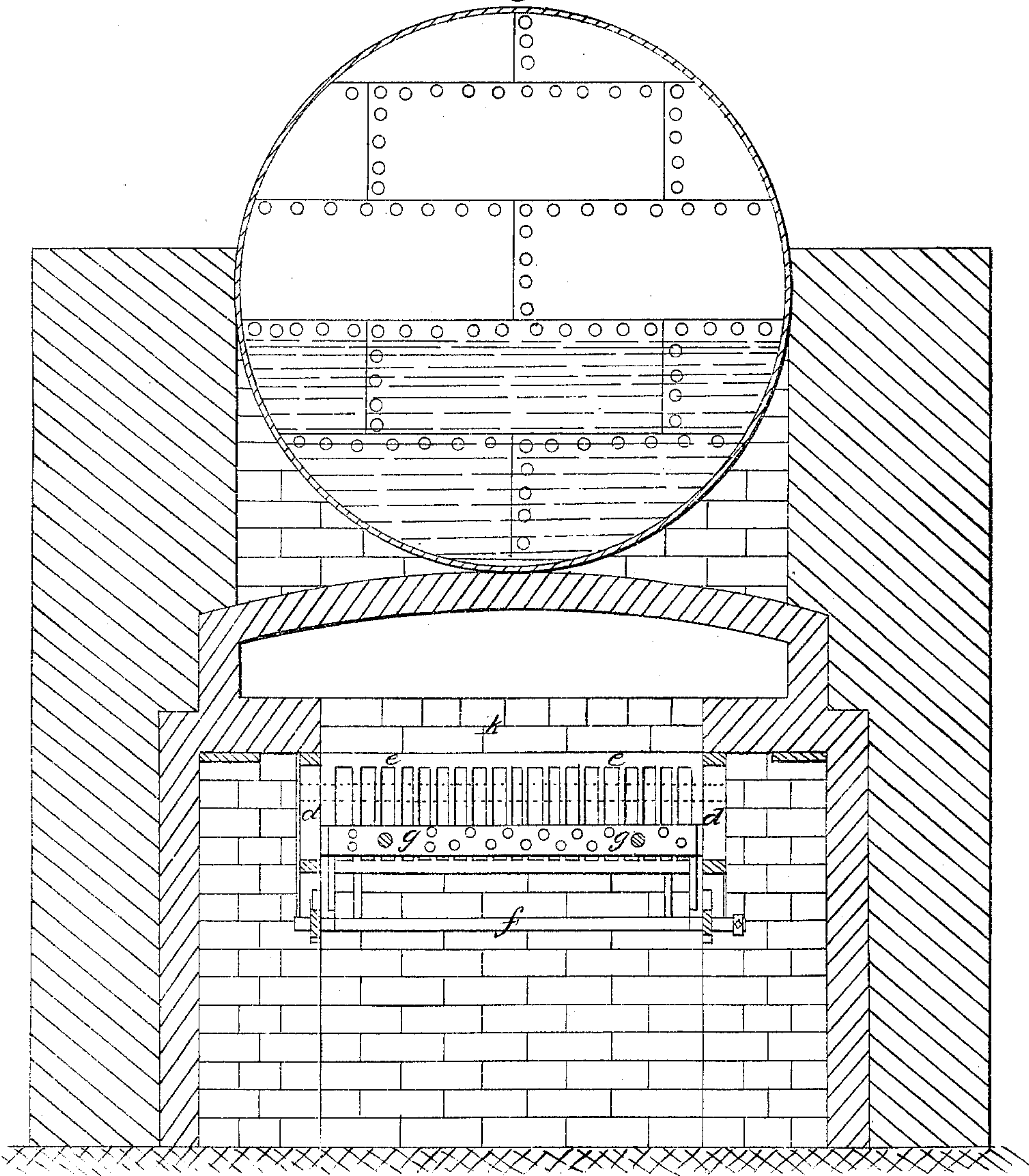
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*Fig. 2.*



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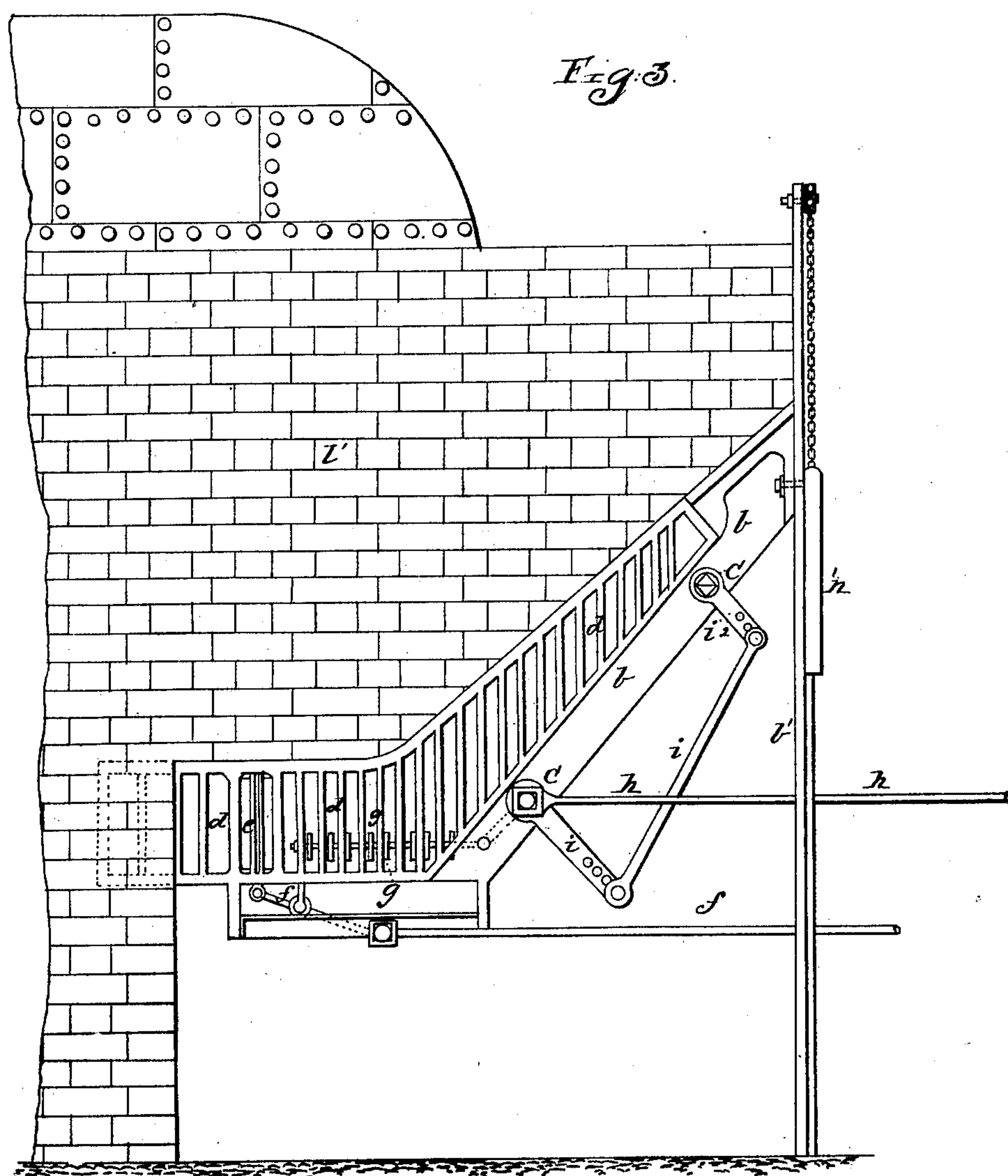
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*Furnace for Steam Boiler.*

N<sup>o</sup> 94, 793.

*Patented Sept. 14, 1869.*



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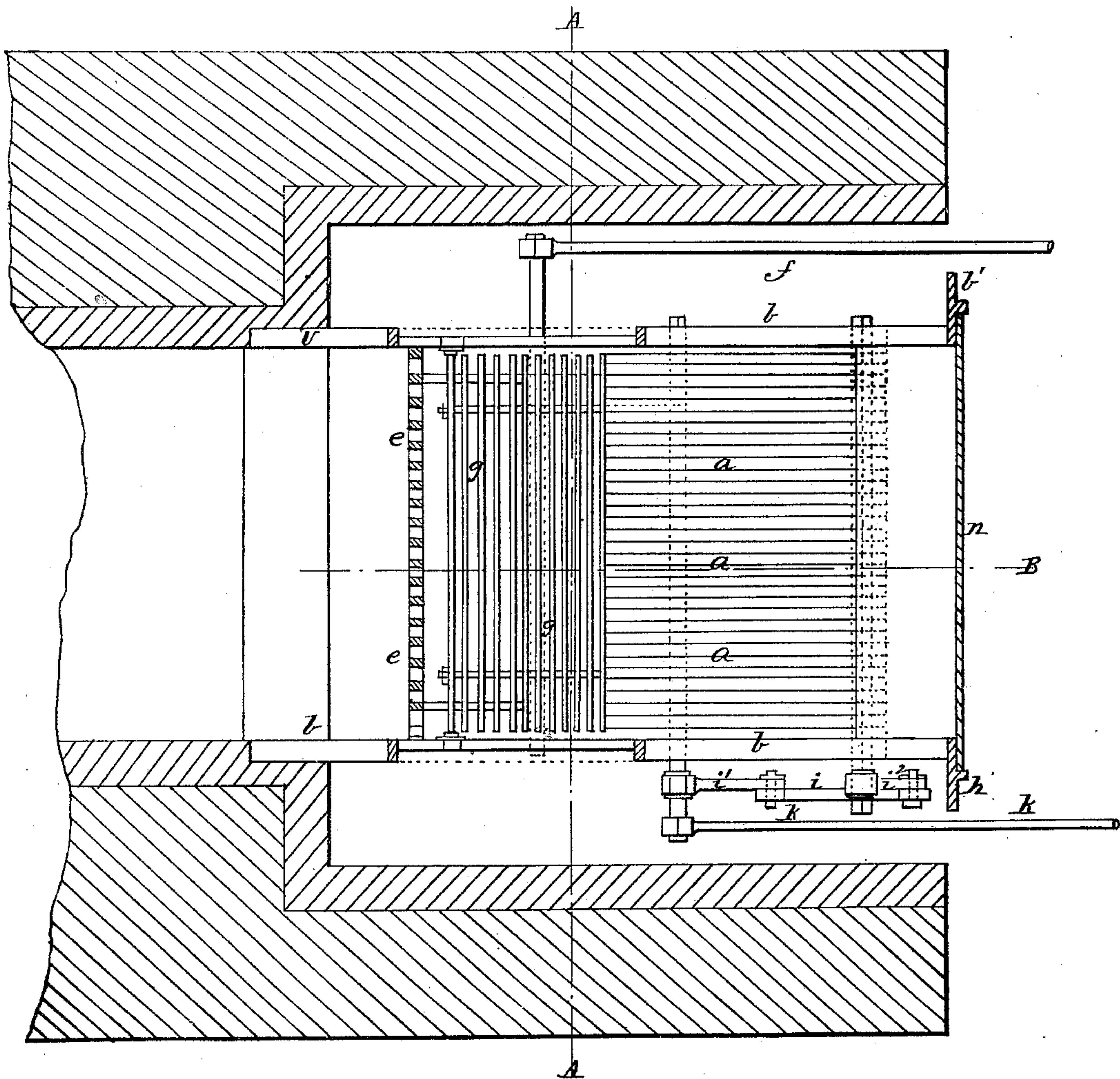
*Tildesley & Bird.*

### *Furnace for Steam Boiler.*

*Patented Sept. 14, 1869.*

N<sup>o</sup> 94,793.

*Fig. 4.*



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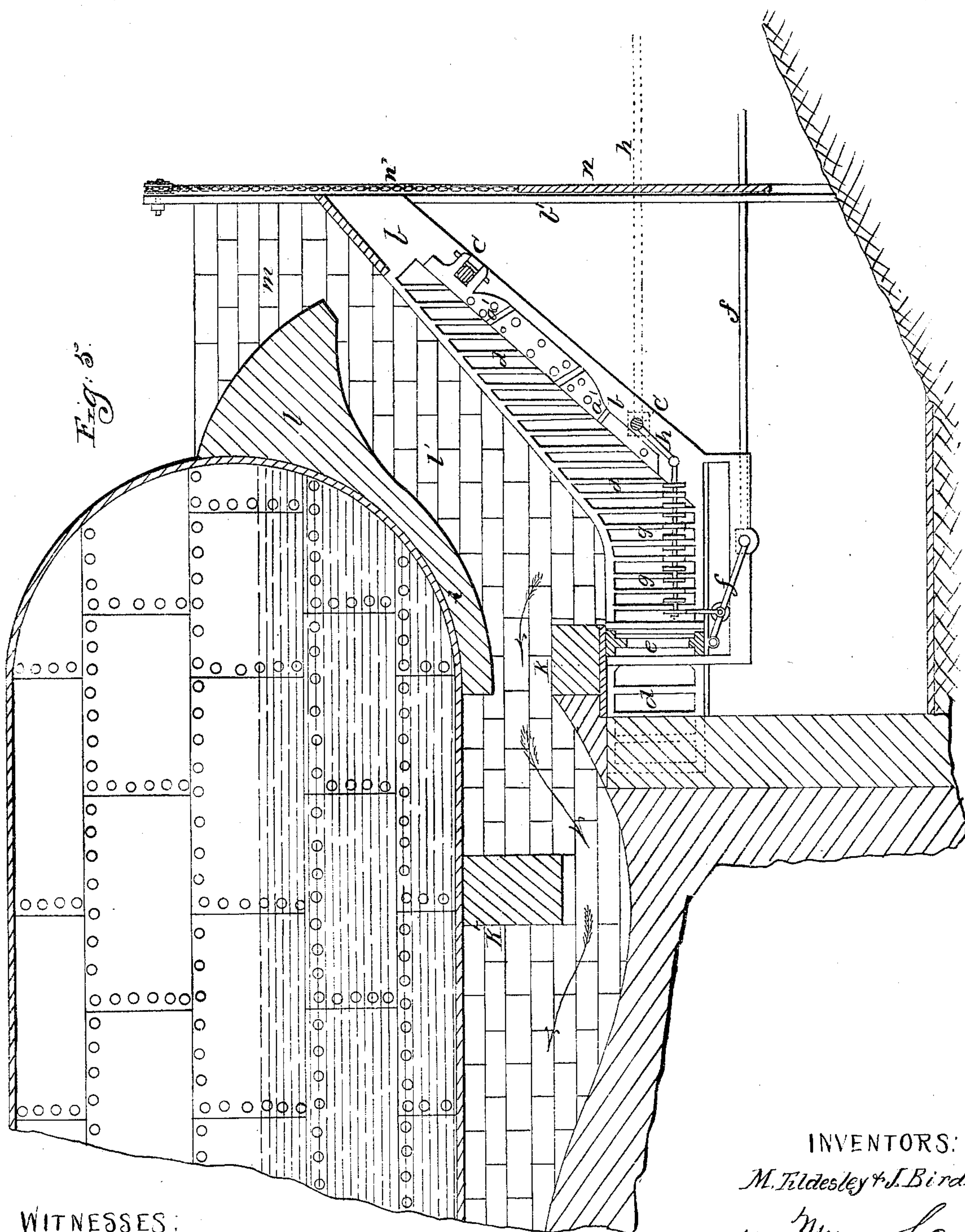
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# United States Patent Office.

MATTHEW TILDESLEY AND JAMES BIRD, OF WILLENHALL, ENGLAND.

Letters Patent No. 94,793, dated September 14, 1869.

## IMPROVEMENT IN FURNACES FOR STEAM-GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that we, MATTHEW TILDESLEY, of Willenhall, in the county of Stafford, and Kingdom of England, and JAMES BIRD, of the same place, have invented new and useful Improvements in the Construction of Furnaces, Stoves, and Fire-Places; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has for its object the construction of furnaces, stoves, and fire-places generally, in such manner that the air may come in contact with the fire, and a draught may be created upon all sides of the fire, at the back end, and at the bottom or under the fire, the top alone being closed, by which construction we obtain smoke-consuming fires.

In order that our invention may be more fully comprehended, we shall now proceed to describe the same in detail, by aid of the drawings hereunto attached, and the letters and figures marked thereon.

Referring to sheet 1—

Figure 1 is a front elevation of a furnace constructed in accordance with our improvements, which we have shown, for the sake of illustration, as applied to the heating of a steam-boiler;

Figure 2 is a transverse section, taken upon the line A A of the plan, and looking into the heating-chamber;

Figure 3, sheet 2, is a side elevation of the furnace;

Figure 4 represents the parts in sectional plan; and

Figure 5, sheet 3, is a longitudinal section, upon the line B B of fig. 4.

Similar letters of reference indicate corresponding parts.

We provide the front of the furnace or fire-place with ordinary sloping-bars, *a*, which extend from the front toward the back, with sufficient incline, for instance, at the angle shown at *a'*, fig. 5.

These bars *a* may be either parallel with each other or formed tapering; that is, with larger space or openings between them at their bottom ends; or the bars may be made to run longitudinally from side to side.

The bars *a* are supported or held in position upon cross-bearers or axes *c*, which are carried by suitable iron castings *b*, and supports or standards *b'*.

*d* are the side gratings or lateral fire-bars, which may be formed solid with the castings *b*, or may be attached thereto, as desired.

In either case, we secure the forward ends of the castings *b* to the supports or standards *b'*, and build in with the brick-work of the furnace the other ends of the side gratings *d* or castings *b*, as indicated in dotted

The lateral fire-bars *d* are shown in the drawings as being exactly vertical, but they may be formed so as to slant from front to back, or to any desired angle, or from bottom to top, or from top to bottom.

*e* is the back plate or back-end vertical set of bars, being held within grooves or recesses in the side gratings at *e'*, with a clear space behind it from the under side, for the free admission of air to the fire at that part, and, if necessary, this back set of bars may have a sliding action up and down within the grooves or recesses *e'*, so as to be opened or closed for enabling the clinker or cinder to be readily removed from the bottom of the grate.

Such opening and closing motion may be given to the back grate or set of bars *e*, from the action of a crank-arm and lever-handle, *f*, or by any other suitable means.

*g* is the bottom set of bars, grate, or grid, which may be capable of being opened for the removal of cinder or clinker, by means of a forward or sideways sliding action of such grate or grid upon flanges or within grooves, and it may also have a rocking or shaking motion, by means of a crank and lever-arm, *h*, and this motion we purpose using, with the front sloping bars, by forming a connection between the bearers or axes *c*, by means of a crank *i* and crank-arms *i'* *i''*, which are secured on the square ends of the bearers *c*, so that the motion of the lever-handle *h* will impart a simultaneous rocking motion to the front bars *a* and bottom bars *g*.

To this motion we lay no claim, and use it merely for the purpose of aiding the passage or descent of the fuel to the fire.

Above the back set of bars or grate *e* is formed the bridge *k*, and above this bridge is an arched opening or mouth, as usually employed, through which the flame passes into the heating-chamber; and in order to obtain a reverberatory transverse of the flame, we sometimes form a second arch, *k'*, so that the flame will travel in the direction of the arrows, fig. 5, this second arch insuring the combustion of any trifling smoke which may have escaped over the bridge *k*.

The top of the furnace or fire-place is furnished with a fire-brick arch, *l*, spanning the width, and supported by the brick-work jambs *l'*, which are built upon the castings *b* and side-grates *d*, or the fire-brick arch *l* may be built upon the flanges of the side gratings *d* and castings *b*, without the brick-work jambs *l'*.

*m* is an opening or feeding-space for the passage of the fuel, and this space we keep always sealed or packed with the fuel, so that no air can possibly play upon the fire at this part.

The fire-brick arch *l* is shown in the drawings as adapted to the shape of the boiler.



For other furnaces or fire-places, the outline of such arch will be somewhat varied, and in applying our invention to a cornice or flue-boiler, we propose inserting about half of the length of the furnace or cradle-form of the fire-grate into the flue of the boiler, allowing sufficient space around the sides from the outside for the free admission of air to the fire at such parts.

*n* is a fire-guard or slide, provided with balance-weights and chains *n'*.

The remaining portions of the drawings are ordinary mechanical details, of which further mention is unnecessary.

Instead of the arrangement already specified, we propose, in some cases, to make our furnaces or other fire-grates of a taper form in plan, widening toward the bottom or toward the top, which form may be either round, oval, square, oblong, or polygonal-sided.

This form we secure in a slanting position, from front toward the back, the one-half or segment of the bottom being furnished with an open-draught grate, and the fuel being fed into the fire from the top, as before specified, or, in some instances, a modified form of our furnace or grate may be formed with one solid cheek or side and one open one, for the admission of air, which arrangement may be desirable in certain conditions; or, by another arrangement, we form the fire-grate or bottom bars in a V-form, sloping from the side inward, as well as from front toward the back of the furnace.

Furnaces constructed as herein described will burn slack, small coal, or other descriptions of fuel, and the main object of our invention is to provide a furnace or

fire-place which shall have a draught brought to bear upon one or both sides and the back end of the fire, as well as at its bottom or under side, no air being admitted above the fuel, thus creating an intense heat toward the bridge, which will be sufficient at the point of combustion to consume all smoke which usually passes through into the stack or flue, the combustion produced in the heating-chamber being a brilliant and clear gas-fire, free from smoke and smell in most cases.

Having thus described the nature and object of our said invention, and the manner in which the same may be carried into effect, we wish it understood that we do not intend to limit ourselves to the precise details herein described and illustrated; nor do we claim any of the mechanical parts apart from the general arrangement or combination of the whole; but

What we do claim as new, and desire to secure by Letters Patent, is—

1. The combination and arrangement of the castings *b* and standards, *b'*, with the inclined front and arch, as described.

2. The arrangement of the jambs *c*, side gratings *d*, inclined front gratings, bottom grates *g*, back end grate *e*, all constructed and fitted together as described.

The above specification of our invention signed by us, this 7th day of July, 1868.

MATTHEW TILDESLEY.  
JAMES BIRD.

Witnesses:

EDWARD JOHN PAYNE,  
WM. TADMAN FOULKES.