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T. M. MORGAN.

METHOD OF AND APPARATUS FOR BURNING CEMENT.

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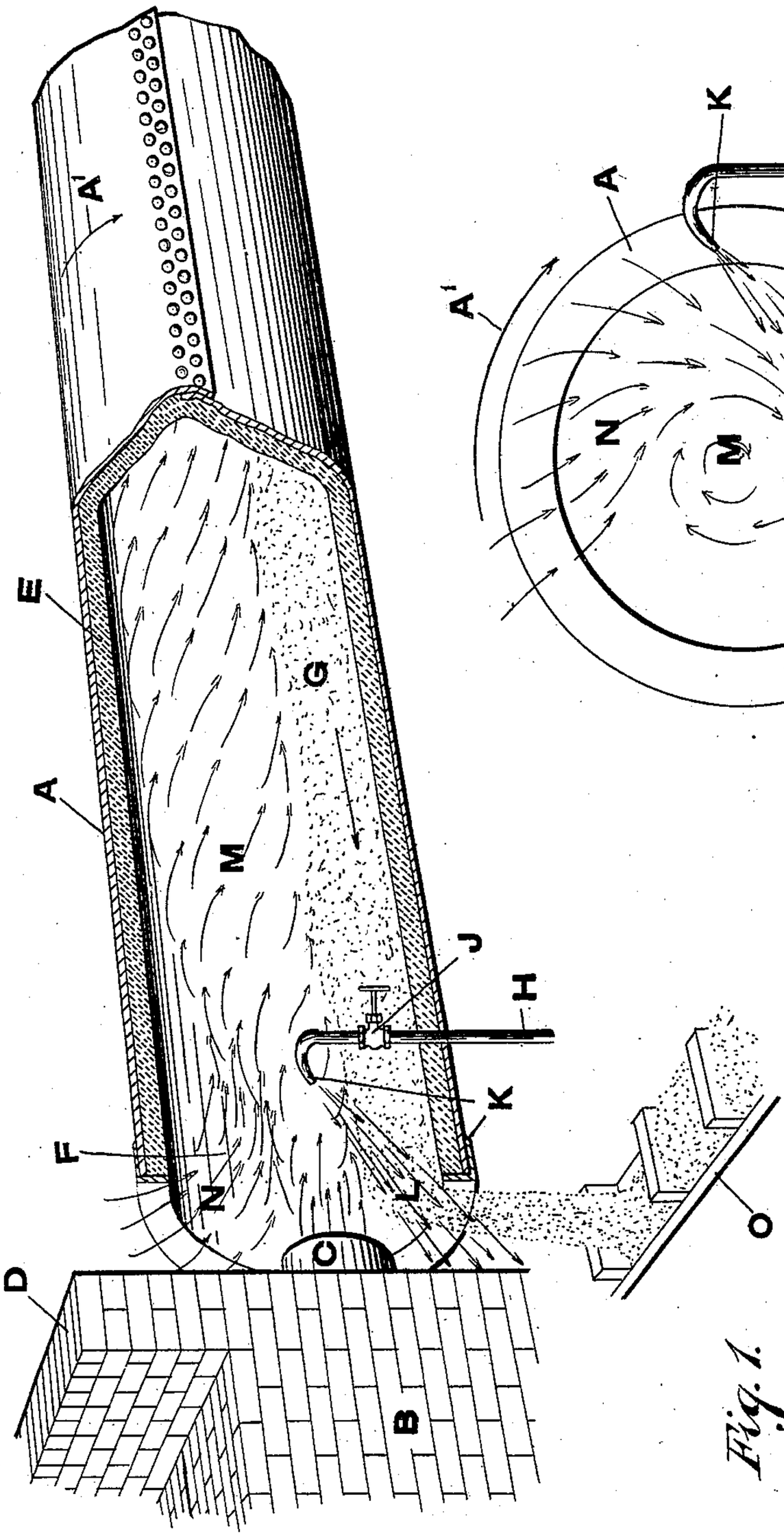

Fig. 1.

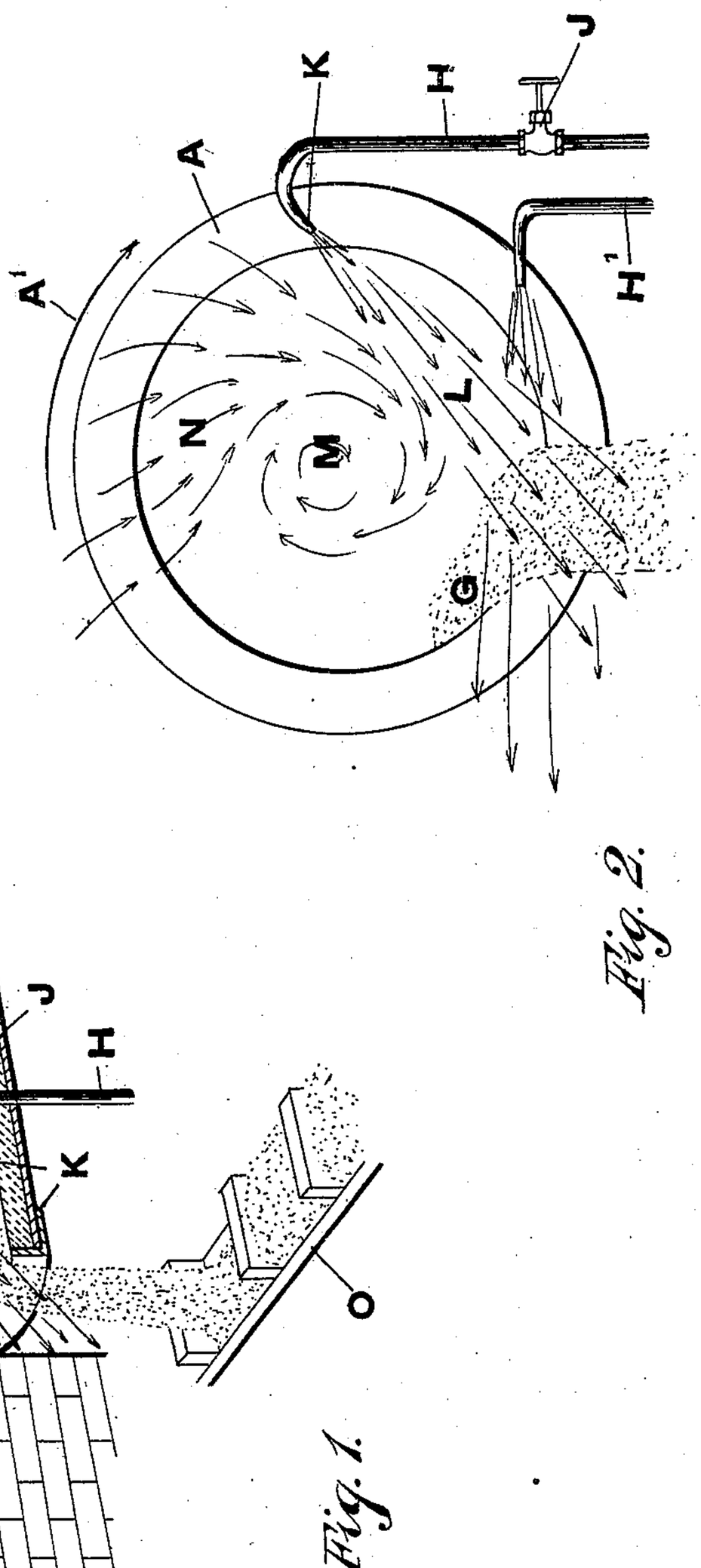

Fig. 2.

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UNITED STATES PATENT OFFICE.

THOMAS MATTHEW MORGAN, OF LONGUE POINTE, QUEBEC, CANADA.

METHOD OF AND APPARATUS FOR BURNING CEMENT.

No. 860,685. Specification of Letters Patent. Patented July 23, 1907.

Application filed February 7, 1906. Serial No. 299,856.

To all whom it may concern:

Be it known that I, THOMAS MATTHEW MORGAN, of the village of Longue Pointe, in the county of Hochelaga, Province of Quebec, and Dominion of Canada, have invented certain new and useful Improvements in Methods of and Apparatus for Burning Cement, of which the following is a full, clear, and exact description.

My invention relates to cement kilns and particularly to kilns of the rotary type.

In the process of making cement, the material is fed into one end of a long revolving cylinder which is slightly inclined so that the product will be gradually advanced to the opposite end of the cylinder.

The usual method of applying the heat necessary to burn the cement consists in injecting into one end of the kiln a blast of inflammable gas, or a stream of finely powdered coal, which is ignited at the mouth of the cylinder.

The object of my invention is to provide a means for conserving a large proportion of the heat that ordinarily escapes at both ends of the kiln.

In burning producer gas, for instance, the flame is directed into the mouth of the revolving cylinder and is carried directly through to the smoke stack, heating the upper portion of the cylinder to a greater intensity than the bottom portion, occupied by the cement. Moreover, at the entrance, a draft of cold air enters at the bottom and tends to drive the flame upwardly, and out from the top of the mouth of the kiln. It is found impracticable to cover either the bottom or top of the entrance, as the cement is being constantly discharged from the bottom, and the heat at the top soon burns away any covering material. My invention is designed to prevent the entrance of cold air from beneath the mouth of the cylinder, thus allowing hot air from above to be drawn into and mixed with the burning gas, and at the same time to give to the flame a swirling or revolving motion, thus bringing it into contact with the circumference of the cylinder and lengthening its path therethrough.

In the drawings which illustrate my invention: Figure 1 is a sectional perspective view showing the relative positions of the parts, and the swirling motion assumed by the flame in its passage through the cylinder. Fig. 2 is an end elevation of the cylinder, showing the direction of impact of the steam or compressed air.

Referring to the drawings, A designates a cylinder of the usual type revolving in the direction of the arrow A^1.

B denotes a hollow fire brick structure, adjacent to the mouth of the cylinder having a flue C adapted to discharge the inflammable material into the cylinder.

D is an extension wall above the structure B for protecting the operators from the intense heat.

E is a lining of fire clay, or other suitable material, inclosing the cylindrical space F.

G represents the cement which is fed into the inclined cylinder at the opposite end and which is gradually advanced by the revolving motion until it is discharged from the mouth.

H is a pipe, filled with steam or compressed air, and having a nozzle K so inclined to the mouth of the cylinder as to direct a jet of steam or air downwardly across the bottom of the mouth and at right angles to the intake of gas. A valve J is adapted to control the discharge from the pipe H.

O represents a conveyer adapted to carry the cement away from the cylinder.

The resultant action of the device is as follows:— The steam or compressed air, represented by the arrows L, being discharged across the mouth of the cylinder and at right angles to the intake of the gas, but to one side of the line of impact therewith, has the effect of disturbing the direct line of inflow and causes the ignited gas to assume a swirling or spirally revolving motion, as shown by the arrows M in Fig. 1. It will be obvious that the flame will thus come into closer contact with the cylinder walls and, as its path through the cylinder will be greatly lengthened, the efficiency of the kiln will be correspondingly increased. Moreover, the jet of compressed fluid being directed across the bottom of the entrance, will prevent cold air from underneath, being drawn in to drive the ignited gas upwardly and out from the top of the mouth of the cylinder. Instead, the draft of the chimney will draw in a quantity of heated air, which is always present above the entrance, to mix with the gas and thereby complete its combustion without unduly cooling the flame. The swirling moton of the burning gas brings the flame into intimate contact with a large volume of air, thoroughly mixing the air and gas and thereby rendering combustion more complete and effective.

The secondary pipe H^1, shown in Fig. 2, designates an auxiliary means for discharging a jet of steam across the bottom of the entrance at an angle to the line of impact from the steam jet H. This may be used to facilitate and quicken the revolving motion imparted to the ignited gas and to assist in accomplishing the various operations above described.

It is found by applying this method to the burning of cement, that greater quantities of the material can be fed through the cylinder in a given time and the speed of revolution increased. The method, moreover, is equally applicable to kilns using producer gas or finely powdered coal.

While I have shown the preferred form and described

the preferred method of applying my invention, I do not wish to limit myself to the precise process disclosed, but reserve the right to make all such modifications as fall within the spirit of my invention.

Having thus described my invention so that the same may be readily understood by those skilled in the art to which it appertains, what I claim and desire to secure by Letters Patent is,—

1. A method of burning cement which consists in injecting a quantity of inflammable gas into a revolving cylinder and imparting a swirling motion to said gas by means of a jet of air or steam discharged across the mouth of the cylinder.

2. A method of burning cement which consists in injecting inflammable material into a revolving cylinder, igniting said inflammable material at the mouth of the cylinder, and imparting to the flame of combustion a swirling motion by means of a pressure jet discharged across the mouth of said cylinder.

3. A method of burning cement which consists in injecting a stream of gas or finely powdered coal into a revolving kiln, igniting said stream at the mouth of the kiln, and imparting to the flame of combustion a swirling or revolving motion by discharging jets of compressed air or steam across the mouth of the cylinder at right angles to the inflow of gas.

4. A method of burning cement, which consists in injecting a stream of inflammable gas into a revolving cylinder, igniting said gas at the mouth of the cylinder, and discharging a jet of compressed air or steam downwardly across the mouth of said cylinder at right angles to the inflow of gas but out of the line of impact with said gas, to thereby prevent cold air from entering the cylinder from below and to impart a swirling motion to the flame of combustion.

5. A method of burning cement which consists in injecting a quantity of inflammable material into a revolving cylinder, and imparting a circumferentially revolving motion to said gas by means of a jet of air or steam discharged across the mouth of said cylinder.

6. A method of burning cement which consists in injecting a stream of inflammable material into a revolving cylinder, igniting said material at the mouth of the cylinder, and imparting to the flame of combustion a circumferentially revolving motion by means of a jet of air or steam discharged across the mouth of the cylinder at right angles to the inflow of gas but out of the line of impact with said gas.

7. In a cement kiln, a revolving cylinder, means for injecting inflammable material into one end of said cylinder, and means, independent of said injecting means, for imparting a revolving motion to the flame of combustion.

8. In a cement kiln, an inclined revolving cylinder, means for discharging a stream of inflammable gas into said cylinder, means for discharging a jet of steam or compressed air downwardly across the mouth of said cylinder to thereby prevent cold air entering from beneath the cylinder, and to impart a swirling motion to the inflammable gas.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

THOMAS MATTHEW MORGAN.

Witnesses:

C. W. TAYLOR,

STUART R. W. ALLEN.