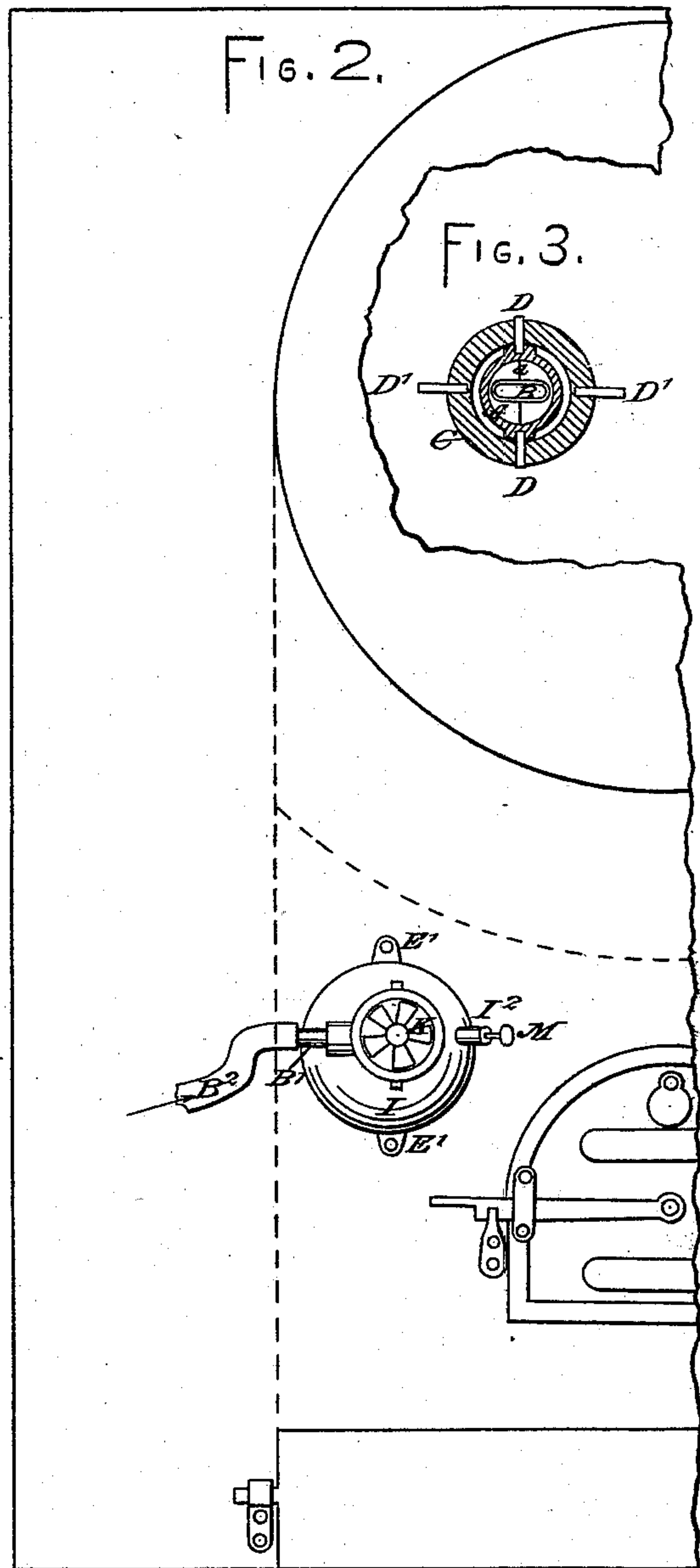
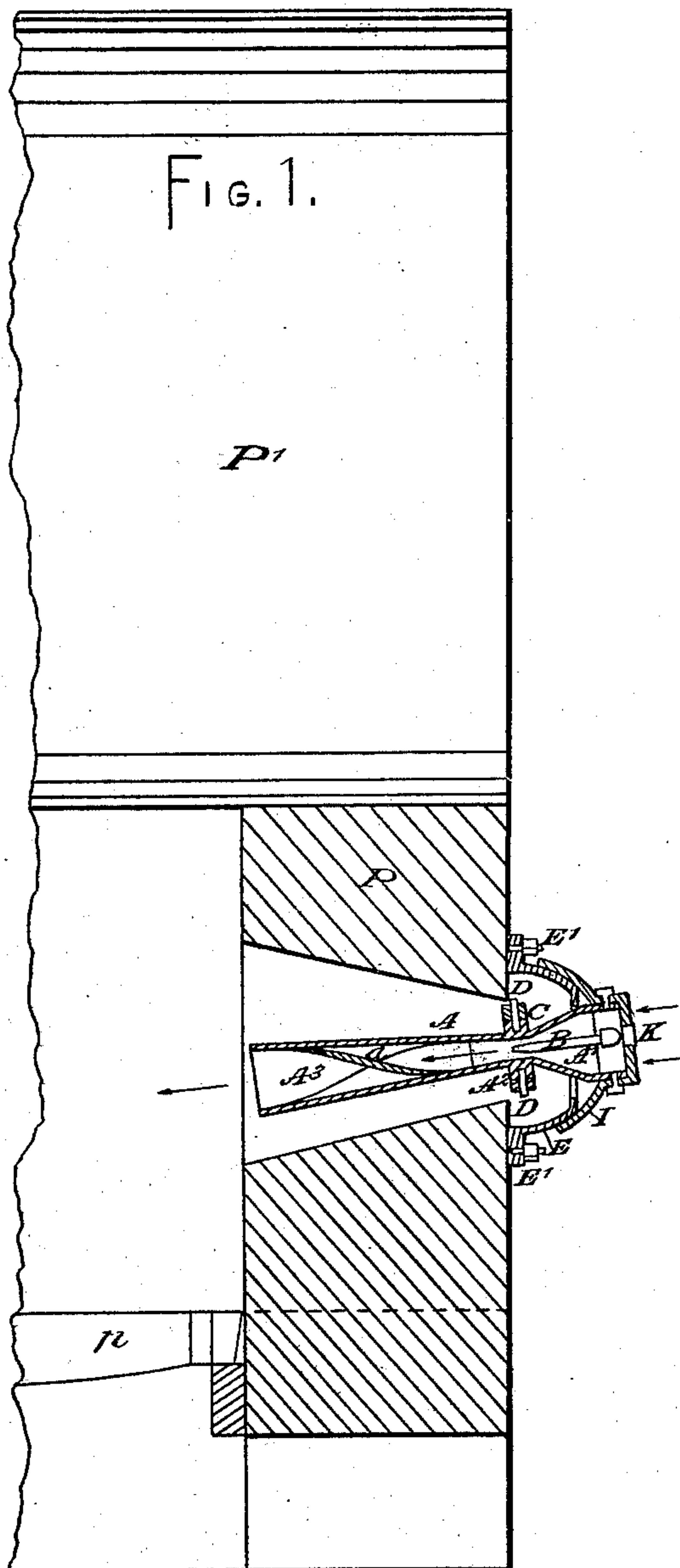


D. C. CREGIER.
Air-Nozzles for Steam-Boiler Furnaces.
No. 223,841. Patented Jan. 27, 1880.



— WITNESSES: —

Charles C. Stetson
E. B. Bolton

— INVENTOR: —

D. C. Cregier
by his attorney
Thomas D. Stetson

UNITED STATES PATENT OFFICE.

DEWITT C. CREGIER, OF CHICAGO, ILLINOIS.

AIR-NOZZLE FOR STEAM-BOILER FURNACES.

SPECIFICATION forming part of Letters Patent No. 223,841, dated January 27, 1880.

Application filed April 3, 1879.

To all whom it may concern:

Be it known that I, DEWITT C. CREGIER, of the city of Chicago, in the county of Cook and State of Illinois, have invented certain
5 new and useful Improvements in Air-Nozzles for Steam-Boiler Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof.

The improvement is adapted for promoting
10 the complete combustion of coal or analogous fuel, and for prevention of smoke. It may be useful in any situation, but is intended particularly for supplying air above the fuel in the furnaces of steam-boilers.

15 The effect realized from fuel is mainly due to the degree of perfection in which the combustion is effected. The gases rising from a bed of coals on the grate sometimes contain a large proportion of valuable fuel and require much
20 air to effect complete combustion.

A strong jet of air, such as I inject, is liable to exert an injurious effect upon the boiler if directed to a particular spot. Therefore I provide for shifting its direction at will within
25 wide limits. I also diffuse it by giving it a peculiar spiral motion. I also provide for controlling both the quantity of air and the power with which it is forced.

It frequently happens that the conditions re-
30 quire to be changed at short intervals. Ordinarily the conditions under which coals are consumed are constantly varying, with little or no facilities for meeting the demands due to such variation. There are radical differences
35 in the quality of the coal and a great range of practice as to the thickness of fire carried. A fire fed at intervals varies greatly in its character at different stages, from the moment of supplying new coals until the mass becomes
40 incandescent, and still later, from which and other reasons—the state of the atmosphere, &c.—the point above the bed of coal to which the air should be supplied is variable.

I provide one or more adjustable tubes peculiarly formed and equipped, which may be
45 located at any level in any of the sides of a furnace or bridge wall, and combine therewith means for introducing a strong current of atmospheric air. It has the effect of accelerating and perfecting the combustion of the fuel,

preventing the generation of smoke therefrom, and increasing draft.

The induced current of air can be directed with accuracy, precision, and convenience to any part of the furnace, and the direction, volume, and force of the air-blast can promptly,
55 and without interrupting its constant operation, be adjusted to meet the variable conditions that may from time to time arise in practice.

To enable others skilled in the art to make, apply, and use the same, I will proceed to describe its construction and operation, reference being had to the accompanying drawings, and letters of reference marked thereon,
60 which form a part of this specification.

Figure 1 is a longitudinal vertical section; and Fig. 2 is a front view, showing my improvement attached to the furnace of a steam-boiler. Fig. 3 is a detail section on a larger
70 scale. It is a section across the air-pipe and its connections near the end of the inclosed steam-jet pipe.

Similar letters of reference indicate like parts in all the figures.

P is the wall of a boiler-furnace, *p* the grate, and P' the boiler. A is a peculiarly-formed tube or nozzle, of cast-iron or other suitable material, mounted in a flaring hole in the wall of a furnace, or at the bridge, adapted to con-
80 duct and deliver a current or volume of atmospheric air forced and induced therein by a jet of steam or other motor. The receiving end of said tube is enlarged, as shown at A'. From thence it gradually tapers to a contracted
85 parallel diameter, A², which extends a little distance beyond the end of steam-jet pipe B, and connects to the tapering delivering end or long arm A³ of said tube, as shown. I
90 provide a spiral feather or guide, *a*, in the interior of said long arm A³, of any desired pitch, extending throughout its length. Said spiral or guide may be cast in as part of tube, or it may be attached separately. In either case
95 said feather or guide, in order to conform to the interior of tube, must be of corresponding differential diameter.

The object is to impart to the air, &c., in its passage a like spiral motion, and upon its release at the end the air will act over a
100

greater space with a given bulk than can be done through the aid of a non-spiral tube, and thereby more thoroughly envelop and inter-mix with the gases generated from the fuel, because the spiral motion given to the ingoing air is adapted to stir and break up the rising gases from the coal.

The tube A and its attachments are held at the point of oscillation by two trunnions, (not shown,) which are held in a gimbal-ring, C, by the guide-pins D. Ring C is suspended upon fixed bearings by its journal-pins D'. The combination of the vertical and transverse bearings here described, similar to the gimbal of a mariner's compass, affords practical facilities for the movements of the tube A. This, with the parts E and I, forms a ball-and-socket joint. I is the socket, which is secured to the receiving end A' of the tube. E is the hollow hemispherical casting or ball, which is secured to the walls of a boiler-furnace by lugs E'. Said socket I is formed so as to move independently of but in close contact with the surface of ball E, and the movement will always be coincident with the radius produced by the traverse of the end of the tube A, described from the center of trunnions (not shown) and ring C.

To admit of proper operation of this combination of parts when in place, the opening in the wall through which said tube is to operate must be considerably larger at the delivery end than the tube, so that the said end may be pointed in any desired direction.

When the apparatus is in place the hole cut for the admission of the tube is covered by the ball E, which also carries and sustains all the parts. All the air entering must pass through the tube A, the admission of said air being controlled by register-valve K.

Steam-pipe B' is inserted near the end of tube A', and connects with jet-pipe B. To the pipe B', I connect a section of flexible steam-tubing, B², so as to allow the ball-and-socket joints E and I to act freely in any direction.

In Fig. 2, M is a set-screw in boss I² for the purpose of being set firmly on the surface of the ball E, and thereby to hold the tube A secure in any position.

Operation: The device being placed and steam conducted from a boiler by a pipe and connected to flexible tube B², steam is turned on by a governing-valve conveniently located. The inlet-valve or register K is opened, and the atmosphere is forced into the furnace through tube A *via* the enlarged receiving end containing the spiral guide or feather *a*. The bed of coal is, say, six to eight inches thick. The person in charge may then direct the tubes so that the induced current of air will be forced among the gases—say several inches above the fire—or he may direct the tube so that the air will impinge directly against the burning fuel or to the fire end over the bridge.

He can, if several tubes, A, are used, point

them so as to make a junction of the currents of air from two or more tubes at any point in a furnace. By straightening the tubes the junction can be removed to a greater distance or avoided entirely. This operation can be carried on without shutting off the steam-jet or interrupting the functions of the device. By such action the point of greatest combustion will be discovered and the smoke prevented. Of course a change of conditions—such as new quality of coal, heavy or light firing, change in density or temperature of atmosphere, &c.—may require more or less change in the volume and direction of ingoing current of air. The quantity of air admitted is controlled by the admission of more or less steam, governed by a steam-valve, (not represented,) and also by opening or closing the register-valve K on the end of the inlet-tube.

When several tubes are in use they may be manipulated and controlled separately or together by suitable arrangements for the purpose.

Modifications may be made. These adjustable and spiral or rifled tubes may be made parallel. They may be made curved and may be varied in length and diameter. The spiral feather may be made of any pitch, and the arrangement for rendering the tube adjustable may be made to traverse more or less of a complete circle than is shown.

I am aware that the steam-jet in many forms attached to various parts of a furnace has long been recognized as an important auxiliary to augment combustion; but, so far as I am aware, said jets of steam and other means of promoting combustion in a fire have always been used through fixed and unadjustable tubes or openings, whether said tubes are attached to the front, at the sides, or at the bridge of a furnace, or on the top or under the grates; but wherever located, and however serviceable for the object intended, under certain favorable conditions, whenever said conditions, change the fixed and unadjustable character of the tubes or openings renders the action of the steam-jet and the injection of air defective.

I do not confine myself to any particular number of tubes to effect this object, nor to any particular point in a furnace or its surroundings.

Air or other gaseous fluid may be driven by any suitable means through the pipe in place of steam.

I claim and desire to secure by Letters Patent—

1. The adjustable air-tube A' A² A³, adjustable on a fixed center nearly coincident with the nozzle of the steam-pipe B, in combination with such pipe, flexible tube B², and with a furnace, as herein specified.

2. The hemispherical case or hollow ball E and corresponding concave or socket-piece I, in combination with each other, and with a

directing-pipe for air, made adjustable about a center, A^2 , coincident with the centers of the parts E and I, and adapted to serve with a furnace and steam-jet, as herein specified.

5 3. The regulator or register K, in combination with the adjustable pipe $A' A^2 A^3$, spiral feather a , steam-pipe B, cases E I, holding means M, and universal joint C D, as herein specified.

In testimony whereof I have hereunto set to my hand this 25th day of March, 1879, in the presence of two subscribing witnesses.

DEWITT C. CREGIER.

Witnesses:

WM. HORNER,

SYLVANUS W. FULLER.