

(Model.)

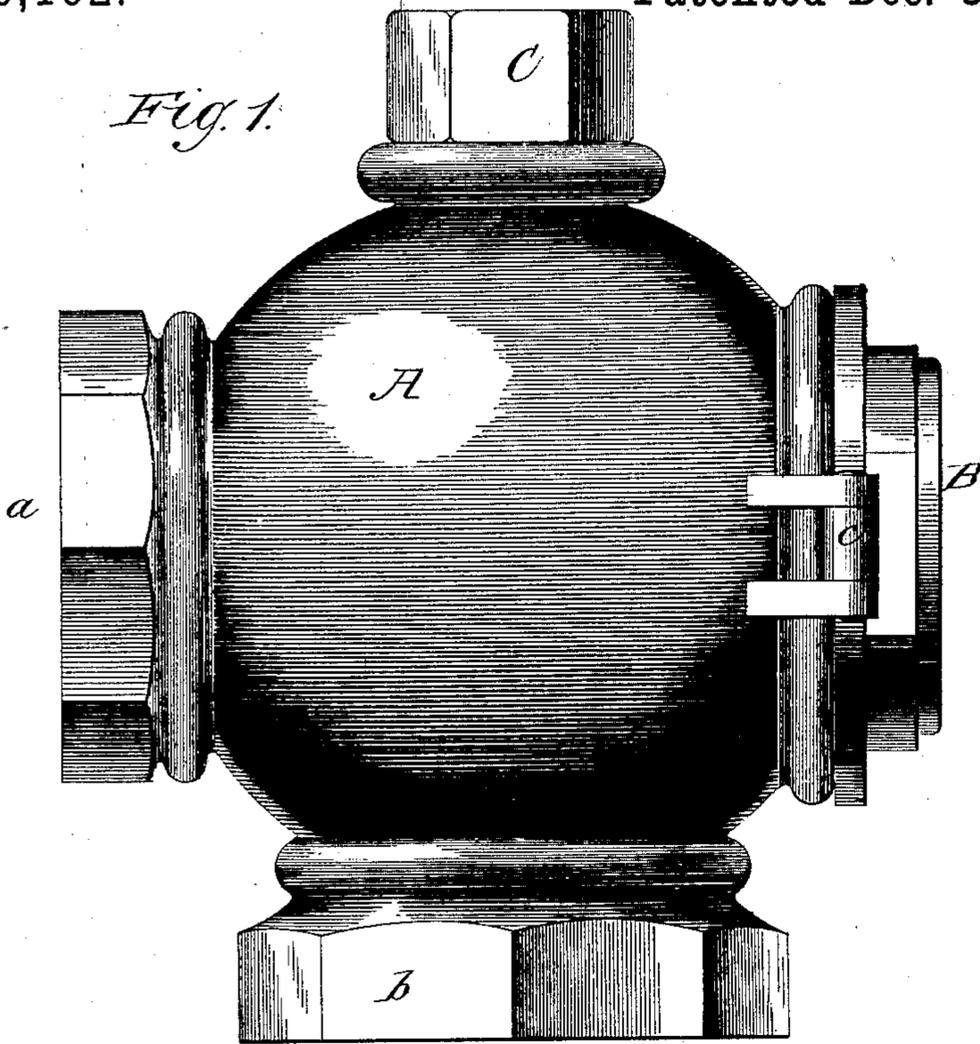
2 Sheets—Sheet 1.

O. D. ORVIS.  
INJECTOR.

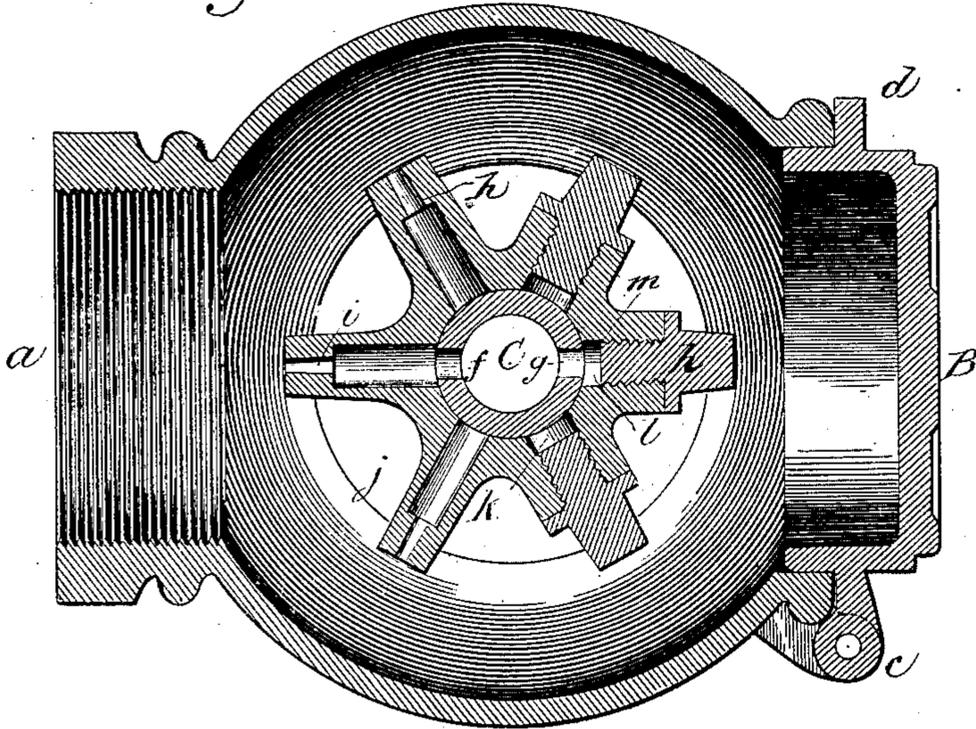
No. 310,162.

Patented Dec. 30, 1884.

*Fig. 1.*



*Fig. 2.*



Witnesses.

*Will R. Quohndro.*  
*W. Rossiter.*

*Inventor*

*Orland D. Orvis*  
*By. Jno. G. Elliott*  
*Atty.*

(Model.)

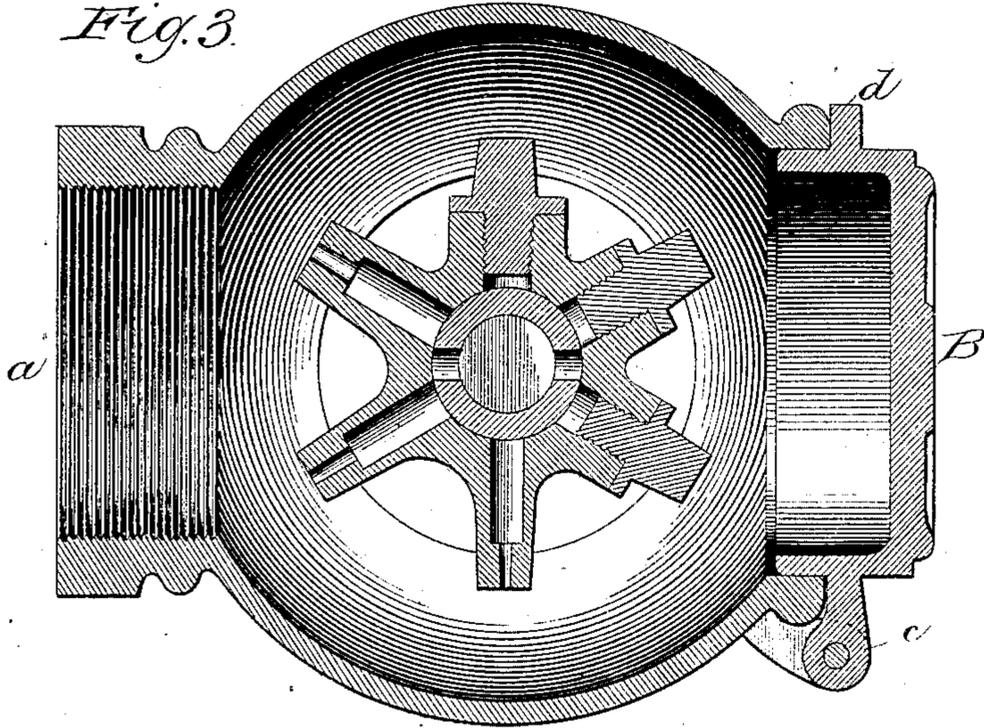
2 Sheets—Sheet 2.

# O. D. ORVIS. INJECTOR.

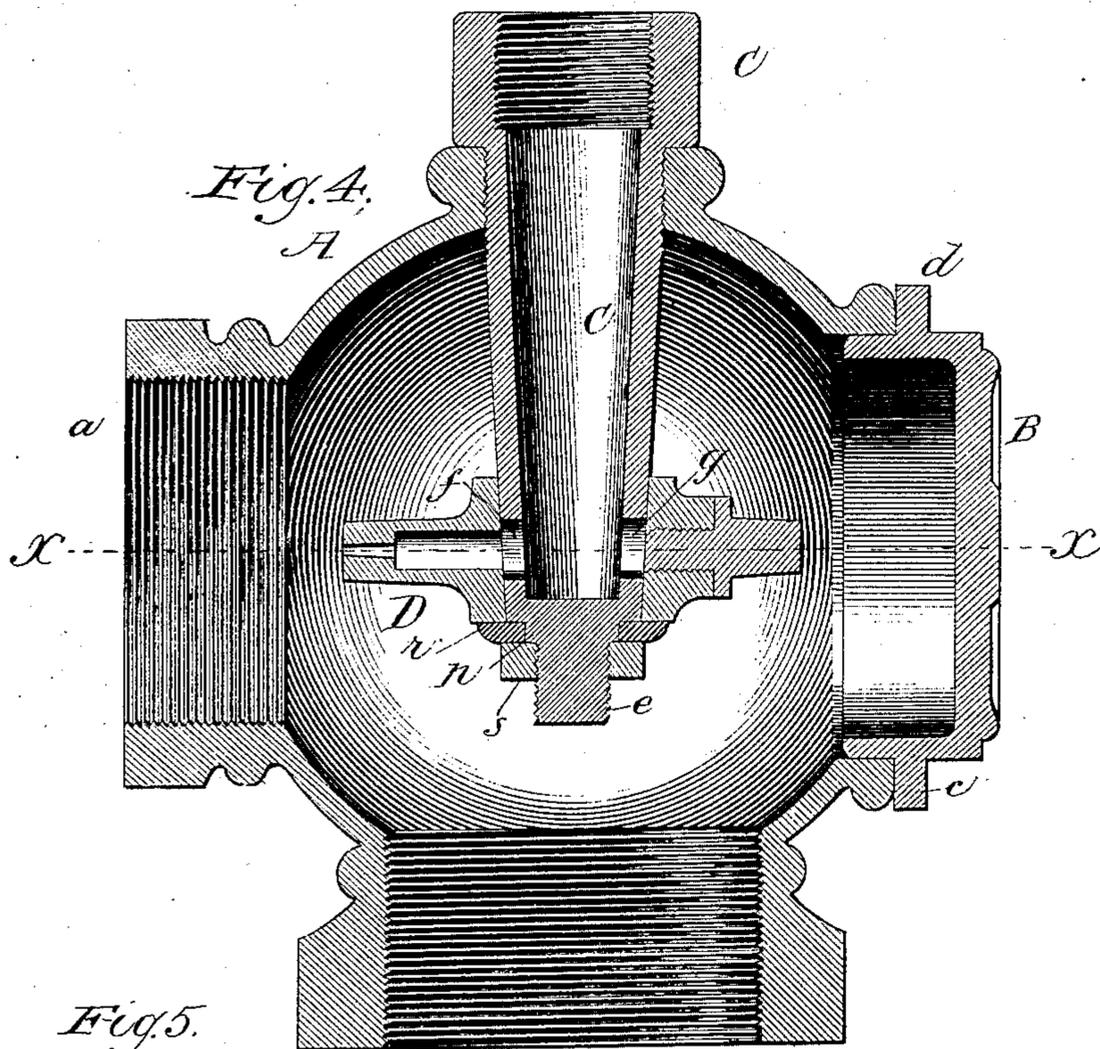
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*Fig. 3.*



*Fig. 4.*  
*A*

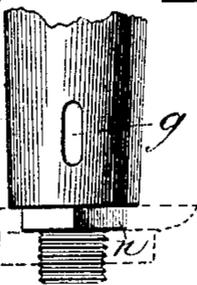


*Fig. 5.*

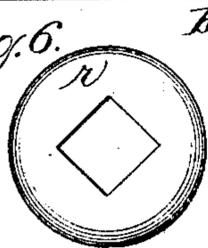
Witnesses.

*Will R. Bushmire.*

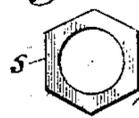
*W. Rosier.*



*Fig. 6.*



*Fig. 7.*



Inventor

*Orland D. Orvis*

By *Jno. G. Elliott.*

*Atty.*

# UNITED STATES PATENT OFFICE.

ORLAND D. ORVIS, OF CHICAGO, ILLINOIS.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 310,162, dated December 30, 1884.

Application filed August 13, 1884. (Model.)

*To all whom it may concern:*

Be it known that I, ORLAND D. ORVIS, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Injectors, of which the following is a specification.

This invention relates to improvements in injectors heretofore consisting, principally, of a globe containing a single and fixed jet or nozzle for steam, and employed for discharging into a fire-chamber of a furnace, to promote combustion, a stream composed of steam and air.

In the attachment of injectors to furnaces practical use has demonstrated that the amount of steam and air required to successfully promote combustion varies in proportion to the difference in area in the fire-chamber, and that with fire-chambers of a given area it is frequently desirable to proportion the volume of the jet in accordance with the mass of fuel being burned or the desired degree of heat to be attained; but with a fixed nozzle these results are impractical, and especially so after its bore has been proportioned to discharge an amount of steam necessary for the average work of the furnace. It has also been found that in order to adapt the jet for the difference in the summer and winter work of a furnace two jets must be employed, and the one removed and substituted for the other, as the case may be, because the diameter of the bore of a jet is necessarily greater for winter than for summer use, owing to the difference in volume of steam and air required when a furnace is run at its maximum capacity.

The objects of my invention are therefore to avoid the objections common to the ordinary jet, and to attain the above results by providing an injector with a series of jets or nozzles, each differing from the other in the diameter of its bore, and joined together and revolving about an axis common to all; to provide an injector with a series of jets having bores of differing diameters and revolving about a common steam-supply in such a manner that when one jet is in communication with the steam-supply the others will be cut off from the same; to provide access to each jet for the purposes of effectively removing obstructions; and, finally, to provide certain details of con-

struction, hereinafter described, for affording a desirable bearing for the revolving jet and for access to the interior of the globe. I attain these objects by devices illustrated in the accompanying drawings, in which—

Figure 1 represents a side elevation of an injector embodying my invention; Fig. 2, a central horizontal section of the same, with a jet in its operative position for delivering steam to a furnace; Fig. 3, a similar view showing all of the jets out of their operative position; Fig. 4, a central vertical section of the injector; Fig. 5, a detail side elevation showing the inlet or slot of the steam-supply chamber to the jets; Figs. 6 and 7, plan views of the washer and nut, respectively, for seating and securing the revolving jet on its bearing upon the steam-supply chamber.

Similar letters of reference indicate the same parts in the several figures of the drawings.

A represents a globe vacuum-chamber, provided at one side with a tapped aperture, *a*, for receiving a pipe opening at its opposite end into the fire-chamber of a furnace, and at its bottom with a similar aperture, *b*, constituting an air-supply passage to the injector, and designed to receive a pipe which may open into the air or breeching of a furnace, as desired, said globe having a diameter greater than either of these apertures. The side of the globe opposite the aperture *a* is provided with a doorway for a door, *B*, preferably flanged, as shown, so as to project partially in the doorway, and secured to the globe by a hinge, *c*, so as to be swung outwardly from the globe when access is desired to the same through the doorway, said door being provided with any suitable catch, *d*, opposite its hinge, for holding it closed.

Tapped in and projecting through the top of the globe is a steam-supply chamber, *C*, designed to be connected at its top by pipe with the dome of a boiler or other source for supplying steam, and closed at its bottom end, where it is provided with a screw-threaded stem, *e*, and at a point above its bottom with opposing and registering slots *f g*.

Fitting and adapted to turn upon and toward the lower end of the steam-supply chamber is a jet-head, *D*, having a series of radial arms half of which are provided with a series of jet-orifices, *h i j*, each of which differ in

diameter, and adapted when in their operative position to register with the slot *f* in the steam-supply chamber. The other half of the radial arms are provided with screw-threaded perforations *k l m*, which are respectively in alignment and register with the jet-orifices, and are closed by plugs *o p q*, provided with suitable heads for engagement with a wrench or key to turn them. When a jet-orifice registers with the slot *f*, its corresponding plug-perforation will register with the slot *g*, so that after the removal of the plug a wire may be passed through the plug-orifice, the steam-supply chamber, and the jet-orifice, for removing any obstructions therein, access to the globe being had through its doorway.

As shown, the steam-supply chamber is tapering, and the bore of the jet-head correspondingly tapering, for the purpose of securing an effective bearing and permitting the jet-nozzle to be pushed upwardly and tightened as its bearing becomes worn, the slots *f* and *g* being elongated, so as to register with the jet and plug orifices, notwithstanding any vertical adjustment of the jet-head that may be necessary.

The stem *e* is provided with a square shoulder, *u*, to receive a correspondingly-slotted washer, *v*, forming a seat and bearing for the jet-head, said washer being held in place by a nut working on the stem *e*.

By the construction described the jets of an injector may be quickly and readily adjusted to vary the capacity of the jet in operation. For example, if the furnace is running at its fullest capacity and requires a corresponding volume of steam and air, the largest jet, *h*, is rotated to its operative position; and if, on the contrary, the furnace is running at its minimum capacity, the smallest jet, *j*, is revolved to its operative position; and in this connection it may be stated that the communication between the steam-supply chamber and a jet is such that only one jet or nozzle can be used at a time, and not then, practically, until in alignment with the inlet-pipe to the furnace, as will plainly be seen by comparison of Figs. 2 and 3 of the drawings.

A revolving adjustable jet of the character described avoids the objectionable features of common jets, before pointed out, and provides

efficient means for introducing into the fire-chamber of a furnace the requisite volume of steam and air to promote perfect combustion, for it will be understood that the volume of air introduced varies with the volume of steam, and that the volume of both should be proportioned to the amount of combustion taking place in a furnace in order to produce the best results.

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

1. The combination, in an injector, with a jet-head provided with a series of radial jet-orifices, of a steam-supply pipe adapted to operate or supply only one of said jets at a time, substantially as described.

2. In an injector, a jet-head provided with a series of jet-orifices and a corresponding series of plugged perforations registering with said orifices, substantially as described.

3. The combination, with a jet-head provided with a series of jet-orifices and a corresponding set of plugged perforations registering with said orifices, of a steam-supply chamber intermediate said orifices and perforations, said steam-supply chamber having slots registering with the orifices and perforations, substantially as described.

4. The combination, with the chamber C and the jet-head, of the washer fitting and held upon a square seat at the lower end of the chamber, and forming a seating or bearing for the jet-head, and means for locking said washer, substantially as described.

5. The tapering-shaped chamber C, in combination with a jet-head having its bearing correspondingly tapered to fit and be revolved on said chamber, substantially as described.

6. In an injector, the combination, with the globe vacuum-chamber, of a door hinged thereto at one side, and provided with a flange projecting into the said globe, and with suitable devices for locking it thereto, substantially as described.

ORLAND D. ORVIS.

Witnesses:

W. W. ELLIOTT,  
CHAS G. PAGE.