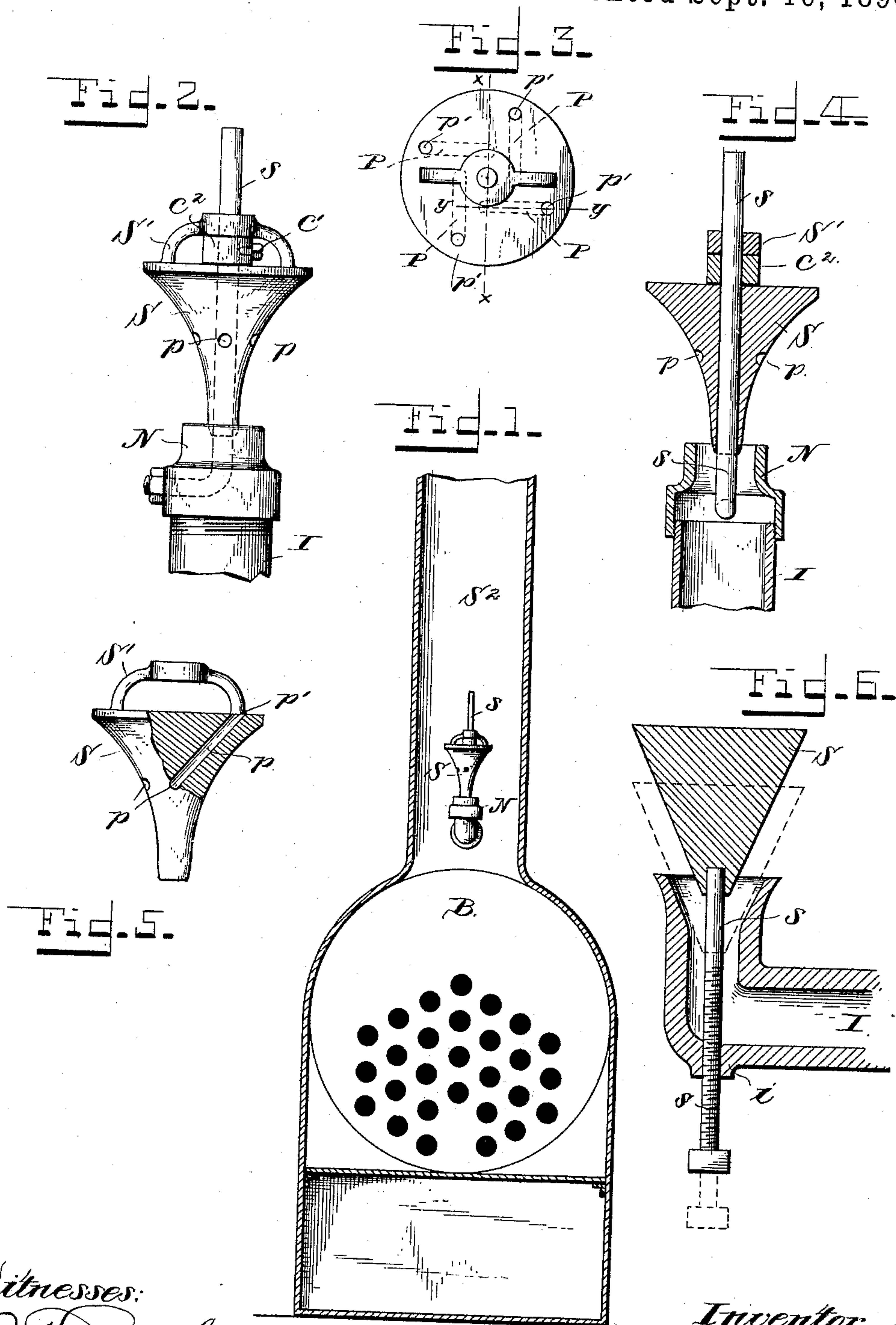


(No Model.)

Q. J. HOKE.  
EXHAUST STEAM NOZZLE.

No. 436,527.

Patented Sept. 16, 1890.



Witnesses:

*J. Thomson Cross*  
*Henry S. Dietrich*

Inventor:

*Quinton J. Hoke.*  
per *Henry M. Hoke*  
Attorney.



# UNITED STATES PATENT OFFICE.

QUINTON JEROME HOKE, OF YORKVILLE, SOUTH CAROLINA, ASSIGNOR  
TO HIMSELF AND SAMUEL LUSK DAVIDSON, OF SAME PLACE.

## EXHAUST-STEAM NOZZLE.

SPECIFICATION forming part of Letters Patent No. 436,527, dated September 16, 1890.

Application filed October 16, 1889. Serial No. 327,163. (No model.)

*To all whom it may concern:*

Be it known that I, QUINTON JEROME HOKE, a citizen of the United States, residing at Yorkville, in the county of York and State of South Carolina, have invented certain new and useful Improvements in Exhaust-Steam Nozzles; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Referring to the drawings, Figure 1 is a vertical sectional elevation of so much of a steam-boiler as will be necessary to illustrate my invention, and showing the exhaust-steam nozzle. Fig. 2 is an elevation of the deflector-cone and a portion of the steam-exhaust pipe detached. Fig. 3 is a top plan view of the exhaust-steam nozzle shown in Fig. 2. Fig. 4 is a vertical axial section on the line  $xx$  of Fig. 3. Fig. 5 is a sectional elevation of the revoluble cone, the section being taken on line  $yy$  of Fig. 3. Fig. 6 is a sectional elevation of a modified arrangement of the adjustable deflecting-cone.

The invention relates to that class of devices known as "exhaust-steam nozzles" and "spark-extinguishers," as applied to steam-boilers in general; and it consists in the combination, with a smoke-stack of a steam-boiler; of a steam-injector of special construction, whereby the objects of my invention are attained, substantially as hereinafter fully described, and set forth in the claims.

It is not new to inject steam in the form of an inverted hollow cone into the smoke-stack of a boiler for the purpose of arresting and extinguishing sparks or other solid incandescent particles of fuel carried along with the products of combustion and at the same time promote the draft. Nor is it new to effect this by means of a conical deflector the apex of which is located in proximity to the nozzle of the injector-pipe and in the plane of its axis. There is, however, this disadvantage, namely, that the draft depends entirely upon the volume of steam injected into the

stack and varies with the speed of the engine when the exhaust-steam is used.

One of the objects of my invention is to provide means for regulating the draft within certain limits by so constructing the so-called "deflector-cone" as to perform the function of the ordinary adjusting-spindle of injectors relatively to the injector-nozzle.

The further object of my invention is to more effectually extinguish the sparks carried into the stack, and at the same time promote or increase the draft for a given volume of steam injected, by so constructing the adjustable spindle as to perform the function of a revoluble multiple jet-injector operating to inject the steam at an angle to the vertical axis of the stack on lines tangential to a common circle and in the plane of greatest diameter of the cone-spindle. In this manner I produce a gyrating column of steam above the cone of steam formed by the conical spindle, a partial vacuum being produced above said spindle that will promote the upward flow of the steam and therefore increase the effect of the cone-jet in producing a partial vacuum below the injector-nozzle, and at the same time impart a gyrating motion to the products of combustion and such sparks and particles of incandescent fuel carried above the point of impact on the stack of the steam deflected by the spindle, thus more effectually extinguishing such incandescent particles.

The first object of my invention may be attained in various ways—as, for instance, by mounting the cone-spindle  $S$  on an arbor or stem  $s$ , secured axially within the injector-nozzle  $N$ , and providing means for adjusting the spindle vertically relatively to the nozzle  $N$ . In Figure 1 I have shown a cone-spindle  $S$  provided at its upper end with a tubular hub or sleeve  $c$ , the cone being adjusted on arbor  $s$  by means of a set-screw  $c'$ , working in a screw-threaded opening in said hub. In Figs. 2 to 5 I have shown the cone-spindle  $S$  provided with a yoke  $S'$ , between which and the cone is interposed a loose sleeve  $c^2$  for adjusting said cone or arbor  $s$  by means of a set-screw  $c'$ . In Fig. 6 I have shown the cone-spindle  $S$  rigidly secured to the arbor  $s$ , which



is screw-threaded and works in a threaded bearing *i*, provided therefor in the injector-pipe *I*, so that the cone-spindle may be adjusted by manipulating the arbor *s*.

5 The second object of my invention is attained by loosely mounting the cone-spindle *S* on arbor *s*, as shown in Figs. 1 to 5, and forming steam-passages *P* therein at an angle to the vertical axis of the spindle, said pas-  
 10 sages having their initial or inlet *p* on the side of the cone some distance below its greatest diameter, and their outlet *p'*, on the upper face of the said cone, as more clearly shown in Fig. 5. Inasmuch as the passages *P* are formed  
 15 at an angle to the vertical axis of the spindle, and inasmuch as each point of said passages is on a line tangential to the circle of the cone, the impact of the steam will impart to the cone a revolving motion on arbor *s*. The  
 20 jets of steam issuing at *p'* on lines tangential to a given circle of the cone, and at angle thereto, will have a gyrating motion, the effect of which is to produce a partial vacuum above the cone that will promote the draft, while  
 25 the gyrating steam-jets will impart to the steam deflected by the cone and to the products of combustion and solid particles carried along therewith a gyrating motion as soon as they reach the plane of impact of the  
 30 jets upon the stack, which gyrating motion will continue until the combined steam and products of combustion issue from the stack.

It is obvious that by adjusting the cone-spindle relatively to the nozzle *N*, as in ordinary injectors, the effect as well as the vol-  
 35 ume of the steam admitted may be regulated.

I preferably construct the spindle *S* somewhat trumpet-shaped, as shown, (instead of giving it a truly conical form, as in Fig. 6,) 40 when the said cone-spindle is a revoluble one,

to more effectually guide the steam to the passage *P*, and to more effectually spread the steam in the stack *S*<sup>2</sup>.

From the above description the operation of the improved exhaust-steam nozzle and 45 spark-extinguisher will be readily understood, and will need no further description, except to say that the described devices are preferably arranged at the base of the smoke-stack *S*<sup>2</sup>, immediately above the junction thereof 50 with the smoke-box *B*.

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

1. The combination, with the smoke-stack 55 of a steam-boiler and an injector-nozzle, of a solid regulating-cone adjustable toward and from said nozzle, said cone being provided with steam-passages arranged at an angle to the axis of the cone, and having their inlet 60 in the periphery of said cone and their outlet in the upper face thereof, substantially as and for the purposes specified.

2. The combination, with the smoke-stack 65 of a steam-boiler and an injector-nozzle, of a solid regulating-cone provided with steam-passages arranged at an angle to the vertical axis of said cone, and having their inlet in the side of such cone and their outlet in the upper face thereof, and a spindle adapted to 70 be adjusted in the axial plane of the nozzle, on which spindle the adjusting-cone is loosely mounted, substantially as and for the purposes specified.

In testimony whereof I affix my signature 75 in presence of two witnesses.

QUINTON JEROME HOKE.

Witnesses:

W. B. McCaw,  
 W. E. Younts.