

No. 676.673.

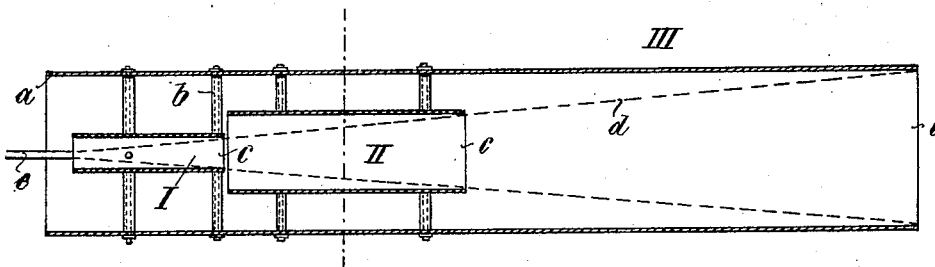
Patented June 18, 1901.

L. O. BOEING.  
INJECTOR FOR FORCING HOT AIR.

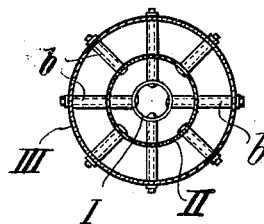
(Application filed Aug. 28, 1899.)

(No Model.)

*Fig. 1.*



*Fig. 2.*



*Witnesses:*

*Geo. W. Rea,*

*[Signature]*

*Inventor*  
*Leo O. Boeing*

*By Janus L. Norris*  
*Attorney*

# UNITED STATES PATENT OFFICE.

LEO OTTO BOEING, OF VALLENDAR, GERMANY.

## INJECTOR FOR FORCING HOT AIR.

SPECIFICATION forming part of Letters Patent No. 676,673, dated June 18, 1901.

Application filed August 28, 1899. Serial No. 728,785. (No model.)

*To all whom it may concern:*

Be it known that I, LEO OTTO BOEING, a subject of the King of Prussia, German Emperor, residing at Vallendar, in the Kingdom of Prussia, and German Empire, have invented certain new and useful Improvements in Injectors for Forcing Hot Air, (for which I have applied for a patent in Germany, dated January 2, 1899, and in Austria, dated July 28, 1899,) of which the following is a specification.

The object of my invention is to provide an improved injector for forcing hot air to promote combustion and for other purposes.

The essential feature of the invention consists in the form and arrangement of the nozzles, which are prismatic or cylindrical and arranged in such a manner one in the other that the front end or mouth of each separate nozzle corresponds with the circumference of an imaginary cone having its base at the mouth of the injector, whereas the back or inlet end of each nozzle is arranged in the same plane or a slight distance from the outlet end of the next and smaller nozzle.

On the accompanying drawings, illustrating this invention, Figure 1 is a longitudinal section illustrative of my invention, and Fig. 2 is a cross-section from which the arrangement of the separate nozzles in each other will be apparent.

A steam-jet *e* is arranged in the middle at the inlet end *a* of the apparatus. The nozzles I, II, and III are of prismatic or cylindrical form, thus having parallel walls throughout their length, and are arranged behind each other in such a manner that the outlet-opening *c* of each nozzle corresponds with the circumference of the cone *d*, formed by the issuing steam. The back or inlet end of each nozzle is situated in the same plane or a short distance in front of the fore or outlet end of the next nozzle of smaller diameter. In such a construction the surface subjected to friction by the air is reduced to a minimum, and the resistance offered by the rarefied air to the sucking action of the steam is reduced to a minimum. The steam-jet spreads out after issuing according to its pressure and forms a cone with a greater or less base in proportion to its unit length.

The nozzles are held by distance-bolts *b*, arranged at suitable points, as shown in the drawings.

The operation of the apparatus may be considered as follows: Steam issuing under a certain pressure and with a given velocity enters the smallest nozzle I, by which it is conducted for a certain distance, then expands into the second nozzle, by which it is further conducted, and so on, exercising a very powerful suction action upon the hot air of 600° to 1,800°.

By reason of the fact that the nozzles I, II, III have their walls parallel through their entire length annular passages having parallel walls are provided between the various nozzles through which the hot air is drawn in and forced through the injector. The hot air therefore passes through the injector in straight lines and is not deflected, and thereby forced against the side walls of the various nozzles, as would be the case if the nozzles were conical. By this construction air at a temperature of from 600° to 1,800° centigrade may be safely forced through the injector without danger of burning out the various nozzles thereof even when the latter are constructed of sheet-iron.

By the use of the term "cylindrical" as used in the following claim I desire to be understood that I contemplate a nozzle which is of cylindrical form or one which is of prismatic form.

What I claim, and desire to secure by Letters Patent of the United States, is—

The herein-described injector for forcing hot air, consisting of a plurality of concentrically-arranged injector-nozzles whose walls are parallel throughout their lengths, and a steam-inlet pipe concentrically arranged with relation to the inlet end of the innermost nozzle, the outermost injector-nozzle being extended the entire length of said injector and the several nozzles being disposed one within another in such manner that the outlet end of each nozzle corresponds with the circumference of a cone formed by the issuing steam in expanding through the successive nozzles toward the mouth of the injector, substantially as specified.

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

LEO OTTO BOEING.

Witnesses:

WOLDEMAR HAUPT,  
HENRY HASPER.