(No Model.) 2 Sheets—Sheet 1.

L. DENAYROUZE.

GAS BURNER.

No. 555,307. Patented Feb. 25, 1896.

Fig 1

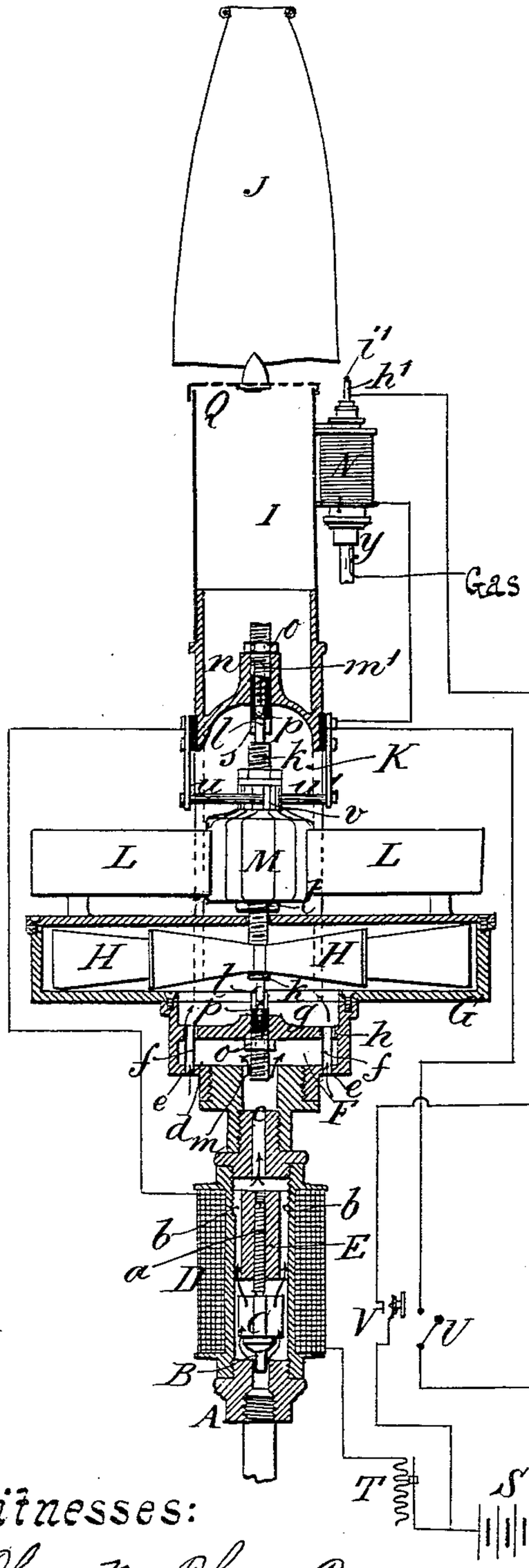
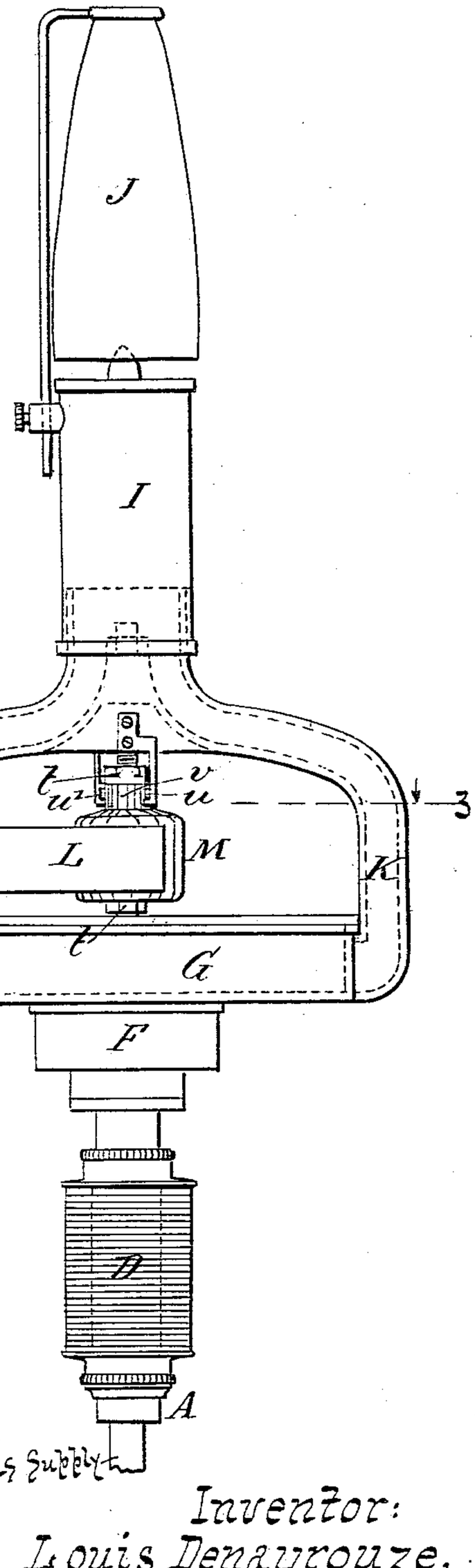


Fig. 2



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

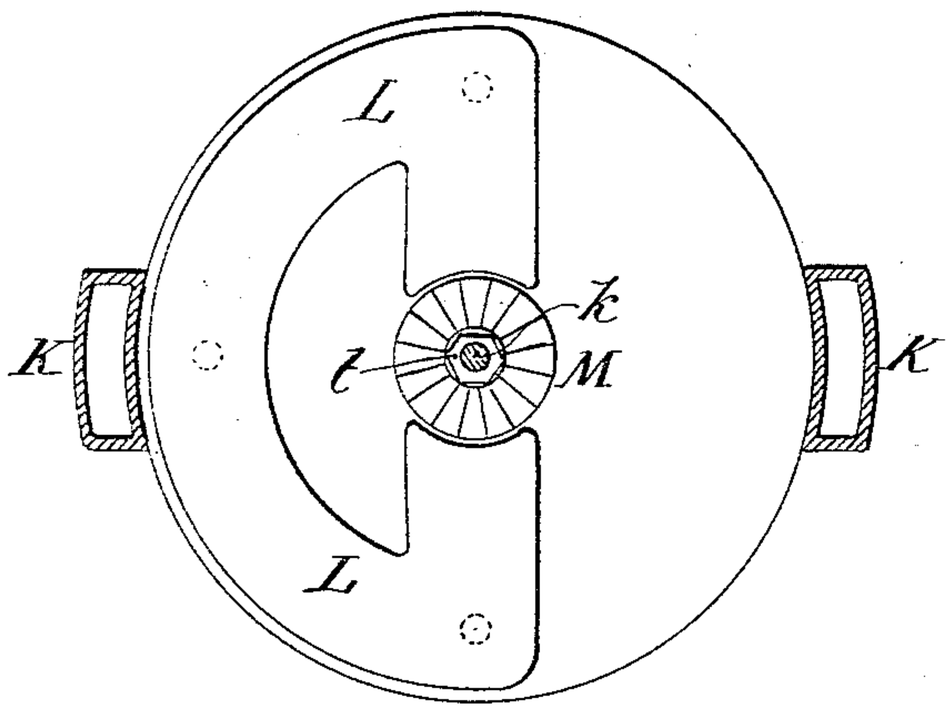


Fig. 4

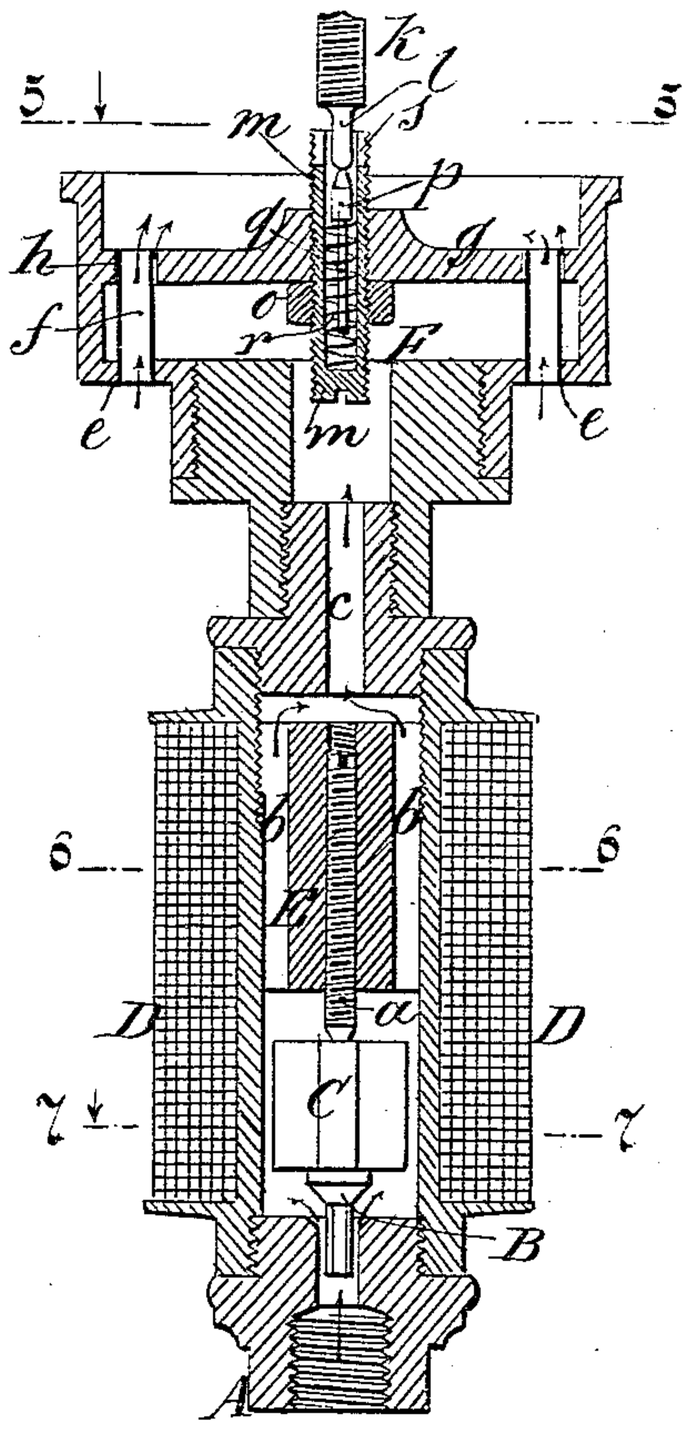


Fig. 8

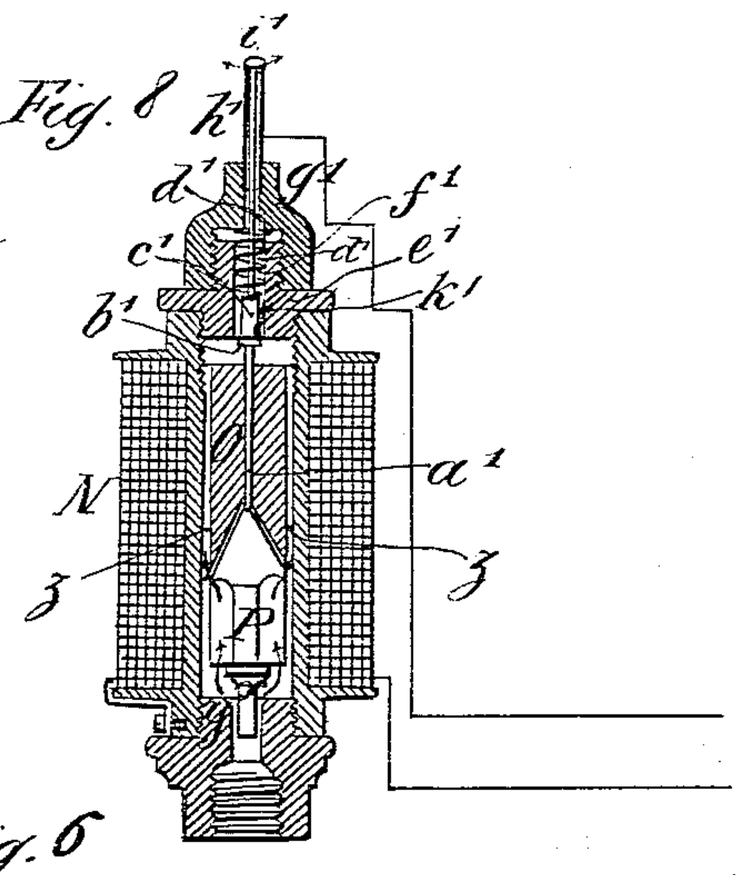


Fig. 6

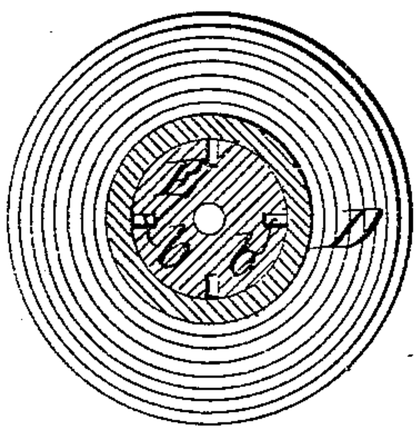


Fig. 7

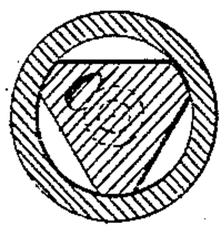
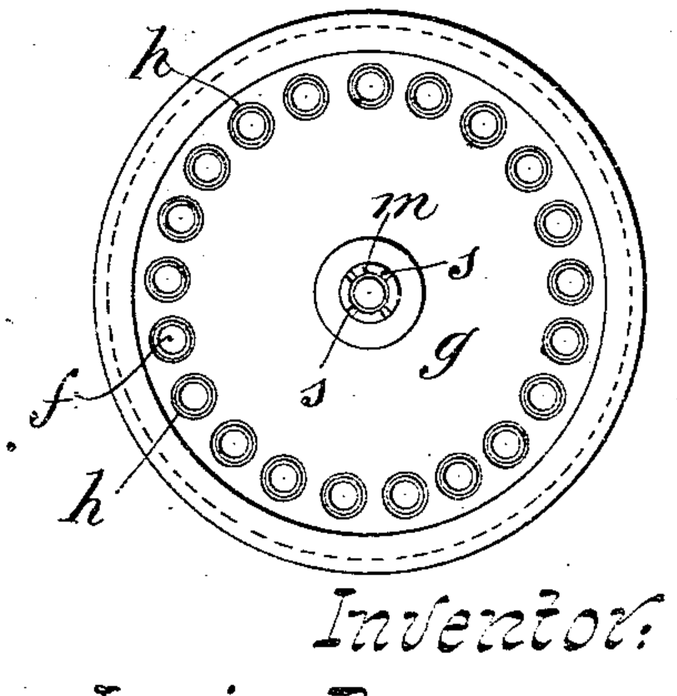


Fig. 5



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UNITED STATES PATENT OFFICE.

LOUIS DENAYROUZE, OF PARIS, FRANCE.

GAS-BURNER.

SPECIFICATION forming part of Letters Patent No. 555,307, dated February 25, 1896.

Application filed April 12, 1895. Serial No. 545,474. (No model.)

To all whom it may concern:

Be it known that I, LOUIS DENAYROUZE, engineer, a citizen of the Republic of France, residing at Paris, France, have invented certain new and useful Improvements in Gas-Burners, of which the following is a specification.

The numerous experiments I have lately made with gas-lighting by incandescence have revealed to me the conditions for obtaining the greatest quantity of light with the smallest quantity of gas and of energy for mixing air with the gas. Among the various conditions for assuring intense and economical illumination by gas, the most important one, in my opinion, is the most perfect mixture of gas and air before reaching the burner, the mixture reaching the burner at a very low pressure, which latter point is characteristic of my researches. In fact, contrary to assuming the burners as large discharge-blowpipes under air and gas pressure, I have obtained the luminous effect by reducing the pressure of the gas at the natural outlet of the conduit. I have added the effect of the expansion of the gas to a limited degree to the effect of a dissemination of the particles of the gas through the mass of air necessary for a good mixture. This dissemination is produced by the agitation of light paddles turning with great speed in the fluid, and it requires very little power to produce it. The means which may be employed to produce this intimate mixture of gas and air may be varied. Evidently any motive power may be utilized—electricity or mechanical action derived from compressed air or vacuum, water and steam, the pressure of the compressed gas itself, the draft of the ascending gas from the burner, or power transmitted in any way.

In attempting to put up my lighting apparatuses under the most favorable conditions for operating apparatus for effecting the intimate mixture of air and gas I have become convinced that a great variety of motive forces may be employed for the purpose.

My system of lighting as actually set up comprises a mixer, by preference rotary, which at the center receives the gas from the gas-conduit and also external air, and discharges at its periphery a mixture of gas and air under a pressure for feeding the burner. Motion is imparted to this mixer by a small electric motor mounted on its shaft.

The admission of the gas to the burner is automatically effected at a distance by passing an electric current into the circuit which supplies the apparatus, and an automatic lighter with which the burner is provided can likewise be operated from a distance, as soon as the motor has commenced to turn for making the mixture. Such is the principle of my burner, which I shall describe.

Referring to the drawings, Figure 1 is a vertical section; Fig. 2, a face view; Fig. 3, a horizontal section in the plane 3 3, Fig. 2. Figs. 4 to 7 show on an enlarged scale the details of the devices for the admission of gas and air. Fig. 8 is a vertical section of the gas-lighter.

The admission of gas from the street is effected through the pipe A provided with a valve B. This valve is fixed on the lower side of an iron block C forming the armature of an electromagnet D, the core E of which is provided in the line of its axis with a screw *a* to serve as a stop for the block when it is drawn up, and consequently limits its course—that is, the throw of the valve.

When the valve B is raised the gas enters the apparatus, passes up through the three openings around the block C, (see horizontal section of the same, Fig. 7,) then passes through the four recesses *b* in the core of the electromagnet, Fig. 6, and thence through the channel *c* into the box F. (Shown in vertical section in Figs. 2 and 4 and in horizontal section in Fig. 5.) This box F, to the lower side of which is screwed the apparatus for admitting gas, is composed of a cup, the bottom of which has a suitable number of circular perforations *e* for receiving the tubes *f*, which communicate with the outside. These tubes extend upward to the upper face of a false bottom *g* across the holes *h* in the same. These holes are of a diameter slightly larger than the outside diameter of the small tubes *f*, so as to leave an annular space around each of the latter. The gas entering the chamber of the fan through the annular spaces draws in the air through the tubes *f* and carries it to the mixer. The shell of the mixer with the blade

H is fixed upon the box F and has two conduits K, which take the mixture of air and gas to the pipe I supporting the mantle J. At its upper end the tube I is provided with a metallic gauze for diffusing the mixture.

The mixer is supported in the following manner: Its shaft *k* has at each end a pivot *l* penetrating several millimeters into a cavity in the screw-bolts *m m'*, the first of which passes through the false bottom of the box F and the second through a box *n* formed at the junction of the two branches of the conduit K. Each one of the screws *m m'* is longitudinally adjustable for regulating the position of the shaft of the mixer. They are held in the proper position by the lock-nuts *o*.

The pivots *l* are rounded at their ends and bear respectively against the two blocks *p* provided with a shank *q* surrounded by a spring *r* placed into the cavity of the corresponding screw, so as to impart very great elasticity to the suspension of the whole of the mixer and of the motor which operates it. To give at the same time a certain flexibility to the system, each hollow screw *m* or *m'* is split at *s* at its end, as shown in Figs. 4 and 5.

The motor which I use in connection with this arrangement comprises a magnet L fixed upon the top of the shell G of the mixer, between the poles of which turns a small armature M fixed on the threaded shaft of the mixer by means of two nuts *t*. Two conveniently-insulated brushes *u u* supply the current to the commutators *v* of the armature.

It is evident that when an electric current is put through the windings of the lower electromagnet D the core E attracts its armature C, which raises the valve B and admits the gas from the street through the passages *b* and the channel *c* to the box F. It passes to the upper compartment of the latter in communication with the mixer in passing through the narrow annular spaces formed by the holes *h* and the tubes *f*, which latter communicate with the exterior and supply the air required.

The electric motor being properly connected to the electromagnet D and to the source of electricity is set in motion and stirs the mixture of air and gas which then passes to the burner.

The lighting of the above-described apparatus is likewise effected by electricity by means of the following auxiliary devices: A small electromagnet N (seen partly in section on an enlarged scale, Fig. 8) is fixed upon the tube I which carries the mantle J. This electromagnet, of a construction analogous to that of D, has on the inside a core O, which, when the current passes through, attracts an armature-block P which carries the small valve *x*, the seat *y* of which is attached beneath the electromagnet. Along the axis of the core, which has the notches *z* for the passage of the gas when the valve is raised, moves with slight friction a rod *a'* carrying a rounded head *b'*. A small piston *c'* is placed above the rounded head *b'* in a channel *d'* of the piece *e'*, and is constantly pressed down by the spring *f'* wound around its rod and freely passing through an insulating-piece *g'* screwed upon the nipple *e'*. The insulating-piece *g'* finally carries a small copper tube *h'*, the upper part of which is of platinum, and upon which normally rests the rounded platinum head *i'* forming the end of the piston *c'*. The wire leaving the winding of the electromagnet N is connected to its metallic frame and consequently to the piston *c'*, which has a small flat spring *k'* rubbing against the inside of the nipple *d'* screwed upon the frame. On the other hand the insulated tube *h'* is connected to the other pole of the source of electricity. If then a current is passed through the winding N, its core O raises the valve *x*. The block-armature P at the same time strikes forcibly the lower end of the rod *a'*, the head *b'* of which throws up the piston *c'*, thereby separating the upper part of the tube *h'* from the rounded head *i'* of the shank of the piston *c'*. A spark is thus formed at the top of the tube, which lights the gas passing the valve *x* and lights the mixture of air and gas at the end of the tube I.

To cause, at the proper time, the admission of gas, the starting of the mixer and the lighting of the burner, I arrange the electric connections of the apparatus in the following manner, Fig. 1: One of the poles of the source of electricity S is connected with the interposition of a rheostat T to the wire *p*, passing to the winding of the lower electromagnet D. The wire leading from the latter is connected to one of the brushes *u* of the electric motor. The second brush is connected to the second pole of the source of electricity S with the interposition of a switch U. Another wire passes from the brush *u'* to the electromagnet N and the current passes to the shank of piston *c'* through the interposed frame of this electromagnet and then to the rounded head *i'* and returns through the tube *h'* and by a return-wire to the proper pole of the source S. A circuit-key V is interposed in this return-wire.

For lighting the burner the circuit is first closed by turning the switch U. The current then passes through the rheostat T to the electromagnet D, thence to the brush *u* of the electric motor, passing out through brush *u'* and returning to the opposite pole of the source S. By this the valve B is raised and admits the gas to the mixer while the latter is set in motion and mixes the gas with air which is supplied through the tubes *f*. The mixture then passes to the burner. A moment later the circuit-key V is depressed, which then permits the current to pass to the lighter, whose valve *x* is raised to admit gas into the tube *h'*. At the same time the head *i'* is rapidly separated from the upper part of the tube *h'* which forms its seat and a spark is generated by the side current, which lights

the gas issuing from *h'* and which lights the mixture discharged from the central tube I beneath the mantle.

What I claim as new is—

1. The combination with a gas-burner, of a valved gas-supply pipe, an enlarged mixer placed between the supply-pipe and the burner, a rotary agitator within the mixer, and air and gas inlets to said mixer; whereby the gas and air are mixed at a reduced pressure before their arrival at the burner, substantially as described.

2. The combination with a gas-burner, of a valved gas-supply pipe, an enlarged mixer located beneath the burner, an admission-box between the supply-pipe and the mixer communicating with the latter through a series of openings, a series of air-tubes extending through the admission-box and into the said openings, and forming annular spaces for the passage of the gas to the mixer, substantially as described.

3. The combination with a gas-burner, of a valved gas-supply pipe, an enlarged mixer located beneath the burner, a rotary agitator within said mixer, an admission-box between the supply-pipe and the mixer communicating with the latter through a series of openings, a series of air-tubes extending through the admission-box and into the said openings, and forming annular spaces for the passage of the gas to the mixer, substantially as described.

4. The combination with a gas-burner, of a valved gas-supply pipe, a mixer placed between the supply-pipe and the burner, an agitator placed within the mixer, and a motor for actuating the latter, substantially as described.

5. The combination with a gas-burner, of a mixer communicating with the atmosphere and with the gas-supply, a rotary agitator within said mixer, and an electric motor in connection with the agitator, substantially as described.

6. The combination with a gas-burner, of a mixer for air and gas located beneath the burner, lateral conduits leading from the mixer to the burner-pipe, an agitator within said mixer, and an electric motor located above the mixer and placed in connection with the agitator, substantially as described.

7. The combination with a gas-burner, of a gas-supply pipe, an electrically-controlled valve for the same, a mixer located between the gas-supply pipe and the burner, an agitator within the mixer, an electric motor for actuating said agitator, an igniter, a source of electricity, and electrical connections of the latter with the valve-operating device, the igniter, and the motor, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LOUIS DENAYROUZE.

Witnesses:
J. ARMENGAUD, Jeune,
CLYDE SHROPSHIRE.