

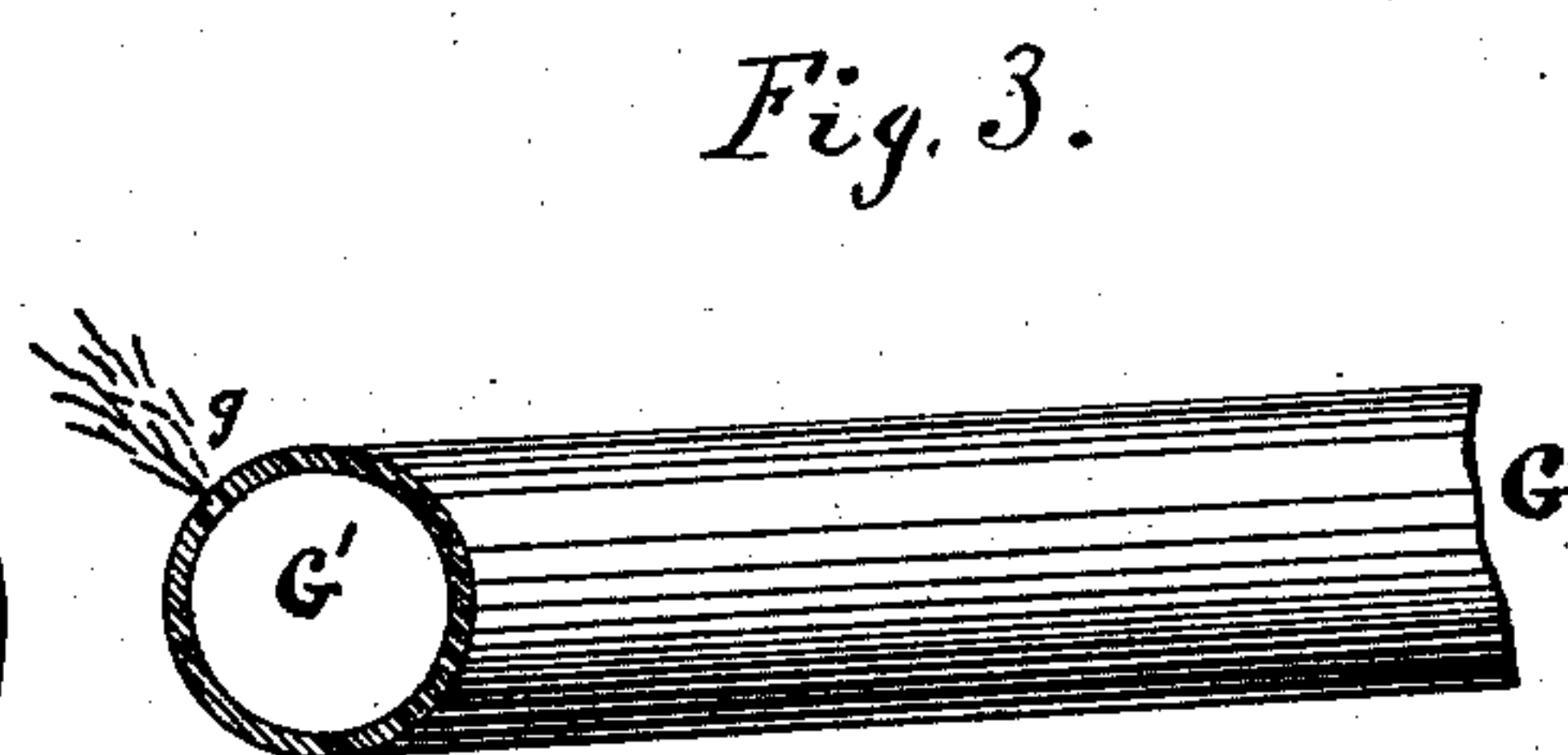
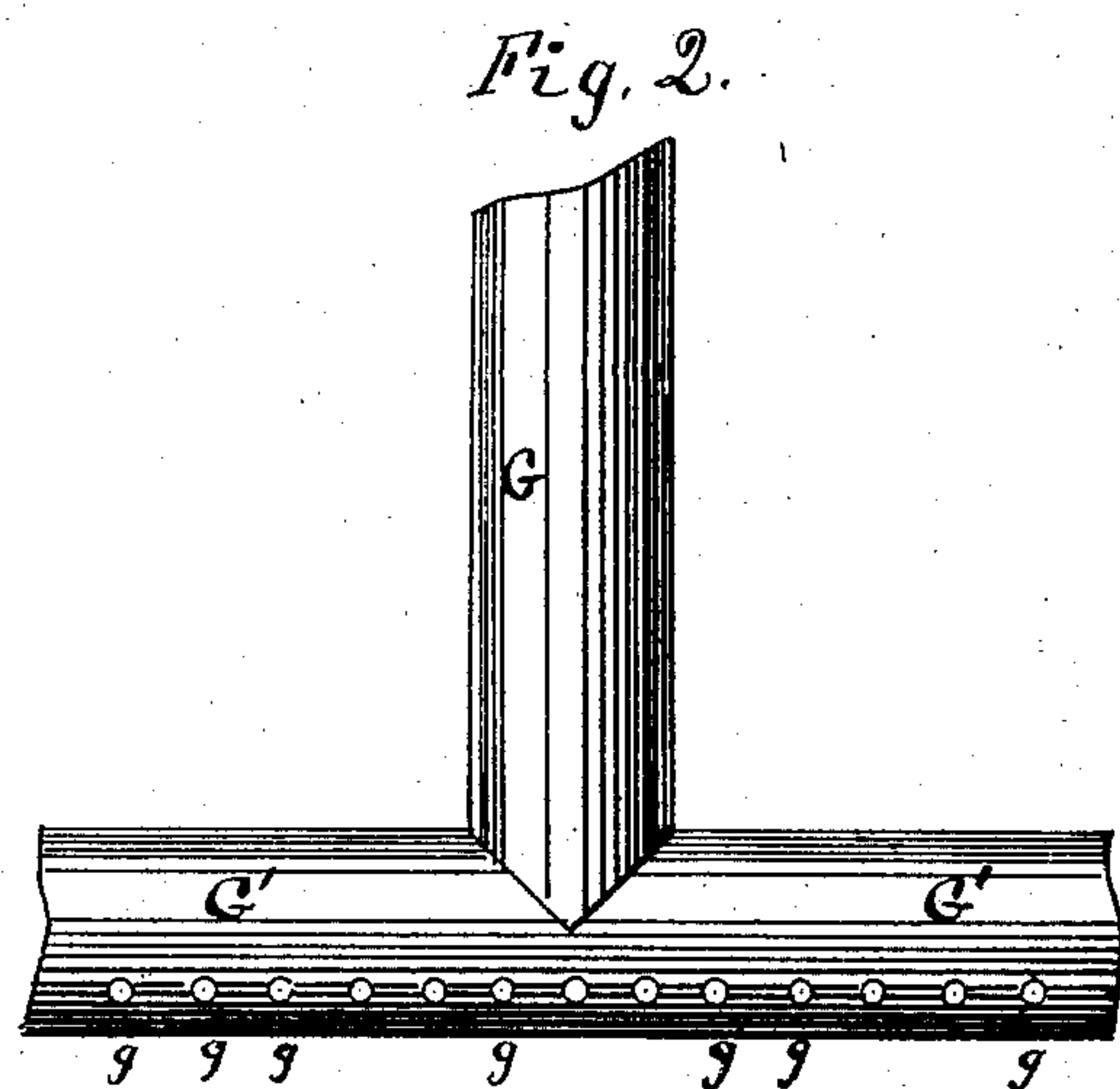
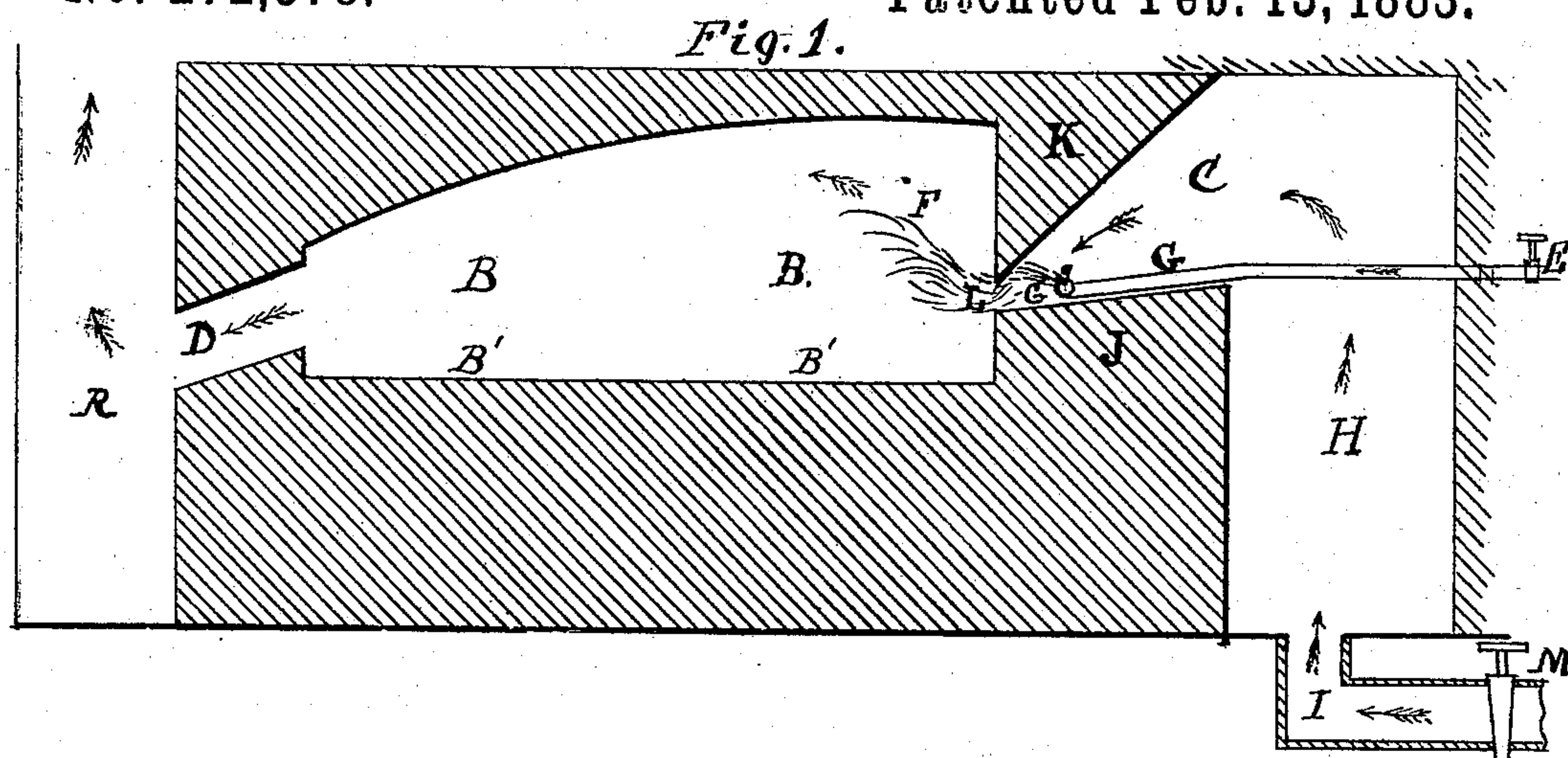
(No Model.)

C. J. EAMES.

PROCESS OF AND APPARATUS FOR BURNING WATER GAS IN FURNACES.

No. 272,378.

Patented Feb. 13, 1883.



WITNESSES:

H. J. Fert,
W. H. Sonneborn.

INVENTOR

Charles J. Eames
BY *John R. Bennett*

ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES J. EAMES, OF NEW YORK, N. Y.

PROCESS OF AND APPARATUS FOR BURNING WATER-GAS IN FURNACES.

SPECIFICATION forming part of Letters Patent No. 272,378, dated February 13, 1883.

Application filed July 26, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. EAMES, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful improvements in processes of and apparatus for burning water-gas in combination with air in furnaces for metallurgical purposes, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to apparatus for burning water-gas in combination with air in furnaces for metallurgical purposes, the combined gas and air being mixed in requisite proportions in a chamber before entering the furnace.

In the drawings, Figure 1 is a longitudinal section of a furnace, showing my improvement. Fig. 2 is a plan view of the gas-supply pipe and burners. Fig. 3 is an elevation of the gas-supply pipe and a section of the pipe, having the holes which are the burners, and showing the angle at which they are pierced, which latter feature forms an important part of my invention.

My invention consists in the construction of a combustion or mixing chamber on the bridge-wall of the furnace, wherein the water-gas is mixed with air in the proportion that develops its greatest intensity, and by aid of valves the combined flow of water-gas and air can at all times be controlled, and is caused to pass from the mixing-chamber into the hearth or body of the furnace; and also in constructing the flue-opening in such proportion that it shall be not more than about one-quarter of the size of inlet of opening on bridge-wall, where the gases enter the furnace; and also in projecting the water-gas against the roof of the mixing-chamber, so that the current of air will combine with the water-gas and pass into the body of the furnace before ignition takes place.

It is well known that water-gas, when used as fuel for domestic purposes, containing but a small percentage of carbon, can be burned without smoke or odor through an ordinary gas-jet or a perforated pipe, but cannot be burned in the Bunsen burner, as ordinary illuminating-gas is, owing to the rapid combus-

tion of the hydrogen contained in this gas. When this water-gas is used for metallurgical purposes, or under conditions where high temperature is important, the gas must be mixed with air at or near the point of combustion, so that as the combined air and gas is forced by the blast of air into the body of the furnace it ignites and develops great intensity of heat. The distance required for mixing water-gas and air is about six inches from the point at which the gas issues from the burner, the inside face of bridge-wall being about that distance from the burner. The requisite intensity of heat required in the furnace is controlled by varying the proportion of gas and air. It has been stated that the theoretical calorific equivalent of water-gas contains 8.798 heat-units; that one cubic foot at the temperature of 62° Fahrenheit requires for its perfect combustion about 2.47 cubic feet of air. This temperature is not reached in a furnace until the surrounding walls of the furnace become heated to a temperature that will melt wrought-iron. When this temperature is reached the air and gas mixture is distended by heat from radiation of the walls of the furnace, and a maximum of air can be combined.

To enable others skilled to make and use my invention, I will proceed to describe it, reference being had to the accompanying drawings.

Fig. 1 is a longitudinal section of a furnace, B, built of fire-brick, showing my combustion or mixing chamber C, built upon the bridge-wall J. This bridge-wall is raised about five inches from the hearth or sole of the furnace B' B', and extends back for eighteen inches, having an incline of two inches. Above this bridge-wall is an opening, L, two inches high, and extending across the entire bridge-wall J. Above this opening L is built the upper pendent wall, K, having its front face inclined at an angle, and formed of fire-tile, placed on the side walls of the furnace, its front face forming an angle of about forty-five degrees and extending back to the air-chamber H, about eighteen inches. This projecting wall is about twelve inches high and extends across the bridge-wall J. H is the air-chamber that receives the air from air-pipe I. M is the air-valve used to regulate the volume required to keep a continuous pressure in the air-chamber

C. E is the valve to regulate the flow of water-gas to pipe and burner G. This pipe lies on the bridge-wall J, and is connected with burner G. This burner is made of iron pipe about two inches in diameter, and is drilled with holes *g*, about three-eighths of an inch in diameter. The number of holes *g*, being equivalent to the diameter of the two-inch pipe G', are so placed that the water-gas, as it issues from the burner, will strike the upper portion of combustion-chamber K. The burner G' is placed on the bridge-wall J, about six inches from the opening L. The flue D is built about the center of the furnace B B, and is so proportioned in size that its opening will be as one to four of the opening on bridge-wall L—that is to say, when the opening on bridge-wall L has one hundred square inches the flue-opening D should have twenty-five square inches. The combustion-chamber can be made of any dimensions. R is the chimney or stack to carry off the products of combustion from the furnace, and can be made of any dimensions.

The manner of operating my combustion or mixing chamber when attached to a reverberatory or other furnace is as follows: The valve E, attached to pipe G, is partially turned on, so that the water-gas will issue in a small stream at holes or burners *g*, a lighted match applied, and the water-gas ignited. Then the valve is opened still wider, so that the flame will pass into the furnace. At this time the air-valve M is also opened partially, and both the gas and air valves are gradually opened until the air mixes with the gas and forces it into the body of the furnace. It will be found in practice that the entire flame will pass into the body or hearth of the furnace when it has become sufficiently heated, and there will be no flame in the mixing-chamber.

It is also important that the position of the burner on the bridge-wall should be six inches from the opening, as that is the precise point at which this water-gas will combine with air and develop its greatest heat in the body of the furnace. The temperature of the furnace is controlled by the water-gas valve and the air-valve by closing the same.

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

1. The method herein described of burning water-gas, in combination with air in furnaces, for metallurgical and other purposes, which consists in projecting the water-gas a distance of about six inches against the inclined wall of the mixing-chamber, and there mixing it with a blast of air, and forcing the mixture into the working-chamber, where ignition and complete combustion take place.

2. In metallurgic furnaces, an air-pipe, I, having a valve, M, and a water-gas pipe and perforated burner, G, and a valve, F, in combination with an air-chamber, H, a mixing-chamber, C, over the bridge-wall, having a reduced opening entering the furnace, and the pendent wall K, having an inclined face, as shown, and for the purpose herein set forth.

3. In a metallurgic furnace, an air-pipe, I, a water-gas pipe and perforated burner, G, arranged, as shown, over the bridge-wall and near the reduced opening of the mixing-chamber C, and constructed in about the proportions described, in combination with an air-chamber, H, mixing-chamber C, and furnace B, with flue-opening D, all constructed and arranged substantially as and for the purpose specified.

CHARLES J. EAMES.

Witnesses:

GEO. H. SONNEBORN,
D. S. GEER.