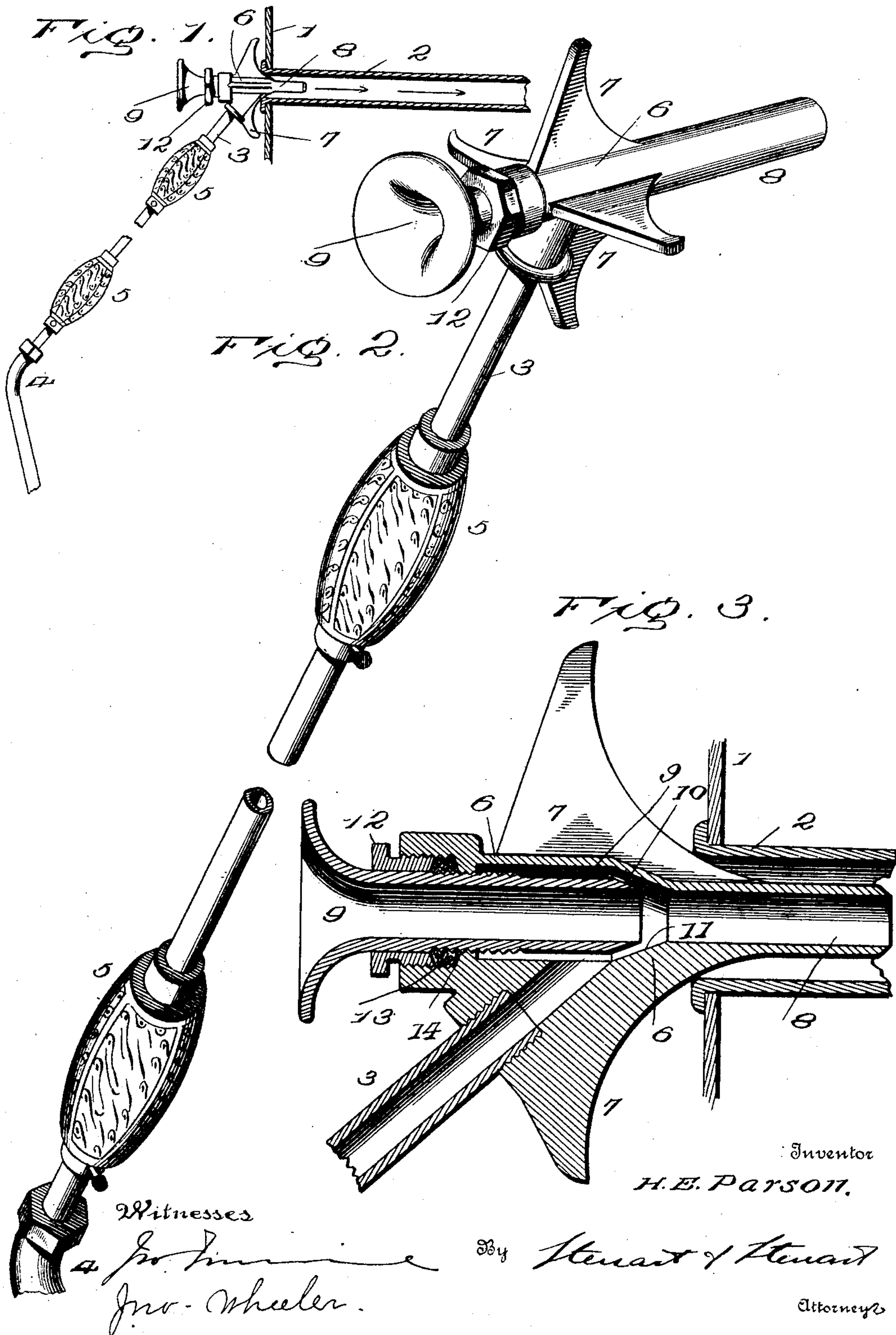


No. 803,504.

PATENTED OCT. 31, 1905.

H. E. PARSON.  
DEVICE FOR CLEANING FLUES.

APPLICATION FILED DEC. 14, 1903. RENEWED OCT. 7, 1905.





# UNITED STATES PATENT OFFICE.

HENRY EDWIN PARSON, OF NEW YORK, N. Y.

## DEVICE FOR CLEANING FLUES.

No. 803,504.

Specification of Letters Patent.

Patented Oct. 31, 1905.

Application filed December 14, 1903. Renewed October 7, 1905. Serial No. 281,752.

*To all whom it may concern:*

Be it known that I, HENRY EDWIN PARSON, a citizen of the United States of America, and a resident of 320 Broadway, New York, State of New York, have invented certain new and useful Improvements in Devices for Cleaning Flues, of which the following is a specification.

My invention relates to a device for quickly and effectively cleaning the flues of a fire-tube boiler, so as to remove scale, dust, and ashes therefrom.

It consists of an instrument by means of which steam and air or air alone under pressure are projected into and through the flue in such a manner as to tear the scale off of the surface of the tube and carry it and all loose material lying in the tube through and out of the tube with great rapidity.

In the drawings, Figure 1 represents my flue-cleaner in its normal position inserted into the end of a boiler-tube. Fig. 2 is a perspective view of the flue-cleaner, showing its connection to its supply of steam. Fig. 3 is a sectional view of the injector and the flue-cleaner in position in the mouth of the tube.

In the drawings the same numerals of reference indicate the same parts in all figures.

Referring to the drawings, 1 is the tube-plate of a boiler. 2 is a fire-tube inserted therein, the walls of which in practice become incrustated with scale produced by the deposit of carbon and other materials carried into the flues by the fire and furnace gases as they pass through the flues to the stack. The deposit of these materials upon the surface of the interior of the flues greatly reduces the conductivity of the walls of the flues and decreases the steaming capacity of the boiler. It is very desirable that the flues should be kept clean and that they should be quickly and easily cleaned by a handy instrument which can be inserted into the front end of the flues and by which the scale and other deposits may be quickly and effectively removed from the surface of the flues.

3 is a steam-pipe connected to a source of steam-supply 4 at one end, provided with handles 5 5, so that it may be grasped with impunity by an operative. Upon the end of the steam-pipe 3 is an injector 6, provided upon its exterior with a series of radial wings 7 7 7, three or four in number. The diameter of the injector is considerably less than the diameter of the tube. The injector consists of a nozzle 8, through which steam passes from the steam-pipe 3 into the flue 2 and is injected into the

flue at or about its axis. The radial wings 7 7 on the sides of the injector are beveled on their forward edges and support the injector centrally within the flue 2, leaving air-passages around the exterior of the injector, through which an induced current of air may enter the flue on the outside of the injector-nozzle 8.

Within the body of the injector 6 is located a central air-supply tube 9, threaded upon its exterior and tapped into the rear end of the injector. The forward end of the air-tube 9 is beveled and ground to a seat at 10 and coöperates with the conical seat upon the interior of the injector at 11.

12 is a gland threaded into the interior of the injector and surrounding the air-tube 9.

13 is packing located between the end of the gland 12 and a shoulder 14 on the interior of the injector-casing.

It will be perceived that when the gland 12 is loosened the air-pipe 9 may be screwed in or out of the injector, so as to leave any desired steam-aperture around its end between its beveled surface 10 and the seat 11. The gland 12 may then be screwed up tight and the air-tube 9 will be locked in a permanent position, so as to maintain the steam-passage between 10 and 11 permanent. If now steam be turned onto the pipe 3 and the device, by means of the handles 5 5, be inserted into a flue, the steam will pass through the nozzle 8 into the center of the flue and will induce two currents of air, one flowing around the exterior of the nozzle 8 and between it and the wall of the flue and the other passing centrally through the air-tube 9 and mixing with the steam as it is emitted from the nozzle 8. It will be noticed that the wings 7 7 automatically center the nozzle 8 in the axis of the flue and regulate the size of the air-aperture between the nozzle 8 and the interior of the flue. During the instant in which steam is turned on certain things happen which produce within the flue a very sudden expansion of gases and a great increase of gaseous pressure, both laterally and forward, with the result that the scale and dirt are torn away from the sides of the flue and ejected from the opposite end of the flue. The action may be compared to the firing with a gun through the tube of a column of air and steam and using the steam as a motive power. At one hundred pounds pressure steam will travel from the orifice of the jet about six hundred and forty-eight feet per second. It thus takes



one-thirtieth part of a second to travel through a twenty-foot tube. The immediate result of this application of force to the comparatively inert column of heated air in the tube is that the injected air is propelled by the suction of the jet and subsequent percussion effect due to pressure of not less than one and one-half inches measured by an appropriate gage and that owing to the inert character of the body of air in the tube this compression proceeds until the inert body of air has been forced from the end of the tube. At the same time the air which is taken in at the mouth of the tube by the jet in a comparatively cold condition is expanded by taking heat from the tube and the steam which propels it. This of course increases the compression as the body of air travels through the tube, and this compression reaches its high point just as the compressed body of air leaves the far end of the tube. As soon as the compressed air has left the tube and air and steam are flowing freely through it, being sucked in at one end and forced out at the other, the compression falls somewhat, and the work of cleansing the tube is practically over. It follows from the foregoing that if a flue-cleaner is kept in a flue for any considerable period of time—say four or five seconds—its effectiveness after the first second is practically *nil*, save to act as a scourer upon the interior of the tube. Its office in cracking off the scale would have been accomplished in a fraction of the first second of its operation. There is another force entering into the action of this cleaner. It has been said that the flue-cleaner cracks off the scale by percussion. It also does so by the contraction of the scale and of the tube, due to the sudden introduction into the flue of comparatively cold air. This body of air in absorbing heat from the tube causes some contraction of the tube and of the scale, and this contraction takes place in such a short interval of time as to crack the scale and prepare it for the action of the jet of steam and air, by which it may be torn away from the wall of the flue.

The device is adjustable, so as to permit any proportion of air and steam to be used, and the small size of its nozzle and the large size of its wings adapt it for use in flues of any diameter.

It will be understood that steam is used in

my flue-cleaner for two purposes—to provide a propelling force to drive the gases and solid matter in the tube through and out of it and also to heat the contents of the tube and expand the gas therein and that which is drawn in. Air is heated by compression and when compressed and heated will serve the same purpose as steam. When, therefore, in the claims I speak of “steam” I desire it to be understood that I mean steam or its equivalent, hot air under pressure.

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

1. In a boiler-flue cleaner, the combination of a steam-nozzle, suitably connected to a supply of steam having upon its interior in advance of the steam-inlet a valve-seat, an axially-located air-inlet tube mounted in the rear of the steam-nozzle, and having a conical end adapted to contact with the valve-seat within the nozzle, and to limit and control the admission of steam to the nozzle, a series of radial wings beveled on their forward edges and located upon the exterior of the steam-nozzle, and adapted when inserted into the mouth of the flue to locate the nozzle axially therein.

2. In a boiler-flue cleaner, the combination of a steam-nozzle provided with a source of steam-supply and having a valve-seat upon its interior beyond the steam admission, an air-inlet tube threaded into the rear of the steam-nozzle, and located axially therein, having a forward conical end to coöperate with the valve-seat within the nozzle and limit and control the admission of steam to the nozzle, a gland surrounding the air-inlet tube tapped into the rear of the nozzle and operating to compress upon the air-inlet tube, and between it and the interior of the nozzle a suitable packing, and a series of radial wings beveled on their forward edges, located upon the exterior of the nozzle and adapted to locate the nozzle axially in the mouth of the flue, substantially as described.

Signed by me at New York city, New York, this 27th day of November, 1903.

HENRY EDWIN PARSON.

Witnesses:

DAVID M. EDSALL,  
E. R. BERKELEY.