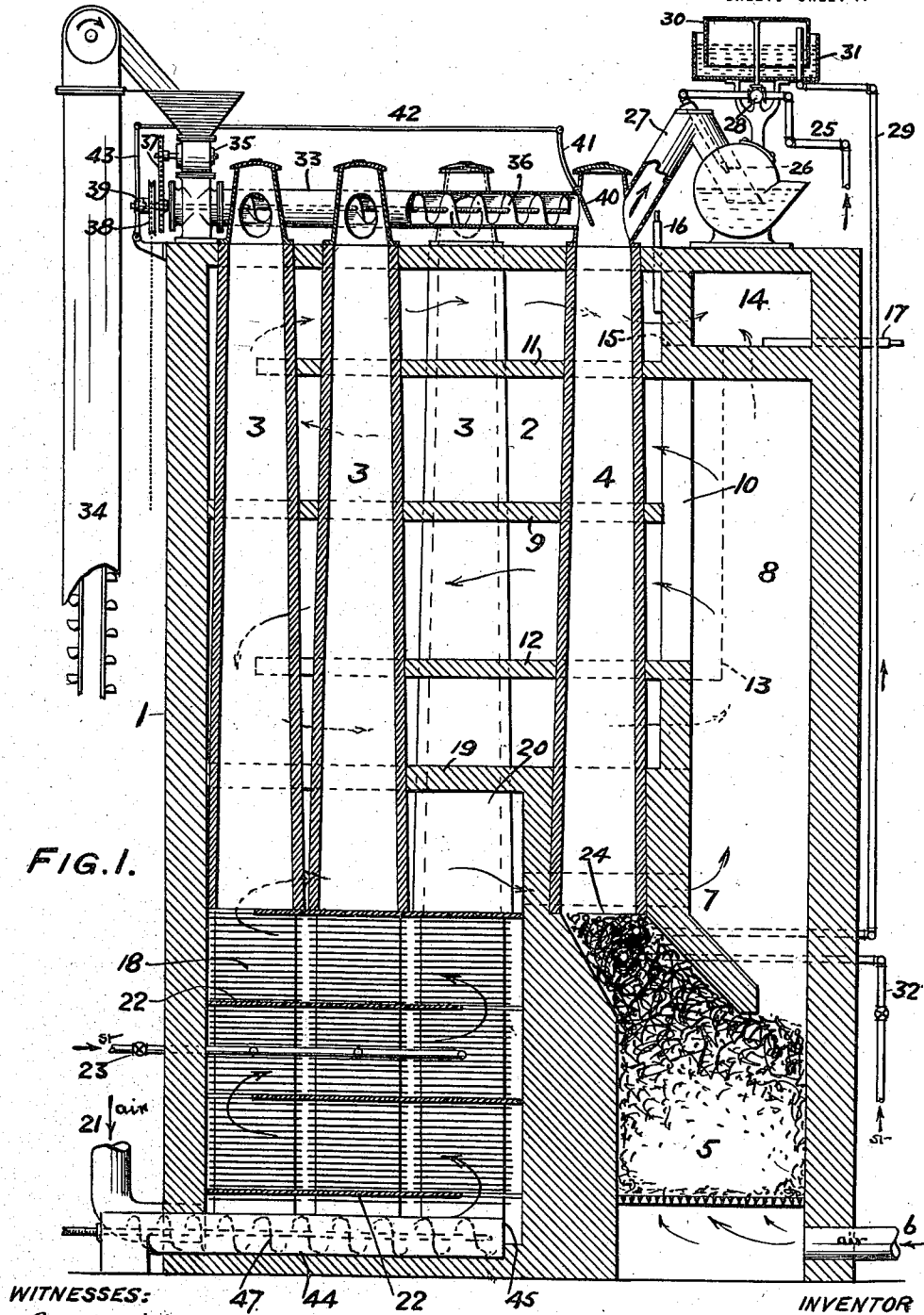


1,176,432.

Patented Mar. 21, 1916.
 2 SHEETS—SHEET 1.



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1,176,432.

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COAL GAS APPARATUS.
APPLICATION FILED SEPT. 11, 1913.

Patented Mar. 21, 1916.

2 SHEETS—SHEET 2.

FIG. 2.

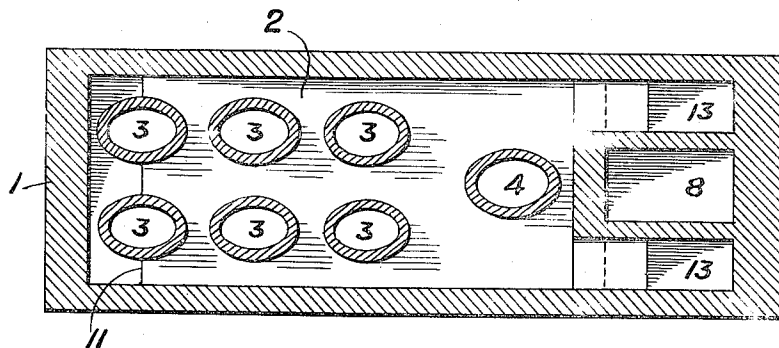


FIG. 3.

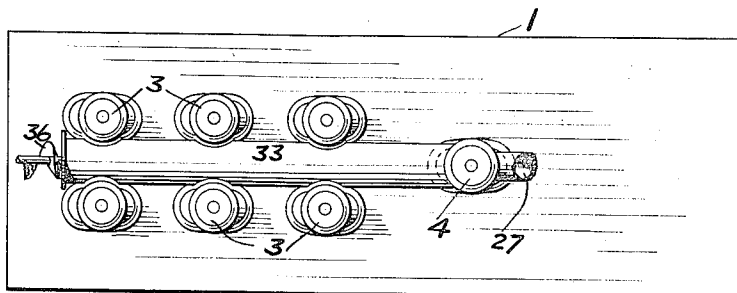


FIG. 4.

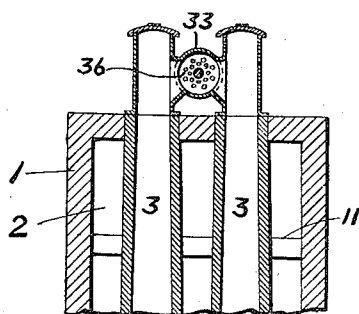
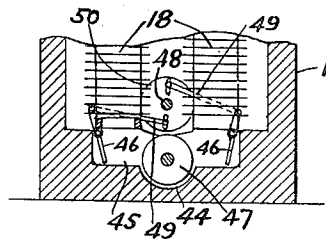


FIG. 5.



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COAL-GAS APPARATUS.

1,176,432.

Specification of Letters Patent.

Patented Mar. 21, 1916.

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To all whom it may concern:

Be it known that I, CHARLES S. CHRISMAN, a citizen of the United States, and a resident of West Chester, in the county of Chester and State of Pennsylvania, have invented certain new and useful Improvements in Coal-Gas Apparatus, of which the following is a specification.

The principal objects of the present invention are to provide a construction of coal gas apparatus which shall be comparatively cheap both as to first cost and in operation; to avoid the necessity of storing a coal supply overhead thus obviating the expense of a structure suitable for that purpose; to save the sensible heat of the coke which is made in a retort and used for the producer and to obviate the necessity and expense of handling that coke; to maintain a constant depth of producer fire and thus obtain uniform heat conditions of the retorts; to prevent producer gas from contaminating the coal gas which is made in the retort that supplies the producer; to recover cool coke and use the sensible heat thereof for preheating the air supply; to insure a proper supply of coal to the retorts, and to provide a continuous vertical retort coal gas apparatus which shall be comparatively inexpensive to erect and comparatively inexpensive and convenient and efficient in operation.

The invention will be claimed at the end hereof but will first be described in connection with the embodiment of it chosen from among other embodiments for illustration in the accompanying drawings, in which—

Figure 1, is an elevational view, principally in section, illustrating a coal gas apparatus embodying features of the invention. Fig. 2, is a transverse sectional view taken through the retorts. Fig. 3, is a top or plan view of a part of the apparatus. Fig. 4, is a transverse sectional view through the top part of two of the retorts, and Fig. 5, is a similar view through the bottom of two of the retorts.

In the drawings 1 is the inclosing wall of the structure.

2, is the retort chamber in which are arranged the vertical retorts 3, of which six are shown although the number is not im-

portant, and also a retort 4, to which reference will be hereinafter made.

5, is a gas producer arranged within the structure and to which air is supplied at 6. Producer gas made in the producer 5 ascends and meeting the secondary air supply at the nostrils 7 burns in the chamber 8. The intense heat of combustion occurs in this chamber 8 which is well adapted to stand it so that the retorts are not exposed to this intense heat. From the chamber 8 the producer gas, secondary air and hot products of combustion enter the retort chamber 2 above and below the partition 9, by way of the opening 10 and then pass upward and downward around the baffle plates 11 and 12 as indicated by the dotted arrows, escaping by way of the flues 13 disposed on each side of the chamber 8 (see Fig. 2) upward to the off-take 14 and by way of an opening 15 shown by dotted lines in Fig. 1, directly to the off-take 14. The retorts are thus uniformly heated and the distribution of heat between the upper and lower parts of the retorts can be adjusted by means of the dampers 16 and 17 which control the outlet 15 and the outlets of the passages or flues 13. The lower parts or bases 18 of the retorts may be made of metal, which is obviously advantageous as it facilitates the transfer of heat, and may be provided with cooling rings as shown.

19 is a partition beneath which is a chamber 20 for heating the secondary air. The secondary air enters this chamber as at 21, passes over the baffle plates 22, as shown by the arrows in Fig. 1 and around the retorts and reaches the nostrils 7. In doing this the secondary air is heated while at the same time the lower parts of the retort and the coke contained in them are cooled, thus the sensible heat of the coke is imparted to the air and the coke is recovered comparatively cool, which is of course advantageous.

To facilitate the use of metal, as cast iron, for making the bottom parts of the retorts, steam is introduced into the bottom part of the retorts, for example, by the connections 23. This steam cools the coke so that cast iron may be safely used and any water gas resulting from the introduction of the steam into the hot coke ascends through the retorts and is not in any way injurious or

objectionable. The retort 4, produces that amount of coke which is necessary or desirable for supplying the producer 5, in such a way that the fuel level therein may be kept constant, thus insuring uniform production of producer gas and consequently providing for the uniform heating of the retorts. One retort 4 is shown, but it will be understood that more similarly constructed and connected may be used if desired.

The retort 4, is in direct communication with the producer 5, for example, by means of a throat 24, so that coke from the retort 4, passes directly into the producer without exposure to air and consequent loss of sensible heat and without handling and in the case of a continuous apparatus, continuously. If gas from the retort 4, is to be saved and not burned in the producer or combustion chamber it is, of course, desirable to prevent coal gas from the retort reaching the producer and to prevent producer gas from reaching the retort 4, and escaping from it along with the coal gas. This can be accomplished by two means to be described either singly or in combination.

25 is a supply of clean coal gas under pressure and it is connected with a jet 26 for example in the dip pipe 27 that leads from the retort 4. In this pipe 25 there is a valve 28 controlled by a gas governor, connected with a pipe 29 opening at or near the base of the retort 4 and responsive to pressure thereat. The gas governor illustrated is chosen from other well known gas governors for the sake of explanation but it will be described.

The gas governor consists of an inverted bell 30, connected with the stem of the valve 28 and dipping into liquid contained in a receptacle 31 and overlying the open end of the pipe 29. By this arrangement the pressure at the throat 24 controls the discharge through the jet 26 which in turn draws gas from the retort 4, thus lowering the pressure therein and preventing the escape of coal gas from the bottom of the retort. Should the pressure at the throat fall off, the jet at 26 will be reduced thus properly adjusting the pressure in the retort 4. The second means referred to comprise a steam jet 32 discharging at or near the throat 24 and the steam so discharged will generate more or less water gas which constitutes a means for properly adjusting the relative pressures of the retort and producer. The pressure at the base of the retort 4 and the pressure in the throat 24 should be relatively such that coal gas from the retort 4 does not reach the producer and producer gas from the producer should not reach the retort, thus these pressures should be substantially balanced and the two means de-

scribed are singly or in combination adapted for the accomplishment of this result.

At the top of the structure there is a screw conveyer 33 to which the coal or other material to be carbonized is delivered from an elevator 34 by way of a feeder 35, which prevents the escape of gas. The feeder and the screw or worm 36 of the conveyer are geared together by gearing 37. The driving wheel 38 may be connected and disconnected from the shaft of the screw by a clutch 39. At the end of the conveyer and in the retort 4 there is arranged one end 40 of a pivotal lever, the other end 41, of which is connected by a link 42 with the clutch lever 43. Ordinarily the conveyer will maintain a continuous feed to the various retorts but should the conveyer become jammed, the material will crowd the end 40 of the lever and thus shift it and the clutch and arrest the feed. At the base of the retorts there is a screw conveyer 44, the housing 45 of which communicates with the lower ends of the retorts 3.

46 are vibratory arms which serve to feed the coke to the screw 47 of the conveyer. These vibratory arms may be operated from an oscillating shaft 48, by means of links 49, the pivot pins of which can be made adjustable radially of the face of a disk 50, so as to permit of the adjustment of the throw of the arms.

Although the operation of the apparatus has been heretofore stated it may be summarized as follows: Fuel or other material to be carbonized may be stored upon the ground and lifted by the elevator 34 and then fed to the various retorts in proper manner by the conveyer 33. At the same time cool coke is continuously removed from the bottom of the retorts by the conveyer 44. The secondary air takes up the sensible heat of the coke by passing around the lower parts of the retorts so that the coke is delivered cool. Coke continuously descends from the retort 4 to the producer, keeping the level of fuel therein substantially constant and thus insuring uniform heating conditions for the retorts. The proper relative pressure is maintained at the lower part of the retort 4 and the upper part of the producer or throat 24 for causing the coal gas to ascend from the retort 4 and for excluding producer gas therefrom by the jet 26 or the steam supply 32 or either or both. It is evident that the sensible heat of the coke made in the retort 4 is not lost as would be the case if it were exposed to the air. This coke descends by gravity and therefore handling is avoided.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details and that some of the described features may be omitted from the others and variously em-

employed, hence I do not limit myself in regard to such matters, but

Having thus described the nature and objects of the invention, what I claim as new and desire to secure by Letters Patent is:

1. In a coal gas apparatus the combination of a vertical retort, a producer having direct communication with the retort for the reception of coke, and means for adjusting the pressure at the base of the retort for excluding producer gas.

2. In a coal gas apparatus the combination of a vertical retort, a producer having direct communication with the retort for the reception of coke, and a jet for excluding producer gas from the retort.

3. In a coal gas apparatus the combination of a vertical retort, a producer having direct communication with the retort for the reception of coke, and a gas jet responsive to pressure at the base of the retort for excluding producer gas from the retort.

4. In a coal gas apparatus the combination of retorts of which one is a continuously operating vertical retort, a producer communicating directly with said vertical retort and receiving therefrom a proportionate supply of coke for maintaining a constant

level and thus insuring uniform heating conditions.

5. Apparatus for making coal gas comprising the combination of a setting including a producer and a combustion chamber communicating with the producer, a retort chamber communicating with the combustion chamber, vertical retorts of which one communicates with the producer and supplies the same uniformly with coke, means for controlling the relative pressure in the last mentioned retort and in the producer, devices for feeding coal to the retorts, and means for withdrawing coke from the bottom of the retorts other than the one that communicates with the producer.

6. In a coal gas apparatus the combination of a producer, a combustion chamber and a retort located above and communicating with the producer, and means for controlling the pressure at and near the base of the retort to prevent the entrance of producer gas into the retort.

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