

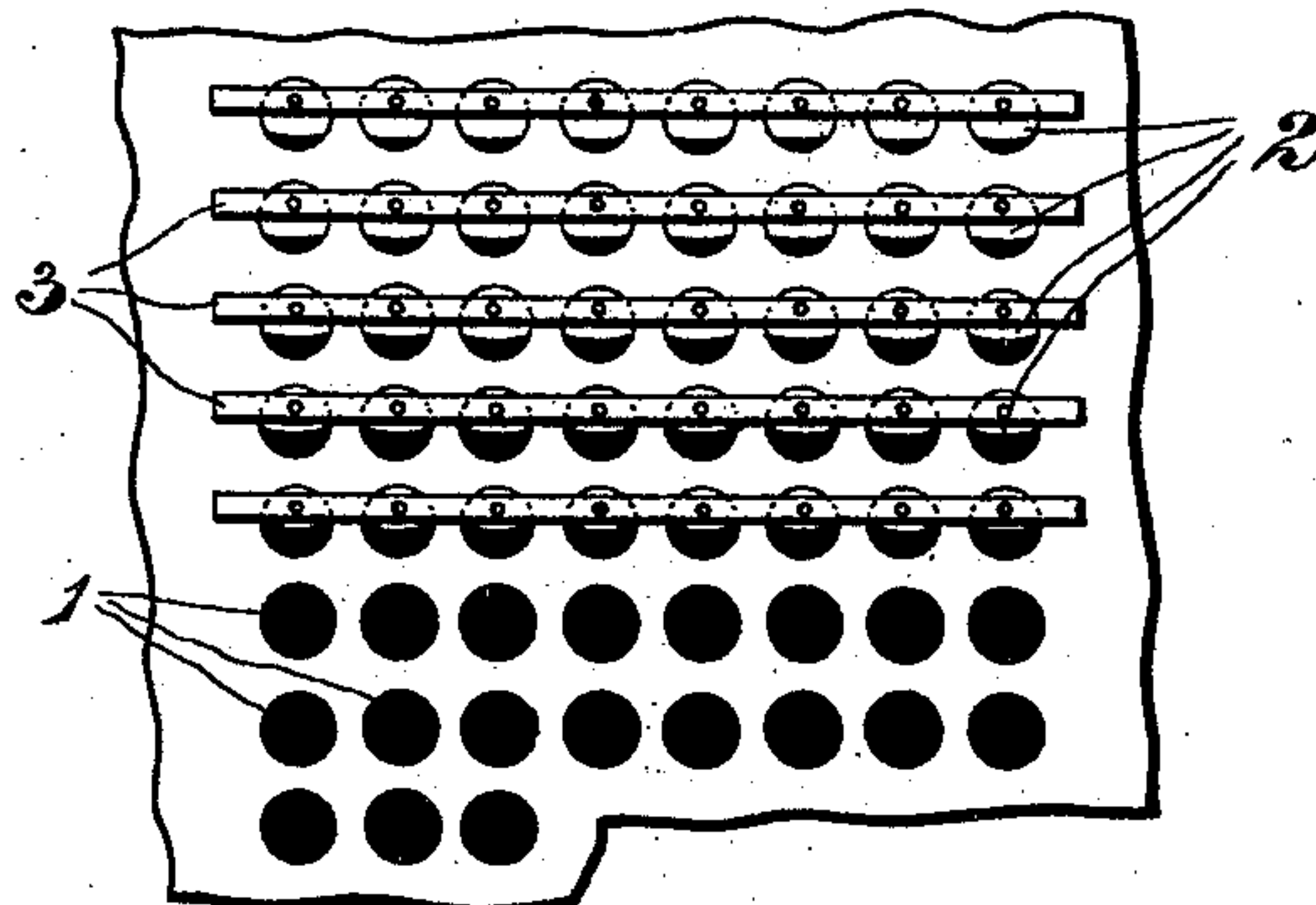
(No Model.)

J. SCOTT.  
MULTITUBULAR BOILER.

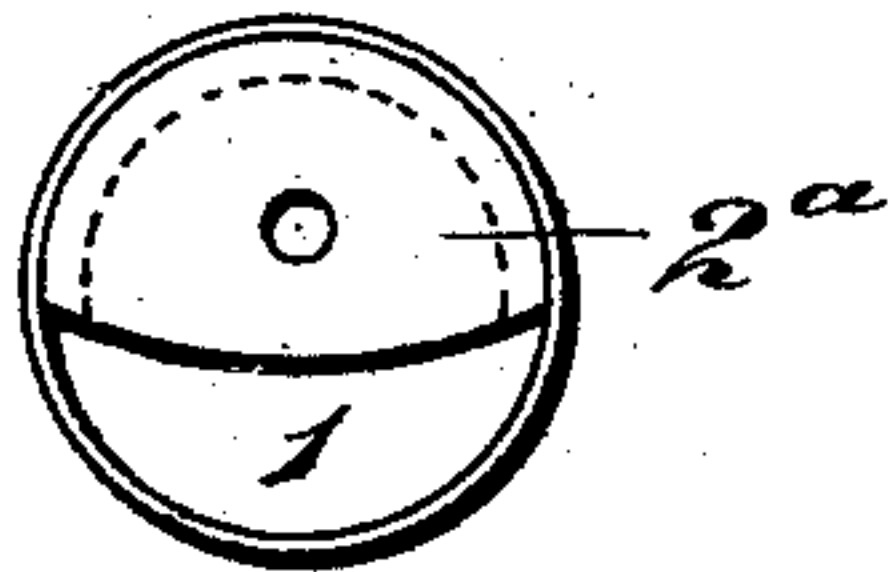
No. 576,901.

Patented Feb. 9, 1897.

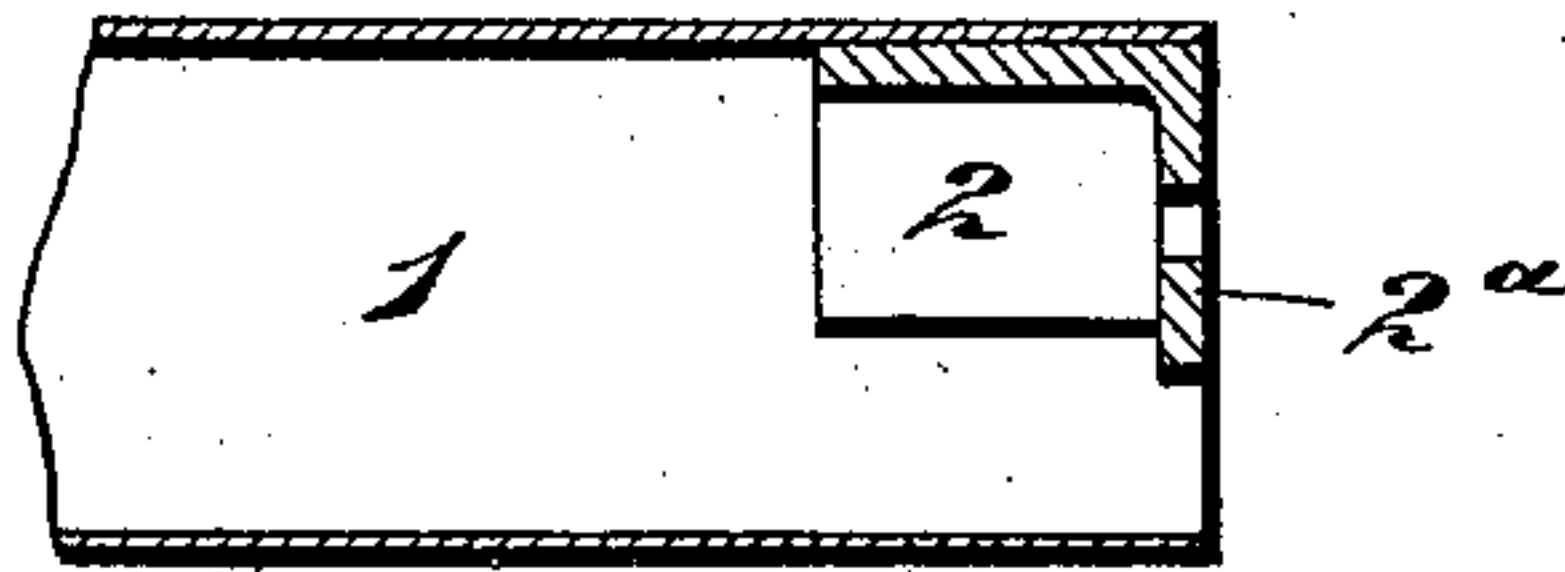
*Fig. 1.*



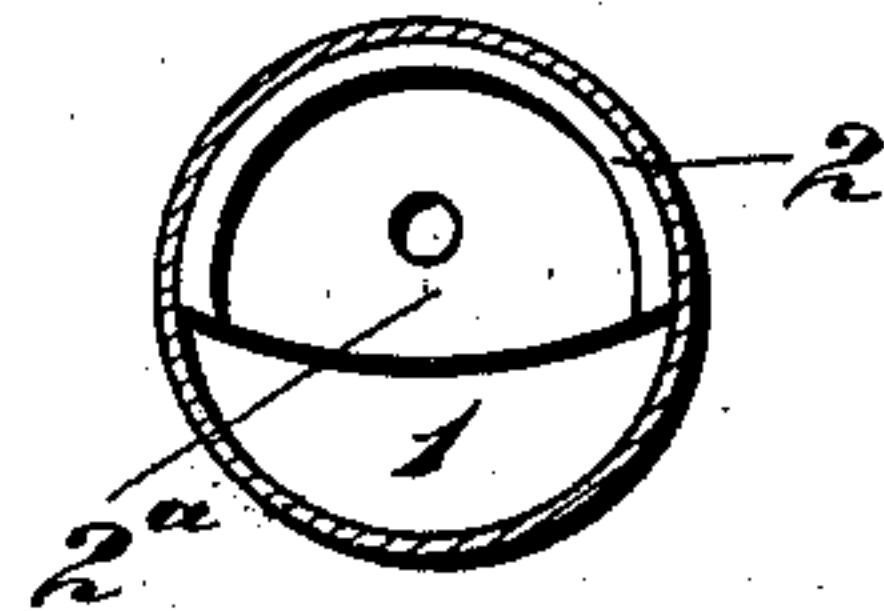
*Fig. 2.*



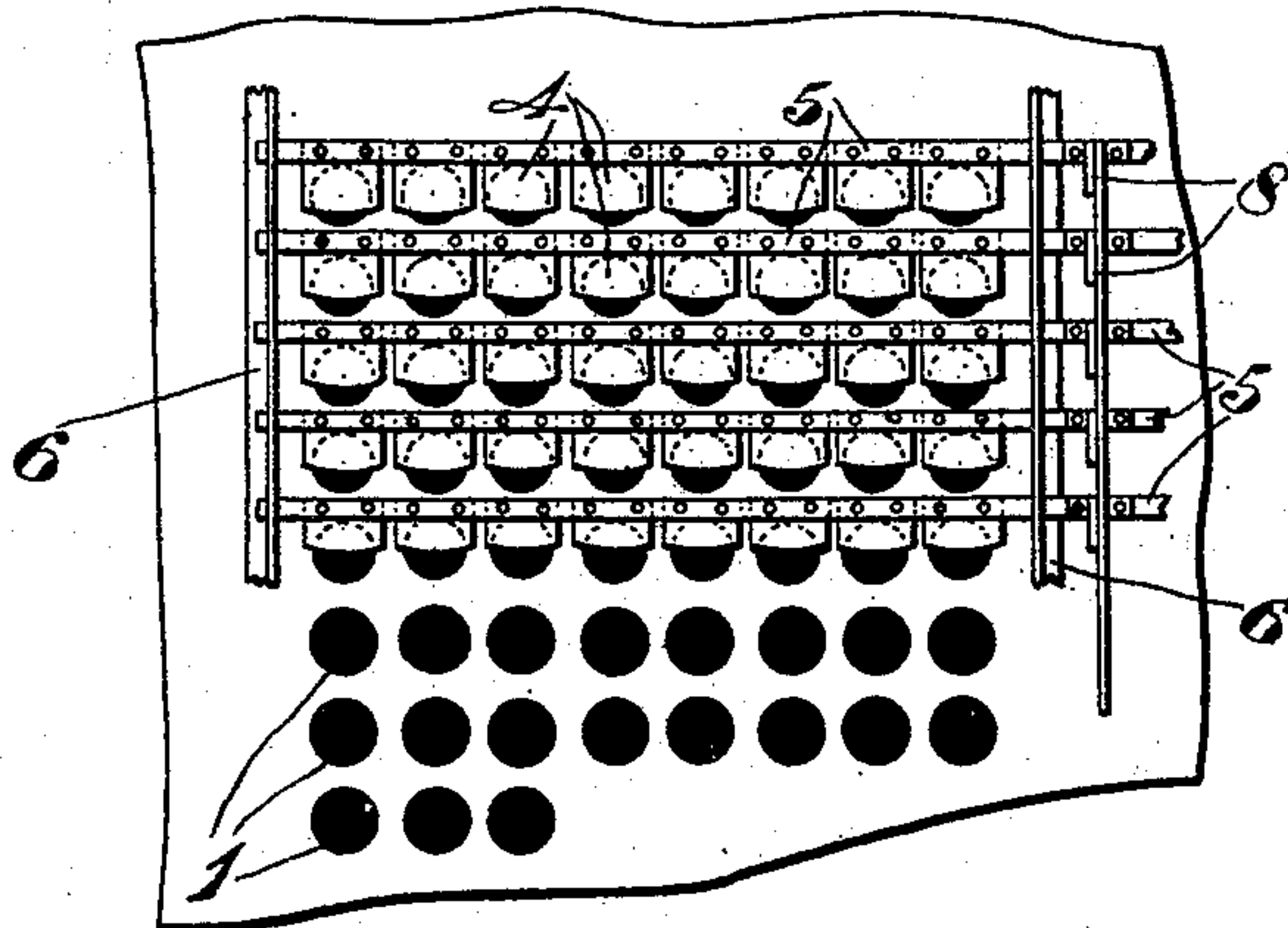
*Fig. 3.*



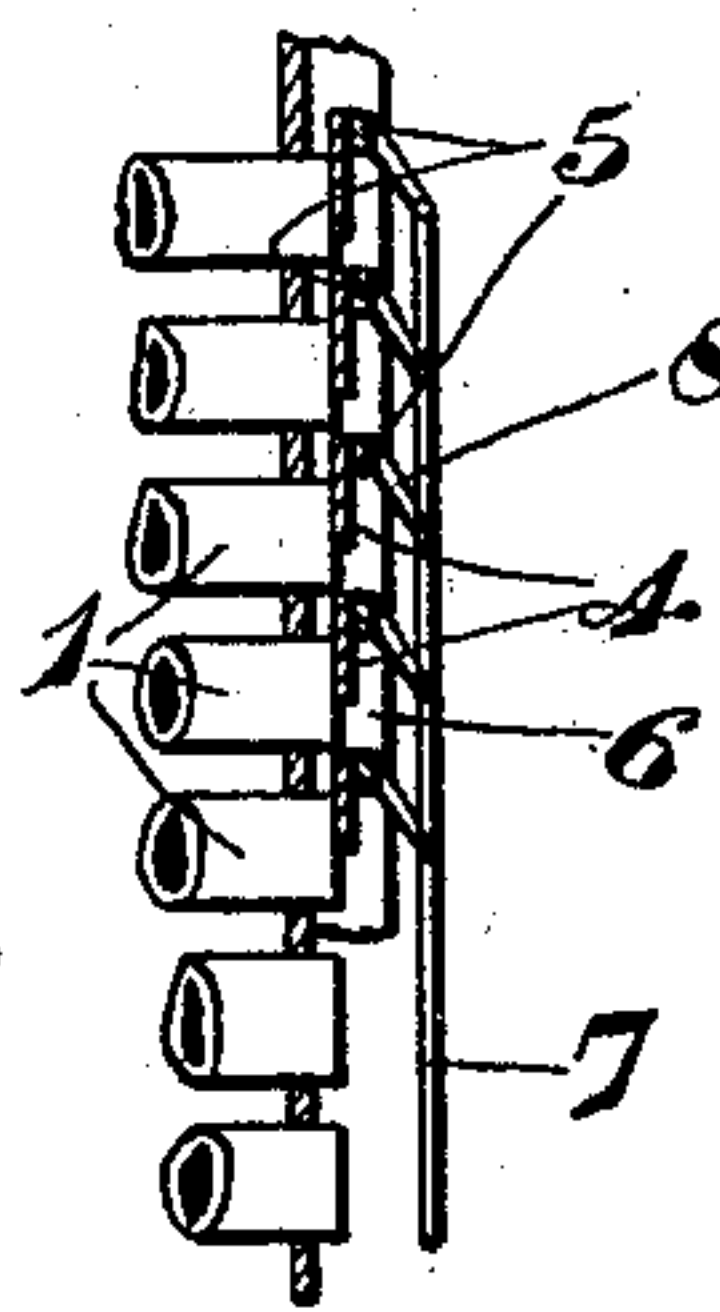
*Fig. 4.*



*Fig. 5.*



*Fig. 6.*



Witnesses.

Geo. E. Frick.

James W. Devaux

Inventor

John Scott,  
By  
Pattison Nesbit, atty.



# UNITED STATES PATENT OFFICE.

JOHN SCOTT, OF JARROW, ENGLAND.

## MULTITUBULAR BOILER.

SPECIFICATION forming part of Letters Patent No. 576,901, dated February 9, 1897.

Application filed November 7, 1896. Serial No. 611,396. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN SCOTT, a subject of the Queen of Great Britain and Ireland, residing at Jarrow-on-Tyne, in the county of Durham, England, have invented Improvements in Multitubular Boilers, of which the following is a specification.

The object of this invention is to cause the products of combustion to pass as uniformly as possible through all the smoke-tubes of a multitubular boiler, that is to say, to insure that practically the same quantity of products of combustion shall pass through the lower rows of tubes as through the upper rows, and thereby render all the tubes practically equal to one another in evaporative efficiency. For this purpose I provide the front or smoke-box ends of the tubes with removable draft-regulating devices adapted to partly close such tube ends, the closing devices for the successive rows being of different depths, so that the tubes of one row are closed to a greater extent than those of the next lower row.

Figure 1 of the accompanying drawings is a front elevation showing the smoke-box ends of the tubes of a multitubular boiler provided with one arrangement of draft-controlling apparatus according to this invention. Figs. 2, 3, and 4 show, respectively, in front elevation, longitudinal section, and back elevation, and to a larger scale than Fig. 1, one of the plugs used in such arrangement. Figs. 5 and 6 are respectively an elevation and vertical section showing a modified arrangement of draft-controlling apparatus according to this invention.

In the example shown in Fig. 1 the tubes 1 of all of the rows except the lowest three rows are partially closed at their outlet ends by pieces or plugs 2 of suitable material, such as iron, one of which is shown to a larger scale in Figs. 2, 3, and 4, and each of which consists, in the example shown, of a part tube closed at its outer end by a flange 2<sup>a</sup>. It will be seen that the end flanges 2<sup>a</sup> of the plugs 2 of the several rows gradually decrease in depth from row to row in a downward direction, the lowest rows of tubes in this case, Fig. 1, being without closing devices. The number of rows of tubes without closing devices may differ in different cases according to the varying condition of working. In this

way the velocity of the escaping hot gases passing through the upper tubes is regulated, with the result that the gases are retained longer in contact with the heating-surfaces of the combustion chamber or chambers and of the tubes than would be the case if all the tubes were left full open, whereby there is a more perfect combustion and a better distribution of the hot gases, both in the combustion chamber or chambers and in the tubes, thereby considerably increasing the evaporative efficiency of the boiler.

The plugs 2 of each row are secured by their flanges 2<sup>a</sup> to a common bar 3 in order that they may be easily and quickly removed to allow of the cleaning of the corresponding row of tubes or of stopping one or more tubes should the same become defective.

Figs. 5 and 6 show a modified arrangement in which the draft-regulating devices are in the form of flat plates or dampers 4, rigidly secured to bars 5, which are mounted in suitable supports 6, so as to be capable of being partly rotated by means of a rod 7, connected to arms 8, fixed to the said bars 5. As in the arrangement hereinbefore described, the depth of the dampers opposite each row of tubes 1 is such that the uppermost row is closed to a greater extent than the next lower row, and this row to a greater extent than the next lower row, and so on downward, and this will continue to be the case if the dampers be turned partly outward, so as to allow the products of combustion to pass through the tubes more freely, should this be found necessary; also, after steaming for some time, by fully opening the dampers for a short period the tubes can be partially cleared of soot by reason of the greater draft then passing through them, thereby obviating the necessity of sweeping the tubes so often in the ordinary manner while the boiler is under steam. Suitable means, such as bell-cranks, rods, and levers, are provided for enabling the rod 7 to be operated from any convenient position by the attendant.

It is not necessary that all the tubes in the same horizontal row should be equally closed, so long as they be closed to a greater extent than the tubes in the next lower row.

I do not claim, broadly, the application of separate draft-regulating devices to the front



or outlet ends of the smoke-tubes of multitubular boilers.

What I claim is—

1. A multitubular boiler in which rows of  
5 smoke-tubes are partly closed at their front or delivery ends by draft-regulating devices applied separately to the tube ends, the said devices for successive horizontal rows of tubes being of different depths, so that the tubes in  
10 the same horizontal row are closed to a greater extent than the tubes in the next lower row, and so on downward, substantially as described for the purpose specified.

2. In a multitubular boiler, the combina-  
15 tion with the front or delivery ends of horizontal rows of smoke-tubes, of draft-regulating devices each adapted to separately control the flow of hot gases through the tube to which it is applied, and bars secured to said  
20 devices so as to form connected removable horizontal rows of devices, the said devices for successive rows of tubes being of different depth so that tubes in the same horizontal row

are closed to a greater extent than the tubes in the next lower row and so on downward, 25 substantially as described for the purpose specified.

3. In a multitubular boiler, the combination with the front or delivery ends of smoke-  
tubes of horizontal rows of plates or dampers 30 arranged opposite the ends of the tubes, the plates or dampers in each row being of less depth than those in the row above, pivoted bars to which said rows of plates or dampers are secured, and means whereby said bars 35 with attached plates or dampers can be partly turned about their axes, substantially as described for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of 40 two subscribing witnesses.

JOHN SCOTT.

Witnesses:

WM. BRAID,

W. HUTCHINSON.