

**No. 693,137.**

**Patented Feb. 11, 1902.**

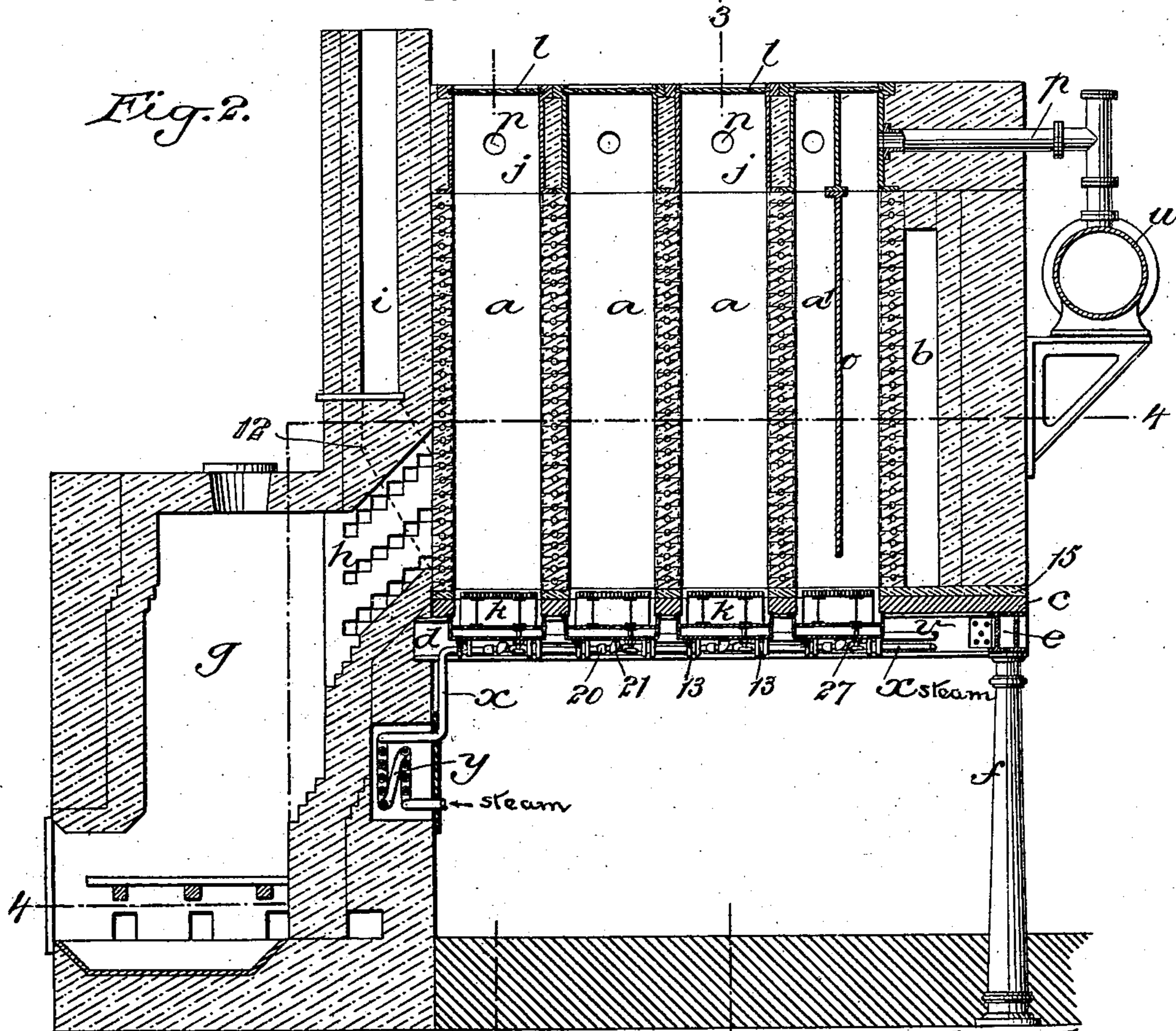
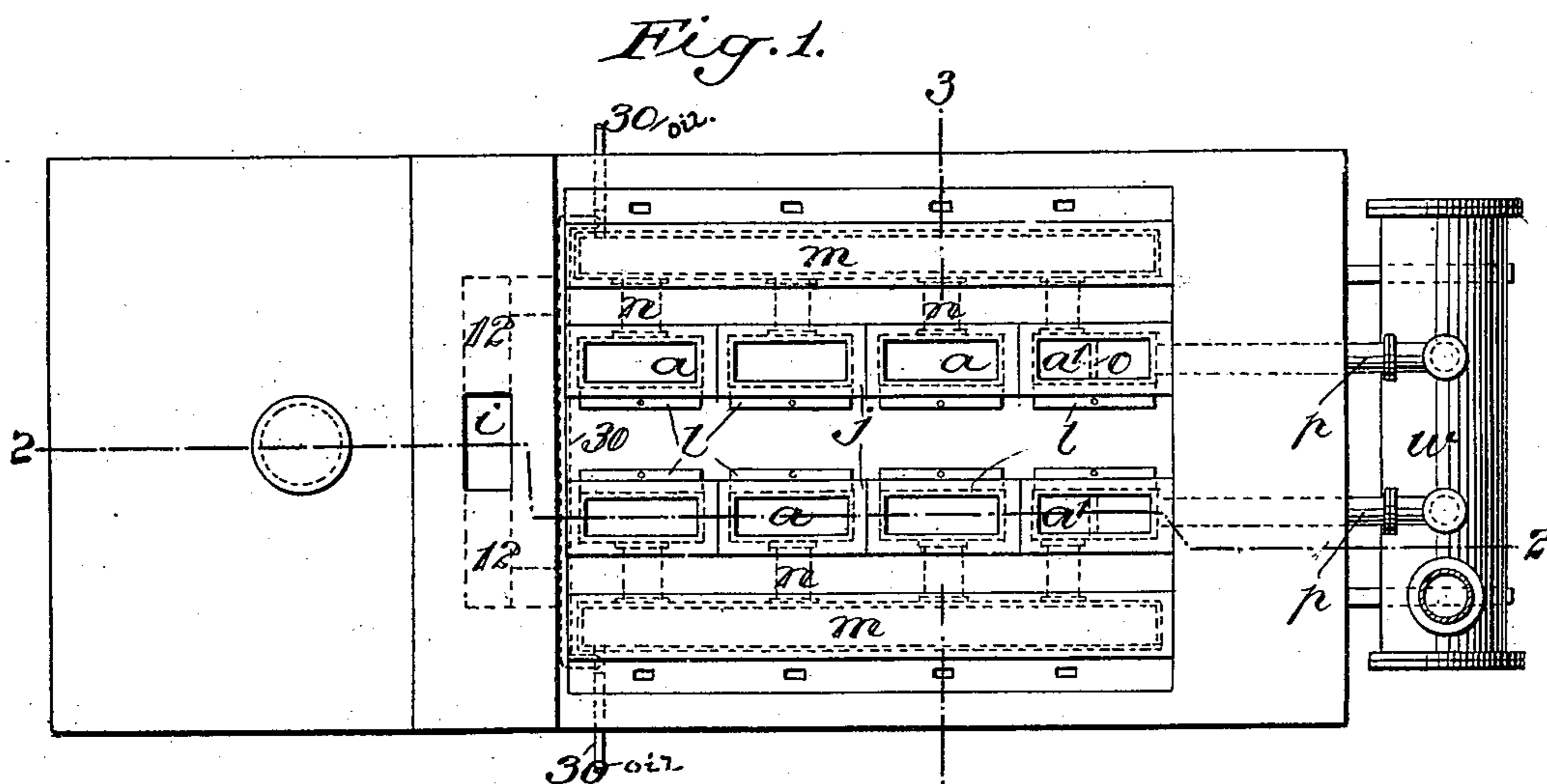
**C. W. ISBELL.**

## APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.

(Application filed May 15, 1901.)

(No Model.)

**3 Sheets—Sheet 1.**



Witnesses:-  
George Barry Jr.  
Henry Thieme.

Inventor.  
Charles W. Isbell  
by attorneys  
Brown & Seward

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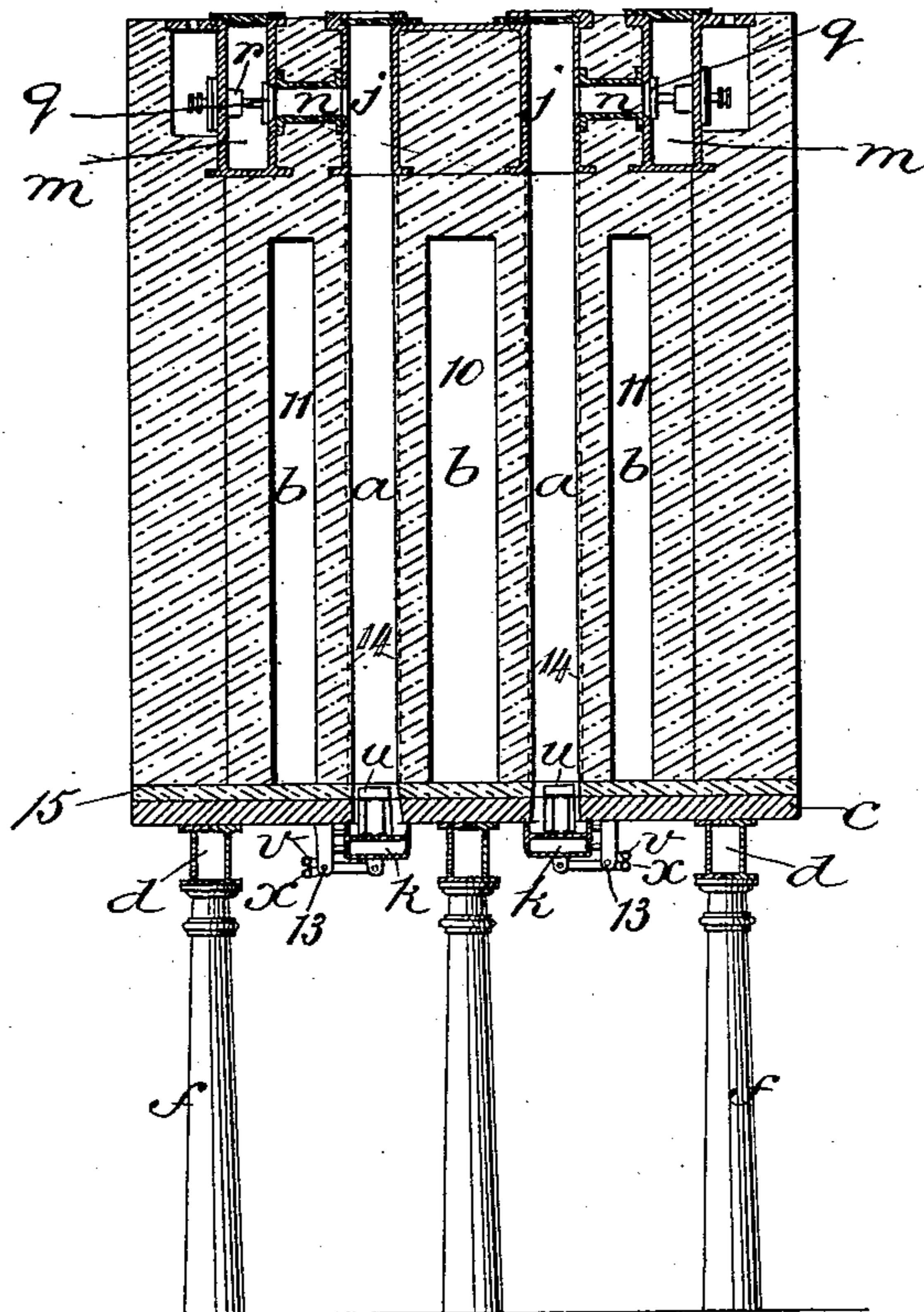
APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.

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(No Model.)

3 Sheets—Sheet 2.

Fig. 3.



Witnesses:-  
George Barry Jr.  
Henry Thierne.

Inventor:  
Charles W. Isbell  
by attorney  
Brown & Howard

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C. W. ISBELL.

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3 Sheets—Sheet 3.

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Fig. 4.

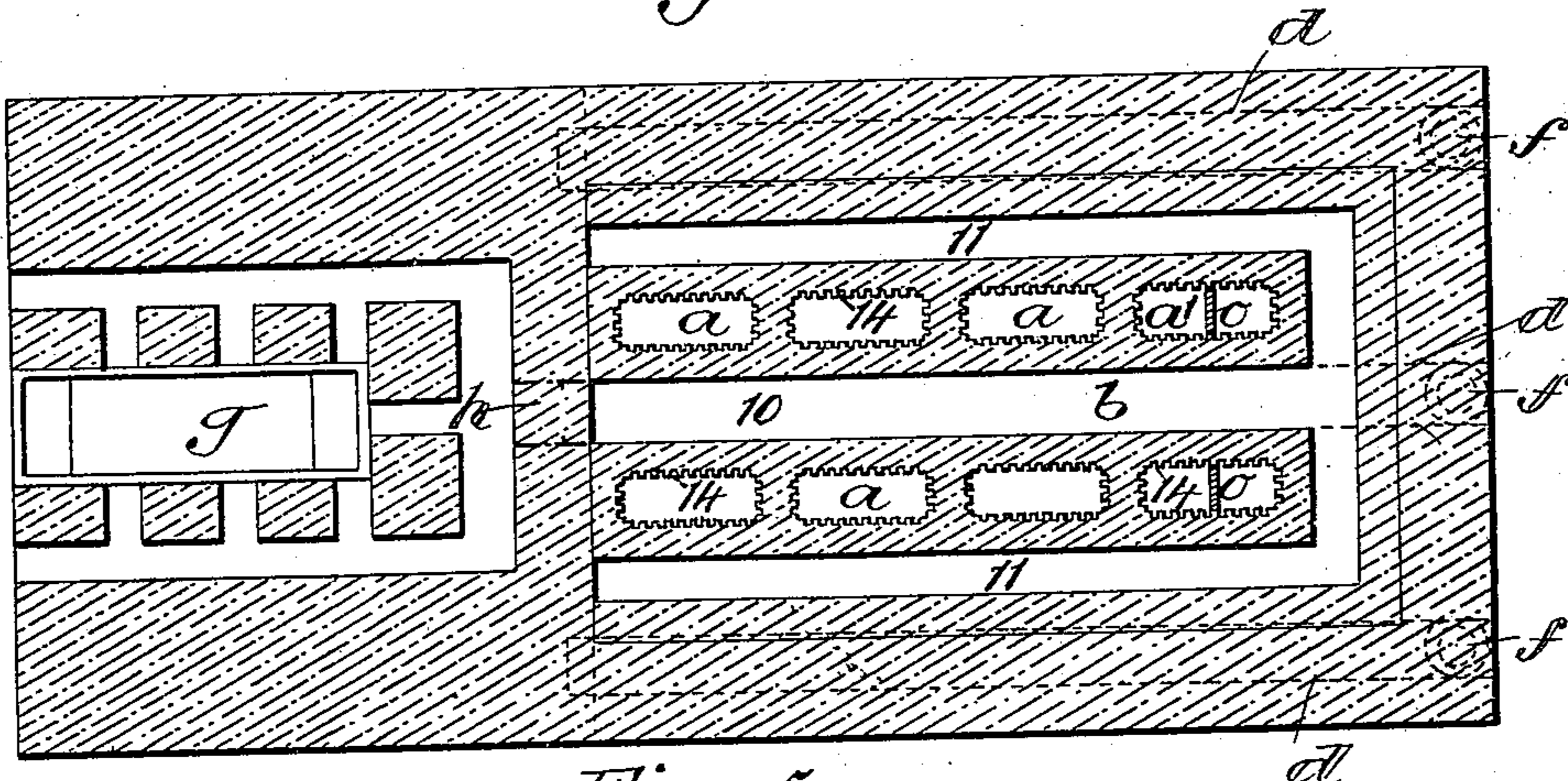


Fig. 5.

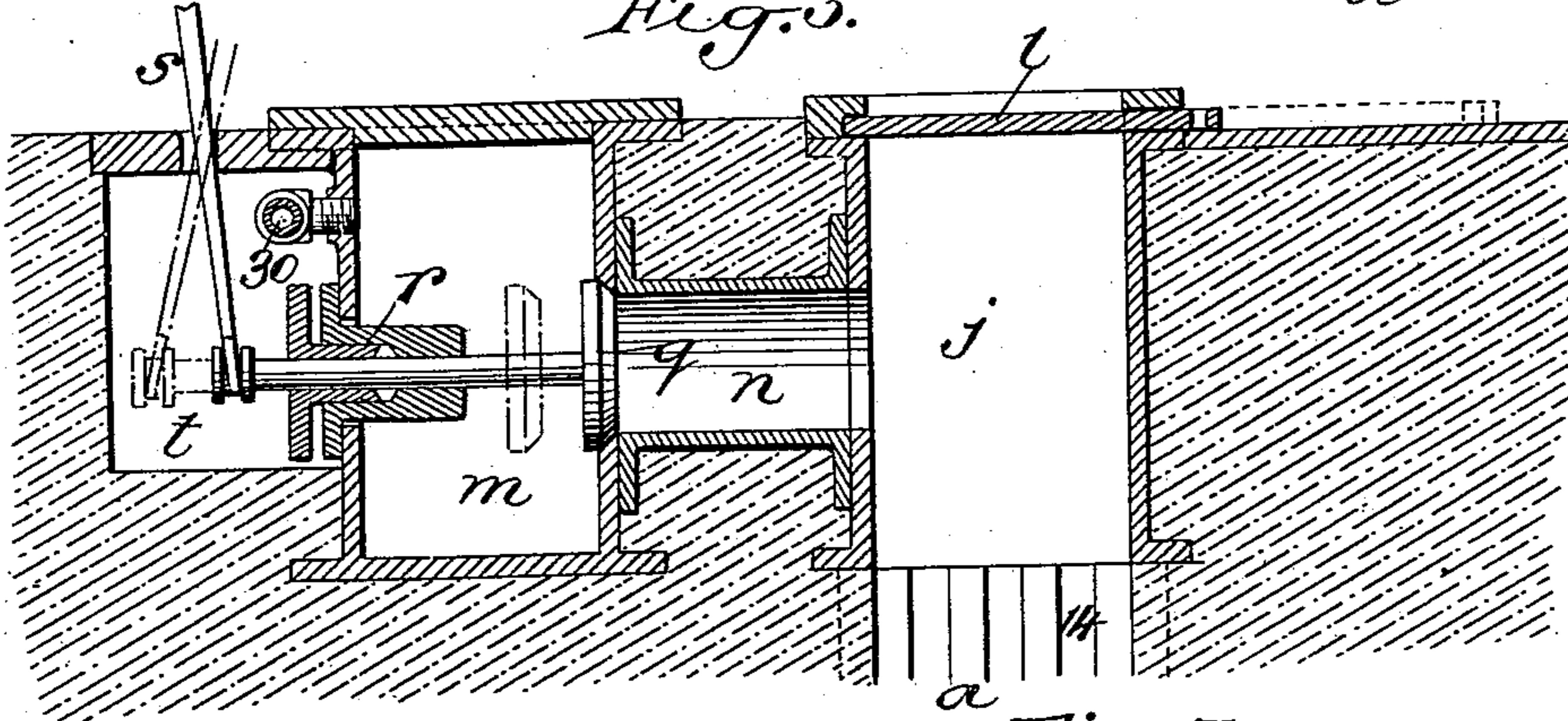


Fig. 6.

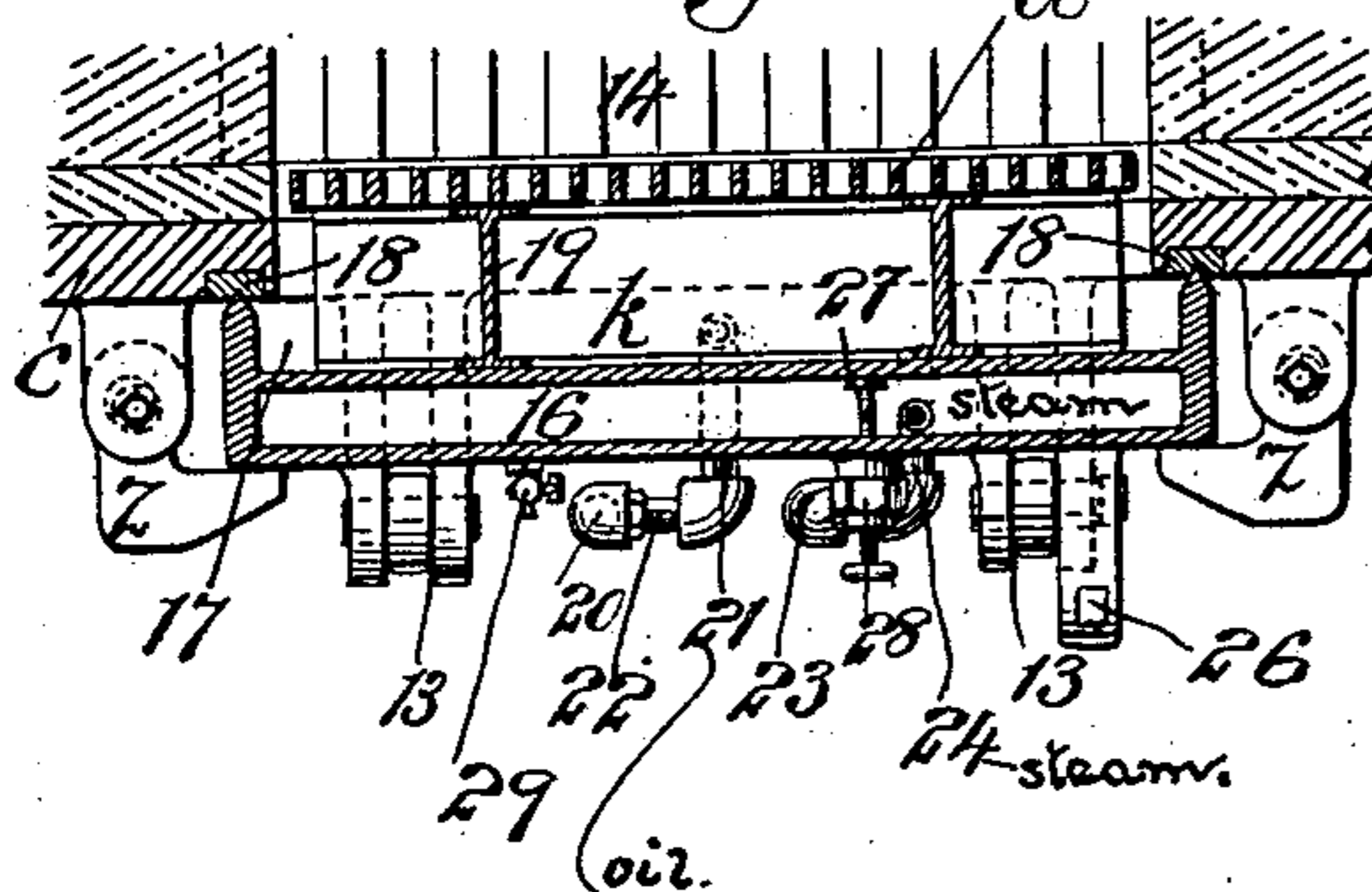
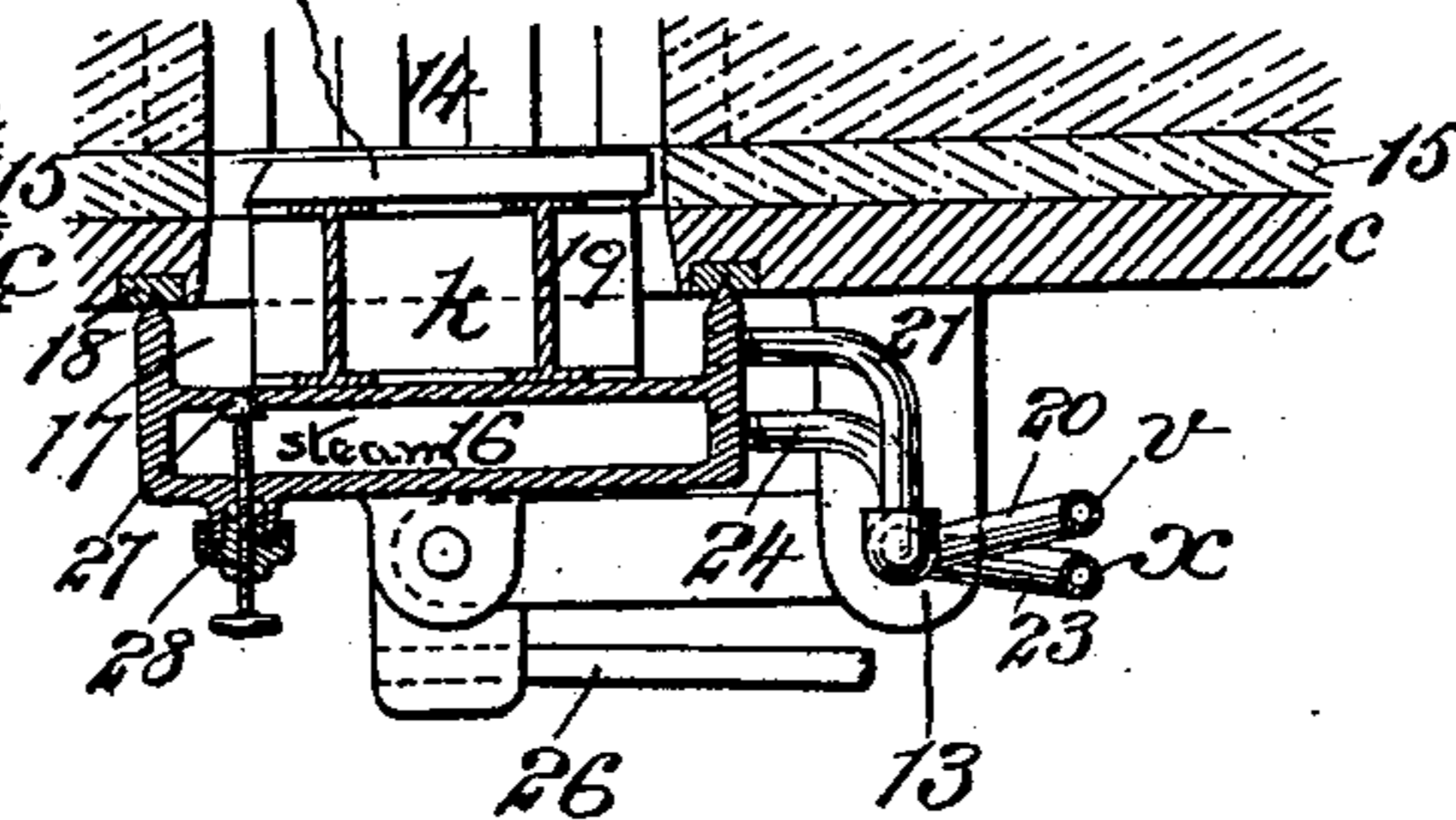


Fig. 7.



Witnesses:

George Barry J.  
Henry Thieme.

Inventor:

Charles W. Isbell  
by attorney  
Brown & Leonard

# UNITED STATES PATENT OFFICE.

CHARLES W. ISBELL, OF NEW YORK, N. Y.

## APPARATUS FOR THE MANUFACTURE OF ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 693,137, dated February 11, 1902.

Application filed May 15, 1901. Serial No. 60,298. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES W. ISBELL, a citizen of the United States, and a resident of the borough of Manhattan, in the city and State of New York, have invented a new and useful Improvement in Apparatus for the Manufacture of Illuminating-Gas, of which the following is a specification.

This invention relates to apparatus with vertical retorts for the manufacture of illuminating-gas from bituminous coal.

The improvement relates in part to the construction of the retorts themselves, whereby provision is made for the expansion of the coal therein, for the free escape of the gas from the coal, for the loosening of the residual coke, and for preventing the impoverishment of the gas by the carbonization and deposit in the coke of any of its illuminating elements.

The improvement further relates to appliances used in connection with upright coal-gas retorts, for the enrichment or improvement of the illuminating quality of the coal-gas by the distillation within the retorts themselves, and in the outlets therefrom of suitable liquid hydrocarbons.

I will first describe my invention with reference to the apparatus represented in the accompanying drawings, in which it is embodied, and will afterward point out its novelty in claims.

Figure 1 in the drawings represents a plan of a gas apparatus embodying my invention; Fig. 2, a vertical section in the line 2 2 of Fig. 1; Fig. 3, a transverse vertical section in the line 3 3 of Figs. 1 and 2; Fig. 4, a horizontal section in the line 4 4 of Fig. 2; Fig. 5, a transverse vertical section of the head of one of the retorts and of the dry main on a larger scale than the preceding figures; Figs. 6 and 7, vertical sections at right angles to each other, on the same scale as Fig. 5, of the lower part and bottom of one of the retorts.

Similar letters and numbers of reference designate corresponding parts in all the figures.

$a$   $a'$  designate the upright retorts, represented as arranged in two parallel rows within a heating-chamber  $b$  and built of fire-brick into the same structure of masonry with said chamber, said structure being supported on

a floor-plate  $c$ , which is faced with fire-brick 15 and is supported on beams  $d$   $e$ , the said beams being supported in part by columns  $f$  55 and in part by a structure of masonry, which includes the furnace  $g$  for heating the several retorts. From this furnace a flue  $h$  leads to the central vertical flue-space 10 in the fire-chamber between the two rows of retorts. 60 The said central flue-space 10 branches off into two side flue-spaces 11 outside of the retorts, and these flue-spaces 11 communicate through flue-spaces 12 (shown in dotted outline in Figs. 1, 2, and 4) with the chimney  $i$ . 65 The arrangement of retorts, heating-chamber, furnace, and flues thus far described is not claimed as any part of the present invention, but is only herein described to illustrate a complete gas-manufacturing apparatus in 70 which said invention is embodied.

I will now proceed to describe the invention itself.

The upright retorts  $a$   $a'$  may be of any suitable horizontal sectional form and of uniform 75 size from top to bottom and are provided with fixed iron heads or mouthpieces  $j$  and with iron bottoms  $k$ , which are hinged at 13 to the floor-plate  $c$ , as shown in Figs. 2, 3, 6, and 7, to provide for the discharge of the residual 80 coke. The sides of said retorts are grooved vertically from top to bottom, as shown in Figs. 2, 3, 4, 6, and 7. The retort-heads or mouthpieces  $j$ , through which the retorts are charged, are all fitted with sliding lids  $l$ . The two 85 rearmost retorts  $a'$  of each row—viz., those farthest from the furnace—are not intended to be charged with coal, but are intended to serve as fixing-chambers for fixing the gas generated in the other retorts  $a$ , and for that 90 purpose each is provided with a transversely-arranged hanging partition or curtain  $o$ , which, as shown in Fig. 2, reaches from the top of the head  $j$  to within a short distance of the bottom of the retort itself. 95

For each row of retorts there is provided a dry main  $m$ , consisting of a box or tube arranged horizontally at one side of the row of retort-heads  $j$  and extending the whole length 100 of the row. The said dry mains are embedded in the upper part of the masonry of the heating-chamber to be heated by the heat of said chamber, and each is connected by short pipes  $n$  with all the retort-heads  $j$  of the adjacent

row. The connections with the heads *j* of the rearmost retorts *a'* or fixing-chambers are made in front of their partitions *o*, and these last-mentioned heads are connected in rear of said partitions by pipes *p* with the ordinary hydraulic main *w*, so that the gas from all the retorts *a* and the dry main is caused to pass first downward and then upward through said retorts *a'*, wherein its fixation is effected or assisted by the great heat to which the latter retorts are subjected. The several pipes *n* are furnished within the dry main *m* with valves *q*, the stems of which pass through stuffing-boxes *r*, provided in the outer walls of the dry main and which may be operated by levers *s*, working in small pits formed in the masonry outside of said mains. The said valves serve the purpose of shutting off any one or more of the retorts from their dry main.

The hinged lids or bottoms *k* (shown in Figs. 2 and 3, but the construction of which is better shown in Figs. 6 and 7) consist each of a slab which is made hollow to form a tight chamber 16 for the reception of air or steam to be supplied therefrom to the interior of the retort, for the purpose hereinafter explained, through a valve 27, which may be opened and closed by an attendant, the stem of said valve passing through the chamber 16 and through a stuffing-box 28 in the bottom thereof, outside of which it is furnished with any suitable hand-gear. Above this chamber the sides of said slab project upward to form a pan 17 for the reception and temporary retention of any tar which may be distilled from and settle down through the coal in the retort and from which naphtha and benzole or other hydrocarbons may be distilled for the purpose of enriching the coal-gas, said pan serving also to receive liquid hydrocarbons from any outside reservoir or source for the same purpose of enrichment. The edges of the pan 17 are made to form tight joints with the floor-plate *c* by asbestos packing 18, inserted in grooves in the bottom of said plate. On the bottom of the pan there is carried by supports 19 a grate *u*, which forms the interior face of the retort-bottom and upon which the coal in the retort is supported. The retort-bottom thus constructed and hinged to the floor-plate *c* is held in place until the time for discharging the coke by means of swinging hooks *z*, as shown in Fig. 6.

To provide for the introduction into the several pans 17 of the retort-bottoms of liquid hydrocarbon from any suitable reservoir or outside source, a fixed pipe *v* runs under the floor-plate *c*, along the whole length of each row of retorts, and from this pipe there are branches leading to the several pans. Such branches must have some sort of flexible connection with the pipe *v* in order to permit the opening and closing movements of the retort-bottoms on their hinges 13. In the example represented I have shown (see Figs. 6 and 7)

each branch as made of two short pipe-sections 20 21, of which 20 is fixedly connected with said pipe *v*, and 21 is fixedly connected with the pan 17, and the two are connected by a spigot-joint the axis of whose spigot 22 is in line with the axis of the hinges 13.

To provide for the introduction of steam or air, preferably superheated steam, into the chamber 16, a fixed pipe *x* runs under the floor-plate *c*, along the whole length of each row of retorts, and from this pipe branches run one to each chamber 16. These branches are represented as each composed of two pipe-sections 23 24 and a spigot-joint connection, which are like the spigot-jointed branches from the pipe *v*, before described. The said pipe *x* is represented in Fig. 2 as receiving steam through a superheating-coil *y*, which is arranged in a small heating-chamber in the masonry of the rear wall of the furnace *g* to be heated by the heat of the furnace. Steam or air admitted from the chamber 16 to the retort by opening the valve 27 after all the gas has been distilled from the coal in the retort and only coke is left may find its way upward between the coke and the sides of the retort and through the channels 14, and so produce combustion of those portions of the coke close to the sides and in the channels and the conversion of those portions into gas, thereby so loosening the charge that it will drop easily from the retort when the bottom is opened. A trap or petcock 29 (see Fig. 6) is provided in the bottom of the chamber 16 for the purpose, when steam is used in said chamber, of letting off any water of condensation. When superheated steam is used in the chambers 16, it may assist in volatilizing the liquid matters in the pan.

To provide for the further enrichment of the gas after it leaves the retorts *a* and before it enters the fixing-retorts *a'*, I make connections between said mains and a reservoir or any suitable source of supply of hydrocarbon by means of pipes 30. (Shown in Figs. 1 and 5.) The hydrocarbon thus introduced into the dry mains by these pipes 30 is quickly vaporized therein and so mixed with or incorporated into the gas entering from the retorts *a* by the several pipes *n* as to prepare the mixture for the most perfect fixation in the fixing-retorts *a'*.

Below the floor-plate *c* and its supporting beams there is room enough for the running in and out under the retorts of wagons for the reception and removal of the residual coke, which drops from the retorts after their bottoms have been swung aside from under them on their hinges 13. The weight of the coke itself may be sufficient to open the bottoms, or the opening may be produced or assisted by hand-levers 26, connected with the bottoms and projecting a suitable distance therefrom.

What I claim as my invention is—

1. An upright gas-retort having a movable bottom and a pan in said bottom for the col-

lection and retention, for further distillation, of tar or liquid matter that may be distilled from the charge in the retort and pass downward therefrom, substantially as herein described.

2. An upright gas-retort having a movable bottom, a grate on said bottom for the support of the charge in the retort, and a pan below said grate for the reception and retention, for further distillation, of tar or liquid matter that may be distilled from the charge and pass downward therefrom, substantially as herein described.

3. An upright gas-retort having a movable bottom, a grate on said bottom for the support of the charge in the retort, a pan on said bottom below said grate and means for supplying liquid hydrocarbon to said pan from an outside source, substantially as herein described.

4. An upright gas-retort having a movable bottom in which is a chamber for air or steam, means for supplying air or steam to said chamber and a valve in said chamber for controlling the issue of air or steam therefrom into the retort, substantially as and for the purpose herein described.

5. An upright gas-retort having a movable bottom in which is a pan for the collection and retention of tar or liquid hydrocarbon from the charge and in which under said pan is a chamber for air or steam to be supplied to the retort, substantially as and for the purpose herein described.

6. An upright gas-retort having a movable bottom in which is a pan for the reception of tar or liquid hydrocarbon, and in which under said pan is a steam-chamber, means for supplying steam to said chamber for heating and distilling the contents of said pans, a furnace for heating said retort, and a superheater heated by said furnace for superheating the steam on its way to said chamber, substantially as herein described.

7. An upright gas-retort having a movable bottom between which and the retort-body there is a hinge connection and in which is a pan for the reception of liquid hydrocarbon, a supply-pipe for liquid hydrocarbon, and a flexible pipe connection between said supply-pipe and said pan, substantially as herein described.

8. An upright gas-retort having a movable bottom between which and the retort-body there is a hinge connection and in which is a chamber for steam or air, a supply-pipe for air or steam and a flexible pipe connection between said supply-pipe and said chamber, substantially as herein described.

9. An upright gas-retort having a movable bottom in which is a pan for the reception of

tar or liquid hydrocarbon and in which under said pan is a steam-chamber, a valve applied between said chamber and pan and means for operating said valve from outside said chamber, substantially as herein described.

10. The combination of a plurality of upright coal-gas-generating retorts, a heating-chamber in which said retorts are arranged, a furnace for heating said chamber, an upright fixing-retort within said heating-chamber, and a dry main forming communications between the several generating-retorts and the fixing-retort, substantially as herein described.

11. In an apparatus for generating illuminating-gas, the combination of a plurality of upright gas-retorts, a furnace for heating said retorts, a hydraulic main common to the several retorts, a dry main common to the several retorts and forming communication between them and the hydraulic main and heated by said furnace, substantially as herein described.

12. The combination of a plurality of upright gas-retorts, a furnace for heating said retorts, a hydraulic main common to the several retorts, a dry main having communication with the several retorts and heated by said furnace, and a fixing-retort interposed between the dry main and hydraulic main and heated by said furnace, substantially as herein described.

13. The combination of a plurality of upright coal-gas-generating retorts, a dry main common to said retorts and having communications with the upper parts thereof, a fixing-retort for receiving the gas from the dry main, means for introducing liquid hydrocarbon into the dry main and a furnace for heating said generating-retorts, dry main and fixing-retort, substantially as herein described.

14. The combination of a plurality of upright gas-generating retorts, a dry main common to the several retorts and having communications with the upper parts thereof, a fixing-retort in communication with the dry main and common to the several generating-retorts, a furnace for heating said generating-retorts, dry main and fixing-retort, and valves in the first-mentioned communications for shutting off either generating-retort from the dry main and fixing-retort, substantially as herein described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 1st day of May, 1901.

CHARLES W. ISBELL.

Witnesses:

FREDK. HAYNES,  
HENRY THIEME.