(No Model.)

W. N. GRAVES.

OIL BURNER FOR FURNACES.

No. 505,355. Patented Sept. 19, 1893.

Fig. I.

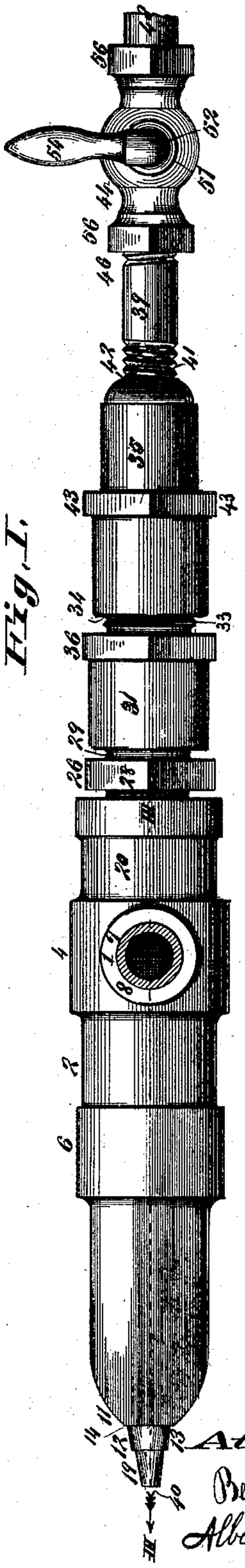

Fig. II.

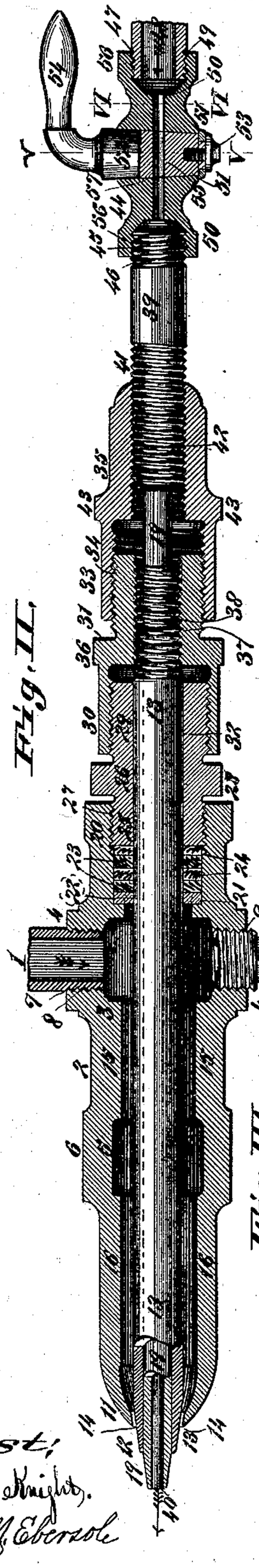

Fig. III.

Fig. VII.

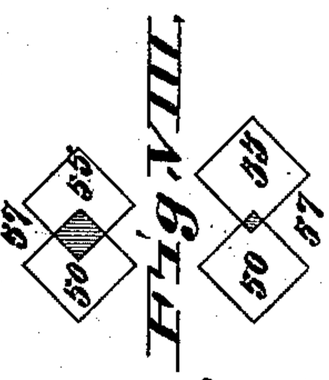

Fig. VIII.

Fig. VI.

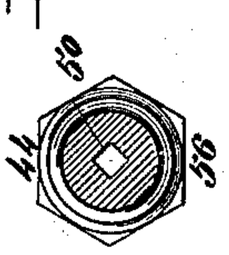

Fig. V.

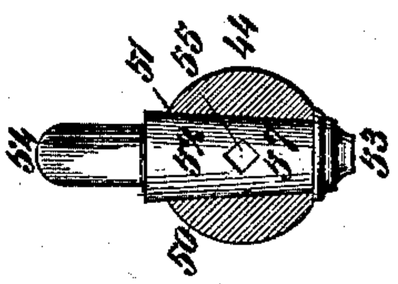

Fig. IV.

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UNITED STATES PATENT OFFICE.

WILLIS N. GRAVES, OF ST. LOUIS, MISSOURI.

OIL-BURNER FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 505,355, dated September 19, 1893.

Application filed January 7, 1893. Serial No. 457,635. (No model.)

To all whom it may concern:

Be it known that I, WILLIS N. GRAVES, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Oil-Burners for Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention is an improvement on my invention patented January 4, 1890, No. 419,515, and it relates to an instrument for effecting the burning of coal-oils provided with a square oil supply valve duct, a coadjutant jet of steam or air being used to project the oil into the furnace and oxygenate said combustible oils at the initial starting point of their combustion, and the projecting annular nozzles of the concentric tubes are made longitudinally adjustable so as to arrange the desired focal projection of the discharge, and the invention consists in features of novelty hereinafter fully described and pointed out in the claims.

Figure I is a top view of the device. Fig. II is an axial vertical section showing part of the oil pipe and valve tube in side view. Fig. III is a longitudinal section of the steam nozzle taken on line III—III, Fig. I. Fig. IV is a transverse section taken on line IV—IV, Fig. III, and shows a cross-section of the spiral steam passage. Fig. V is a vertical section taken on line V—V, Fig. II, and shows the oil supply valve in elevation and the square port of said valve in registry with the port of the supply pipe. Fig. VI is a transverse section of the valve section of the supply pipe, taken on line VI—VI, Fig. II, and shows the square tube center of said valve section supply pipe. Figs. VII and VIII are enlarged, diagrams and show respective, progressive and retrogressive degrees of the conjunctive registry positions of the square ports of the valve and the supply pipe.

I will describe my invention as used in connection with a steam generator, but it is equally applicable, and it is to be so understood, that without any change in construction, it is alike adapted for use in connection with an air pressure chamber, in which case the part termed the steam pipe would be the air pipe, and the word steam where it appears in the description would be changed to air. Thus either a steam or air draft is alike applicable for use in conjunction with the device, without any change in its construction.

Referring to the drawings:—1 is the transverse steam pipe in connection with a steam generator (not shown).

2 is the steam nozzle cylinder, which is provided with an initial enlarged steam-chamber 3, within its cylinder and a peripheral bulge 4 outside said cylinder; also an intermediate enlarged, steam-chamber 5, between said former chamber and the outlet of the nozzle, and a peripheral bulge 6, outside said cylinder. The peripheral screw end 7 of the supply steam pipe 1, is seated in the internal screw 8, that passes through said bulge 4 into said steam chamber 3. The said bulge 4 is also provided with a screw threaded port 9 opposite the steam pipe insertion, and said port is stopped by the screw plug 10. The said nozzle cylinder is contracted at the front discharge end 11, and within said contracted end is the tapering end 12 of the tube 13, the said end forming a valve in conjunction with said discharge end 11 of the nozzle, there being between them an annular port or passage 14, the capacity of which may be varied by the movement of the tube 13, that is worked within said cylinder. The steam passes through said annular passage 14, into the furnace-chamber, (not shown) when the device is in position and in operation.

15 represents an annular steam supply chamber that connects the bulge steam chambers 3 and 5 within the nozzle cylinder, and 16 is a like chamber that connects said chamber 5 to the annular port or passage 14 at the discharge end 11 of the nozzle.

17 represents spiral or rifle grooves extending lengthwise within the bore of the steam chamber 16, between which grooves are the spiral ribs 18. The said spiral arrangement within the bore of said steam chamber turns the steam that it receives from the chamber 5, into a spiral course to its valvular discharge around the tapering end 12 of the tube 13 at the nozzle, which spiral course has a spraying effect on both the steam and oil supply as will hereinafter be more particularly described.

19 represents the centrally located oil-pipe, that works freely longitudinally and radially within the tube 13, under the influence of its concentric drive screw connection, which with that operating said tube 13, will be hereinafter described, so that while the said tube 13, and pipe 19 have endwise movement as well as on and in each other, the said parts are always concentric.

20 represents a stuffing box at the rear end of the steam nozzle cylinder 2, at the inner end of which stuffing box is the flange stopper 21, which has a bore 22 in which said tube 13 fits snugly, but also works freely. In said box are packed the alternate elastic rings 23 and metal rings 24 that fit around the tube 13, and constitute the stuffing when packed by the forward screw end 25 of the gland or follower 26, that is screwed into the screw threaded rear end 27 of the nozzle cylinder by means of its projecting peripheral nut face 28. The rear screw end 29 of said gland engages in the forward screw 30 of the nut section 31, and the tube 13 passes through the snug but free fitting bore 32 in said gland 26. The said packing, when pressed home by said gland prevents the rearward escape and loss of steam. Now as the tube 13 is concentrically seated and works in said bore 32 in said gland 26, and the interior of said tube 13 freely but snugly fits the periphery of the oil pipe 19 that works within it, therefore said parts have always respective concentric movements, both in respect to each other, and to the mouth of the nozzle between which and themselves is the annular valvular discharge 11. The rear peripheral screw 33 of said nut 31 (which with those already described are right hand screws), is seated in the inner forward screw 34 of the nut cylinder 35.

36 is the projecting sex-angular wrench face of said nut section 31 by which it is turned.

37 represents a left hand peripheral drive-screw on the rear end of the tube 13, and 38 is its bed-screw in which said screw 37 works when respectively driven or retracted by the action of the nut section 31, to protrude more or less through the valvular, annular port 14 at the discharge mouth of the nozzle.

39 represents a diametrically, enlarged, continuation tube stem that is an integral extension of the pipe 19, and which is provided with a central bore 40, which make a continuation of that alike numbered of said pipe 19, and is of equal capacity therewith, so as to effect a continuous passage of the supply oil.

41 represents a peripheral left-hand drive screw on the forward end of said tube stem 39 that works in the internal bed screw 42 in the rear end of said nut cylinder 35 when said cylinder is turned by means of its sex-angular wrench face 43, to longitudinally adjust said tube 19.

44 represents a valve pipe section, the forward, internal right hand screw 45 of which engages on the rear peripheral screw 46 of said enlarged pipe stem 39, when turned by means of its sexangular nut face or faces 56. The peripheral connecting screw 47 of the oil supply pipe 48 engages in the internal bed-screw 49 at the rear end of said valve pipe section 44.

I now come to a very important improvement in the oil duct connections of my adjustable oil supply valve, that overcomes the difficulty long experienced from the choking of the feed especially with heavy and crude oils. So that the peculiar construction of my square oil duct and adjustable valve supply and its improvement may be better understood, I will simply state the disadvantage of the old round duct adjustable valve supply, that my square duct overcomes or avoids. As the valve, unless choked, has only to be turned partially or slightly on to supply the required volume in the flow of oil, therefore in the usual circular valve bore or duct, the valve opening is in the form of an elongated, narrow crescent, or in the shape of a new moon at the time of its first appearance, being a long, narrow aperture, tapering toward its horns above and below. Now with any oils, but more especially with heavy or crude oils, the said elongated, narrow port opening of the valve almost invariably chokes after a short period of use. With this explanation, my square duct and square port valve opening will be better understood.

50 represents a square duct that extends longitudinally through the oil supply valve pipe section 44. 51 is the inverted, cone valve-seat in said section, and 52 the conical valve which fits and works in said seat, in which it is adjustably held by the screw 53, and turned by its handle 54. The operative, inverted cone 52 of said valve is pierced by a square duct 55, which square duct registers more or less with the square ducts 50 of the valve pipe section, according to the volume of the oil supply required, (see Figs. II, V, VI, VII and VIII.) Now it will be seen that when said valve is partially turned on from the very commencement of the port registration of the valve duct with that of its pipe section, (see Fig. VIII,) to a farther opening of said port, (see Fig. VII) and farther to that of the full coincident registration of said ducts, (see Figs. II and V,) the coincident registration of the opening of said valve ducts is always square from its initial opening to that of its complete coincidence, the said square ducts 50 in the valve section pipe and 55 in the valve, being placed in a diagonal position in both valve and pipe section, as shown in Figs. II, V, VII and VIII, so that their registering connection commences and progresses as most clearly shown in Figs. VII and VIII, from the time that the square points of the ducts commence to overlap each other, making an open, square registering port 57 from its first minute inception, to its full coinci-

dence, thus at its initial opening point avoiding the usual long, narrow, crescent shaped port, that soon chokes with heavy and crude oils.

Another important improvement on my previous invention (Patent No. 419,515), is the system of diverse left and right hand connecting and drive screws, by which respectively the connection of the operative parts is effected and the steam adjusting tube 13, with its valvular outlet 14, and the oil-pipe 19, are respectively driven and withdrawn in the adjustment of their projection from the nozzle, to their right respective focal distances, to the best regulate the focal oil discharge, and the drive head of steam that has both the projectile force of its head and the rotary course it attains by passing through the spiral grooves 17.

Although in my said previous invention, I also had in some measure, as now, a spiral, annular steam jet to drive the oil jet and as now also to spray the same by its rotary movement, yet in the present device there is a great improvement in the means of manipulation, and focal adjustment of said parts. Also the square duct of the supply valve provides a novel means of avoiding all danger of choked ports in connection with the supply valve. It will also be seen that, in the connection of the various screw attaching multiple incasing sections of the machine, right-hand screws are invariably used as means of said attachment, and to the contrary on the other hand the operative drive and draw-screws that respectively adjust the focal projectile and withdrawal set of the tube 13, and the oil pipe 19, are left-hand screws. When the projectile ends of said tube 13 and oil-pipe 19 are described as being driven and retracted by said screws 37 and 41, the term is respective in relation to the nozzle cylinder 2, and its rear attached sections 26, 31 and 35, for said parts may either be adjustable on said tube 13 or said tube with its incased oil-pipe be the moving members in said adjustment, without changing the relative action of said elements of the device. Now it will be seen that by the said reverse action of the respective section case attaching screws on the one hand, and of the operative or drive screws on the other, the adjustment of the focal projection of said driven parts is much more readily effected. In arranging the respective focal adjustment of said tube 13 and said oil-pipe 19, it will be seen that by turning the nut cylinder 35, the left-hand drive screw 41 is operated, and thereby the discharge end of the oil-pipe 19 is advanced or retracted in the tube 13, while the turning of the nut section 31 causes the said tube 13 and said oil-pipe 19 to be advanced or retracted simultaneously. It will also be seen that the distance of the focus of the steam or air jet from the jet orifice 11 at the discharge end of the nozzle, through the annular valve 14, will be governed by the position of the tapering valve-end 12 of said tube 13, the focus being thrown farther forward by the advance of said part, and retracted by its withdrawal. The flame produced may be much modified in length and volume by the adjusted positions of said taper-valve end of the tube 13, and of the discharging taper end of the oil-pipe 19, and also by their individual relative positions. As the focal distance is lengthened, the projectile distance of the flame into the furnace is increased to a much greater degree. It has been found that the position of the discharge end of the oil-pipe must be changed with the change of focus to produce the best results. These changes may be easily made by the above described operative left hand drive and draw-screws, while the device is in full operation. It is also found that the attachment of the machine through the pipe 1, may be respectively changed to and from a steam or air blast, or the combination of both, as the case may be, without any stay or hinderance to the action of said machine.

I claim as my invention—

1. An oil-burner comprising a nozzle 2, a screw threaded follower 26, located at the rear end of the nozzle, a nut section 31, located at the rear end of the follower, a nut cylinder 35, located at the rear end of the nut section, a tube 13 extending through the nozzle and through the follower, having screw thread connection with the latter, and an oil pipe 19 extending through the tube, having screw thread connection with the nut-cylinder; substantially as described.

2. In an oil burner, the combination of a steam and air supply pipe 1, a nozzle cylinder 2, said nozzle provided with the steam and air chambers 3, 5, 15 and 16, the spiral grooves 17 within the nozzle; the rear end of said nozzle cylinder inclosing the stuffing box 20, a perforate flange stopper 21 at the forward end of said stuffing box, elastic packing rings 23 and metal rings 24, a tube gland or follower 26, a tube nut-section 31, provided with the internal bed screw 38, that is screw seated on said gland, a nut cylinder 35, screw seated on said section, and provided with an internal bed screw 42, a tube 13, a left hand drive screw 37, integral with said tube, an oil pipe 19, a tube stem 39 integral with said oil pipe, a peripheral left hand drive screw 41, and a right hand screw 46 on said stem, the said screw 41, working in said bed-screw 42; substantially as described.

3. In an oil burner, the combination of a steam and air supply pipe 1, a nozzle cylinder 2, the steam and air chambers 3, 5, 15 and 16, the latter chamber provided with the spiral grooves 17, the rear end of said cylinder inclosing the stuffing-box, a perforate flange stopper 21 at the forward end of said stuffing-box, elastic packing rings 23 and metal rings 24, a tube gland or follower 26, a tube nut-section 31, provided with the internal bed

screw 38, that is screw-seated on said gland, a nut cylinder 35, screw seated on said section, and provided, with an internal bed screw 42, a tube 13, a left-hand drive-screw 37 integral with said tube, an oil pipe 19, a tube-stem 39 integral with said oil-pipe, and a peripheral left-hand drive screw 41, and a right-hand screw 46 on said stem, the said screw 41, working in said bed screw 42 of said nut cylinder 35, substantially as described.

WILLIS N. GRAVES.

In presence of—
BENJN. A. KNIGHT,
ALBERT M. EBERSOLE.