(No Model.) 4 Sheets—Sheet 1.

# M. GRIMM.

## PROCESS OF AND APPARATUS FOR BURNING ACETYLENE GAS.

No. 605,868. Patented June 21, 1898.

Fig. 1

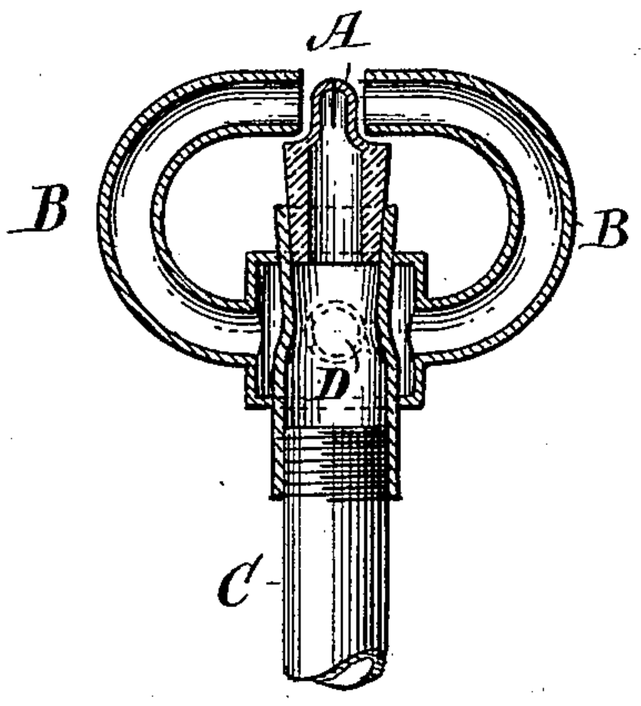



Fig. 3

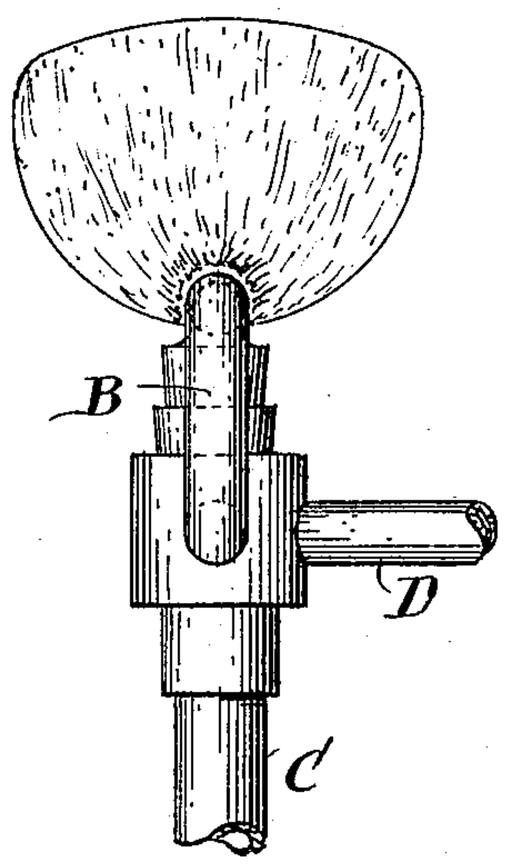
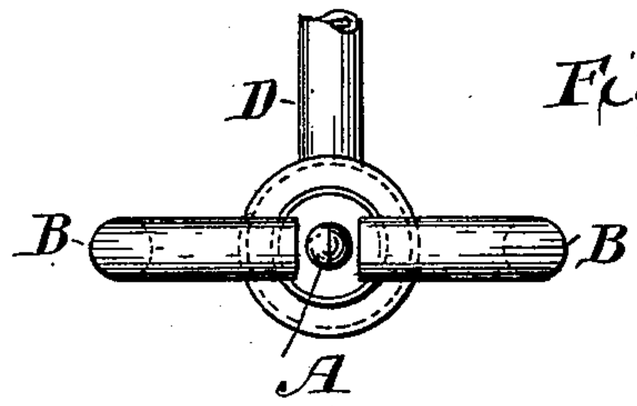



Fig. 2

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(No Model.) 4 Sheets—Sheet 2.

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## PROCESS OF AND APPARATUS FOR BURNING ACETYLENE GAS.

No. 605,868. Patented June 21, 1898.

Fig. 4

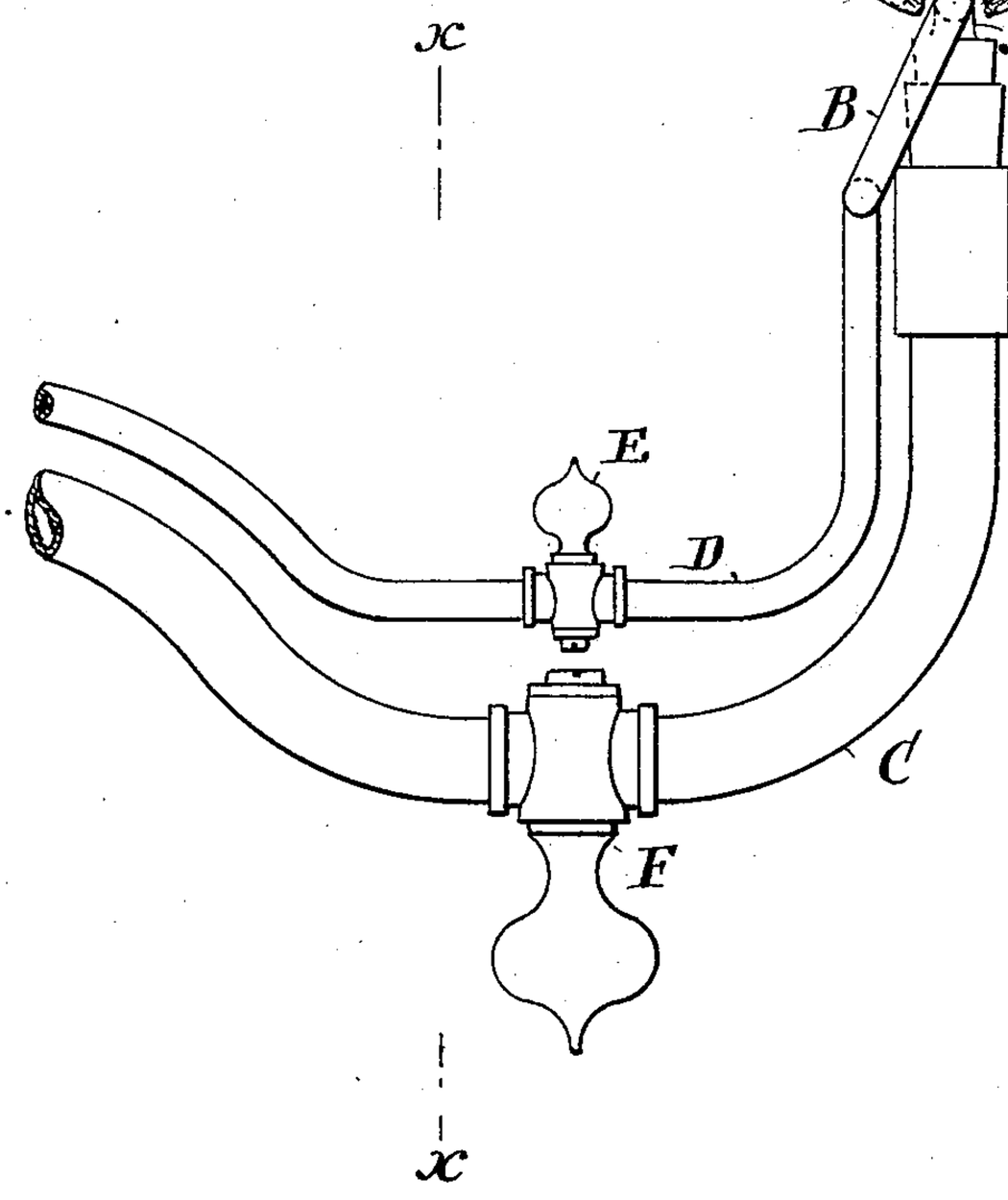
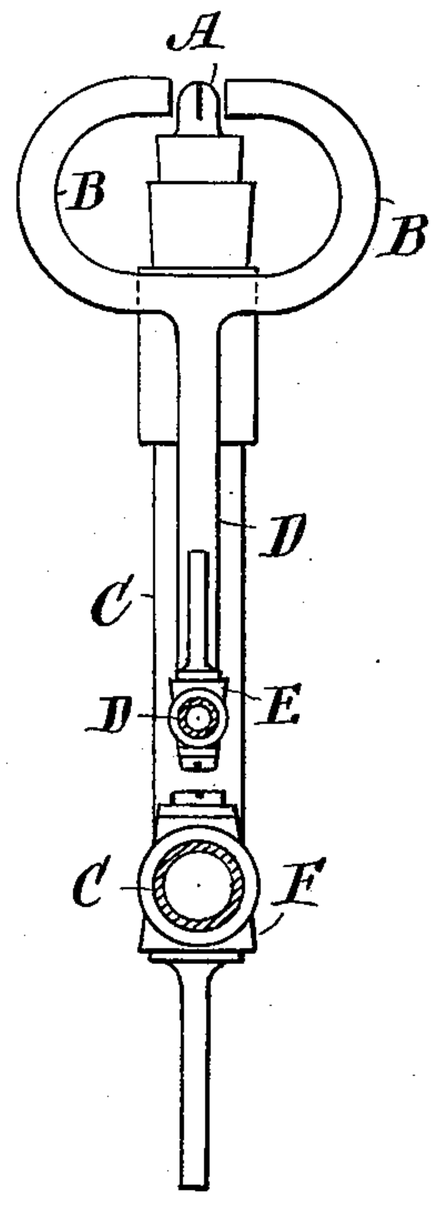



Fig. 5

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## PROCESS OF AND APPARATUS FOR BURNING ACETYLENE GAS.

No. 605,868. Patented June 21, 1898.

Fig. 6

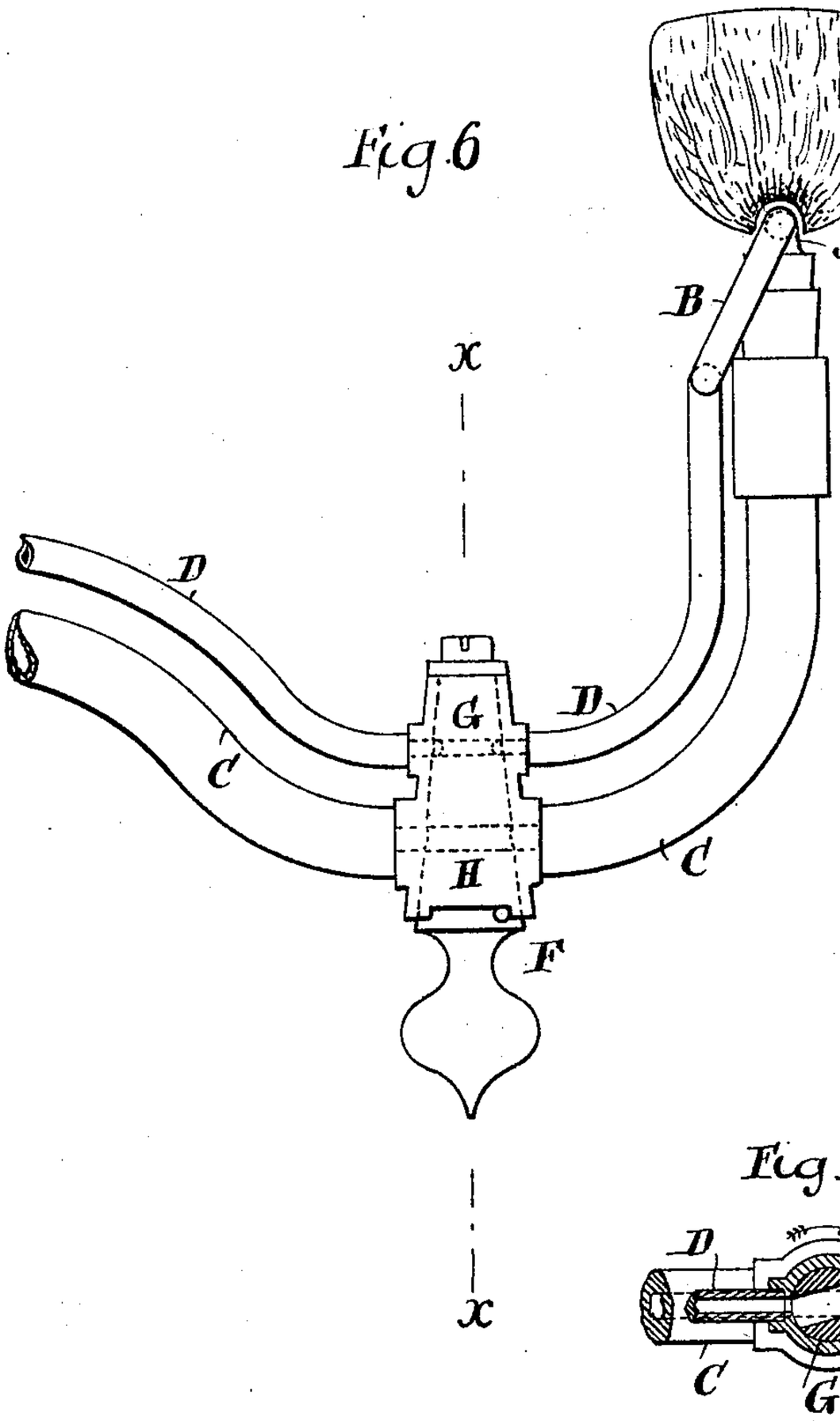


Fig. 7

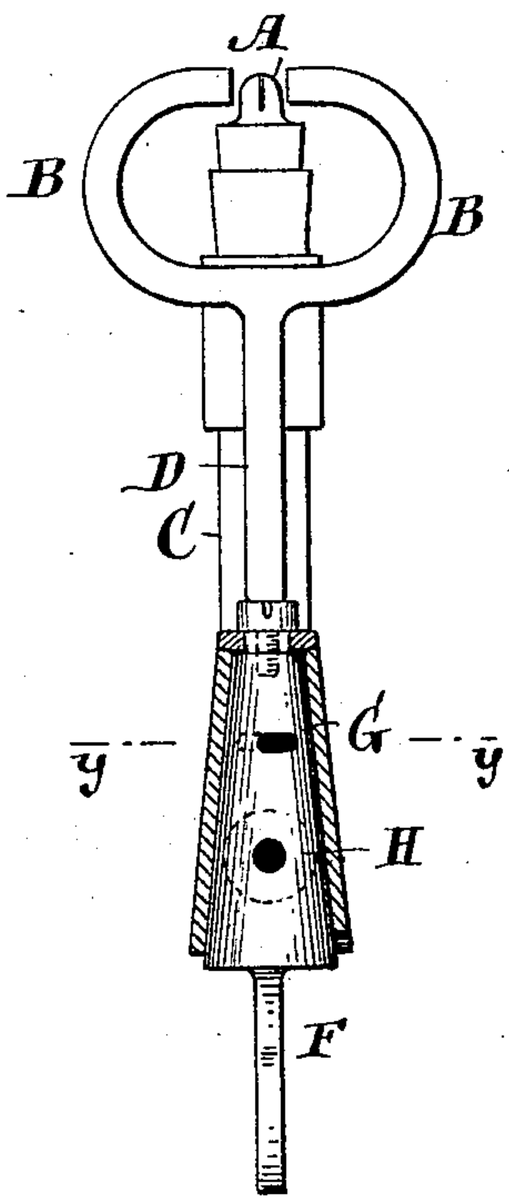


Fig. 9




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## PROCESS OF AND APPARATUS FOR BURNING ACETYLENE GAS.

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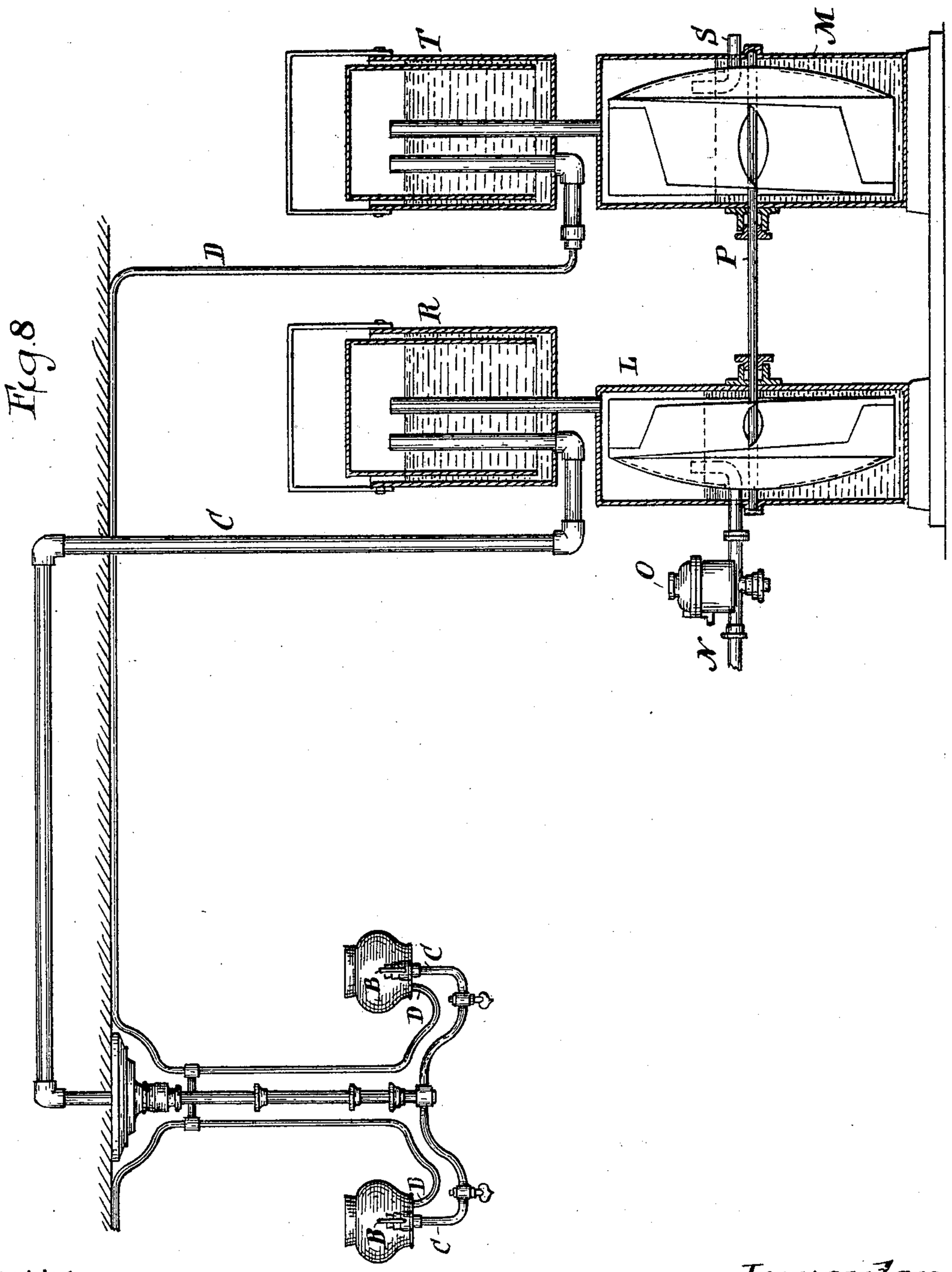
Fig. 8

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# UNITED STATES PATENT OFFICE.

MAXIMILIAN GRIMM, OF WEST HOBOKEN, NEW JERSEY, ASSIGNOR TO EDWARD N. DICKERSON AND JULIUS J. SUCKERT, OF NEW YORK, N. Y.

## PROCESS OF AND APPARATUS FOR BURNING ACETYLENE GAS.

SPECIFICATION forming part of Letters Patent No. 605,868, dated June 21, 1898.

Application filed January 15, 1897. Serial No. 619,357. (No model.)

*To all whom it may concern:*

Be it known that I, MAXIMILIAN GRIMM, of West Hoboken, Hudson county, State of New Jersey, have invented a new and useful Improvement in Processes of and Apparatus for Burning Acetylene Gas, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

A very curious and unexpected difficulty has arisen from the practical burning of acetylene gas, which is that after a period of use, when the acetylene is burned in an ordinary burner, a deposit is around the outlet and sometimes within it. This deposit, which is generally carbon, causes a gradual choking up of the burner and consequent smoking, since it requires a special relation of the aperture and pressure to burn acetylene pure in a smokeless flame. Many efforts have been made to avoid this deposit.

I have succeeded in producing a burner which is free from deposit no matter how long it may be burned, and, moreover, have avoided another difficulty which exists in the ordinary condition of burning acetylene—namely, that many of the burners, though burning acetylene without smoke at a full pressure, if the gas is half turned down smoke readily.

The principle of my invention is dependent upon the discovery that as acetylene gas is heated between the cold condition and the hot temperature at which it will burn without smoke it passes through an intermediate condition of temperature—say a low red heat—at which it will be decomposed into benzol, free carbon, and other products. If there is a solid body present at this point, the carbon will deposit upon it; but if the rapid change through this temperature occurs at a point where there is no solid body then the temperature of the acetylene rapidly advances to a point at which the carbon is thoroughly consumed without deposit. I do not state this theory as an absolute fact, but I believe it to be true, and it affords at least a reasonable explanation of the successful operation of my burner.

In the ordinary burner, of course, as soon as the gas leaves the tip it begins to burn, the flame itself joining immediately the lava of the tip. By my process I separate the point at which the temperature of the gas reaches the depositing temperature of the acetylene from the tip itself. In other words, I prevent the combustion reaching the kindling temperature of the gas in contact with the surface of the tip. I may do this in various ways; but in practice I have found the best way is to prevent the kindling temperature of the gas from coming in contact with the face of the burner by a lateral jet or jets of air at the surface or delivery-point of the burner. These jets of air, in the form of burner which I have shown in my drawings, prevent any apparent flame at the surface of the tip. This may be due to the fact that the sudden inrush of air forces the acetylene gas forward and upward so rapidly that the combustion does not reach back to the surface of the tip; but I believe it to be due to the fact that the considerable volume of cold air jetted in at that point prevents the gas from being heated to its kindling temperature until it passes beyond the direct line of the draft. In practice, therefore, I bring to each acetylene-burner a pair of air-jets which may, if desired, approximate in their delivery-points the contour of the gas-orifice, and which delivery-jets, being in the immediate neighborhood of the orifice and jetting against each other horizontally and at right angles, cut off the flame from contact with the surface.

My process can be carried out in many ways, of which the accompanying drawings show only some illustrations, and in which—

Figure 1 is a cross-section of a simple form of burner showing my invention, Fig. 2 being a plan view of the same; Fig. 3, a view at right angles to Fig. 1, showing the flame, Fig. 4 showing an arrangement of stop-cocks for controlling the air and gas; Fig. 5, a cross-section through Fig. 4 on the line *x x;* Fig. 6, another arrangement of a double stop-cock for accomplishing the same purpose; Fig. 7, a section through Fig. 6 on the line *x x;* Fig. 8, a view of my arrangement for producing the air-pressure by means of the flow of the gas, and Fig. 9 a horizontal section through the double stop-cock on the line *y y*.

In my drawings, A represents the burner-tip, which may be of any suitable variety capable of being affected by this process; but I prefer and use as my tip the ordinary slip-tip, as distinguished from the union-jet variety. A pair of air-jets B B deliver air-currents at about the surface of the burner and at an angle to the direction of the flame, as shown approximately at right angles, though I do not limit myself to this angle. The gas is supplied by the pipe C and the air by the pipe D. In the form shown in Figs. 1, 2, and 3 the air is supplied through a jacket surrounding the gas-pipe, to which jacket the air-pipes are fastened; but this of course is non-essential, the form shown in the other figures being equally operative.

There must of course be some relation between the pressure of the gas and the pressure of the air and its flame as delivered. Taking a burner of the type here shown, burning one cubic foot per hour at a pressure of one and seven-tenths inches, I have found that an air-pressure of two-tenths of an inch is sufficient to deliver about two cubic feet of air per hour. Under these circumstances the flame has the appearance as shown in Fig. 4, where it is cut off from the delivery of the burner. In Fig. 4 is shown a stop-cock E for the air and a separate cock F for the gas. In Fig. 6 the same cock F serves for both, but has a double port G H. The port H will gradually close, whereas the port G remains open until the port H is closed. This is due to the wide port G as compared with the outlet of the gas.

The gas and air passing through the pipes C D is delivered by the gas air-pump L M, which may be any apparatus in which the movement of the gas operates a pump to supply a separate quantity of air. The gas enters by the pipe N, where its pressure should be regulated by the governor O. Then, passing through the chamber L, it rotates the shaft P, which operates a pump M connected therewith. The escaping gas may pass through a regulator R, and thence to the pipe C, as described. Air is drawn into the pump M through the pipe S, and is thence delivered, preferably through the regulator T, by the pipe D to the burner. The regulators R T, insuring uniformity of pressure, have stops limiting their upward movement. The regulators O R T are plainly not essential; nor is it essential, according to my process, that the air-pressure be occasioned by the flow of the gas. It may be derived from any other source.

In turning down the gas it is advantageous to diminish the flow of the gas before the air-flow is appreciably diminished. In this way smoking is prevented. One arrangement of maintaining the full flow, or until the gas is cut off, is shown in the stop-cock exhibited in Figs. 6 and 9.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The process of burning acetylene gas, which consists in ejecting the same at suitable pressure through a burner, and in preventing the gas from reaching its kindling temperature at its point of escape to the atmosphere, substantially as described.

2. The process of burning acetylene gas, which consists in causing the gas to reach its kindling temperature only at a distance from the burner-surface and not in contact with the orifice where the escape occurs, substantially as described.

3. The process of burning acetylene gas, which consists in preventing the burning gas from reaching its kindling temperature in contact with the burner by cooling the gas by a jet of air under pressure and thereby preventing its reaching its kindling temperature until it has left the burner-surface, substantially as described.

4. The process of burning acetylene gas, which consists in cutting off the flame from the burner-surface by means of two opposed jets of air under pressure, approximately horizontally directed toward each other at about the point of delivery of the burner, substantially as described.

5. A burner for acetylene gas, which consists of a gas-jet and two separate air-jets having their delivery-points approximately at right angles to each other at about the surface of the burner, substantially as described.

6. The combination in a gas-burner of the jet A, the horizontally-delivering pipes B, B, the pipes D, C, and the single stop-cock for controlling both the air and gas pressure, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MAXIMILIAN GRIMM.

Witnesses:
H. COUTANT,
W. LAIRD GOLDSBOROUGH.