J. ARMSTRONG.

COKE OVEN.

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917,744.

Patented Apr. 13, 1909.

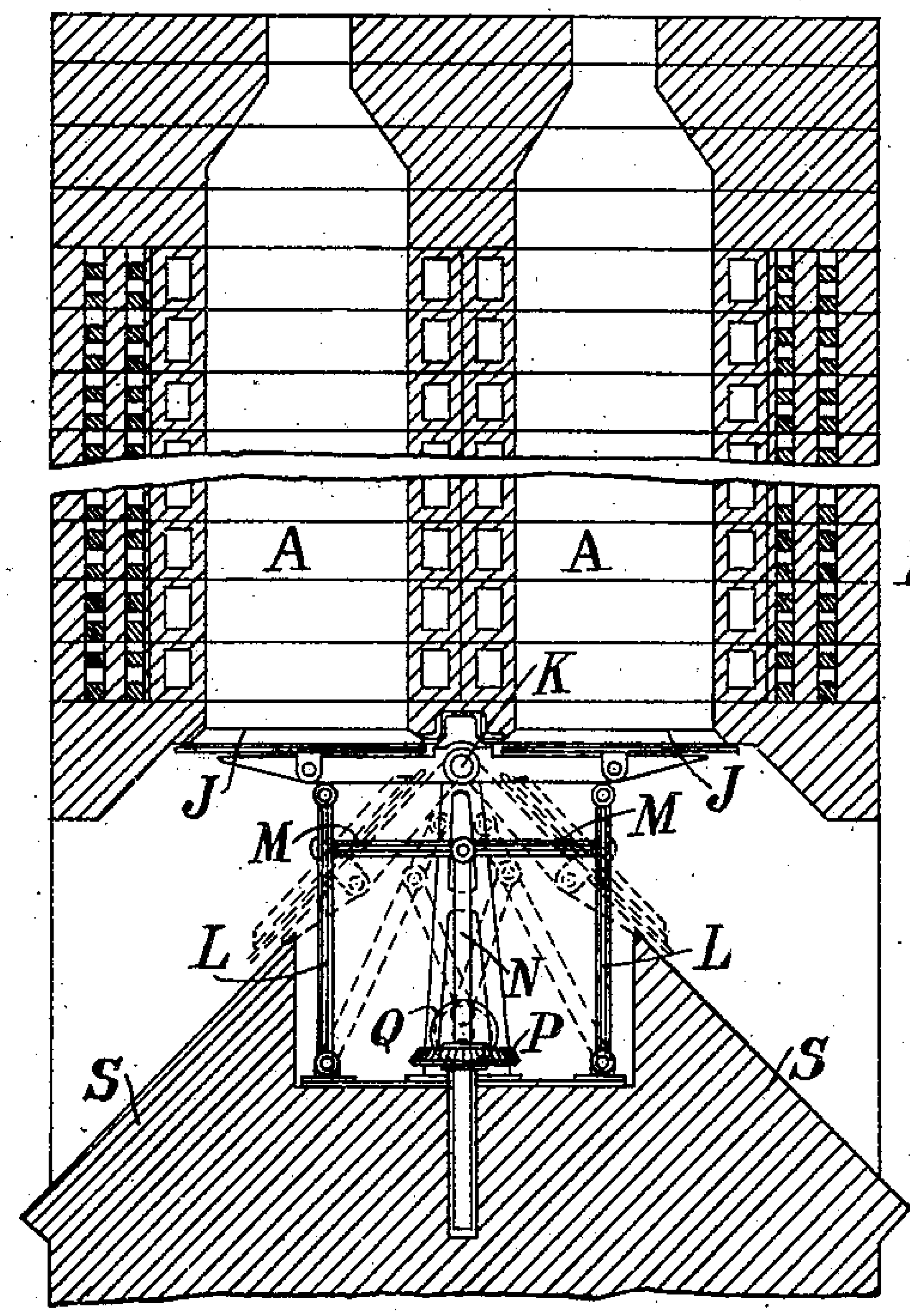

FIG. 1.

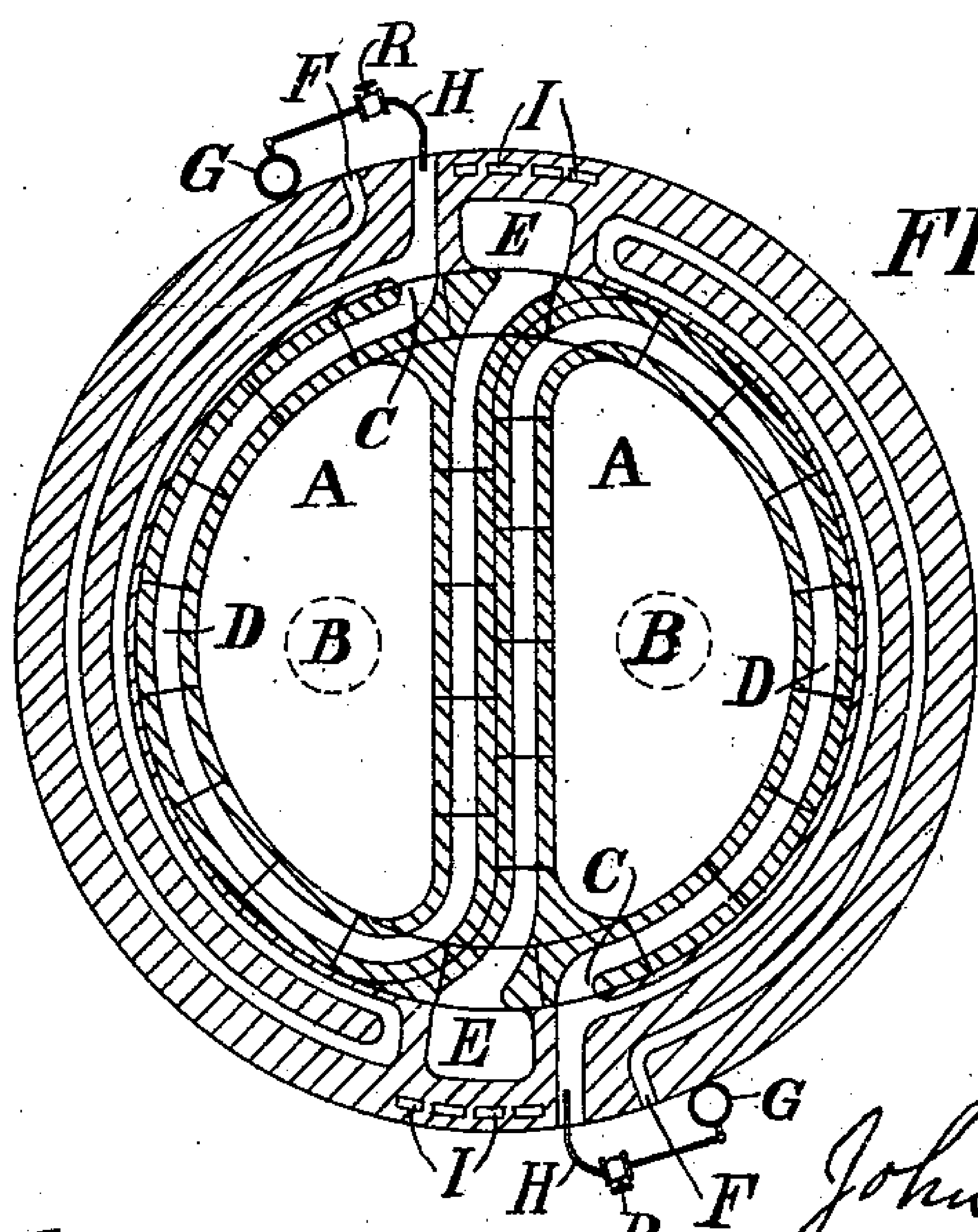

FIG. 2.

Witnesses

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UNITED STATES PATENT OFFICE.

JOHN ARMSTRONG, OF LONDON, ENGLAND.

COKE-OVEN.

No. 917,744. Specification of Letters Patent. Patented April 13, 1909.

Application fied October 29, 1907. Serial No. 399,745.

To all whom it may concern:

Be it known that I, JOHN ARMSTRONG, a subject of the King of Great Britain, residing in London, in the Kingdom of England, engineer, have invented certain new and useful Improvements in Coke-Ovens.

This invention is for the purpose of making hard metallurgical coke and at the same time making it of the same character and quality as the best coke now produced from the best coals in bee-hive ovens, but saving all the by-products such as gas, tar, ammonia, et cetera, and making this high quality coke from inferior coals by the application of high temperature and pressure, which has hitherto been impossible in any other oven shown by the fact that I have been enabled to make the best hard coke from soft Lanarkshire coal which had been tried without success in every other known oven.

The theory of the failure of ordinary by-product ovens to coke coals of the Lanarkshire type is the existence in the chemical composition of the coal of certain quantities of oxygen and hydrogen which two gases combine to form water at the coking temperature which in the ordinary oven produces a violent endothermic reaction, so much so that the heating powers of these ovens are incapable of overcoming this cooling effect, with the result that no coherent coke is formed but simply a mass of coke powder. On the other hand by actual tests made in this new oven through its regenerative principle of heating the air for combustion any desired temperature can be maintained, but it must not be overlooked that the maintenance if it were possible of such a high temperature in the ordinary oven would rapidly destroy it.

In this invention the oven is designed on a circular plan and vertical, the circular plan being the strongest possible form of coke oven construction where the outside walls which are permanent are never highly heated because the air heating flues are first carried around inside these walls which keeps them cool and conserves their stability. The interior of the oven is formed of hollow blocks all of segmental form which cannot be displaced as in an ordinary oven by high temperature. This interior lining it will be observed is made absolutely independent of the outside permanent walls so that the weight of the oven is not supported upon hot brickwork and this interior can thus be readily taken out and replaced when necessary.

The oven is constructed vertically for the purpose of maintaining during the coking period the pressure of vastly larger quantities of coal than is possible by other forms of oven, this pressure being essential in coking certain classes of coal.

This invention is best described by the aid of the accompanying drawings.

Figure 1 is a vertical section through the foundations, the mechanism for opening the bottom doors, and the lower part of the oven; Fig. 2 is a horizontal sectional plan at the point where Fig. 1 is broken off at the top.

In Fig. 1 and Fig. 2 an oven is shown circular in plan and vertical and with a diaphragm wall constructed across its center dividing it into two semi-circular coking chambers marked A A. The dotted circles on Fig. 2, marked B B, represent the positions of the feeding hoppers constructed in the roof of the oven. This oven is constructed with a circular outside wall in which are formed air heating flues marked F in Fig. 2. These air flues are carried around the outside wall, the cold air entering at F thus keeping the walls cold. This air flue then turns around traveling immediately behind the heating flue marked D the air being intensely heated enters the combustion chamber at C.

Heating flues are constructed as shown at D and run entirely around each coking chamber. They are heated by gas which is carried up the outside of the oven in a vertical gas pipe marked G. This gas pipe is provided with branch pipes marked H, fitted with movable joints and gas cocks marked R. The gas is lighted at the nipples on the branch pipes H; it then meets the highly heated air in the combustion chamber C producing a very high temperature in the heating flues D. This high temperature is carried by the waste gases of combustion into the common flue E constructed in the permanent wall. This flue E is in connection with a chimney shaft after passing the heated gases through boilers for raising steam apart from the oven. The heating flues D are constructed of hollow blocks of refractory material whose perpendicular joints radiate to a center or centers, the blocks forming segments of circles. The faces of these joints are either rabbeted or grooved and tongued. These horizontal heating flues with their corresponding air

heating flues behind them are constructed one over the other as shown in Fig. 1 up to near the top of the oven. There are flues constructed in the permanent wall marked I for the purpose of keeping the wall cool behind the descending flue for waste gases marked E. These flues may contain cold water tubes for heating water for the boiler. After this oven has been carefully heated to the proper coking temperature, the doors at the bottom being closed, the chambers are filled with powdered coal up to the top. During the coking period the gas given off in the lower parts of the oven deposits its heavy hydrocarbons in the upper portion of the coke, enriching it, which under pressure forms an agglomeration, producing a coke harder and denser than by any other method. The gas is taken off from these coking chambers by pipes at the top of the oven and is passed through coolers, condensers, and scrubbers in the ordinary way.

When the coking process is finished the shaft and bevel wheel Q are turned driving down the links M M these in turn draw the upright supports L L together, the tops of which are provided with wheels or rollers which travel along the bottoms of the doors J J which being hinged on the central shaft K fall into the inclined position shown by dotted lines, the coke falling by gravity from the coking chambers A A down the slopes S S where it is chilled. It is then received upon a conveyer or into wagons. When this has been accomplished the mechanism of the doors is reversed, the perpendicular screw marked N, actuated by the bevel wheels P and Q is raised, the links M M are extended, and the perpendicular supports L L are pushed out by which means the doors J J are raised up and closed; the full weight of the doors and the charges above them is thus securely supported by the strong uprights L L. The oven is now ready to take another charge of coal for coking as above described.

I declare that what I claim is:—

1. A vertical by-product coke oven having circular permanent outside walls containing horizontal air heating tubes and vertical exhaust tube with an internal wall consisting of a series of superimposed combustion flues formed of arch blocks.

2. A vertical by-product coke oven having circular permanent outside walls and independent inside walls, the outside walls containing horizontal air heating tubes and the inside walls horizontal combustion tubes into which the air heating tubes open near the points of combustion.

3. In a vertical coke oven having circular permanent outside walls, a movable interior lining formed of hollow radial blocks constructed as horizontal superimposed heating flues occupying nearly the entire height of the oven, and a common vertical flue into which all the heating flues discharge, the interior flue blocks and the outside walls touching each other all around, and the walls being thus solid right through at short intervals in the height, whereby a strong column capable of being held together by encircling metal bands is obtained.

4. A by-product vertical coke oven with circular permanent outside walls with two semi-circular coking chambers separated by a vertical diaphragm formed by the continuation of the horizontal heating tubes.

5. In a by-product coke oven the combination of two vertical semi-circular coking chambers, a vertical diaphragm separating them, a series of superimposed horizontal heating flues passing around the chambers and through the diaphragm and a vertical flue receiving the contents of the horizontal flues.

6. In a vertical by-product coke oven, with circular permanent outside walls, the combination of an outside wall containing air heating tubes and an interior lining containing a series of superimposed horizontal heating flues passing nearly around the coking chamber, and a vertical flue or flues receiving the gaseous contents from these horizontal flues.

7. In a vertical by-product coke oven with circular outside walls the combination of a series of superimposed horizontal heating tubes and a series of air heating tubes outside these doubling on themselves horizontally, and having one end open to the atmosphere and the other open to the horizontal heating flue near the point of combustion.

In witness whereof, I have hereunto signed my name this 16th day of October 1907, in the presence of two subscribing witnesses.

JOHN ARMSTRONG.

Witnesses:
H. D. JAMESON,
F. L. RANDS.