No. 656,600. Patented Aug. 21, 1900.

R. DOOLITTLE.

MEANS FOR MANUFACTURING CARBIDS.

(Application filed Oct. 20, 1899.)

(No Model.)

Fig. 1.

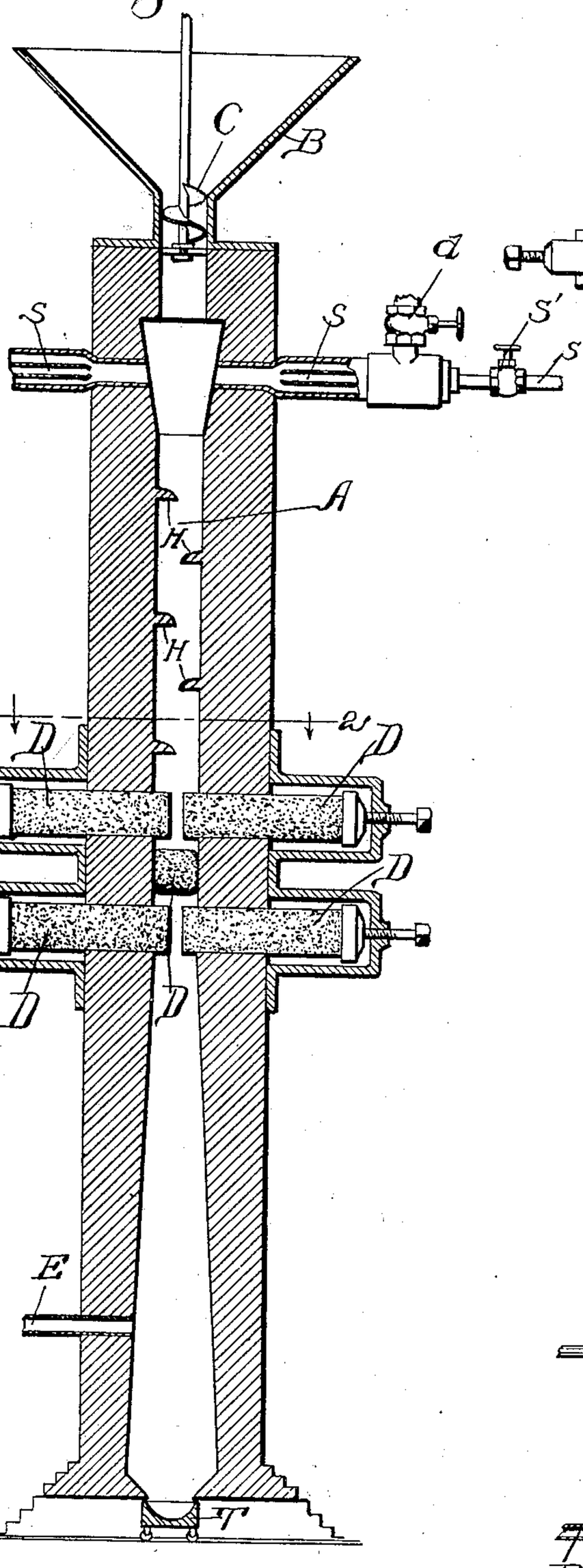


Fig 2

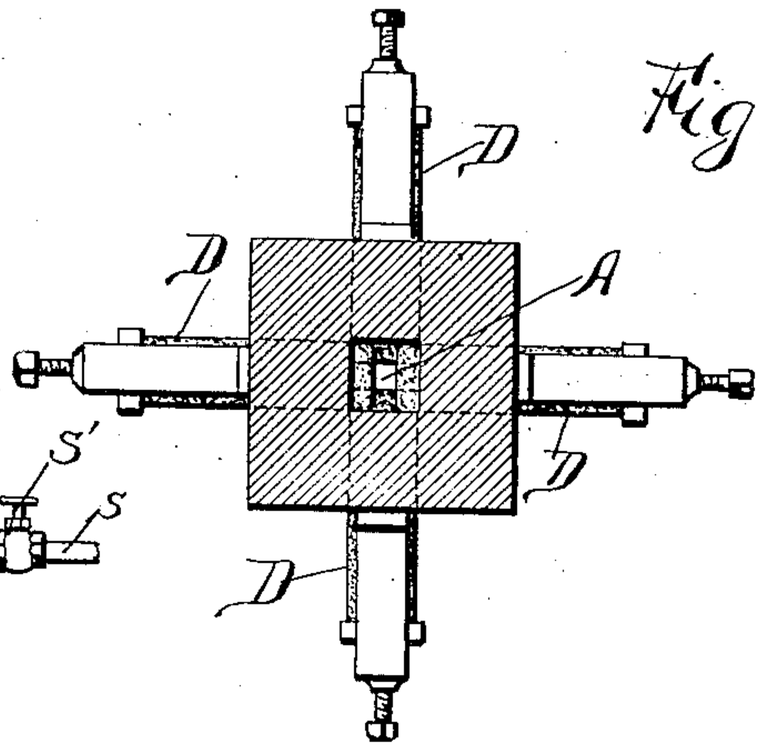


Fig. 3.

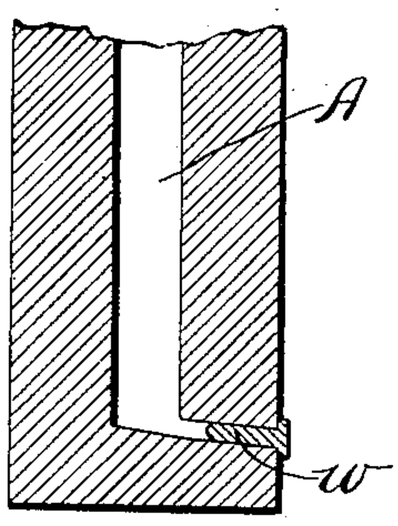
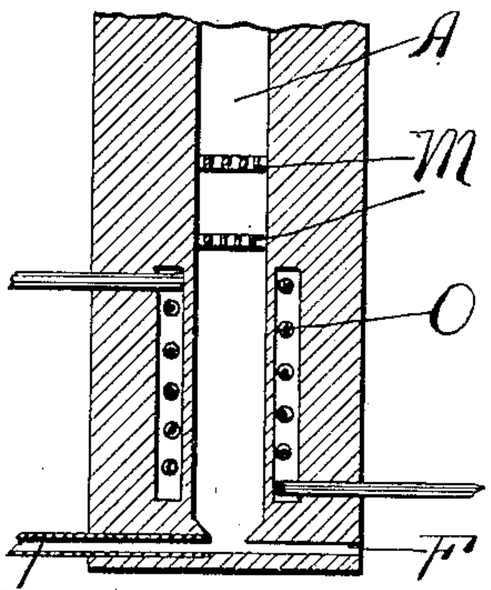


Fig. 4.



Witnesses
J. B. Keil
Ira H. Perry

Inventor
Reuben Doolittle,
By John D. Keil
Att'y.

UNITED STATES PATENT OFFICE.

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

MEANS FOR MANUFACTURING CARBIDS.

SPECIFICATION forming part of Letters Patent No. 656,600, dated August 21, 1900.

Original application filed October 16, 1896, Serial No. 609,116. Divided and this application filed October 20, 1899. Serial No. 734,228. (No model.)

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 and State of Illinois, have invented certain new and useful Means for 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 the line 2 2 of Fig. 1, and Figs. 3 and 4 are sections showing modifications of the lower part of the apparatus.

This is a divisional application, the subject-matter being taken from an application filed by me on October 16, 1896, bearing Serial No. 609,116, for improved process of and means for manufacturing carbids.

The apparatus here described and claimed is designed to carry out the process set forth in said application, permitting the continuous manufacture of carbids of a unifom quality.

To this end my invention consists in the novel means for carrying out said process.

It also consists in such novel construction and combination of parts as are shown and described and as are particularly pointed out in the claims.

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. As shown, the material falls by force of gravity, which is aided by a down draft 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. 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 carbid 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 any preferred form of carbon and a suitable base—for example, substantially one part of carbon or coke to two parts of lime or its equivalent—and after thoroughly 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 or shower. 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 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, which combine with the alkali, forming calcium cyanid, as is now well un-

derstood. 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 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 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 is 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 may then be 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, if desired, 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 reaction 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.

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

1. A smelting-furnace consisting of the following elements in combination, a structure inclosing a vertical shaft, electrodes arranged to form an electric furnace, means near the top of the shaft for feeding the material to be treated into the shaft in a freely-passing shower of fine particles substantially as described, means for directing a flame into the shaft above the electrodes through which the material passes, a draft-pipe below the electrodes for causing a downdraft and for drawing off the gases, and means for removing the smelted material, substantially as described.

2. A smelting-furnace, consisting of a vertical shaft provided with electrodes arranged to form an electric furnace between the top and bottom of the shaft, means for adjusting the electrodes and a draft-pipe below the electrodes in combination with means for feeding the material to be treated into the shaft above the electrodes in a continuous stream or shower of freely-passing fine particles, means for directing a flame into the shaft above the electrodes through which flame the material passes, and means for removing the smelted material, substantially as described.

3. A smelting-furnace consisting of the following elements in combination, a structure incasing a shaft provided with means for feeding the material to be treated into the shaft near its top at will in a shower of freely-passing fine particles, means near the top of the shaft for directing a flame into the shaft in the path of the falling material, electrodes arranged below the flame to form an electric furnace and a draft-pipe below the electrodes, substantially as described.

4. A smelting-furnace, consisting of the following elements in combination, a structure inclosing a shaft or chamber, means for feeding the material to be treated into the chamber near its top at will, electrodes arranged to form an electric furnace between the extremes of the chamber for subjecting the falling material to a high temperature, a draft-pipe below the electric furnace for drawing off the gases, a cooling-jacket inclosing the lower part of the chamber and a pipe adapted to direct a blast upon the material to further cool it and deliver it in a granular form.

5. A smelting-furnace, consisting of the following elements in combination, a vertical shaft provided with means for feeding the material to be treated into the shaft near its top at will, means near the top of the shaft for directing a flame into the shaft in the path of the falling material, electrodes arranged in a plurality of superimposed couples to form arcs of increasing temperature, a draft-pipe below the electrodes for drawing off the gases, and means for removing the smelted material.

6. A smelting-furnace, consisting of the following elements in combination, a vertical shaft provided with means for feeding the material to be treated into the shaft near its top at will, means near the top of the shaft

for directing a flame into the shaft in the path of the falling material, electrodes arranged to form an electric furnace below the flame, a draft-pipe below the electrodes for drawing off the gases, means for cooling the material in transit near the bottom of the shaft and means for directing a blast upon the material to further cool it and deliver it in granular form.

7. A smelting-furnace, consisting of the following elements in combination, a vertical shaft provided with means for feeding the material to be treated into the shaft near its top at will, means near the top of the shaft for directing a flame into the shaft in the path of the falling material, electrodes arranged to form an electric furnace below the flame, a draft-pipe below the electrodes for drawing off the gases, a cooling-jacket incasing the lower part of the chamber and a pipe adapted to direct a blast upon the material to further cool it and deliver it in a granular form.

8. A smelting-furnace, consisting of the following elements in combination, a vertical shaft provided with means for feeding the material to be treated into the shaft near its top at will, means near the top of the shaft for directing a flame into the shaft in the path of the falling material, electrodes arranged to form an electric furnace below the flame, a draft-pipe below the electrodes for drawing off the gases, means for dividing the falling material into small streams or parts, a cooling-jacket inclosing the lower part of the chamber, and a pipe adapted to direct a blast upon the material to further cool it and deliver it in granular form.

9. A smelting-furnace for the purpose set forth comprising the following elements in combination, a structure inclosing a shaft, a burner for directing a flame into said shaft, an electric furnace below said burner, and means for feeding the material in a freely-passing shower or stream through said flame and electric furnace, substantially as described.

10. A smelting-furnace for the purpose set forth, comprising the following elements in combination, a structure inclosing a vertical shaft, electrodes arranged to form an electric furnace between the top and bottom of said shaft, means for feeding the material in a freely-passing shower or stream through said electric furnace, and a draft-pipe below the electric furnace for causing a downdraft through the electric furnace, substantially as described.

REUBEN DOOLITTLE.

Witnesses:
LEONORA WISEMAN,
BESSIE SHADBOLT.