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DISTILLATION OF COAL AND OTHER CARBONACEOUS SUBSTANCES

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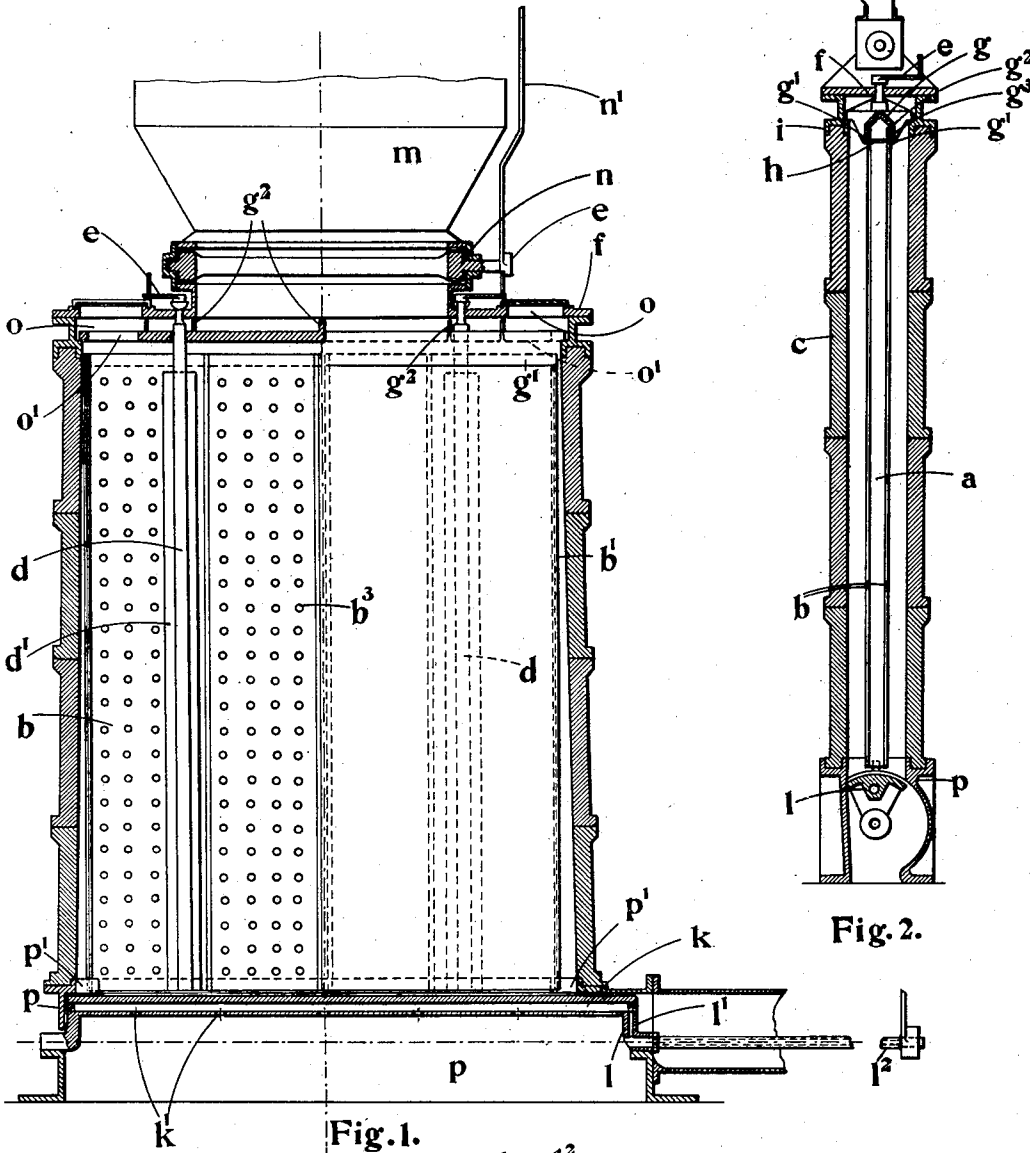


Fig. 1.

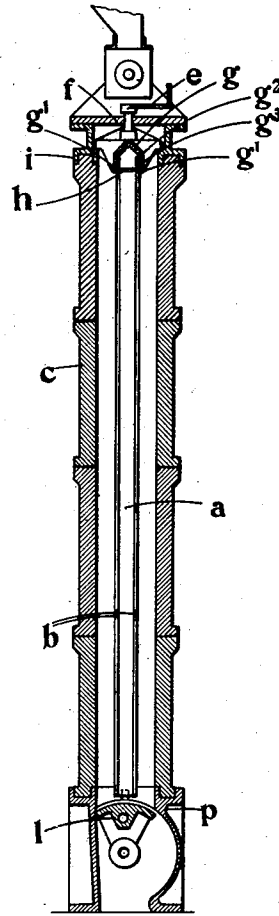


Fig. 2.

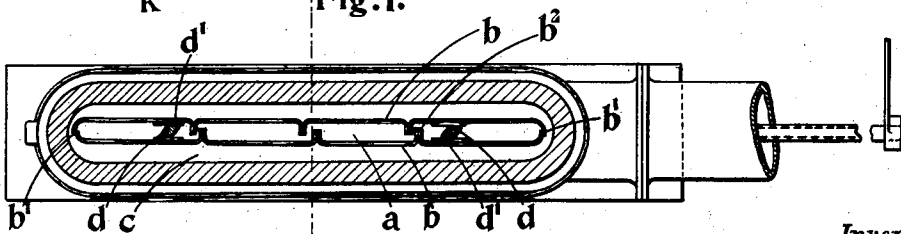


Fig. 3.

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DISTILLATION OF COAL AND OTHER CARBONACEOUS SUBSTANCES.

Application filed May 13, 1921. Serial No. 469,312.

To all whom it may concern:

Be it known that we, THOMAS MALCOLM DAVIDSON and HAROLD LAVERS ARMSTRONG, subjects of the King of Great Britain and Ireland, both residing at London, S. W., England, have invented certain new and useful Improvements Relating to the Distillation of Coal and Other Carbonaceous Substances (for which application for patent in Great Britain has been made No. 25,104, dated 14th October, 1919), of which the following is a specification.

This invention relates to the distillation of coal and other carbonaceous substances especially under low temperature conditions for example up to about 750° C., and has among its objects to provide simple and effective means for discharging vertical retorts of the residue of distillation and to prevent the adherence of the charge within the retort as the result of its expansion in the course of the distillation, and to permit of the charge freely falling on the bottom doors being opened.

The invention has also for its object to provide means for quickly withdrawing the vapours and gas in the course of the distillation, out of contact with the hot walls of the retort, and to secure a high yield of tar oils and other distillates.

The gas and vapours are removed immediately from the zone in which they are produced at comparatively low temperatures, the gas and vapour passing into a central space formed in the retort, from which they are withdrawn under vacuum, so that thus the gas and vapour do not take up heat from the external walls of the retort.

According to the invention, the charge is distilled in relatively thin layers at a low temperature and under such conditions that the gas and vapour evolved throughout the charge in the retort are rapidly drawn away from the hot retort walls to which the heat is applied, into a central space or chamber whence they are immediately withdrawn.

According to the invention in its adaptation to vertical retorts of an oblong transverse section, we provide in the centre of the retort a collapsible casing which may be formed of two parallel disposed plates by which the retort itself is thus divided into three compartments, namely one compartment on each side of the collapsible casing and a central compartment between the

plates forming that casing. Means are provided which may consist of two or more vertically disposed bars extending between the plates and of an oblong section, so that on these bars being turned in one position the plates are maintained at a determined distance apart, while on the bars being turned into a position at right angles to their former position, the plates are permitted to move inwardly, the space between them being then determined by the narrow width of the bars. The respective plates are suspended from a fitting provided at the upper end of the retort in such manner as to permit of their movement towards and away from each other in the manner described, while similarly their lower ends are secured to the bottom fitting of the retort. Similarly the bars referred to are respectively carried at their lower ends within the bottom fitting of the retort and within the top cover plate respectively.

The invention is illustrated by way of example in the accompanying drawings in which—

Figure 1 represents a sectional elevation of a vertical retort provided according to the invention.

Figure 2 is a vertical section corresponding to Figure 1, and

Figure 3 is a corresponding sectional plan.

The invention is applicable to vertical retorts of an oblong transverse section, or to horizontal retorts of an oblong transverse section or to inclined retorts. The refractory walls of the retort may be tapered outwardly towards the bottom. It is preferred, however, that the side walls be plumb and true and without taper, whilst the ends of the retort are tapered outwardly towards the bottom. Two parallel disposed and perforated plates *b b*, are mounted in the retort by which the retort itself is thus divided into the central chamber *a* between the plates *b b*, and two lateral chambers *c c* at each side. Means are provided which may consist of two or more vertically disposed rods *d d* extending the length of the retort between the plates *b b*, and of an oblong section, so that on these rods being turned into one position by means of levers *e e* mounted at the upper ends of the rods that protrude above the top cover plate *f* of the retort, the plates are maintained at a determined maximum distance apart,

while on the rods being turned into a position at right angles to their former position, the plates *b b* move inwardly and away from the coal charge in the respective lateral chambers *c c*, the space between them being then determined by the narrower section of the rods *d d*, and in the former position by the wider part of the section. The ridge fitting *g* is supported upon the top fitting *i* of the retort upon which the top cover plate *f* is mounted. The plates *b b* are suspended from the ridge fitting *g* in such a manner as to permit of their movement towards and away from each other in the manner described, this being conveniently effected by means of a series of transversely disposed bolts *h* carried by downwardly extending walls *g¹ g¹* of the ridge fitting *g*, so that thus the plates *b b* may thus to a determined extent slide inwardly or outwardly upon the bolts *h* in the operation of the rods *d d*. The lower ends of the rods *d d* may be guided by a boss cast on the bottom door casing between the two plates *b b* to prevent them both moving in the same direction too far, otherwise the lower ends are free as also may be the lower ends of the rods.

Small quantities of steam may be admitted to the retort through the channel *k* in the bottom door *l* through which water is passed which evaporates and thus serves the double purpose of keeping the bottom door cool and producing steam for admission into the retort. The steam passes through the holes *k¹* on the underside of the bottom door and ultimately into the retort along the sides of the door. The bottom door is thus not intended to be gas tight as there is provided a gas-tight chamber below the retort to take the discharged residue.

It will be understood that water may be continuously supplied through the hollow trunnion *l¹* to which the tubular operating spindle *l²* is connected, by which the bottom door is operated. The production of steam may be regulated by means of a water drip at the end of the hole in the shaft.

In operation the coal may be distributed by means of a scraper conveyor into a hopper *m* above the retort. This hopper may be used as a measuring device to contain the proper amount of coal required to make a charge for the retorts, a rotary door *n* being provided between the hopper *m* and the retort. By rotating this door *n* by means of the handle *n¹* the charge may be admitted into the retort from the hopper *m*. Prior to this the casing within the retort formed by the perforated plates *b b* may be opened to the full extent by means of the rods *d d*, so that the central chamber *a* within the retort is opened to the full extent. Having charged the retort the rotary

door *n* between the hopper *m* and the top of the retort is closed.

After a determined period the levers *e* may be turned a little way slightly moving the plates *b b* inwardly. After a further period the levers *e* may be turned to a position 90° from their original position to allow the plates *b b* to move further inwards towards each other and away from the charge.

After the completion of the process of distillation the bottom door *l* is rotated to allow the charge to fall into a cooling receptacle below. The plates *b b* are now brushed clean by means of steel brushes passing through holes *o* in the top cover plate *f* and through corresponding holes in the ridge fitting *g*, and the plates *b b* are then set into their outermost positions again for receiving another charge.

It will thus be understood that on the distillation of the charge the plates *b b* are permitted the inward movement to take up the expansion of the charge, and also to release the charge after its distillation, so that it does not become compressed within the retort, but lies free to fall of its own weight on the opening of the bottom door *l*.

The plates *b b* may be made of cast iron or cast steel or of steel plates, of calorized steel or any other metal or material that will withstand the temperature of distillation. The plates *b b* may be provided with inturned vertical edges or flanges *b¹* or with ribs *b²* of symmetrical form arranged so that they avoid each other when the plates are brought together, and horizontal braces or ledges for stiffening purposes of symmetrical form, so that when the plates are brought together these latter ledges are oppositely disposed to butt one against the other.

It will be understood that the respective plates *b b* are advantageously separate one from the other. They may be plain, corrugated or other shape.

The downwardly extending walls *g¹ g¹* are disposed above the central chamber *a*, and the integral outwardly extending bridge parts *g²* are provided by which the fitting is supported upon the top fitting *i*. Thus two lateral channels are formed for directing the coal into the lateral chambers *c c* on either side of the plates *b b*. The gas and vapour may be removed from the inner chamber *a* through the holes *g³* provided in the walls *g¹* of the ridge fitting *g*, and so situated as to avoid the chance of coal falling into the inner chamber *a* when the retorts are being charged. The plates *g g* are perforated with holes so that thus the gas and vapour may be quickly withdrawn from the charge in the course of distillation.

It will be understood that the invention

is not confined to any particular construction of the casing referred to, but it is advantageously constituted of parts that permit of its being collapsed during the course of distillation. The rods *d* may be so disposed that the plates may move inwardly under the pressure imposed upon them by the expansion of the charge, and for this purpose it would only be necessary to set the bars slightly at an angle to permit of the plates exercising pressure upon them to turn them.

We claim:

1. A retort for the distillation of coal and other solid carbonaceous substances, the said retort being oblong in horizontal cross section and having disposed therein two oppositely disposed plates adapted to form a free space between them, the said plates constituting a casing capable of contraction, substantially as described.

2. A retort for the distillation of coal and other solid carbonaceous substances, the said retort being oblong in horizontal cross section and having disposed therein two oppositely disposed plates adapted to form a free space between them, the said plates constituting a casing capable of contraction, and means operable from without for permitting the movement of the plates towards each other; substantially as described.

3. A retort for the distillation of coal and other solid carbonaceous substances having disposed therein two perforated and oppositely disposed plates adapted to form a free space between them, the said perforated plates constituting a casing capable of contraction, and a vapour outlet for the said retort accessible from the said free space, substantially as described.

4. A retort for the distillation of coal and other solid carbonaceous substances, the said retort being of oblong horizontal cross section, a centrally disposed device within the said retort comprising two oppositely disposed plates, means comprising rotatable rods extending the length of the plates and in position between them to permit of the plates approaching each other, and means for operating the said rods from without, substantially as described.

5. A retort for the distillation of coal and other solid carbonaceous substances, the said retort being of oblong horizontal cross section, a centrally disposed device within the said retort comprising two oppositely disposed plates, means comprising rotatable rods extending the length of the plates and in position between them to permit of the plates approaching each other, means for operating the said rods from without, and means for positioning the lower ends of the said plates and the lower ends of the said rods, substantially as described.

6. A retort for the distillation of coal and other solid carbonaceous substances, the said retort being of oblong horizontal cross section, a centrally disposed device within the said retort comprising two oppositely disposed plates, means comprising rotatable rods extending the length of the plates and in position between them to permit of the plates approaching each other, means for operating the said rods from without, and a ridge fitting from which the said plates are suspended within the retort, substantially as described.

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