4 Sheets—Sheet 1.

C. TESSIE du MOTAY & E. J. JERZMANOWSKI.

Process and Apparatus for Manufacturing Carbonic Oxide.

No. 216,584. **Patented June 17, 1879.**

Figure 1.

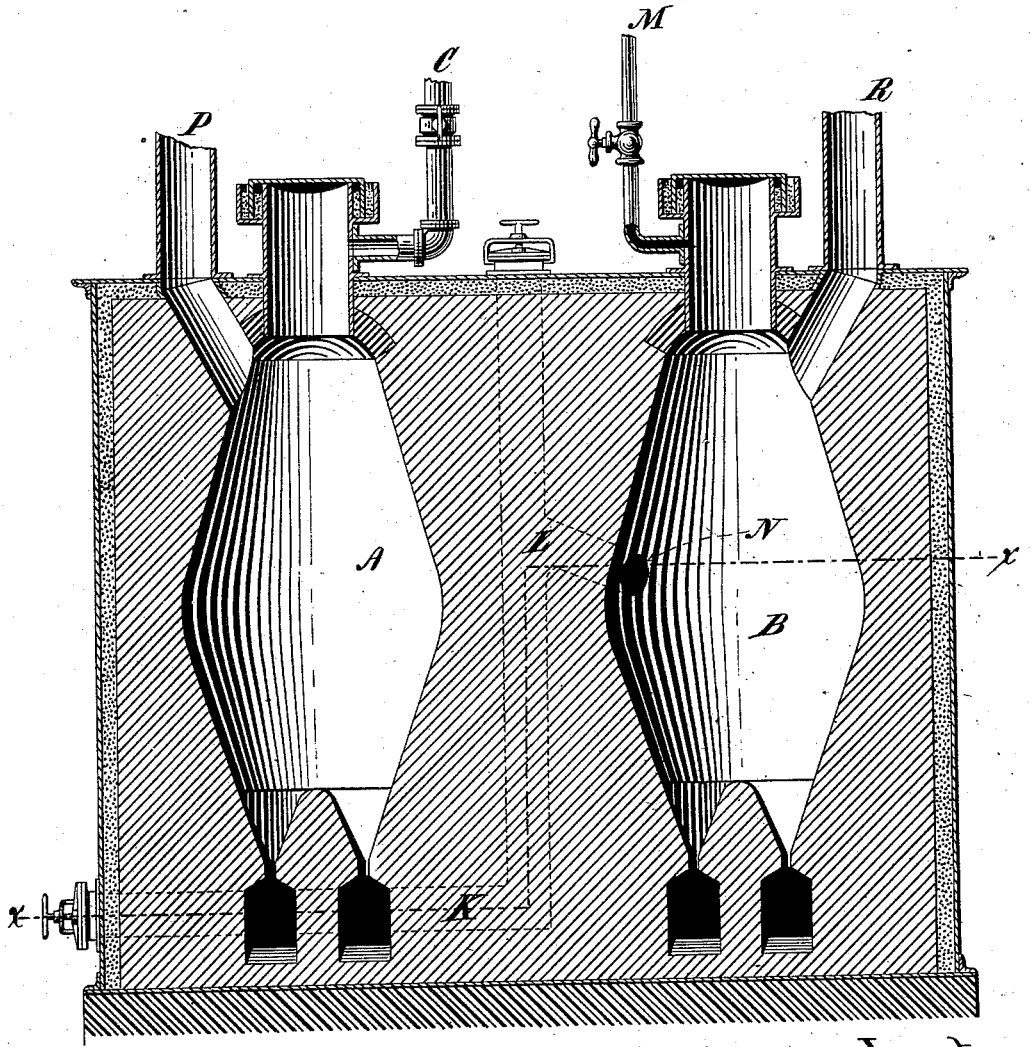

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Figure 2.

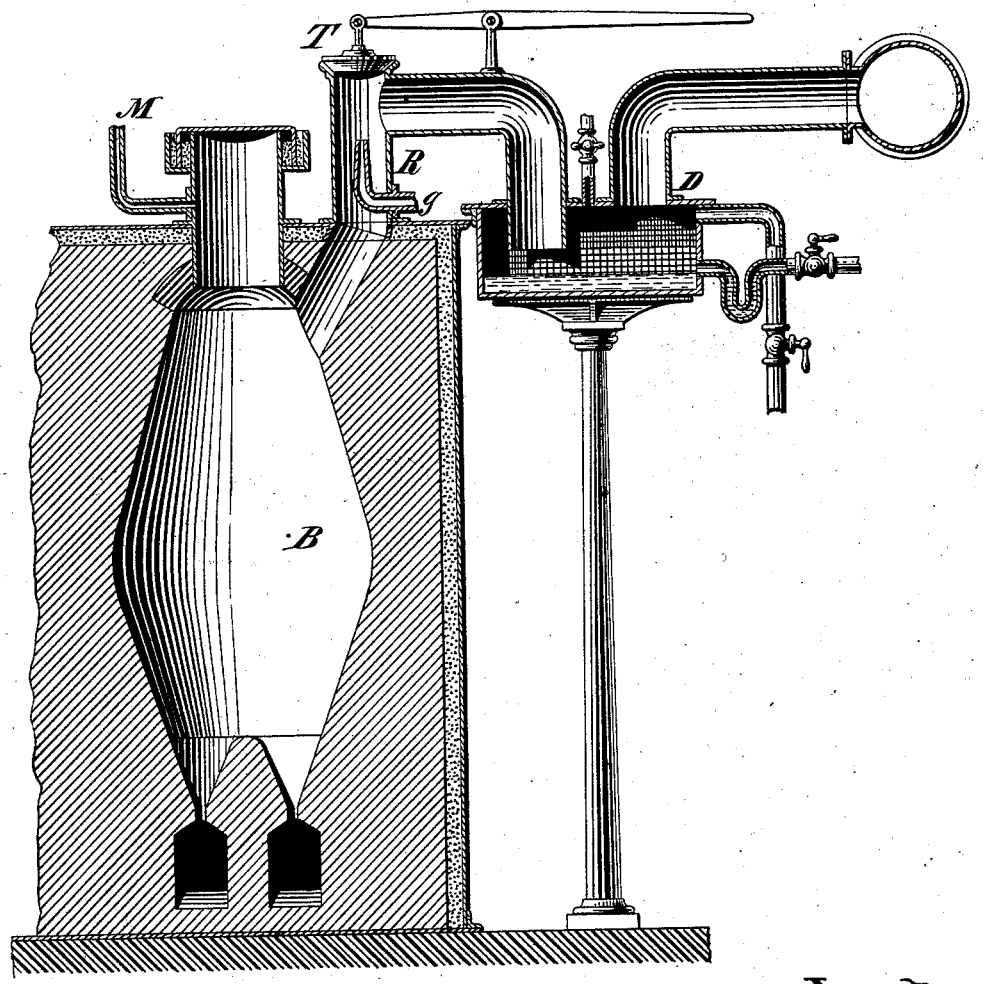

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Figure 5.

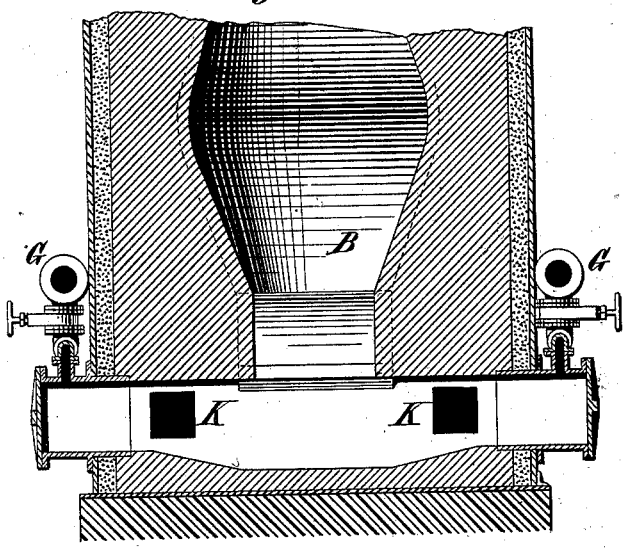
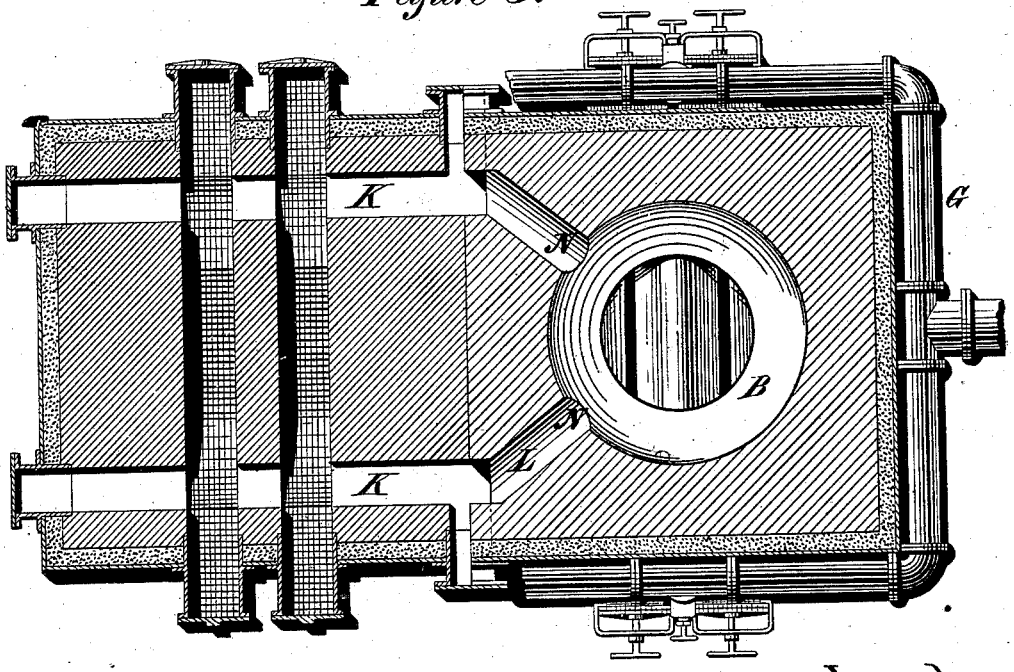


Figure 3.



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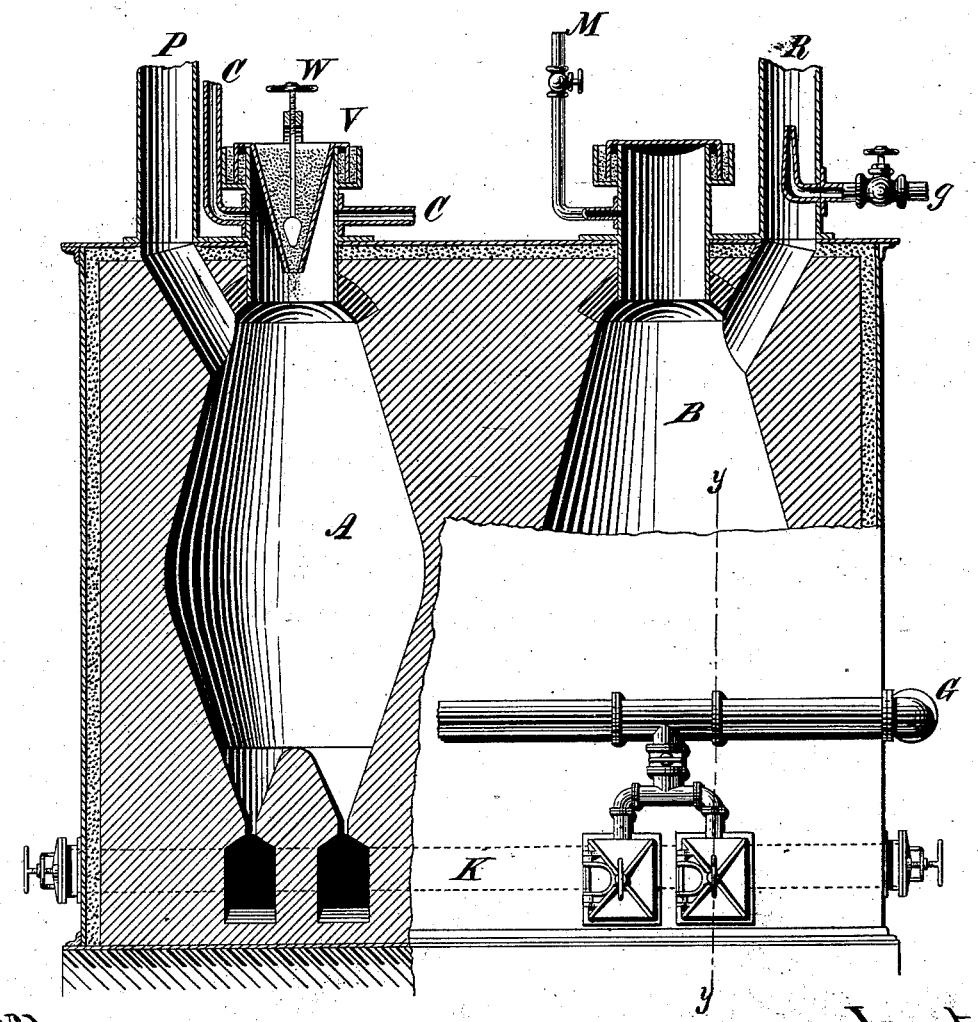
Process and Apparatus for Manufacturing Carbonic Oxide.

No. 216,584. **Patented June 17, 1879.**

Figure 4.



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UNITED STATES PATENT OFFICE.

CYPRIEN TESSIÉ DU MOTAY AND ERAZM J. JERZMANOWSKI, OF NEW YORK, N. Y., ASSIGNORS TO EDWARD STERN, OF SAME PLACE.

IMPROVEMENT IN PROCESSES AND APPARATUS FOR MANUFACTURING CARBONIC OXIDE.

Specification forming part of Letters Patent No. **216,584**, dated June 17, 1879; application filed February 21, 1879.

To all whom it may concern:

Be it known that we, CYPRIEN TESSIÉ DU MOTAY, of the city of New York, and ERAZM J. JERZMANOWSKI, of the city of New York, have invented a new and useful Process and Apparatus for the Manufacture of Carbonic Oxide from wood, peat, turf, carbonaceous powder, and similar gas-producing substances, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

The object of our invention is to produce cheaply and abundantly a supply of carbonic oxide, by means of the utilization of material of little value containing carbon in a greater or less quantity; and our process consists, generally, in bringing such carbonaceous refuse in contact with a bed of incandescent coal or coke, whereby it is partly converted into carbonic oxide and partly into carbonic acid, and then in passing this mixture of gas through a subsequent converting-chamber, also filled with incandescent coal or coke, wherein the carbonic acid contained in the gas passing from the first generator is converted into carbonic oxide, so that only the latter gas escapes from the second chamber. The conversion of the carbonaceous material into carbonic oxide in the first generator takes place in consequence of the reaction between itself and a sufficient supply of air in presence of the heated body of coal or coke before described.

Our apparatus consists in an arrangement of generators, chambers, and connections for carrying out the herein-described process; special apparatus consisting of a double generator, having the connections so arranged that the carbonic refuse may be fed into the top of one, where it is met by a sufficient supply of air, the resulting carbonic oxide or acid being passed downward through said generator, and out through the bottom, and into the bottom of the converting-generator. The two generators are connected together by a suitable tube or connection, the resulting gas escaping from the top of the second generator by means of a delivery-pipe. The connection between the bottoms of the two generators does not pass directly under them, but at one side, so as to be somewhat out of the way of the falling ashes.

Figure 1 represents a cross-section of the two generators, which I shall distinguish as the "primary" and "converting" generators. Fig. 2 represents a view of the converting-generator, with the hydraulic main and connections in detail. Fig. 3 is a cross-section through Fig. 1 on the line *x x*. Fig. 4 represents a view of that arrangement of our apparatus in which carbonaceous powder is used, and shows a slight difference in the arrangement of the communicating channels. Fig. 5 is a partial section view of the same on the line *y y*.

The generators A and B are in their main construction similar to those generally employed in the manufacture of carbonic oxide. As shown, they are arranged with a swell or expansion somewhat below the middle, and they should be preferably arranged with fire-clay grate-bars, similar to those heretofore patented by Jerzmanowski. The generator A is provided with a pipe, P, which can be closed by a valve, for the purpose of igniting the coke, afterward used in the production of carbonic oxide. Air may be forced in at the bottom for this purpose. It is also provided with an air-pipe, C, for a purpose to be hereinafter explained. A passage, K, is provided through the brick-work of the structure, which, in the first modification of our apparatus, delivers about the middle, or somewhat below the middle, of the connecting retort by means of the pipe L and aperture N.

As shown in the drawings, there are two such passages, which are arranged in the sides of the structure, so as not to be choked by the ash or refuse which falls from the generator A. Suitable openings are left for cleaning both ash-chambers K and L.

The gas leaves the converting-generator by pipe R, preferably provided with some form of exhauster, *g*, which may be used for increasing the draft or keeping it up while the ash-doors of the generator A are open.

The pipe R may deliver into the hydraulic main D, arranged to be filled with or discharged of water.

The naphtha-pipe M may be provided for increasing the richness of the gas which passes from the converting-generator B by injecting therein a sufficient supply of naphtha or other rich oil.

The operation of our apparatus can now be understood. The generator A is half filled with coal, coke, or similar material. The converting-generator B is filled almost to the top with a similar material. The coal or coke in the generator A is brought to an incandescent condition by a sufficient supply of air forced through it, the products of combustion escaping at the pipe P; and the coal or coke in the retort B is brought into a similar condition, the products of its combustion escaping by purge-valve T. The pipe P and purge-valve T are then closed, and a certain quantity of the material to be converted into gas is thrown upon the coke in the generator A. A current of air, preferably heated, is then forced in by pipe C, and the gas produced (which would, in this case, be a mixture of hydrogen, carbonic oxide, and carbonic acid) passes off by passage K, L, and N into the converting-generator B. Air is continually forced into this generator through the air-pipes G, and the air used in both generators should preferably be heated. This air coming in contact with the heated coal or coke in generator B is itself converted into carbonic oxide, and meeting the stream of gas from the generating-retort at the aperture N it passes up through the remainder of the coke, and any carbonic acid which might remain in the gas is thereby converted into carbonic oxide, and passes off by the pipe R a mixture of carbonic oxide and hydrogen.

The aperture N is placed somewhat above the bottom of retort B, for the purpose of avoiding an explosion, which might result from bringing air in contact with hydrogen passing from the primary generator.

Whenever coal-dust is employed an apparatus similar in construction to that shown in Figs. 4 and 5 is employed. The carbonaceous powder is fed through a hopper, V, and its flow is regulated by valve W. Two or more air-pipes, C, are provided to bring a sufficient supply of air in contact with this powder as it falls upon the incandescent mass of coal or coke below. The passage K in this case may be carried across horizontally between the generating and converting retorts, because as anthracite-coal powder is employed there will be no generation of hydrogen. An additional supply of air is forced in by pipes G.

We do not claim, broadly, the production of carbonic oxide from coal or coke, or even the production of this gas in one generator and its subsequent further conversion in a second retort; but our process is limited to the production of carbonic oxide from refuse in the manner described.

We are aware of the English Patent No. 1,946 of 1863, and also of the American patent to W. H. Strong, November 13, 1877, No. 197,062, and do not claim anything there shown.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The process of producing inflammable gases, which consists in casting on the top of an incandescent bed of coal or coke a sufficient supply of wood, turf, or other carbonaceous refuse, and of forcing downward upon the top of the same a sufficient supply of air, and causing the resulting gases to pass downward through the bed of coke, thereby causing the gases resulting from the combustion of the carbonic refuse to be converted into carbonic oxide, as distinguished from the process of forcing downward through a body of coal a supply of air in the manner described, substantially as described.

2. The herein-described process of making carbonic oxide from wood, turf, refuse, carbonaceous powders, and similar material, which consists in casting such gas-producing substance upon a bed of incandescent coal or coke, and of forcing down upon and through the same a sufficient supply of air, thereby partially consuming it and producing carbonic oxide and carbonic acid, mingled with other gases, and then forcing the resulting gases down through such coke, and of then passing them into the bottom of a second converting-generator filled with incandescent coke, wherein the carbonic acid is converted into carbonic oxide and allowed to escape from the top of the same, substantially as described.

3. In an apparatus for producing carbonic oxide, the combination of a primary generator and a converting-generator, both generators being supplied with a sufficient amount of incandescent coal or coke, the supply-pipe entering the top of the primary generator, the connection between the primary generator and converting-generator, and the delivery-tube from the top of the converting-generator, the fuel and air used in the production of gas being delivered into the primary generator at the top of the same, the gas resulting being passed out of the bottom of the same and into the bottom of the converting-generator by means of the connection shown, and finally escaping from the top of the converting-generator, substantially as described.

4. The combination of a primary generator, A, and converting-generator B, the primary generator being provided with a fuel-supply aperture and an air-supply pipe at the top of the same, and with the connections shown delivering into the converting-generator B, which generator is provided with a tube for forcing in a sufficient supply of air at the bottom, and with a delivery-passage, R, for carrying off the resulting gas at the top, substantially as described.

5. The combination of two generators, A and B, arranged in one setting, and connected by a pipe or pipes, K, which is situated at one side of the generator A, and is connected with the ash-chamber, for the purpose of preventing the choking of the pipe by the falling ash, substantially as described.

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