

L. F. SCHRADER, W. E. ROBERTS AND V. BREDLIK.
DISTILLATION OVEN.

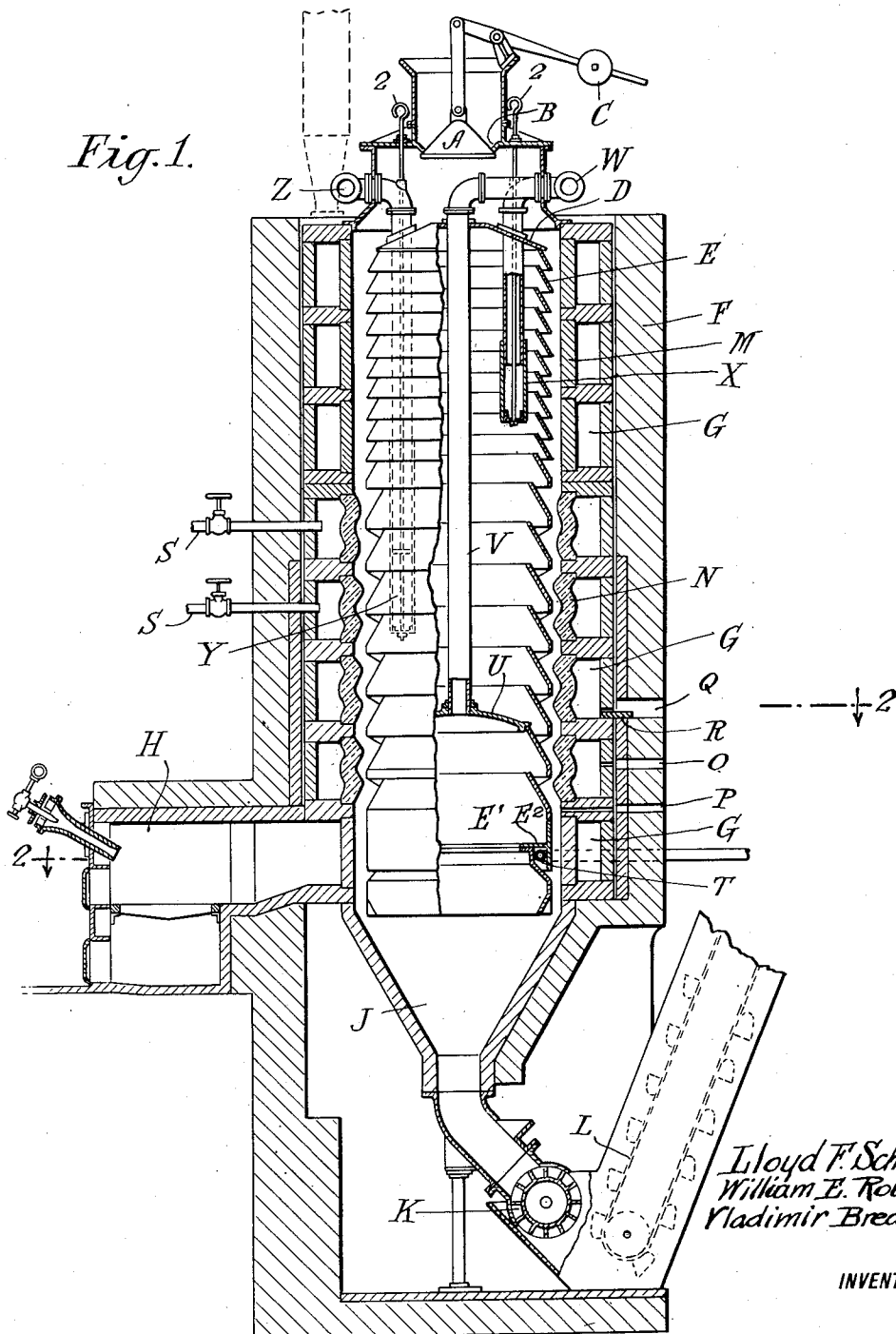
APPLICATION FILED FEB. 24, 1919.

1,382,746.

Patented June 28, 1921.

2 SHEETS—SHEET 1.

Fig. 1.



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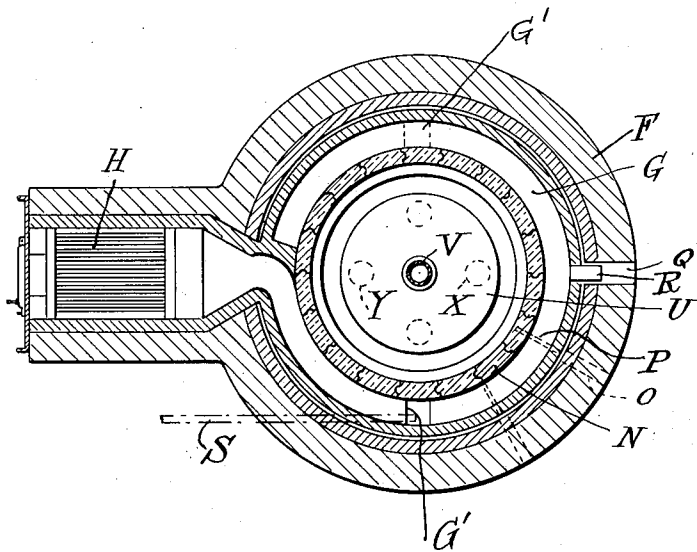
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2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

LLOYD F. SCHRADER, WILLIAM E. ROBERTS, AND VLADIMIR BREDLIK, OF NEW YORK, N. Y., ASSIGNORS, BY MESNE ASSIGNMENTS, TO FOUNDATION OVEN CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

DISTILLATION-OVEN.

1,382,746.

Specification of Letters Patent. Patented June 28, 1921.

Application filed February 24, 1919. Serial No. 278,762.

To all whom it may concern:

Be it known that we, LLOYD F. SCHRADER and WILLIAM E. ROBERTS, citizens of the United States, and VLADIMIR BREDLIK, a subject of the Republic of Czecho-Slovakia, and residents of New York city, U. S. A., have invented certain new and useful Improvements in Distillation-Ovens, of which the following is a specification.

The invention provides improvements in a type of ovens used for distilling the volatile matters from bituminous coal, lignite, peat or like carbonaceous materials at a comparatively low temperature, lower than that required for cooking. The accompanying drawings illustrate an embodiment of the invention.

Figure 1 is a vertical section, and Fig. 2 is a horizontal section on the broken line 2-2 of Fig. 1.

Referring to the embodiment of the invention illustrated, the oven is in the usual stack form with an outer and an inner shell having a space between them through which the carbonaceous material passes from top to bottom. At the upper end is a bell A closing upward against a seat B and held up by a counterweight C. The material is introduced on top of the bell and at a proper time the latter is lowered and the material drops on to a diaphragm or spreader D which directs it into an annular space, down which it moves gradually. The inner shell comprises a number of frusto-conical rings E with spaces between them for the passage of the gases driven off from the charge. The outer shell F is formed with heating flues G extending around it and communicating with one another through openings G' (Fig. 2) arranged at alternate sides of successive flues so that the heating medium passes from bottom to top of the stack around the outside of the charge and drives off the water and gases from the latter. A fire-box H serves to mix the air with the gas or oil which is used for fuel and this fire-box leads directly into the lowest of the circular flues G whence the gases of combustion pass up in succession through the several circular flues. When all practicable moisture has been driven off the charge passes down through a chute J to a rotating discharge gate K which delivers into the bottom of the conveyer whence the charge is elevated by a

chain and bucket device L to any suitable point. The general principles and design of the machine as above described have been long known and such machines have been used. Our invention aims to provide certain improvements therein.

A particular process for which the present apparatus is designed and adapted, is described in detail in the application of Vladimir Bredlik, No. 319,132, which may be briefly described as subjecting coal to a gradually increasing temperature, first heating it sufficiently to drive off the moisture, then sufficiently to drive off the tar and benzol products and then sufficiently to form ammonia, the heat being applied so slowly as to destroy the coking quality and bring the coal to a granular structure which may be subsequently used in briquetted, powdered or other form. The apparatus may be used also for other processes.

The lining of the outer shell is made of clay or other argillaceous material such as the fire-clay bricks M in the upper part and of silicious material, such as the silica brick N, at the lower part. This difference in the material of the lining has the following advantage. Silica brick will stand a higher temperature than clay brick. Clay brick on the other hand will stand a greater quantity of water or steam without spalling than silica brick. In an oven of this type the heat is greatest at the bottom and gradually diminishes toward the top. The water content of the charge and the quantity of water driven off is greatest at the top and diminishes toward the bottom. Therefore each material is in the best location as respects both heat and water.

A further feature of advantage in the lining lies in the shape of the bricks N. The inner faces of these bricks are formed with convolutions in vertical section. This strengthens the brick against horizontal strains. And the convolutions are arranged to be approximately parallel with the outer contour of the inside shell of the oven; thus providing, for a given height, a longer passage and of more even thickness for the charge and a better heating effect.

The height to which the ribbed bricks N are used, and the level at which the change is made from silica to clay are matters which depend largely on the nature of the

charge and this may vary considerably in moisture and in carbon content.

The heat at different levels should be regulated in order to secure the best results. We provide holes O and P, the first leading to the combustion flue and the second to the charge, into which thermostats may be introduced to determine the temperature; these holes being repeated at desired intervals. For cooling, if we find the temperature too high in any heating flue, we provide air inlets Q with a sliding brick R nearly fitting a port Q' leading to a flue G and serving as a valve so that when pulled out it allows free entrance of cold air or when shoved in it cuts off such air wholly or partially. For increasing the temperature in case it be found too cold at any level we provide gas pipes S which lead into the successive annular flues. Additional gas let in through any of these pipes will be burned so as to raise the temperature.

The thermostat holes, air inlets, and gas pipes may be repeated at all levels of the stack. For simplicity we have shown only one or two of each.

The by-products recovered by this oven are chiefly coal tar and ammonia. The first matter driven off is merely water or moisture. Then as the charge moves downward coal tar passes off in gradually increasing quantity, and near the bottom ammonia gas is driven off. The yield of ammonia can be increased by an addition of steam, and for this purpose we provide a steam pipe T arranged to force steam into the bottom of the column, the pipe T being located within one of the rings E' of the inner shell so as to be protected from direct contact with the descending charge and being cut off from the space within the ring E' by an annular plate E². A diaphragm U is extended across the inner shell at the highest point where there is any substantial yield of ammonia. All the ammonia gas therefore collects below this diaphragm. A pipe V is provided for carrying off such gas, extending up through the top of the inner shell and connecting to a main W. The ammonia, following the path of least resistance enters the inner shell below the diaphragm rather than force its way upward through the coal.

In the space above the diaphragm U there will be valuable coal tar, gas and moisture;

the former of which is to be collected for use and the latter of which is to be carried off separately. For this purpose a pipe X open at the lower end extends down to the lowest level at which the water content of the gas is so great as to make it valueless; and a similar pipe Y extends down nearly to the bottom of this space to carry off the valuable gas; the moisture pipe X discharging into the air and the gas pipe connecting with a main Z overhead. With changes in the charge, atmospheric conditions and other circumstances, the best level for the open lower ends of the pipes X and Y may change. For this purpose we form each of these pipes of two parts one telescoping into the other as shown and the lower part connected to a controlling rod 2 exposed on the top of the oven whereby it may be lifted or lowered as desired. The positions of adjustment of these parts will be determined by observing the character of the discharge from the pipes.

Various changes may be made in the details and arrangement of the parts described without departure from our invention as stated in the following claims.

What we claim is:

1. An oven for distillation of carbonaceous materials comprising an outer shell formed with heating flues having an inlet at the lower end and an outlet at the upper end and an inner shell formed with openings for carrying off gases, a diaphragm near the lower end of the inner shell forming a chamber for receiving the gases from the lower portion of the material, and means for introducing steam into the lower portion of the material to form ammonia and cause it to pass into said chamber.

2. An oven for distillation of carbonaceous materials comprising an inner and an outer shell with a space between them for the material, one of said shells having openings for the passage of the gases and the other having a face which is sinuous in longitudinal section and is approximately parallel with the opposing face of the first.

In witness whereof, we have hereunto signed our names:

LLOYD F. SCHRADER.
WILLIAM E. ROBERTS.
VLADIMIR BREDLIK.