No. 656,599. Patented Aug. 21, 1900.

R. DOOLITTLE.

PROCESS OF MANUFACTURING CARBIDS.

(Application filed Oct. 16, 1896.)

(No Model.)

Fig. 1.

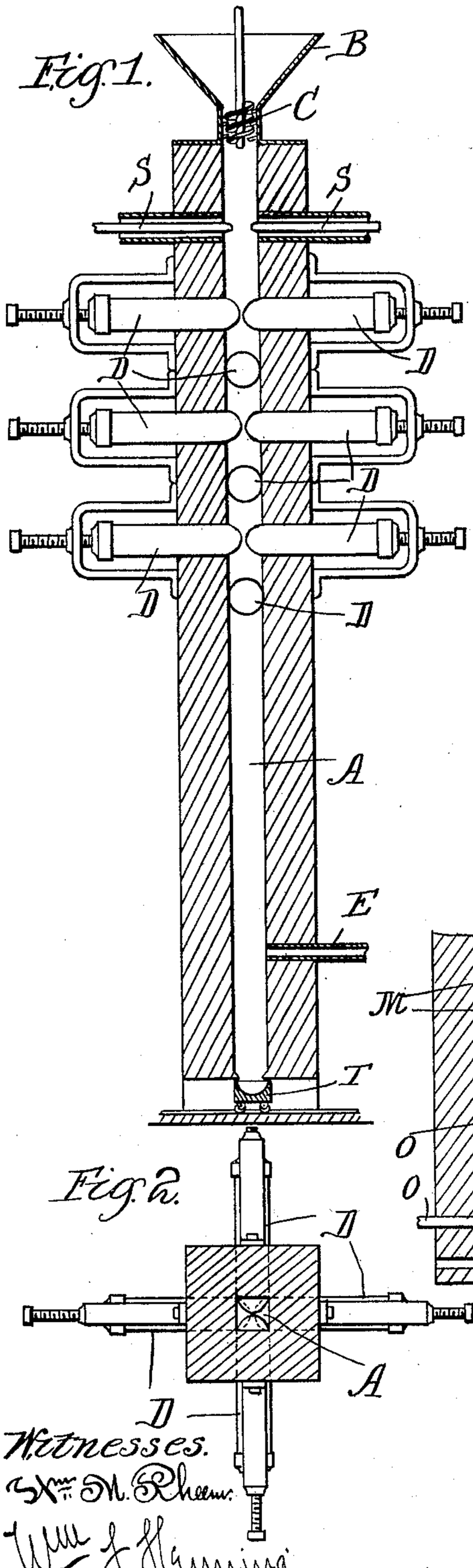

Fig. 4.

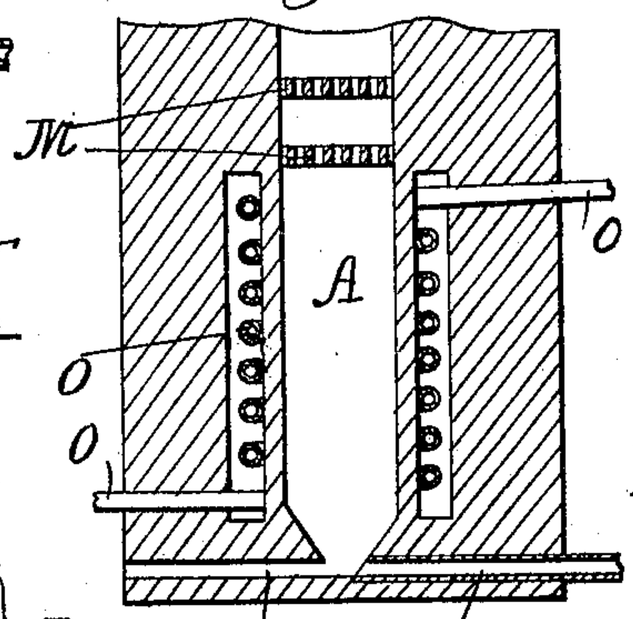

Fig. 3.

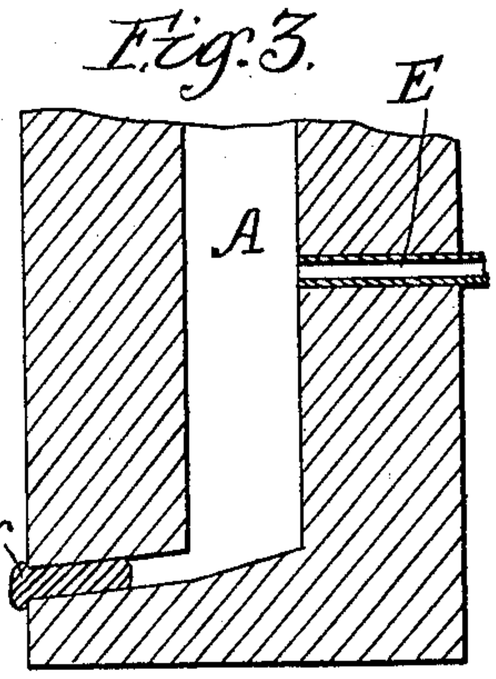

Fig. 2.

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UNITED STATES PATENT OFFICE.

REUBEN DOOLITTLE, OF CHICAGO, ILLINOIS, ASSIGNOR TO MARY V. DOOLITTLE, OF SAME PLACE.

PROCESS OF MANUFACTURING CARBIDS.

SPECIFICATION forming part of Letters Patent No. 656,599, dated August 21, 1900.

Application filed October 16, 1896. Serial No. 609,116. (No specimens.)

To all whom it may concern:

Be it known that I, REUBEN DOOLITTLE, a citizen of the United States of America, residing at Chicago, in the county of Cook, in the State of Illinois, have invented a certain new and useful Process of Manufacturing Carbids, of which the following is a description.

Referring to the accompanying drawings, wherein like reference-letters indicate like or corresponding parts, Figure 1 is a vertical section of my improved apparatus. Fig. 2 is a transverse section of the same in line 2 2 of Fig. 1, and Figs. 3 and 4 are sections showing modifications of the lower part of the apparatus.

This invention relates to a new and improved process for the manufacture of carbids, and has particularly in view a continuous process for such purpose. To this end it is embodied, broadly, in thoroughly mixing together pulverized carbon with an oxid of calcium, strontium, barium, or other suitable material, then passing the mixture in the manner hereinafter described and claimed through a suitable furnace, where it is first preliminarily heated, then submitted to a sufficiently-high temperature to bring about reactions important in the process, and finally to such a temperature as will result in the formation of a carbid, then drawing off the superheated gases thus treated for further use, as desired, leaving the carbid.

In order that the process may be better understood, I have shown and described means for carrying out the same.

Referring to the accompanying drawings, A represents a vertical chamber surmounted by a hopper B, provided with any preferred device for regulating the feeding of the material into the chamber. For this purpose the worm C is provided.

s s are pipes used to admit gas, oil, or other fuel near the top of the chamber, a space being provided around them to admit sufficient air to secure the desired combustion. By these means the falling material is primarily heated and treated by passing through the flame, the quality of which may be regulated by controlling the admission of the air and of the gas, oil, or other fuel. Lower down in the chamber I arrange horizontal electrodes D in opposing couples. In the preferred form a plurality of such couples is used, the material falling through the contracted space between the ends of the several electrodes as it falls to the bottom of the chamber, Figs. 1 and 2. The material falls by force of gravity, which is aided by a downdraft through the chamber, caused by drawing off the superheated gases below the electrodes through the gas-pipe E. Any preferred means—such as a pump, stack, or exhaust-fan—may be employed to draw off the gases through the pipe E. The superheated gases thus removed are of value and may be employed for various useful purposes.

It is obvious that the electrical current may be varied with the separate couples of electrodes, as desired. Thus they may be arranged to subject the falling material to a gradually-increasing temperature until the necessary action takes place resulting in a carbid.

By means of my improved apparatus a perfect control of the temperature is secured at various points as the material descends, thus accomplishing the most perfect and economical results. The carbids may be removed in any preferred manner. Thus it may flow into a removable receptacle T, as shown in Fig. 1, be tapped out at *w*, as in Fig. 3, or be delivered in granular form, as in Fig. 4, the method of which will be hereinafter more fully explained.

The mode of operation is as follows: I take the proper proportions of carbon and a suitable base—for example, substantially one part of carbon or coke to two parts of lime—and after thoroughly pulverizing and mixing the two together I place them in the hopper B, which is regulated to feed the material into the chamber in a continuous stream. By "continuous stream" or "freely-moving stream or shower" is meant an unsupported or unimpeded moving mass, in contradistinction to a mass held in a pan or muffle and simply allowed to settle as the material is removed from underneath. Before beginning to feed in the material the chamber is heated to the desired temperature by means of the combustion of the fuel through the pipes *s s*, as described, and also by the aid of the electric arc. When the chamber reaches the desired temperature, the material is admitted, the

stream first passing directly through the flame and later between the electrodes and thence to the bottom of the chamber, where it is removed as a carbid. My understanding of the process and of the chemical reactions which take place is that the first effect of this operation is the formation of cyanogen and acetylene, the cyanogen combining with the lime and forming calcium cyanid, as is now well understood. By this combination a percentage of the nitrogen derived from the atmosphere admitted for the purpose of producing combustion, above referred to, is taken up, the greater part, together with any other gases released, moving onward with the calcium cyanid. As the material comes within the influence of the electrodes, which are especially arranged and controlled for this purpose, the falling material passes into a zone of heat, in which the temperature is sufficient to cause the decomposition of the calcium cyanid and of the cyanogen and acetylene therewith, (supposed to be about 1,775° centigrade.) The decomposition greatly increases the temperature, as is well known. This increase of temperature, together with that already caused by the combustion of the gas and oil before mentioned, brings the temperature to a point approximating that necessary to complete the process in the formation of the carbid, thus greatly economizing the electrical energy usually found necessary for that purpose. The electrical current is managed to secure and maintain just the temperature necessary to secure the best results in completing the desired reaction. The superheated gases passing through this zone of high temperature are drawn off through the pipe E for use as may be desired. It will be seen that the operation is continuous and economical, securing carbid of a uniform quality, and resulting also in a large quantity of superheated gases, which may be employed for various useful purposes.

If it be desired to deliver carbid in a granular form, and thus while heating and securing a uniform grade of the product avoid the necessity and expense of grinding, I construct the lower part of my furnace with that particular object in view. In the form shown I incase the lower part of the chamber in a cooling jacket or coil O, Fig. 4, through which a cooling fluid or gas may be circulated, thus partially cooling the product. It is then subjected to a blast through the pipe F, which forces it through the pipe R, still further cooling and granulating it. Plates or grates M, provided with perforations or elongated openings, may be employed, if desired, to retard the flow of the product during the first cooling and deliver it to the action of the blast in small streams.

By my improved process I am enabled to use the raw materials, such as pulverized slack coal and limestone, the passing of the material through the flame being sufficient to transform the limestone into caustic lime, the reactions taking place as effectually as though caustic lime was initially used. This enables me to dispense with the expense of first burning the lime and results in a substantial saving in the cost of the product.

After thus describing my improved process it is obvious various immaterial changes may be made without departing from the spirit of my invention.

Having thus described my invention, what I claim as new, and desire to cover by Letters Patent, is—

1. The herein-described process of manufacturing carbids, consisting in first mixing together pulverized carbon and a suitable base in suitable proportions, second, passing the mixture in a shower through a flame, third, passing the heated mixture and accompanying gases through a zone of increasing temperature including an electric furnace where the mixture becomes transformed into a carbid, and, fourth, drawing off the superheated gases and permitting the carbid to cool, the whole constituting a continuous process.

2. The herein-described process of manufacturing carbids, consisting in first mixing together pulverized carbon and lime in suitable proportions, second, passing the mixture in a shower through a flame, third, passing the heated mixture and accompanying gases through a zone of increasing temperature including an electric furnace where the mixture becomes transformed into a carbid, and fourth, drawing off the superheated gases and permitting the carbid to cool, the whole constituting a continuous process.

3. The herein-described process of manufacturing carbids, consisting in first mixing together pulverized carbon and a calcium-bearing material in suitable proportions, second, passing the mixture in a shower through a flame, third, passing the heated mixture and accompanying gases through a zone of increasing temperature including an electric furnace where the mixture becomes transformed into a carbid, and, fourth, drawing off the superheated gases and permitting the carbid to cool, the whole constituting a continuous process.

4. The herein-described process of manufacturing carbids, consisting in first mixing together finely-divided carbon and an alkaline substance in suitable proportions, second subjecting the said mixed carbon and alkaline substance to the direct action of a flame, third passing the heated mixture and accompanying gases through arcs of increasing temperature sufficient to transform the mixture into a carbid and fourth, drawing off the heated gases and permitting the carbid to cool, the whole constituting a continuous process.

5. The herein-described process of manufacturing carbids, consisting first in mixing together finely-divided carbon and an alkaline material, second passing said mixture in a freely-moving stream successively through

arcs of increasing temperature whereby the temperature of the mixture and accompanying gases is gradually increased to a degree of heat sufficient to effect the formation of carbid, and third, drawing off the heated gases and permitting the carbid to cool, the whole constituting a continuous process.

6. The herein-described process of manufacturing carbids consisting in subjecting a moving body of carbid-producing material to the action of heat, passing the material successively through arcs of increasing temperature until a temperature is reached which is sufficient to effect the formation of carbid and finally permitting the same to cool.

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Witnesses:
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