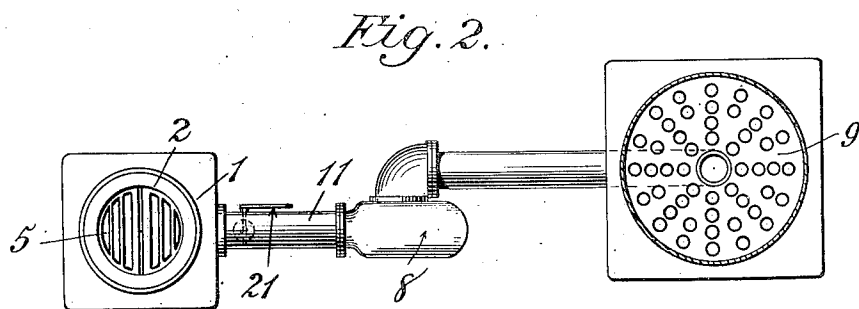
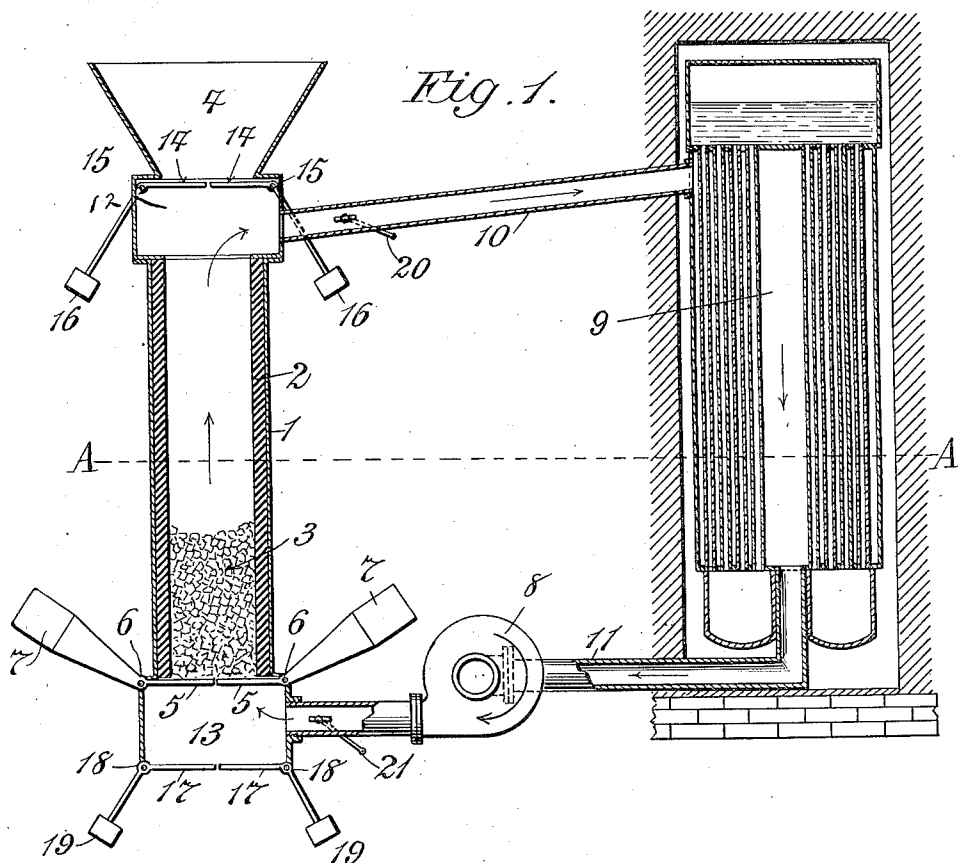


E. SCHULTE.
PROCESS FOR QUENCHING COKE.
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958,184.

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UNITED STATES PATENT OFFICE.

EDUARD SCHULTE, OF NEW YORK, N. Y., ASSIGNOR TO THE UNITED COKE AND GAS COMPANY, A CORPORATION OF WEST VIRGINIA.

PROCESS FOR QUENCHING COKE.

958,184.

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To all whom it may concern:

Be it known that I, EDUARD SCHULTE, a subject of the Emperor of Germany, residing in New York city, county and State of New York, have invented a certain new and useful Improvement in Processes for Quenching Coke, of which the following is a specification.

One of the most troublesome problems hitherto met with in the manufacture and marketing of coke has been that incident to the "quenching" of the product after it comes from the oven. "Quenching" is the term applied to the process of cooling the coke, which is discharged from the ovens in the form of intensely hot glowing masses.

It is obvious that as soon as glowing carbon is brought into contact with the atmosphere it rapidly oxidizes with formation of CO CO₂, causing great waste. For this reason, and also to permit loading into cars and handling generally, the coke must be deprived of its heat as rapidly as possible. Two principal methods have been hitherto resorted to for this purpose. The earliest practice was to discharge the glowing coke directly onto wide brick or metal floor in front of the ovens, where a stream of water was played upon it until the desired lowering of temperature was reached. This process involves waste by oxidation through the free action of air and at first, of dissociated steam. The great quantities of steam generated acted to hide the product from the workmen, who were thus prevented from seeing their way to treating the whole mass evenly, and besides this the coke, being of a porous nature became impregnated with moisture to a degree not ascertainable in any given case. Thus guarantees as to quality could not be safely given. A more modern expedient resorted to involves discharge of the hot coke into large closed receivers which are wheeled from oven to oven. These receivers are arranged to flood their contents with water which flows over the upper edge and fills the holding space. While loss by access of air is diminished, by the use of this process, there still remains the objection that wet coke is produced, the material in one part of the receiver is much wetter than in another, producing an uneven product, and the apparatus is expensive to build and to operate. In addition to these disadvantages, both of these methods is open

to the objection that the great quantity of heat stored in the glowing coke is entirely wasted.

It is the object of the present invention to supply a method of quenching coke which shall be free from all of the objections above mentioned. By use of this invention a coke is produced which is perfectly dry and of uniform quality, waste by oxidation is reduced to a minimum and virtually all of the heat in the coke is saved and applied to useful ends.

My improved method of quenching or cooling coke as it comes from the oven consists essentially in forcing a current of substantially inert gas at a relatively low temperature through the mass of coke to be cooled. The gas may or may not be used repeatedly.

My process is carried out by inclosing the coke within a substantially air tight casing wherein is also placed a cooling medium, such as a boiler, and then circulating inert gas through the casing from the cooling medium to the coke, or other material to be cooled, and back again. Spent air is preferably used as the inert gas. The spent air is cooled at the boiler and is returned to the coke, passing thence again to the boiler where the heat from the coke is stored up and made available for power or for other purposes in the form of steam. By using virtually the same exhausted air over and over again for successive charges of coke, waste by oxidation is reduced to a minimum. There being no water brought into contact with the coke, difficulty from absorption of moisture is entirely avoided.

The process thus described can be carried out in any appropriate form of apparatus, but I prefer the general arrangement of parts exemplified by the accompanying drawings in which—

Figure 1 is a sectional view of one form of apparatus made in accordance with my invention and Fig. 2 is a horizontal sectional view thereof, taken on the plane, A—A in Fig. 1.

In the drawing, a receiver for the coke is shown at 1, the same being provided with a refractory lining 2, or being otherwise constructed to resist the heat of the coke when first dumped into the receiver. The position and the proportions of the receiver are immaterial to this invention.

In the preferred form shown the coke

which is indicated at 3, is dropped into the top of the receiver through a hopper 4, and is supported upon a movable bottom so that, when the coke has been cooled it can be conveniently removed from the receiver. In the drawing this movable bottom takes the form of a grating 5, composed of two halves meeting in the middle and hinged or pivoted at each side underneath the receiver as shown at 6. Appropriate means are provided for holding and pivoting half gratings in the horizontal position shown in Fig. 2, during treating of the coke. In the form shown counter weights 7 are supplied whose tendency to lift the gratings prevent their being pushed down by the weight of the coke.

In its general form this invention involves the use of a system of ventilation including a receiver, means for passing a current of practically inert gas through the system, and means for cooling said gas while passing through each portion of said system. While the means in question and the system of ventilation adopted, may take a variety of forms without departing from the invention, I have illustrated one of the numerous possible embodiments of the invention in the drawings, wherein the means for propelling the gases takes the form of an ordinary centrifugal blower 8, and the cooling means are embodied in any appropriate form of boiler as 9. The ventilating system is completed by means of the large pipes 10 and 11, the former of which leads from the top of the coke receiver to the boiler while the latter leads from the boiler through the blower, back to the bottom of the coke receiver. It is to be understood that this particular arrangement whereby the cooling gases are led upward through the coke and downward through the boiler, is not absolutely essential to my invention, but I prefer this arrangement because it is natural for the gases to rise while they are heated and move downward during cooling. It is furthermore desirable that the gases to be cooled should leave the boiler where it is coolest.

In order to dissociate the ventilating system from the outer air during operation, I provide air spaces above and below the receiver as shown at 12 and 13. The air space 12 is separated from the hopper 4, preferably by automatic valves or doors, which in the particular device shown, takes the form of two half doors 14 meeting in the middle and pivoted at the sides as at 15. Appropriate means are provided for automatically closing these doors, and for this purpose I have shown counter weights at 16, attached to the doors in the manner illustrated. The small air valves separate the air chamber 13 from the outer atmosphere, said valves being shown at 17, and pivoted at 18. The counter weights 19, hold the valves, 17 in

place without preventing the coke from passing out at the bottom when the operation of cooling is completed since the counter weights 19, are made light. Valves are provided in the pipes 10 and 11, whereby the opening in these pipes may be securely closed and these valves may be of any desired construction, being operated by levers 20 and 21, in the form shown.

The mode of operation of the device is as follows: The first time the device is used the ventilating system, including the fire space in the boiler, receiver and air chambers will be full of air. The coke as it comes from the ovens, is charged in the receiver, acting by its weight to open the air valves 14, which valves close behind it when the coke is in place. The valves 20 and 21, being open, and all other valves closed the blower 8 is set in motion and the cooling air in the ventilating system is forced through the body of coke carrying the heat of the coke over to the boiler where said heat is taken up by the water in the boiler, the air being returned to the coke at the comparatively low temperature of the water in the boiler. The first volume of air used will of course contain oxygen and a certain amount of waste through oxidation will take place in the coke, but, since the same volume of air is continually used over and over again, it will very shortly become quite inert, the composition of the gas being then virtually a mixture of carbonic acid and nitrogen. This process is continued until the coke is cooled to the temperature desired. The blower is then stopped the valves 20 and 21 are closed and the counter weights 7, are raised so as to open the supporting gratings 5, allowing the charge of coke to fall out at the bottom into cars or other appropriate receptacles.

The closing of the valves 20 and 21 preserves in the ventilating system almost all of the inert gases, so that when the next charge of coke is treated, the only oxygen present in the cooling current of gas will be the very small amount carried in with the coke from the outer air. Of course the valves 20 and 21 are kept closed until the new charge of coke is in place and the operation of cooling is to be recommenced by starting up the blower 8.

It will be seen that by use of the process above described the coke is kept perfectly dry and is exposed to a minimum of oxidizing action while all of the heat is transferred to the water in the boiler and can be applied to useful work by generation of steam.

A variety of modifications can be made in the apparatus as well as in the method above described without departing from this invention and the invention is not to be understood as confined to the details herein shown and described.

What I claim is—

1. The process of cooling combustible substances, which consists in inclosing them within an air-tight casing containing a cooling medium and inert gases, and circulating said gases in a continuous circuit in contact with the combustible substances and the cooling medium.

2. The process of cooling and quenching combustible substances which consists in inclosing said substances within an air-tight casing containing a cooling medium, excluding the air from said casing, and circulating the gases within said casing in a continuous circuit in contact with the combustible substances and the cooling medium.

3. The process of cooling and quenching coke, which consists in inserting said coke while in an incandescent state in a casing, excluding the air from said casing, cooling an inert gas, and circulating said gas in contact with the coke.

4. The process of cooling coke, which consists in inserting said coke while in an incandescent state in an air-tight casing containing a cooling medium, and circulating the inert gases resulting from the slight combustion of the coke, in intimate contact with the cooling medium and the coke.

5. The process of cooling coke, which consists in inserting said coke while in an incan-

descent state in an air-tight chamber containing a cooling medium, forcing the inert gases which are within said casing and resulting from the slight burning of the coke, into contact with the cooling medium, and blowing said gases through the coke, whereby further burning of the coke is prevented and the temperature thereof reduced below the point of ignition.

6. The process of cooling and quenching coke which consists in removing it while in an incandescent state from the kiln, inclosing it within an air-tight casing containing a cooling medium, excluding the air from said casing and circulating the gases within the casing in a circuit in contact with the coke and the cooling medium, substantially as described.

7. The process of cooling and quenching coke which consists in removing the same from the kiln while in an incandescent state, inserting the same within a casing separate from the kiln while still incandescent, excluding the outer air from said casing, cooling an inert gas, and circulating said gas in contact with the coke, substantially as described.

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Witnesses:

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