No. 715,420. Patented Dec. 9, 1902.

E. REAGAN.

INJECTOR BURNER.

(Application filed May 26, 1902.)

(No Model.) 3 Sheets—Sheet 1.

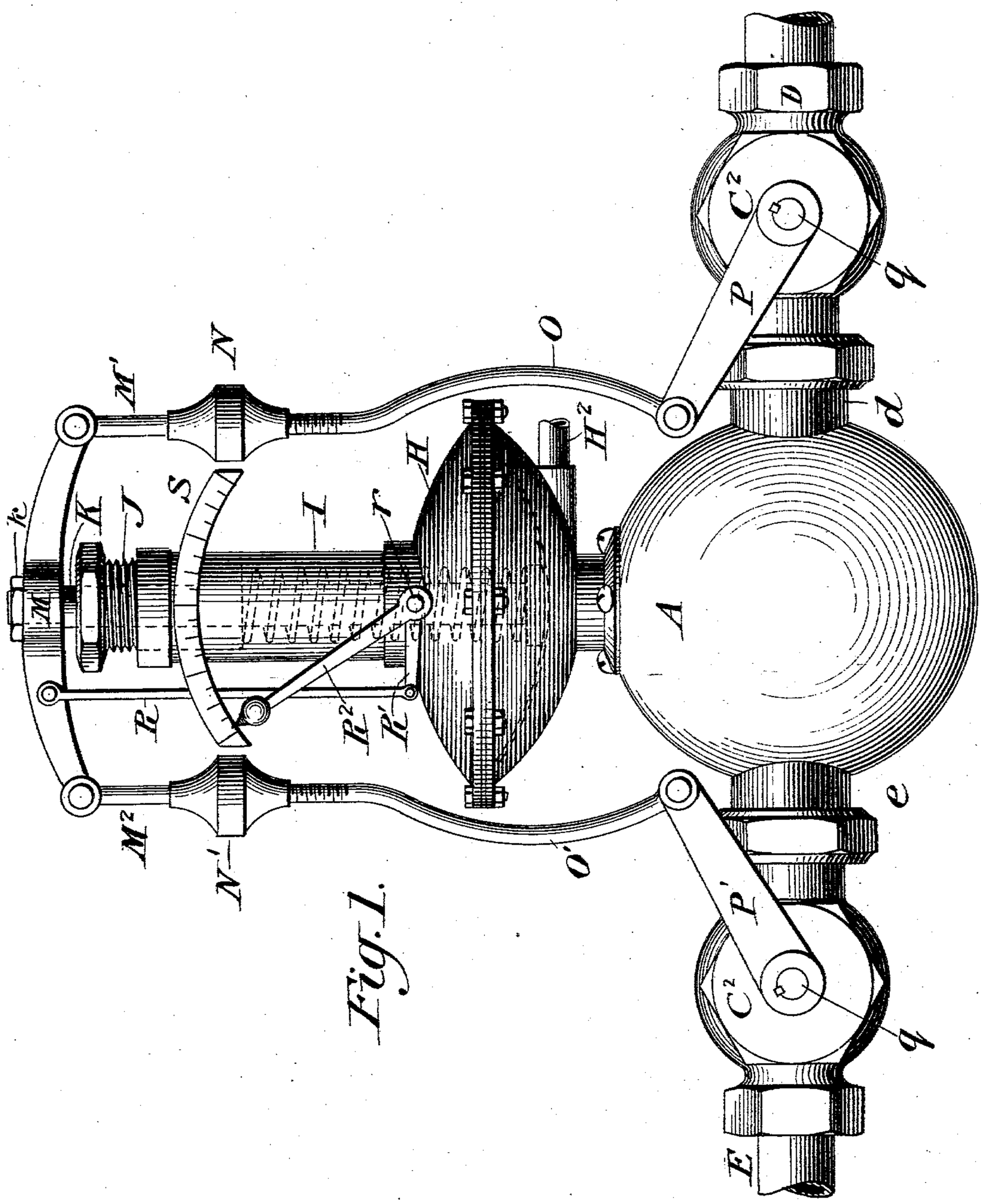

Fig. 1.

Witnesses
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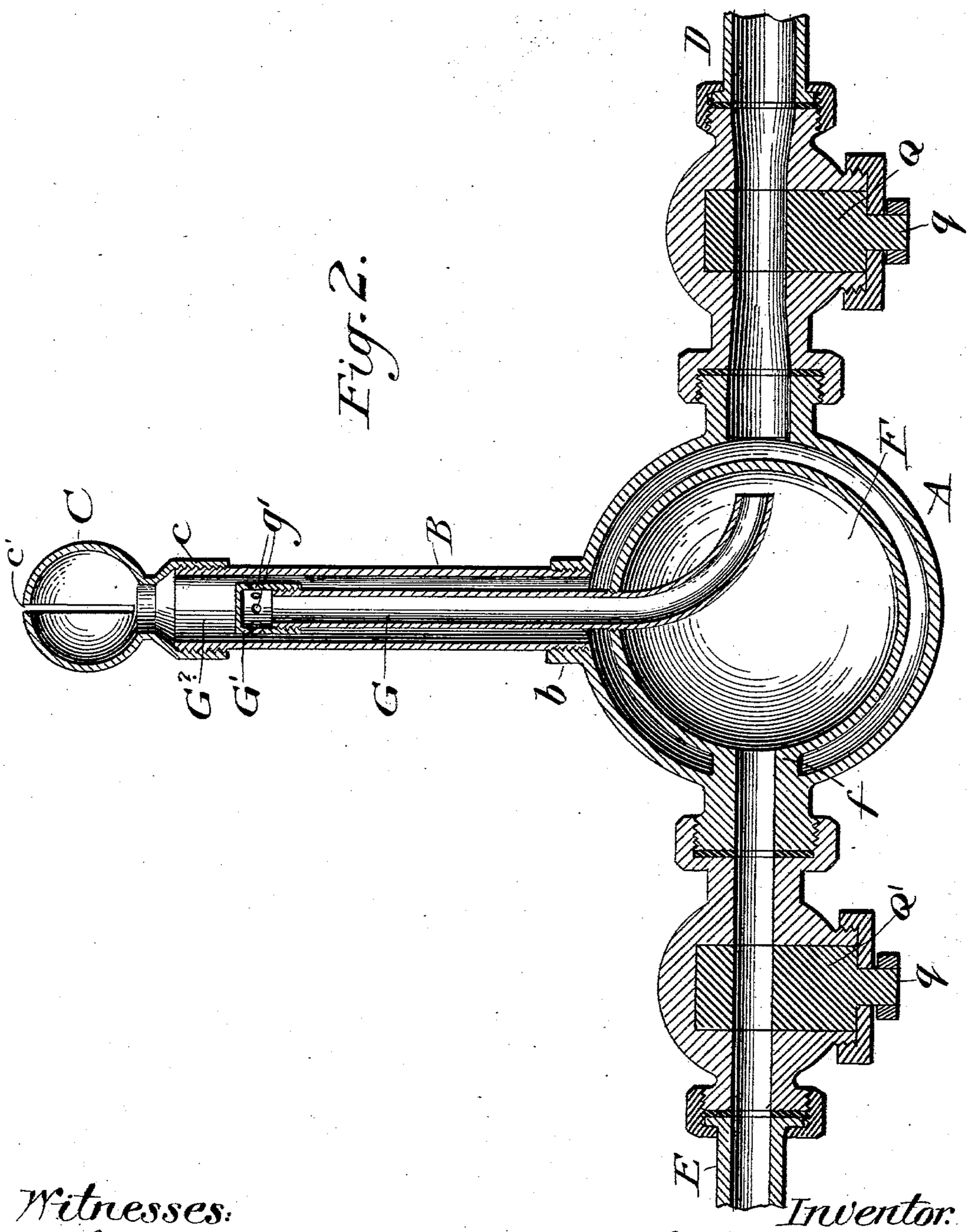

Fig. 2.

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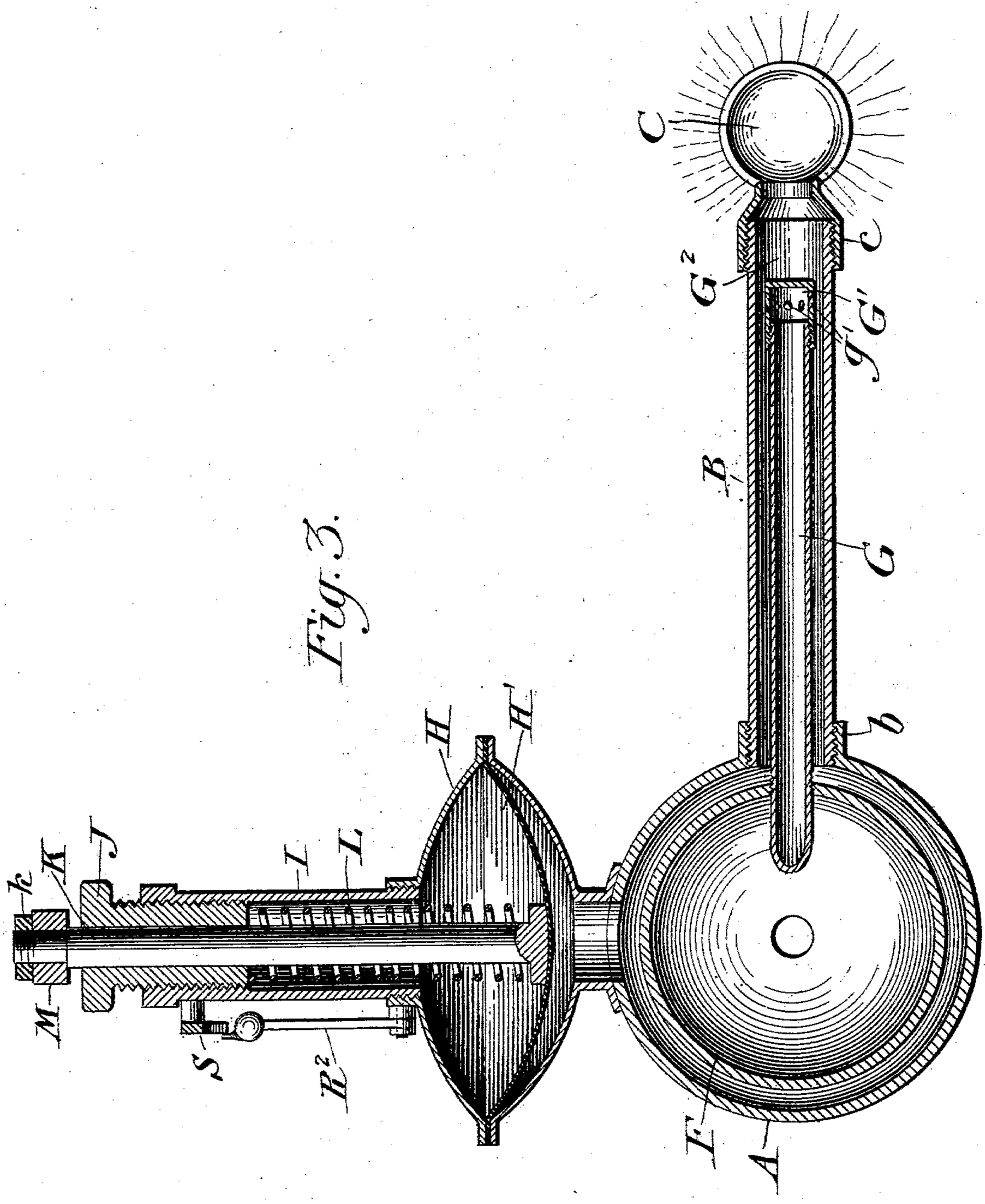

Fig. 3.

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UNITED STATES PATENT OFFICE.

EDGAR REAGAN, OF FLORESVILLE, TEXAS.

INJECTOR-BURNER.

SPECIFICATION forming part of Letters Patent No. 715,420, dated December 9, 1902.

Application filed May 26, 1902. Serial No. 108,998. (No model.)

To all whom it may concern:

Be it known that I, EDGAR REAGAN, a citizen of the United States, residing at Floresville, in the county of Wilson and State of Texas, have invented certain new and useful Improvements in Injector-Burners; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of my invention is to provide an improved injector-burner in which provision is especially made to provide a maximum heating-surface for the walls of the oil-chamber, the inner contour of said walls being such as to cause a cyclonal or whirling motion to the oil as it enters the chamber, forcing it in contact with and causing it to be constantly distributed over the inner surface of the heated walls, thereby producing rapid vaporization.

It is also my object to provide an improved form of nozzle having an oil-outlet pipe which conducts the heated oil and vapor from the oil-chamber to the mixing-chamber in the nozzle and forces it through the steam to direct contact with the highly-heated walls of said chamber, which thoroughly vaporizes the oil, and thus insures complete and instantaneous combustion of said vapor before it can be driven to any appreciable distance from the burner.

It is also my object to provide a detachable burner-nozzle which will afford ready access to the burner, including the oil and steam chambers, for cleaning, repair, renewal, or the substitution of tips affording a different character of flame, the construction being such that the component parts of the nozzle, including its oil-outlet pipe, are all detachably connected and can be readily duplicated.

It is also my object to provide a burner-tip designed to give a maximum spread of flame, and thereby avoid concentration of the heat upon any one portion of the boiler, the shape of the tip being such as to deflect the flame horizontally nearly in a circle, thereby spreading the flame evenly under the boiler and affording sufficient rearward deflection to superheat the walls of the mixing-chamber.

It is also my object to provide an injector-burner with means for automatically governing the flow of fuel-oil and steam to the burner, said means being adjustable and connected with the fuel-supply valves and provided with an indicator which will register a steam-pressure in the boiler corresponding to the adjustment of said valves.

In the accompanying drawings, forming a part of this specification, Figure 1 is a front elevation of my burner. Fig. 2 is a central longitudinal section taken through the oil and steam supply pipes and valves, the oil and steam chambers, and the nozzle and tip. Fig. 3 is a central vertical section showing the burner proper in side elevation.

Referring more particularly to the drawings, A denotes a hollow sphere, forming the steam or heating chamber, provided with diametrically opposite collars *e* and *d*, threaded externally to receive a steam-feed pipe D, an oil-feed pipe E, and provided with a collar *b*, threaded internally to receive the nozzle of the burner. B denotes the burner-nozzle threaded externally at one end to enter the said collar in the steam-chamber, and threaded at its opposite end to receive the burner-tip.

C denotes the burner-tip, having a collar *c*, threaded internally to receive the nozzle and is formed of a hollow sphere divided by a circular cut or slot *c'*, which forms the mouth of the tip.

F denotes the oil-chamber, formed of a hollow sphere, inclosed within and cast integral with the sphere A through a union *f*, leaving a space between said spheres, which forms the steam-chamber for the circulation of steam.

G denotes an outlet-pipe leading from the oil-chamber to and through the burner-nozzle, terminating near the outlet end of the nozzle. The outer end of the oil-pipe is threaded externally to receive an internally-threaded cylindrical cap G', provided with a series of small perforations *g'*, surrounding the cap and arranged at an angle or diagonally, so that the oil and vapor as they are forced out of said openings *g'* will come in contact with the walls of the mixing-chamber.

G^2 denotes the mixing-chamber, which is located near the end of the nozzle immediately forward of and surrounding the cap G'.

H denotes a cage formed of two cup-shaped

castings bolted together by their flanged rims, between which rims is clamped a diaphragm H′. H² denotes a pipe connecting said cage with the steam-boiler.

I denotes a tube-shaped casting secured to the cage H, as shown in Fig. 3, and threaded at its upper end to receive the threaded head J. Said head is bored centrally to receive, and has loosely mounted thereon, a plunger K, which bears by its lower flanged end upon said diaphragm.

L denotes a coiled spring surrounding the plunger, its upper end bearing upon the head J and its lower end bearing upon the lower or flanged end of said plunger. The upper end of the plunger is shouldered and threaded and is securely fastened by a nut *k* to a yoke M, forming part of an adjustable valve-gear or frame, which is automatically operated by boiler-pressure through said plunger and diaphragm to control the fuel-supply valves, as hereinafter described.

The valve-gear consists of the yoke M and two depending arms M′ M², threaded at their lower ends and united by nuts N N′, provided with right and left hand screw-threads, to depending connecting-rods O O′. P P′ denote two links pivoted at one end to said rods and at their other ends to valve-spindles *q q* of fuel-supply valves Q Q′, the valve Q′ serving to control the supply of oil in the pipe E and the valve Q to control the supply of steam in the pipe D.

R denotes a connecting-rod fastened by its upper end to the yoke M and pivoted at its lower end to a link R′, which is connected to and operates a rock-shaft *r*, to which shaft is fastened an indicator R².

S denotes an arc-shaped scale suitably graduated and rigidly fixed to the casting I.

My burner is operated as follows: In order to set the indicator to the required steam-pressure in the boiler, the head J is adjusted up or down, carrying with it the yoke, which, through the arms, connecting-rods, and links, operates the valve-spindles and valves accordingly to give the required supply of fuel. The action of boiler-pressure upon the diaphragm operates the plunger upward against the spring-pressure thereon, which actuates the valve-gear to reduce the amount of fuel-supply, and when the pressure decreases the spring overcomes the resistance of the diaphragm, forces the plunger downward, thus actuating the valve-gear to increase the flow of fuel. Therefore the action of boiler-pressure upon the valve-gear is automatic and regulates the supply of fuel to keep up a given steam-pressure in the boiler. If it should be desired to increase or decrease the relative supply of either steam or oil to the burner, the nuts N N′ are designed for this purpose, the nut N serving for such adjustment of the steam-supply and the nut N′ for the oil-supply.

The flame produced by my burner forms nearly a complete circle, thus giving a maximum spread of flame under the boiler. The advantage of the spherical tip is the maximum surface exposure its walls offer to the flame, which spreads around it, as well as under the boiler, thereby heating the walls of the tip and the walls of the mixing-chamber intensely. As the oil is forced out of the cap G′ it is thrown directly against the highly-heated walls of the mixing-chamber, is mixed with steam, and is carried with the steam into the spherical chamber of the tip, which is still more intensely heated. The result of this mixture of the oil and steam in these highly-heated chambers is a highly-inflammable mixture, causing it to ignite instantly at the mouth of the burner-tip. These are among the most important features of my invention, as my burner in this respect avoids the difficulty heretofore incident to injector-burners—namely, insufficient vaporization of the oil before it leaves the burner, causing it to be carried by the steam-pressure far back under the boiler before combustion takes place, effecting a concentration of the flame at this point, and in some instances a waste from unconsumed oil.

Another important feature of my invention is the spherical oil-chamber and its outlet-pipe. As the oil enters the chamber F it first flows down over its lower walls, is heated, and vaporized. The vaporized oil, immediately spreading over the highly-heated walls of this hollow sphere, is further vaporized, forming a vapor-gas. As the gas-pressure increases it passes out of the pipe G, carrying with it but a small proportion of the denser vapor. Such of this denser vapor as escapes is forced out of the opening *g* by gas-pressure directly in contact with the highly-heated walls of the mixing-chamber, converting it into gas before it reaches the flame. As seen in Fig. 2, the pipe G projects within the oil-chamber, with its inlet suspended above possible contact with the oil. By this construction I avoid the objection of feeding oil before it is vaporized to the mixing-chamber, causing part of it to be carried by steam-pressure through the tip in liquid state.

Having thus shown and described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an injector-burner a steam-chamber and an oil-chamber located within the steam-chamber, a nozzle leading from the steam-chamber and forming a mixing-chamber at its outer end, an outlet-pipe for the oil-chamber provided with apertures in its periphery near its outer end adapted to discharge its contents against the walls of the mixing-chamber the inner end of said outlet-pipe being suspended within the oil-chamber and curved in a direction away from the inlet-opening of the oil-chamber.

2. An injector-burner having a steam-chamber, an oil-chamber located within the steam-chamber, a nozzle having a mixing-chamber at its outer end and leading from the steam-chamber, a pipe leading from the oil-chamber

and arranged within the nozzle and mixing-chamber provided with apertures arranged to discharge the contents of said pipe against the surrounding walls of the mixing-chamber, in combination with a burner-tip arranged at the end of said mixing-chamber provided with a slot arranged to discharge a portion of the flame against the walls of the mixing-chamber.

3. An injector-burner for steam-boiler furnaces having oil and steam supply pipes with valves for controlling the supply of oil and steam to the burner and a body portion located between said supply-pipes having an extension secured thereto inclosing a steam-actuated diaphragm and an adjustable plunger connected to said diaphragm, in combination with a valve-gear consisting of a yoke connected to said plunger having arms depending from its opposite ends, connecting-rods adjustably attached to said arms, and links pivoted to the lower ends of said rods and fastened to the stems of said oil and steam supply valves.

In testimony whereof I affix my signature in presence of two witnesses.

EDGAR REAGAN.

Witnesses:
WM. C. LOTT,
E. F. MCCARTY.