H. E. PARSON.

HYDRO-CARBON INJECTOR.

No. 191,546. Patented June 5, 1877.

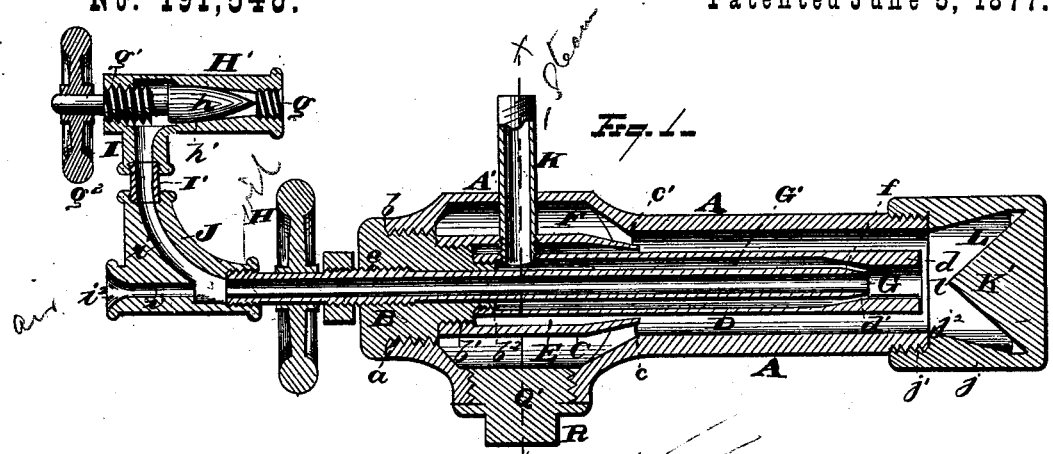

Fig. 1.

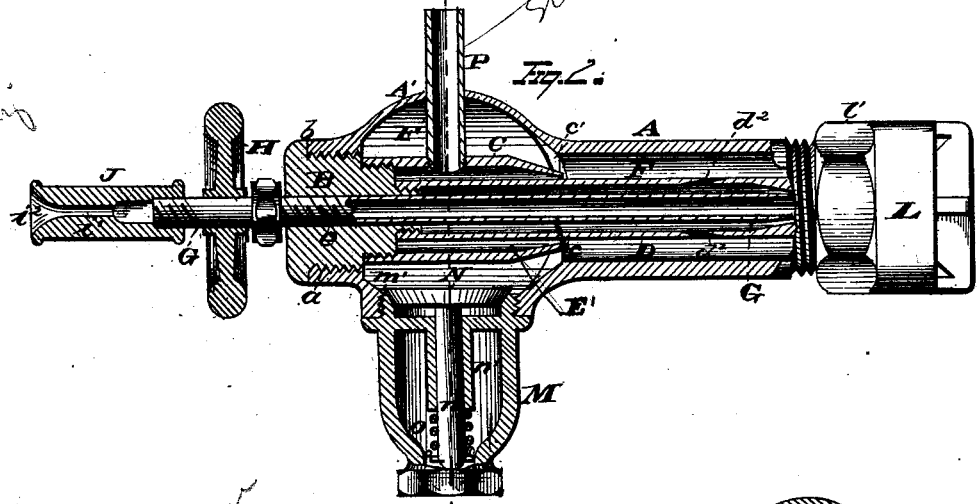

Fig. 2.

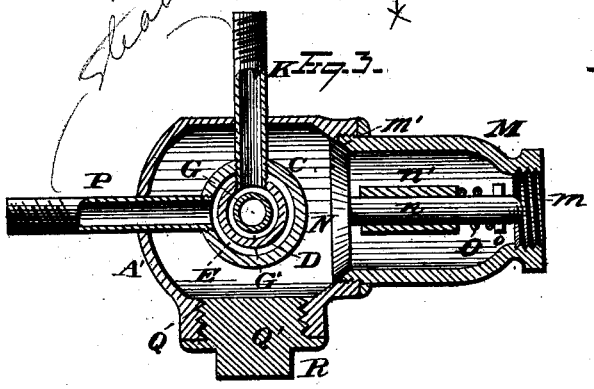

Fig. 3.

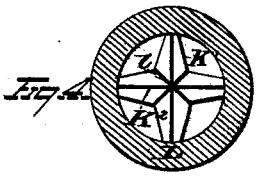

Fig. 4.

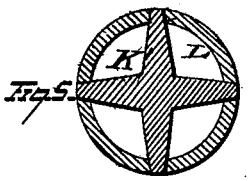

Fig. 5.

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HENRY E. PARSON, OF WATERTOWN, NEW YORK.

IMPROVEMENT IN HYDROCARBON-INJECTORS.

Specification forming part of Letters Patent No. **191,546**, dated June 5, 1877; application filed April 25, 1877.

To all whom it may concern:

Be it known that I, HENRY E. PARSON, of Watertown, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Hydrocarbon-Injectors; 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in hydrocarbon-injectors for furnaces; the object of the same being to provide an apparatus whereby oil, air, and steam, or oil and gas, may be delivered into the fire-box of a furnace in a thoroughly atomized and intermingled condition, and the resulting hydrocarbon vapors utilized as fuel for heating purposes.

In the accompanying drawings, Figure 1 is a vertical section of my improved apparatus. Fig. 2 is a horizontal section of the same. Fig. 3 represents a cross-section taken through lines *x x* of Figs. 1 and 2. Fig. 4 shows a rear view of the atomizer, and Fig. 5 a front view of the same.

A represents the outer casing of the injector, the forward part of which is preferably cylindrical in form, while the rear portion is enlarged at A′, for a purpose hereinafter described. The rear end of casing A is screw-threaded on its inner side at *a*, for the attachment of a plug, B, which latter has a shoulder, *b*, formed thereon, to fit snugly against the rear edge of casing A, and form a tight joint therewith. The periphery of shoulder *b* is hexagonal, or of equivalent form, in order that a wrench may be secured thereto, when it is desired to secure the plug in place. The inner end of plug B is formed with projections b^1 b^2, each of which is screw-threaded for the attachment of the outer and inner tubes C D, which latter are arranged as shown, to constitute an intervening annular chamber, E, between said tubes, and a large annular space, F, between the tubes and the outer casing A. The outer tube C is formed with a conical delivery end, *c*, which serves to contract the opening E between tubes C and D, while the chamber or opening F between the outer surface of tube C and the casing A is likewise contracted, owing to the form of the casing at *c*′. To the forward end of tube D a contracted nozzle, *d*, is secured, or formed as a part of said tube, said nozzle *d* having a conical valve-seat, d^1, within which fits the forward end of an oil-supply pipe, G, which latter forms a steam-chamber, G′. The rear end of oil-pipe G is screw-threaded, and passes through an opening, *e*, in plug B. A hand-wheel, H, is rigidly secured to the oil-pipe G, at a point outside the injector, and it will be readily understood that the hand-wheel, when turned, serves to impart an endwise movement to the oil-pipe G, and thus regulate the amount of opening between the outer surface of the forward end of said pipe, which constitutes a valve, *f*, and the conical valve-seat d^1.

Oil is fed to the injector as follows: H′ represents a T-piece, having one end screw-threaded at *g*, for its attachment to an oil-supply pipe leading to an oil-tank or source of supply, while the valve-stem g^1 is fitted to the opposite end of piece H′.

The outer end of valve-stem g^1 is provided with a hand-wheel, g^2, which is rigidly secured to the valve-stem in any desired manner, and to the opposite end of stem g^1 is attached a conical or other valve, *h*, which seats snugly against the valve-seat *h*′.

The lower stem I of piece H′ connects, by means of a pipe, I′, with an angular coupling-piece, J, which latter is secured to the movable oil-pipe G. An oil-passage, *i*, is formed in the coupling-piece J, and serves to conduct oil from the valve to the injector.

In order that a supply of air may be admitted to the injector with the oil furnished thereto, coupling-piece J is provided with an air-passage, i^1, which has a flaring mouth, i^2, said passage being formed preferably on a line with oil-pipe G.

K represents a steam-pipe, one end of which connects with the steam-space of any form of steam-generator, while the other end, or a coupling-piece attached thereto, passes through the outer casing A of the injector, and through the outer tube C, and is screwed into the inner tube D, thus enabling steam to be conducted into the steam space G′, between the oil-pipe G and the inner tube D.

To the forward end of the injector-casing A is secured an atomizing-nozzle, L, which consists of a tube, *j*, screw-threaded at j^1, and provided with a shoulder, j^2, which latter fits snugly against the forward end of casing A. The opening in the nozzle L is obstructed by any desired numbers of cross-bars, K′, which are joined at their centers, the rear edges of said cross-bars gradually decreasing in thickness to constitute knife-edge deflectors K″, while all of said deflectors converge to form a single conical deflector, *l*. The outer surface of atomizer L has a hexagonal boss, *l′*, formed thereon for the attachment of a wrench, in order that the atomizer may be readily detached from the injector. Atomizer L is placed in the fire-box of a furnace, and may be of any desired length to project inwardly into the furnace as far as may be desired, and it may be made of cast-iron, or of any refractory material, to withstand the intense heat to which it is subjected when in use.

The operation of the several parts of the injector, as above described, is as follows: The oil-valve *h* is opened and any desired quantity of oil allowed to flow into the oil-pipe G. Steam is then admitted to the chamber G′ through steam-pipe K, and issues in a thin annular jet through the annular opening between the valve *f* and valve-seat d^1. As the volume of steam escapes under pressure through the contracted nozzle *d*, it forms a partial vacuum in the oil-pipe G, and operates to draw forward the oil contained therein, which is intimately intermingled with the steam, together with air drawn through the air-passage i^1; and as the combined mixture of steam, oil, and air is directed forcibly against the sharp deflectors K″ and conical deflector *l*, the mixture is thoroughly atomized and fed into the fire-box in the form of spray, where it is ignited, and causes a vivid combustion with an intense heat. The intensity of the heat may be regulated by means of the valve governing the flow of oil, and the force of the injector is also regulated by the hand-wheel H, whereby the steam-eduction to the atomizer is varied in size, according to the relative position of the valve *f* and valve-seat d^1.

In order to adapt my improved apparatus for use where a supply of gas can be obtained for fuel, the following means are provided, whereby steam and gas may be thoroughly intermingled and forced into a furnace; or, if desired, gas may be admitted and mingled with oil, air, and steam.

To the enlarged portion A′ of injector-casing A is secured a valve-casing, M, the lower end of which is inwardly screw-threaded at *m*, for the attachment of a pipe connecting with the supply of gas. The upper end of valve-casing M is provided with a conical valve-seat, *m′*, upon which is seated an inwardly-opening valve, N. Valve-stem *n* is guided in its vertical movement by a guide, *n′*. The valve is held against its seat by a spiral spring, O, one end of which rests against the stationary guide *n′*, while the other end rests against a pin or nut, *o*, secured to the lower end of valve-stem *n*.

Steam-pipe P leads from the steam-generator, and, passing through the outer casing A, connects with the outer tube C, thereby establishing a communication between the steam-generator and the steam-chamber E, the latter formed between the tubes C D. When it is desired to supply gas to the furnace, steam is admitted to chamber E through pipe P, and as the steam issues forcibly through the contracted annular passage between the tube D and the forward end of tube C, it operates to draw the air contained in the enlarged chamber of the injector through the contracted passage formed by the inclined wall *c′* of the casing, and thereby creates a partial vacuum in said chamber, which allows the atmospheric pressure to open the valve and admit gas to the injector. The gas is thoroughly commingled with the steam, and, if desired, the mixture may be further mixed with combined oil, air, and steam before it is injected into the furnace fire-box.

Oftentimes it is desirable to have a steam-blower attached to a furnace, in order to hasten and promote the combustion of fuel therein, and hence I have adapted my improved injector for such use, as will appear from the following description: In the enlarged portion A′ of the injector-casing A, and opposite the steam-pipe K, there is formed a large opening, Q, the sides of which are screw-threaded for the attachment of a solid plug, Q′, which latter has a nut, R, formed thereon, in order that it may be readily removed by a wrench. When the injector is to be used as a steam-blower the valve regulating the supply of oil is closed, the plug Q′ removed, and steam admitted through pipe P to steam-chamber E. As the steam escapes from chamber E it operates to draw air through the opening Q and discharge a constant and forcible stream of air into the fire-box. It is evident that instead of using a solid plug, Q, an inwardly-opening valve, similar to gas-valve N, may be substituted therefor; and by means of a suitable device for locking the valve—as, for instance, by a wedge or key passing through a slot in the valve-stem—the injector may be very readily transformed into a steam-blower.

Hydrocarbon-injectors constructed in accordance with my invention, as above described, are adapted to be applied to all kinds of furnaces for generating steam, and also to puddling and glass furnaces, and many other purposes not necessary to mention.

I would further observe that there are three little steam-outlets, d^2, two only of which are shown in the drawing, formed in the tube D. These are diagonally inclined rearward, and connect steam-passage G′ with the passage F. They create a strong current of air through the passage F, thus aiding combustion, and also maintaining the mouth of the burner at a low temperature.

They partially accomplish the effect of an injector in the casing A, and aid the delivery from the steam-chamber G′; hence practically giving the device a double-injector consturction.

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

1. In a hydrocarbon-injector, the combination, with the oil-supply pipe located within the injector, and adapted to have an endwise movement therein, of an oil-supply valve and a coupling-piece, the latter provided with an oil-passage, and also with a passage leading to the open air, substantially as and for the purpose set forth.

2. In a hydrocarbon-injector, the combination, with the outer casing, having a plug secured within one end of the same, of a tube removably secured to a screw-threaded boss formed on the inner end of the plug, said tube provided with a conical valve-seat and a contracted nozzle, and an oil-supply pipe, arranged to extend through said plug, the forward end of the oil-pipe having a conical valve formed thereon, substantially as and for the purpose set forth.

3. In a hydrocarbon-injector, the combination, with the outer casing, and oil and steam pipes arranged within the same, of an atomizing-nozzle, formed with a conical deflector, made up of a series of knife-edge deflectors, substantially as and for the purpose set forth.

4. In a hydrocarbon-injector, the combination, with an outer casing having an enlarged chamber formed therein, of an inner steam-tube of practically the same length as the enlarged chamber, and a steam-supply pipe leading to said tube, and an inwardly-opening valve, substantially as and for the purpose set forth.

5. The combination, with the outer casing of a hydrocarbon-injector, constructed substantially as shown, and a valve-casing, the upper end of which constitutes a conical valve-seat, of a valve and a spring, which latter is interposed between the valve-stem guide and a pin or nut secured to the valve-stem, substantially as and for the purpose set forth.

6. In a hydrocarbon-injector, the combination, with the outer casing, having an enlarged chamber formed therein, and suitable steam-pipes, of a removable plug, Q′, substantially as and for the purpose set forth.

7. In a hydrocarbon-injector, the combination, with casing A, formed with an enlarged portion, A′, provided with opening Q, of the steam-pipe P, tubes C D, the several parts constituting the chambers E and F, substantially as and for the purpose set forth.

8. In a hydrocarbon-injector, the combination, with the tubes C and D and steam-pipe P, of the outer casing A, provided with an inwardly-opening valve, constructed with an inclined inner surface, c', in close proximity to the forward end of tube C, substantially as and for the purpose set forth.

9. In a hydrocarbon-injector, the combination, with casing A, having an enlarged portion, A′, of the plug B, tubes C D, oil-pipe G, and steam-pipes K P, substantially and as for the purpose set forth.

10. A hydrocarbon-injector constructed with independent steam-chambers and connecting-pipes, the same arranged substantially as set forth, whereby either air and steam, or gas and steam, or oil, air, and steam, may be injected, separately or collectively, into a furnace, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 23d day of April, 1877.

HENRY E. PARSON.

Witnesses:

GEO. V. NORTHRY,

JOSEPH WALKER.