

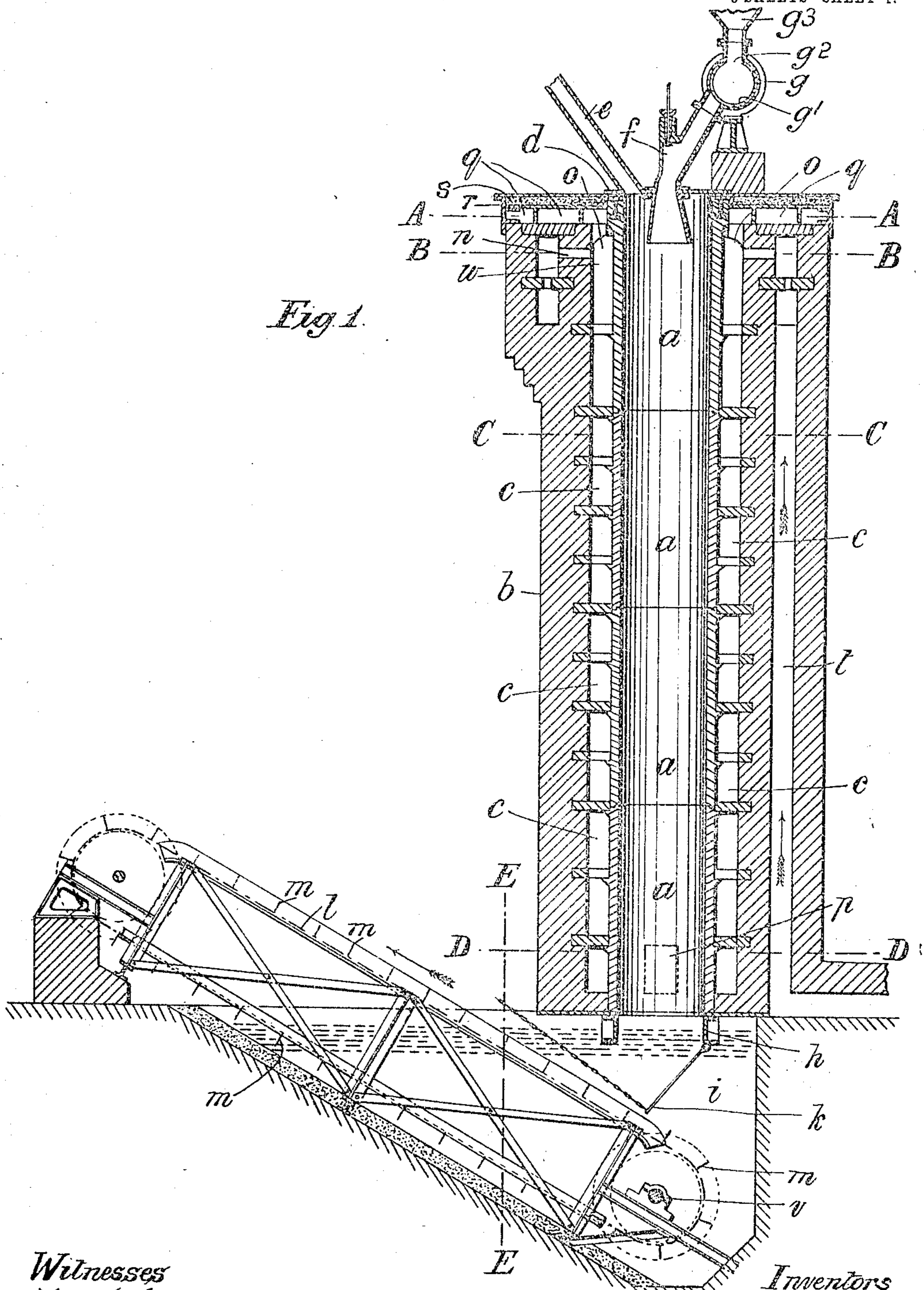
No. 885,308.

PATENTED APR. 21, 1908.

H. W. WOODALL & A. McD. DUCKHAM.
APPARATUS FOR THE MANUFACTURE OF GAS.

APPLICATION FILED JULY 1, 1904.

3 SHEETS—SHEET 1.



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Fig. 2.

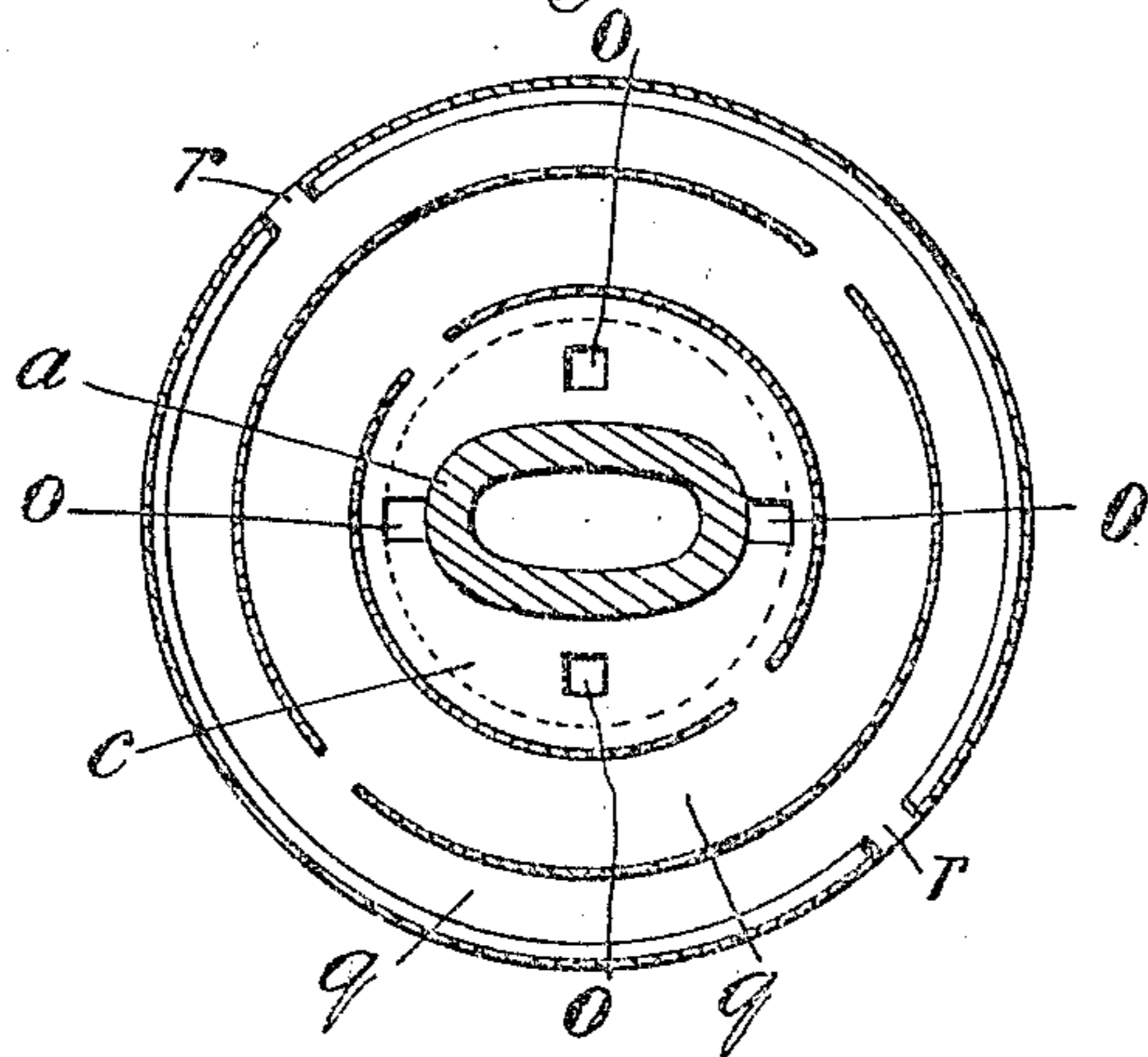


Fig. 3.

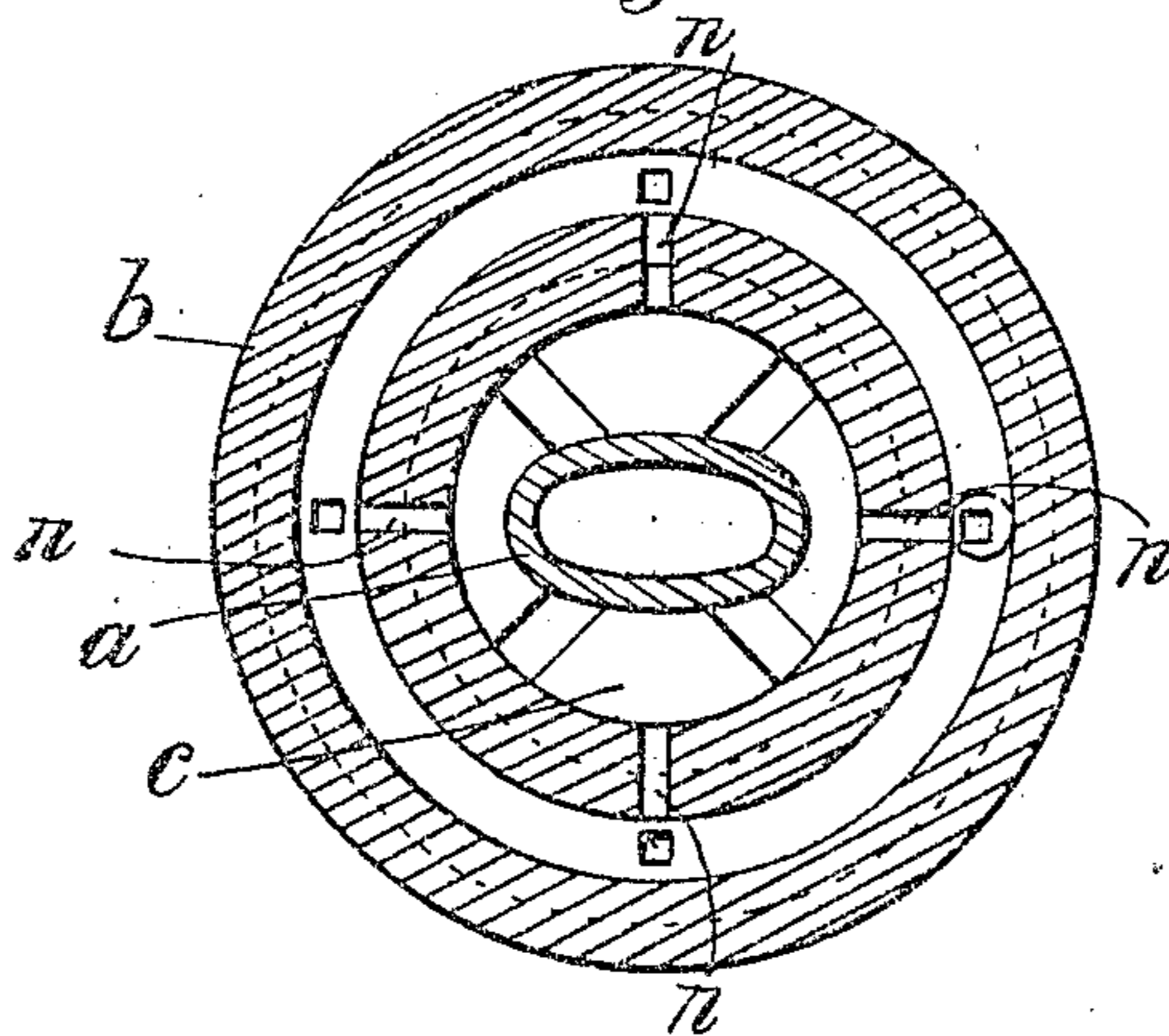
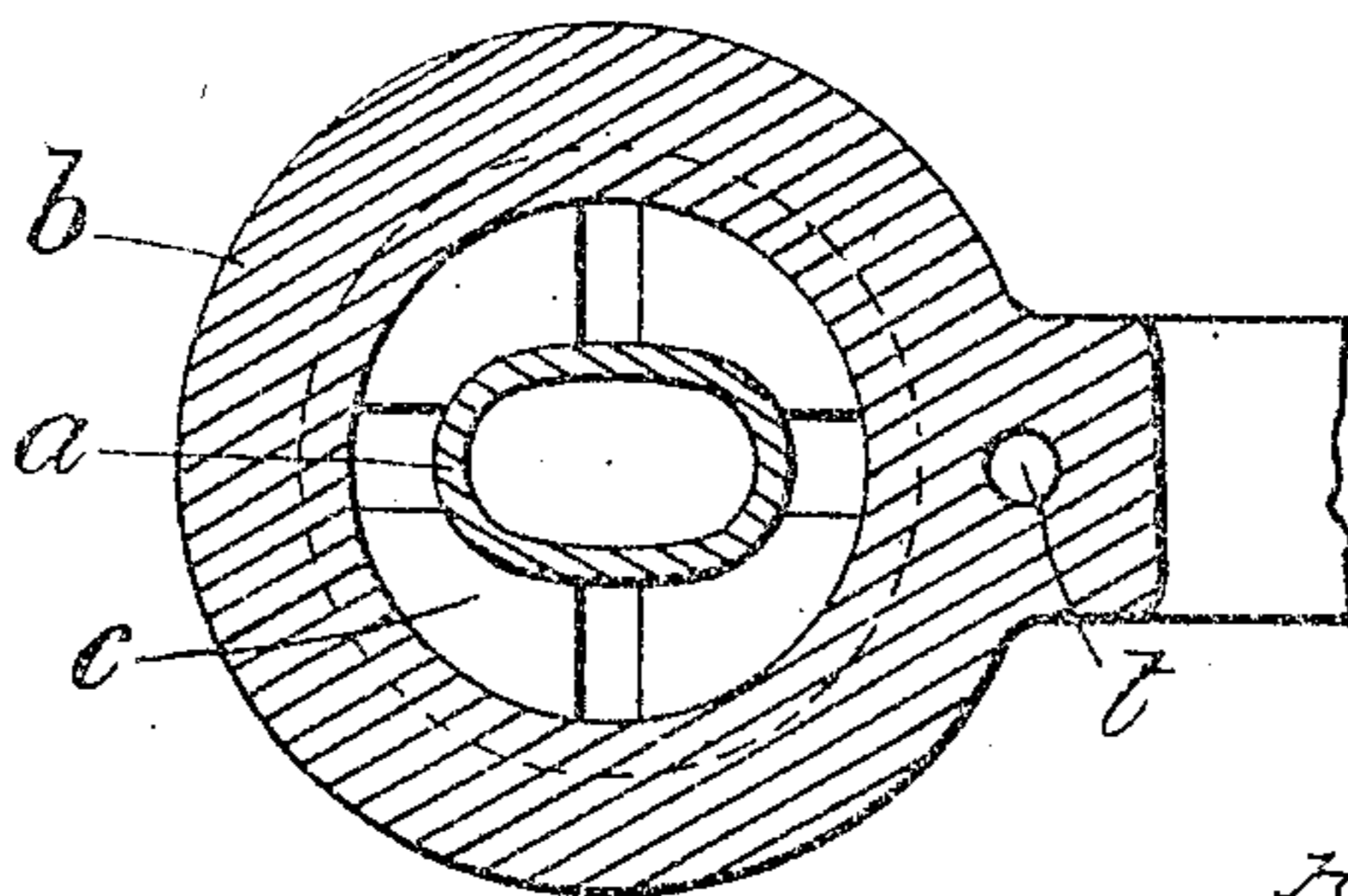


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

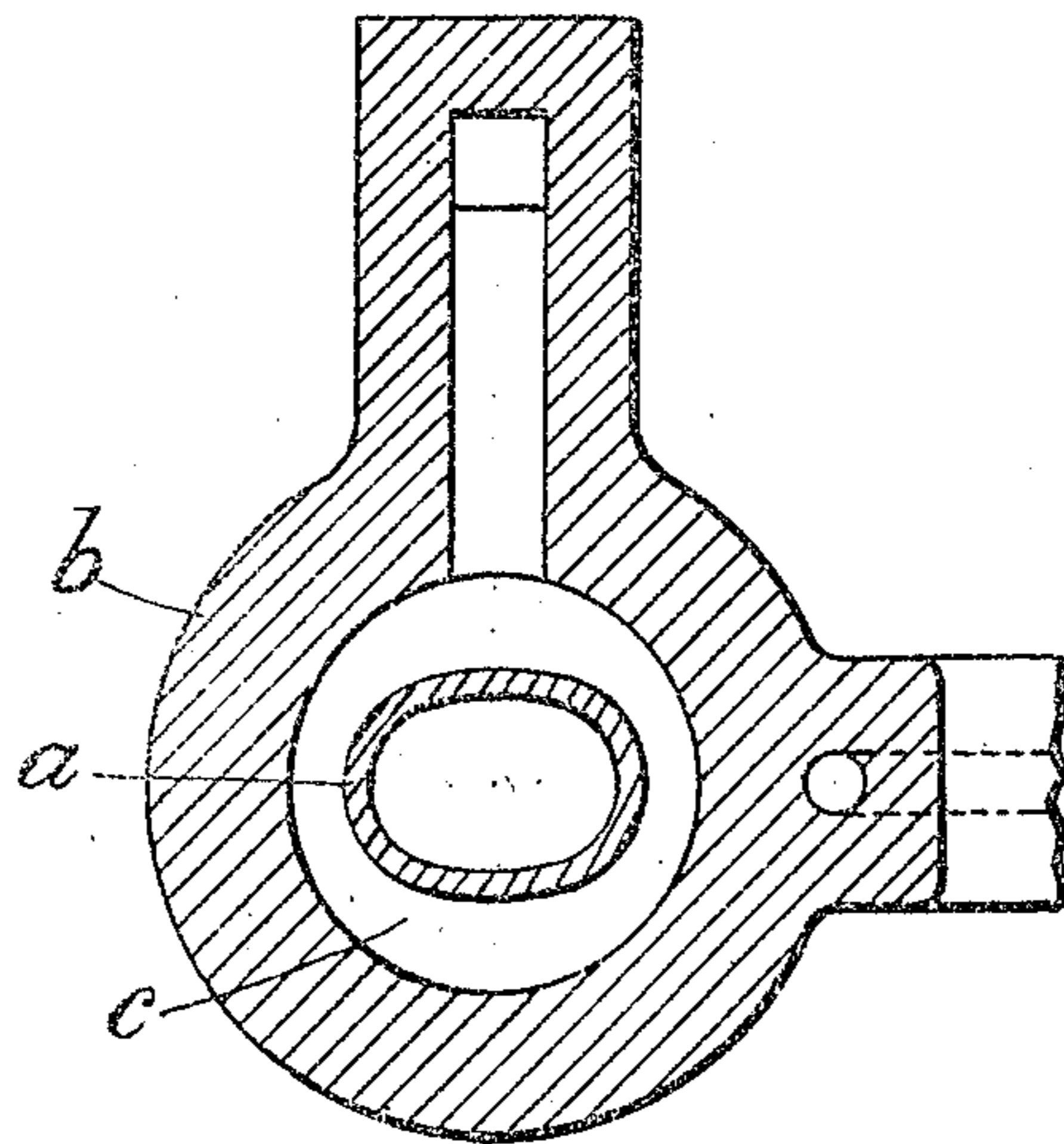
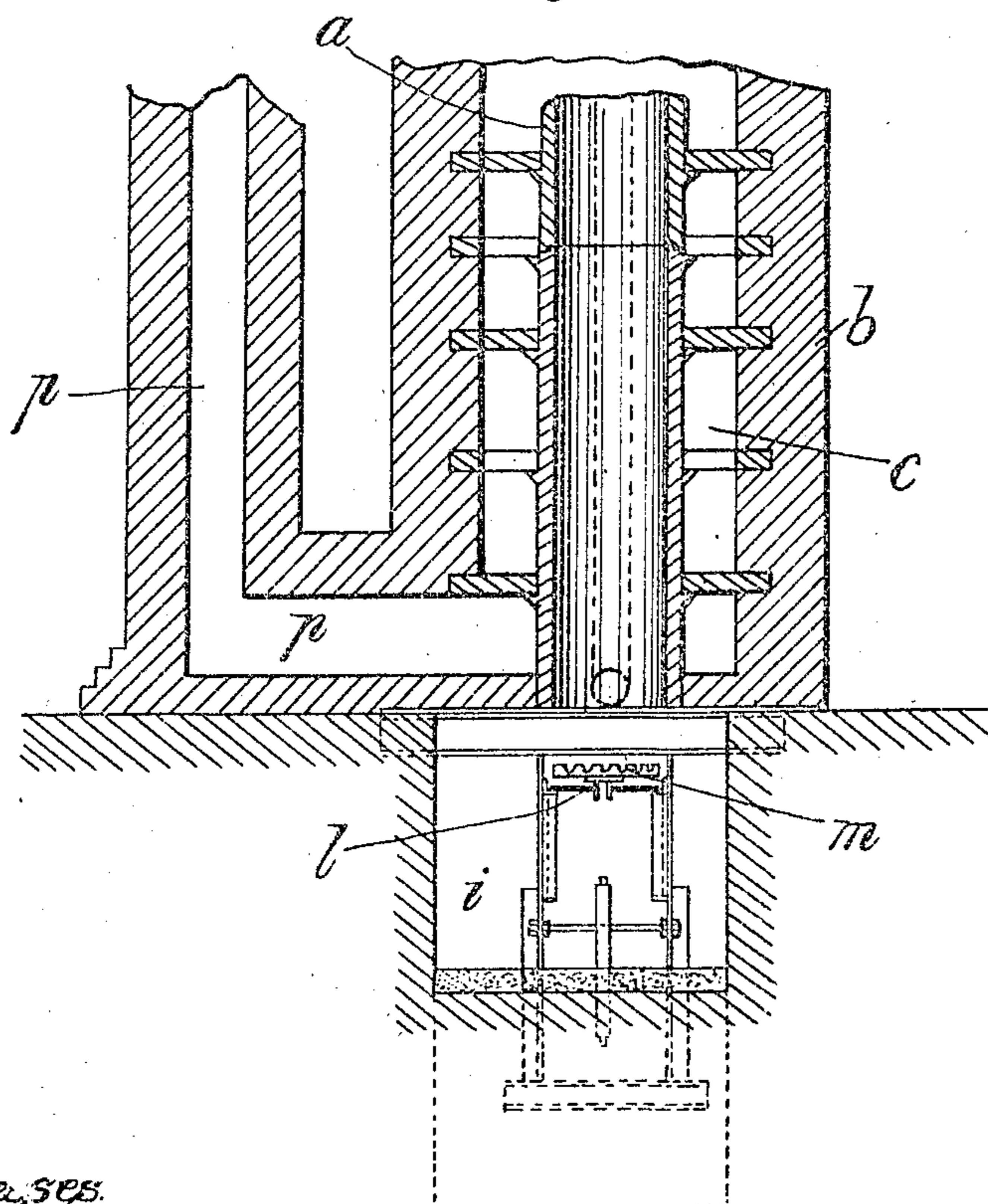


Fig. 6.



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UNITED STATES PATENT OFFICE.

HAROLD WHITEMAN WOODALL, OF WIMBORNE, AND ARTHUR McDOUGALL DUCKHAM, OF UPPER PARKSTONE, ENGLAND, ASSIGNORS TO ISBELL-PORTER COMPANY, A CORPORATION OF NEW YORK.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 885,308.

Specification of Letters Patent.

Patented April 21, 1908.

Application filed July 1, 1904. Serial No. 214,995.

To all whom it may concern:

Be it known that we, HAROLD WHITEMAN WOODALL, a subject of His Majesty the King of Great Britain and Ireland, and resident of Royston, Wimborne, in the county of Dorset, England, gas and water engineer, and ARTHUR McDOUGALL DUCKHAM, a subject of His Majesty the King of Great Britain and Ireland, and resident of Walden, Alexandra road, Upper Parkstone, in the county of Dorset, England, gas engineer, have invented certain new and useful Improvements in and Connected with the Manufacture of Gas, of which the following is a specification.

This invention has reference to the manufacture of gas and has for its object the continuous production in one and the same retort of coal gas and water gas, the continuous carbonization of coal for the production of coal gas being carried on in the retort simultaneously with the manufacture of water gas which latter is enriched to some extent by the hydrocarbons which would otherwise be deposited in the production of the coal gas.

In carrying out this invention we employ a substantially vertical retort into the top of which the coal is continuously charged and from the bottom of which the coke is continuously removed the speed at which the coal is distilled and passing through the retort being regulated according to the nature of coal under treatment, the heat of the retort, and the quality and quantity of gas required, the retort being preferably heated in such a manner that the greatest intensity of heat is about the top of the column of coal which thus becomes the zone of most active destructive distillation.

The destructive distillation of coal in vertical retorts is already known, but as practiced hitherto the process has always been intermittent so that it shared all the disadvantages of other intermittent retorts, namely the considerable loss of heat in the quenching of the coke, the loss of gas and heat in opening the retorts for drawing and charging, the great variation in the volume of gas given at any one time during the process of destructive distillation and the large amount of labor needed to work the system. Moreover vertical retorts have been heated to the same tem-

perature throughout and have been partly or entirely charged with coal at one time so that not only is a very large amount of heat needed to distil the whole of the charge but also a very large volume of gas is given off at one time, most of which has to travel up through the coal and in close proximity to the heated retort for a considerable distance which becomes overheated and cracked. Also in such cases as continuous working has been tried there has been no such method of insuring that the retort will always remain full and the charge at a constant level.

By the present invention these disadvantages in the use of the vertical retort are overcome for the coal is fed continuously into the top of the retort and passes by gravity through it, issuing into a water seal as coke, which is removed by a suitable conveyer. The gases which are to heat the retort are burned in flues surrounding the top thereof so that the coal enters the retort at the hottest place and most of the gas in the coal is given off at once and passes away from the retort. The products of combustion from the upper flues pass down other flues surrounding the middle and lower parts of the retort thus heating them and causing the completion of the distillation of the coal and the formation of water gas as hereinafter mentioned, as well as obtaining the best duty from the gases used to heat the retort. The coke on issuing from the retort enters a sump containing water forming a water seal to the retort; steam generated by the quenching of the coke enters the retort making water gas in the lower portions thereof. It will be seen that the retort is both a still and a generator and is making gas of different qualities in different parts. If desirable the water gas may be allowed to travel through the whole of the coal and coke in the retort, thus passing away with the coal gas, helping the distillation and holding in suspension many of the hydrocarbons which would otherwise have been deposited; or the whole or part of the gases of lower illuminating power formed in the lower parts of the retort may be drawn off at some point or points below the zone of most active distillation. The gas thus drawn off may be

used either to heat the retort or for other purposes.

The speed with which the coal passes through the retort is governed by the rate at which the coke is taken away from the water seal, the coal being fed into the retort through a gas tight feeding device and a chute which terminates at the point predetermined as the top level of the coal in the retort. The feeding device is so actuated that the chute is always full and an excess of coal always remains in the feeding device.

It will be seen from the above description that the greater part of the labor in connection with the distillation of coal is done away with, also that the quality and quantity, of the gas given off is under control and will remain constant at any desired value so long as outside conditions remain the same.

Our invention is illustrated by the accompanying drawings on which

Figure 1 is a vertical section of a retort suitable for this invention and with a conveyor for removing the coke from the retort; Fig. 2 is a sectional plan on line A A of Fig. 1; Fig. 3 is a sectional plan on line B B of Fig. 1; Fig. 4 is a sectional plan on line C C of Fig. 1; Fig. 5 is a sectional plan on line D D of Fig. 1; and Fig. 6 is a sectional elevation of the lower part of the retort and conveyor.

The same letters of reference indicate the same parts in all the figures.

The retort *a* is of any suitable material and is set in brickwork *b* and surrounded by flues *c*. The retort is by preference oval in cross section as shown and being larger at the bottom than at the top so as to prevent the coal from sticking and facilitate the discharge of the coke.

By an examination of Figs. 1, 2, 3, 4 and 5, it will be seen that the retort is parallel from top to bottom on the longer diameter, but tapers on the shorter diameter from the sides shown in the section Fig. 2 which is taken at the top of the retort to the sides shown in Fig. 5 which is taken at the bottom of the retort.

The upper end of the retort is closed by a cast iron plate *d* which carries one or more pipes *e* for conducting the gas as it is formed in the retort to the usual purifying and other apparatus. The chute *f*, through which the coal enters the retort from the feeding device *g*, passes through the plate *d* and extends a short distance into the retort which above the hollow of the chute may be enlarged if desired to allow of the gas being taken away quickly.

The bottom of the retort is open and has a cast iron extension *h* which dips beneath the surface of the water, in the sump *i*, forming a water seal of any desired depth; this extension *h* may be more or less closed by the flap *k*

hinged thereto and situate below the retort which takes part of the weight of the coal and coke off the conveyer and regulates the delivery of the coke. The flap *k* may be set at any desired angle by the chain *u* connected to any suitable means, not shown. The coke is received on an endless traveling band *l* provided with cross bars *m* and is thereby conveyed to be dumped or to be transferred to another conveyer. Any kind of conveyer suitable for the purpose may be substituted for that shown.

The feeding device is of a well known type and consists of a drum *g'* revolving in a cylindrical casing *g* provided with an opening *g''* in its periphery so as to be filled with coal from the chute *g'* in passing the mouth thereof and more or less emptied as it passes the mouth of the chute *f*. Any feeding device may be used so long as it is gastight in all positions and delivers into the chute *f* in such a manner that the latter is always full and the excess of coal does not jam the charge but remains in the feeding device. The retort here illustrated is designed so that the maximum heat is applied at the zone where it is most required. For this purpose the producer gas or like gas for heating the retort is introduced into the top flue *w* from the passage *t* at ports *n* where it meets air issuing through ports *o* and burns, the products of combustion passing down through flues *c* to escape by the chimney flue *p*. The air which issues through the ports *o* is drawn along channels *q* between the top of the brickwork *b* and an iron casing *r* packed with non-conducting material *s* and is thus pre-heated.

It will be understood that there being a partial vacuum or reduced pressure in the retort, produced by the usual exhaustor, the steam generated by the quenching of the coke as it descends into the water in the sump *i* is drawn up through the hot coke in the retort and there becomes water gas.

Although in the foregoing specification the retort has been said to be single and vertical it is obvious the setting may be of one or more retorts and each of these may be set at any angle or angles to the horizontal sufficient to insure the descent of the coal by gravity.

What we claim as our invention and desire to secure by Letters Patent is:—

A device for continuously distilling coal consisting of a vertical retort, a water sump into which the lower end of the retort dips, a conveyer adapted to partly support the weight of the charge in the retort and to remove the coke from the bottom of the same, a gas tight feeding device adapted to keep the retort full by being capable of delivering relatively more coal to the retort than the coke removing conveyer removes coke and so

formed that this excess of coal is maintained in the feeding device and exerts no undue pressure in the coal in the retort, and means for heating the retort consisting of a combustion chamber surrounding the top of the retort and flues through which the products of combustion pass downwards towards the bottom of the retort.

In witness whereof we have hereunto set our hands in presence of two witnesses.

HAROLD WHITEMAN WOODALL.
ARTHUR McDOUGALL DUCKHAM.

Witnesses:

E. T. GAZE,
ARTHUR W. JOY