E. C. CARNT & A. FORSTER.

SPRAY BURNER.

APPLICATION FILED JULY 16, 1909.

952,306.

Patented Mar. 15, 1910.

3 SHEETS—SHEET 1.

Fig: 1.

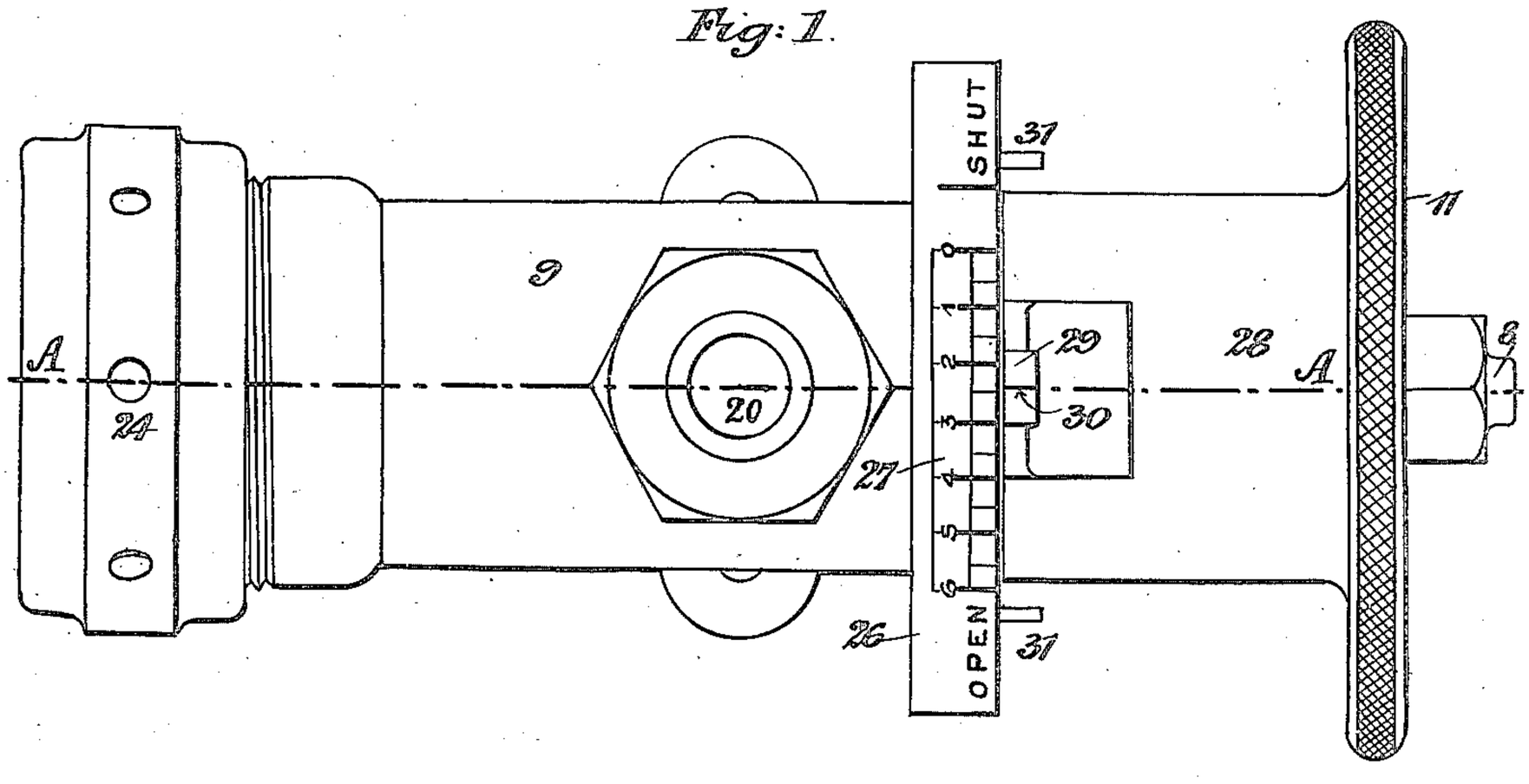
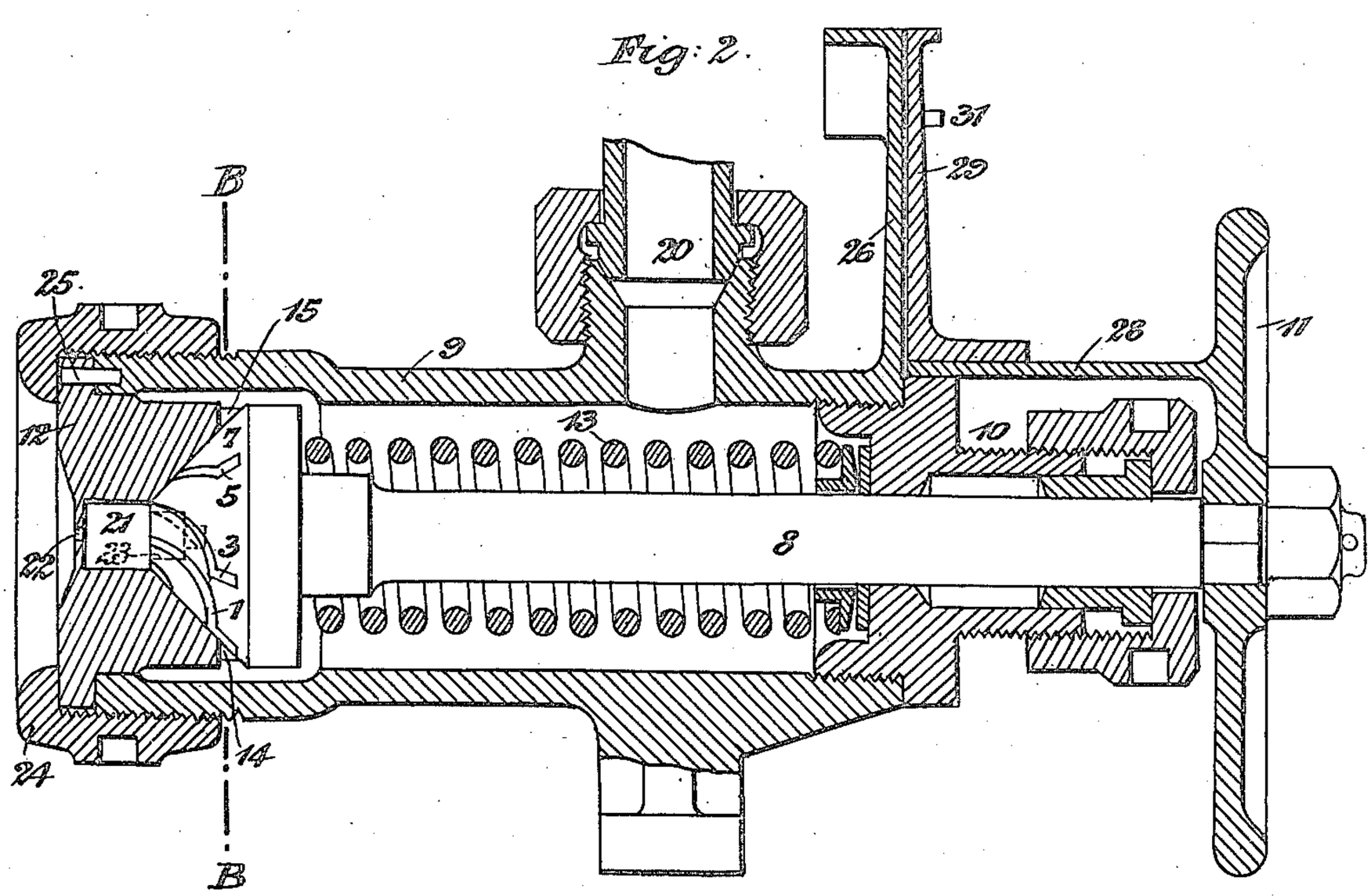


Fig: 2.



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3 SHEETS—SHEET 2.

Fig: 3.

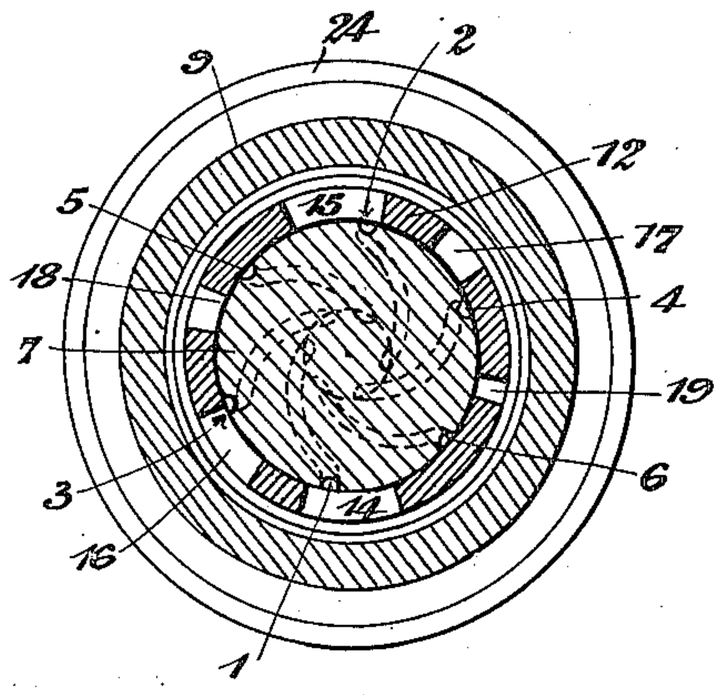


Fig: 4.

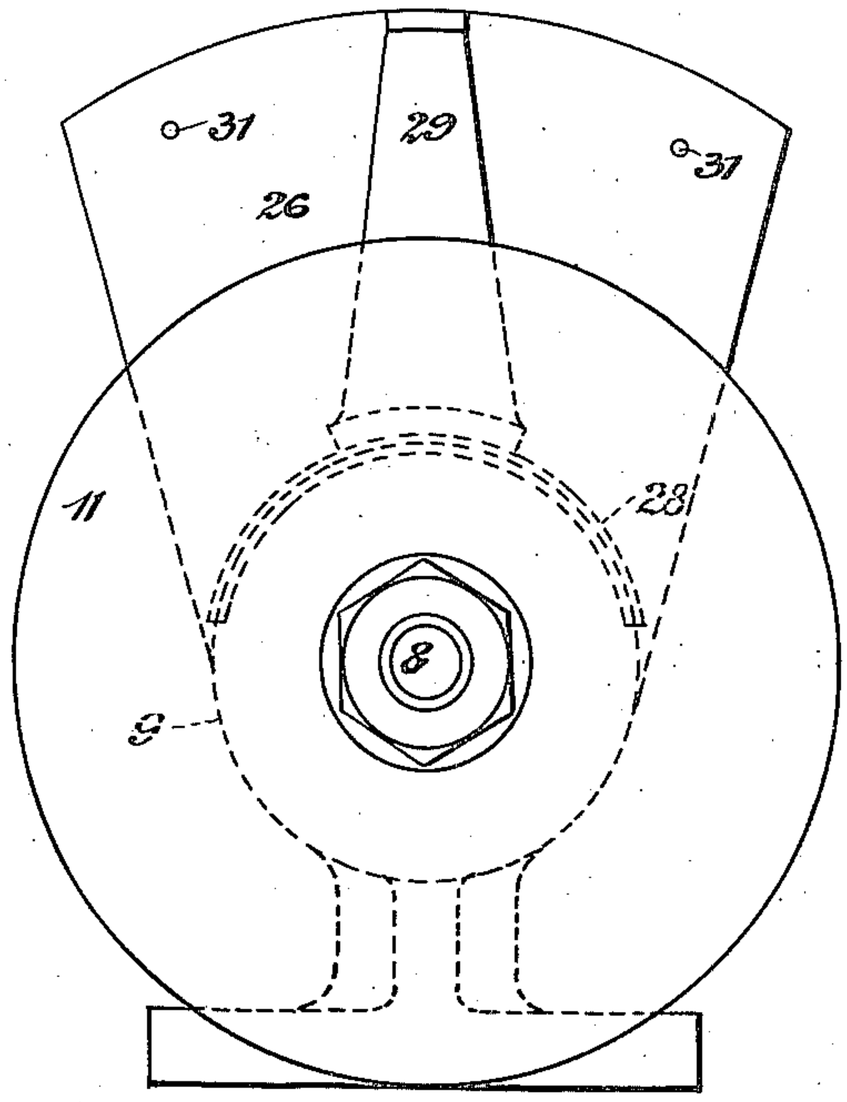


Fig: 5.

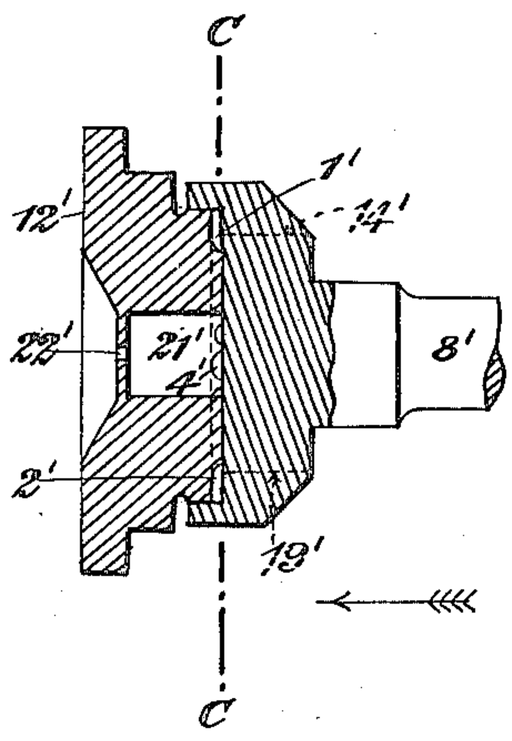
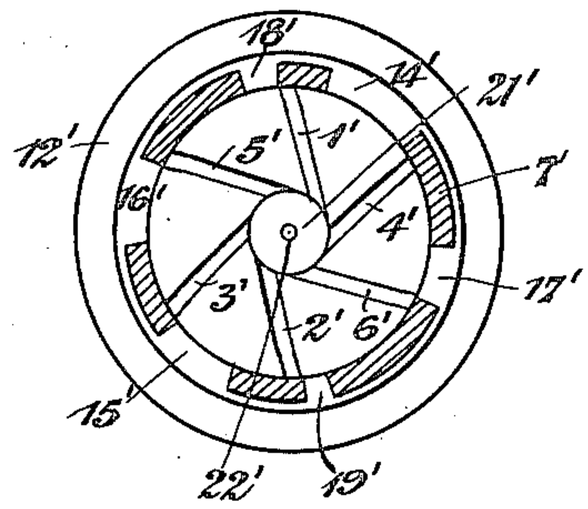


Fig: 6.



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3 SHEETS—SHEET 3.

Fig: 7. Fig: 8 Fig: 9 Fig: 10 Fig: 11 Fig: 12

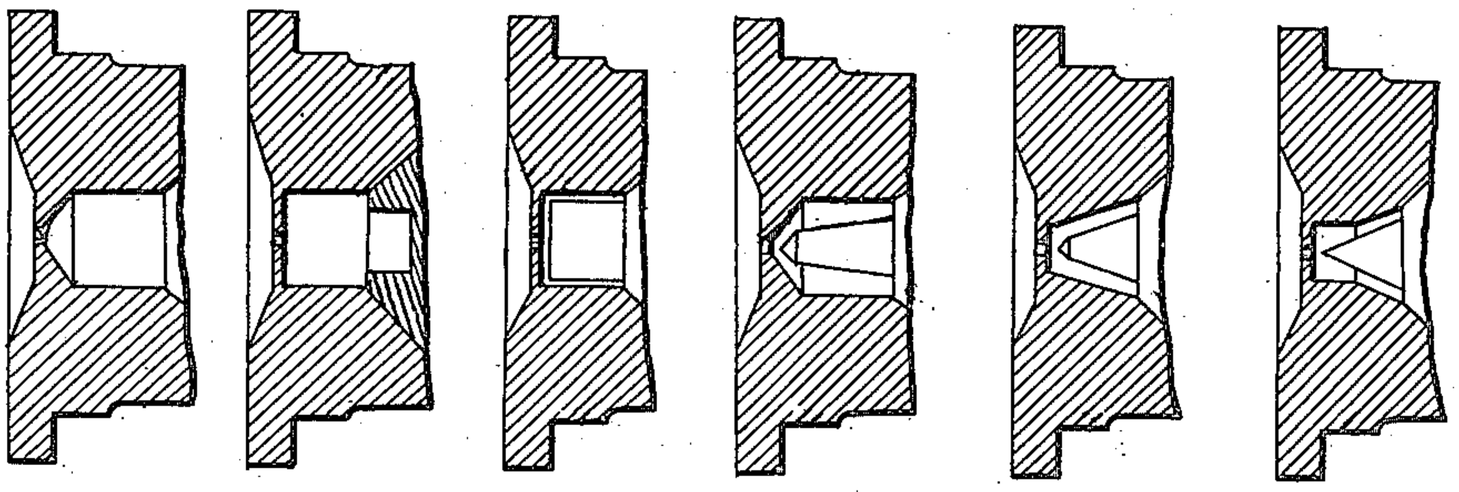

Fig: 13.

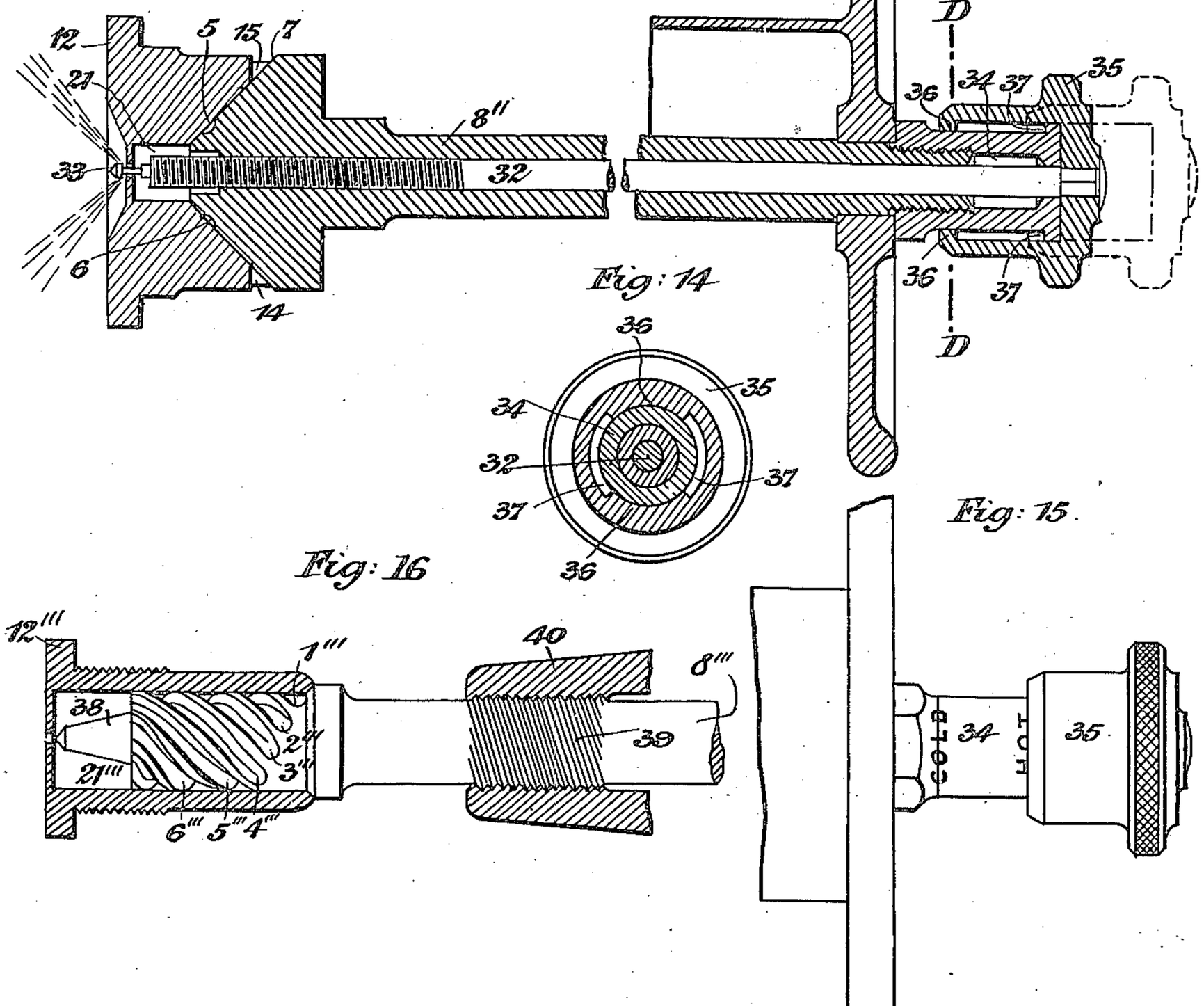

Fig: 14

Fig: 16

Fig: 15.

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UNITED STATES PATENT OFFICE.

EDWIN CHARLES CARNT AND ANDREW FORSTER, OF EAST COWES, ISLE OF WIGHT, ENGLAND, ASSIGNORS TO J. SAMUEL WHITE AND COMPANY LIMITED, OF EAST COWES, ENGLAND.

SPRAY-BURNER.

952,306. Specification of Letters Patent. Patented Mar. 15, 1910.

Application filed July 16, 1909. Serial No. 507,959.

To all whom it may concern:

Be it known that we, EDWIN CHARLES CARNT and ANDREW FORSTER, both subjects of the King of Great Britain, and residing at East Cowes, Isle of Wight, England, have invented new and useful Improvements in Spray-Burners, of which the following is a specification.

The said invention relates to that type of liquid fuel sprayers for furnaces in which the fuel is sprayed solely by the agency of pressure, and the main objects of the said invention are to provide for more efficient and convenient regulation of the discharge and for greater range of such regulation than are possible with sprayers of known constructions, and to so provide for such regulation that it may be effected without producing variation or material variation of the shape or angle of the spray, and also to provide means whereby cold thick oil may be sprayed.

The said invention consists mainly in providing near the discharge nozzle of the sprayer a number of passages for the fuel, and combining therewith means whereby such passages may be successively opened or successively closed for the purpose of varying or regulating the quantity of fuel passing to the discharge nozzle.

The said invention is hereinafter described with reference to the accompanying drawings, the parts of which are referred to in the following description by the numerals marked thereon, the same numerals of reference indicating the same or equivalent parts in all the figures.

Figure 1 of the said drawings is a plan view of a sprayer embodying the said invention; Figs. 2 and 3 are sections thereof taken on the lines A A Fig. 1 and B B Fig. 2 respectively; and Fig. 4 is an end view, the said section and end view, Figs. 3 and 4, showing the parts looking in the direction of the arrow in Fig. 2. Fig. 5 is a central longitudinal section of certain parts of another embodiment of the said invention; and Fig. 6 is a section thereof taken on the line C C Fig. 5, looking in the direction of the arrow in that figure. Figs. 7, 8, 9, 10, 11 and 12 are central longitudinal sections showing modified forms of the whirling chamber and of the end of the regulating spindle of a sprayer embodying the said invention as hereinafter described. Fig. 13 is a central longitudinal section of parts of a sprayer embodying the said invention, showing provisions for spraying cold thick oil. Fig. 14 is a section taken on the line D D, Fig. 13, and Fig. 15 is a plan view of a portion of the parts shown in Fig. 13. Fig. 16 is a central longitudinal section of another embodiment of the said invention.

In the embodiment illustrated in Figs. 1, 2, 3 and 4 the aforesaid passages (hereinafter referred to as regulating passages) are of the form of tangential and spiral grooves, are six in number, marked respectively 1, 2, 3, 4, 5, 6 and are formed on the face of a conical boss 7 at one end of a spindle 8, (hereinafter referred to as the regulating spindle), mounted axially in a barrel 9 constituting the body of the sprayer, the other end of which spindle 8 passes through a stuffing box 10 on the rear of the sprayer and carries a handwheel 11 by which the regulating spindle 8 may be turned. The conical boss 7 is seated in a correspondingly coned cap 12 at the discharge end of the sprayer, and is kept in place against any unbalanced pressure of the liquid fuel by a helical spring 13 arranged around the said spindle.

In the part of the cap 12 contiguous to the entry ends of the regulating passages 1, 2, 3, 4, 5, 6 are ports 14, 15, 16, 17, 18 and 19 which, by partial rotation of the regulating spindle 8, may be caused to coincide with the said ends of the said passages in order to open communication between them and the interior of the barrel 9. Said barrel is in communication through the passage 20 with the fuel supply and has no provision for communication with the regulating passages 1, 2, 3, 4, 5, 6 otherwise than through the said ports. The positions of the ports 14, 15, 16, 17, 18, 19 and their respective widths are such that by turning the regulating spindle 8 to a certain extent one only may be put in communication with one of the regulating passages 1, 2, 3, 4, 5, 6, and by turning the said spindle a few degrees farther another port and another of the said passages may also be put in communication, and so on, further turning of the spindle increasing the number of ports and regulating passages in communication until all are open.

In the smaller end of the conical seat in the cap 12 is a cylindrical cavity 21, (hereinafter referred to as the whirling chamber),

the inner end wall of which is formed by the smaller end of the conical boss 7, and the outer end wall of which has a central aperture 22 constituting the discharge orifice of the sprayer. The said end of the boss 7 also has a cavity 23 of two diameters, as shown in broken lines in Fig. 2 whereby the capacity of the whirling chamber 21 is increased. The outer ends of the regulating passages 1, 2, 3, 4, 5, 6 communicate with the whirling chamber 21, the positions of the points of communication being such that the liquid fuel in passing through the sprayer under pressure takes a spiral direction in the said chamber, or is whirled around therein, whether one or more or all of the regulating passages 1, 2, 3, 4, 5, 6 be in communication with the fuel supply.

The cap 12 fits in the end of the barrel 9 and is retained in axial position by the flanged screw ring 24, and rotation of the said cap 12 is prevented by the pin 25. The rear portion of the sprayer carrying the stuffing box 10 is secured to the barrel 9 by screwing, so that the said portion may be detached in order to remove the regulating spindle 8 and admit of convenient access to the interior of the sprayer for cleaning purposes without dismounting it.

On the barrel 9 is a bracket 26 having on its upper face a scale 27, and upon a bracket 28 on the handwheel 11 is secured an indicating finger 29 adapted to coöperate with the said scale and having a scoring 30 on its end. The said scale 27 is so designed that when the finger 29 is at one end thereof the position of the regulating spindle 8 is such that none of the regulating passages 1, 2, 3, 4, 5, 6 is in communication with any of the ports 14 15 16 17 18 19. No liquid fuel can therefore pass from the interior of the barrel 9 into the whirling chamber 21 and through the discharge orifice 22 from the sprayer. When the finger 29 is at the other end of the scale 27, all the regulating passages and ports are open to the said whirling chamber. Stop pins 31, 31 on the bracket 26 limit the movement of the finger 29 to this range.

Intermediate portions of the scale 27 indicate angular positions of the finger 29 and regulating spindle 8 in which one, two, three, four, or five of the regulating passages 1, 2, 3, 4, 5, 6 are respectively open for passage of fuel, such positions being indicated on the scale by the numerals 1, 2, 3, 4, 5, 6 respectively. When the scoring 30 of the finger 29 is opposite the zero of the scale, all the regulating passages 1, 2, 3, 4, 5, 6 are closed, but in order to provide sufficient lap for prevention of leakage the extremity of the range of angular movement of the said finger is somewhat beyond the zero in the direction of closing as shown in Fig. 1.

Each of the regulating passages 1, 2, 3, 4, 5, 6, when open, always communicate with the same one of the ports 14, 15, 16, 17, 18, 19; thus 14 is the corresponding port to the passage 1, and 15 is the corresponding port to the passage 2, and 16 the port to passage 3, and so on.

Assuming that the handwheel 11 and spindle 8 are in such angular position that the finger 29 is at the closing extremity of its range of movement, and that it is desired to put the sprayer into action, the said handwheel is turned to the left hand, looking at Fig. 4. When the scoring 30 on the finger 29 is passing the zero of the scale 27, the regulating passage 1 begins to open into the port 14, and when the said scoring has reached the position marked "1" on the said scale, that passage is fully open to the said port, while the other regulating passages remain closed, thus permitting liquid fuel to pass from the sprayer through the medium of that passage only. By further turning the regulating spindle 8 until the finger 29 is opposite the position marked "2" on the scale, the regulating passage 2 is opened to its corresponding port 15, while the passage 1 remains open to its port 14, thus allowing fuel to pass from the sprayer through the medium of the two passages 1, 2. Further turning of the spindle 8 in the same direction successively brings the regulating passages 3, 4, 5, 6 into communication with their respectively corresponding ports 16, 17, 18, 19, until all six regulating passages are thus opened those previously opened remaining open in consequence of the respective widths of the ports 14, 15, 16, 17, 18, 19, as shown in Fig. 3 in which figure and in Figs. 1, 2 and 4 the regulating spindle 8 is shown in the position when the regulating passage 3 is being opened to its port 16.

By the construction hereinbefore described, precise regulation of the volume of discharge from the sprayer may be insured without great skill, and a great range of such regulation provided for, without variation of volume of any individual current of liquid fuel at the regulating point or axial movement of the regulating spindle or other action that affects the shape or angle of the spray.

The regulating passages 1, 2, 3, 4, 5, 6 need not be helical but may be straight and the end of the regulating spindle 8 may be of other shape, than conical, as hereinbefore described.

A portion of a flat ended regulating spindle 8′ with a correspondingly shaped cap 12′ is illustrated in Figs. 5 and 6. In this embodiment the regulating passages 1′, 2′, 3′, 4′, 5′, 6′ are formed in the seat face of the cap 12′ and the corresponding ports 14′, 15′, 16′, 17′, 18′, 19′ are formed in the cir-

cumferential portion of the boss 7′ of the spindle 8′. In these figures the parts are shown in the relative positions they occupy when all the regulating passages 1′, 2′, 3′, 4′, 5′, 6′ are closed.

The quantity and shape or angle of the spray may be altered by modifying the shape and size of the whirling chamber, which may be effected by varying its sectional shape and size, as exemplified in Figs. 7 to 12, or by varying the shape of the end of the boss 7 as exemplified in Figs. 8, 9, 10, 11 and 12 Fig. 8 showing a cavity in the said boss of less depth than that indicated in Fig. 2 and Figs. 9, 10, 11 and 12 showing the said boss provided with an axial projection of respectively various shapes extending into the whirling chamber and thereby decreasing its capacity and modifying its shape.

In the case of thick oil fuel the provisions hereinbefore described for whirling and discharge are not sufficient to spray it, although such provisions are sufficient when heat is available to bring the oil to a suitable temperature and so increase its liquefaction. Consequently, according to the said invention, sprayers designed for use with such thick oil are provided with means for causing the said thick oil to take the form of an open spray and to atomize on its exit from the whirling chamber, which means are adapted to be put out of action while the sprayer is working, when their action is not needed, that is, when sufficient heat is available to increase the liquefaction of the fuel to the degree requisite for spraying. Figs. 13, 14 and 15 illustrate such means combined with the contiguous parts of a sprayer embodying some of the improvements hereinbefore described, the said means consisting of an additional axial spindle 32 so mounted in an axial passage within the regulating spindle 8″ that the end 33 may extend through the whirling chamber, and so shaped at that end as to constitute, when so extended, a valve acting in conjunction with the outer edge of the discharge orifice, as shown in Fig. 13. That is the end 33 is of such diameter as to have a sliding fit in the said orifice, and is reduced in diameter near the extremity so as to form a neck which, when the spindle 32 is fully extended through the whirling chamber, is within the orifice and permits passage of oil therethrough.

At the handwheel end the spindle 32 is provided with a stuffing box 34 and a milled knob 35 by which the said spindle may be rotated, and toward its other end is provided with a screw thread which engages with a screw thread at that part in the axial passage in which it is mounted. By means of such screw thread engagement and knob 35, the spindle 32 may be caused to advance, so that its end assumes the position shown in Fig. 13, when cold thick oil is to be used with the sprayer, the said oil passing through the orifice and being sprayed in an outward direction and atomized by passing through the small annular space between the outer edge of the said orifice and the edge of the outer shoulder of the aforesaid neck near the end 33 of the spindle 32, as indicated by the broken lines at that part in Fig. 13. When heat is available and the special provisions for spraying cold thick oil are not required, the spindle 32 is rotated by the knob 35 so as to withdraw the end 33 into the axial passage in the regulating spindle 8 leaving the orifice 22 fully open as in Fig. 2. Longitudinal withdrawal movement of the spindle 32 is limited by the shoulders 36, 36 upon knob 35 abutting against the shoulders 37, 37 upon the end of the stuffing box 34, the said shoulders 36, 37 being respectively shaped bayonet joint fashion, as shown in Fig. 14, in order that the knob 35 may be mounted on its spindle 32.

In another embodiment of the said invention illustrated in Fig. 16, the end of the regulating spindle 8‴ is cylindrical and has a number of helical grooves in it forming the regulating passages 1‴, 2‴, 3‴, 4‴, 5‴, 6‴. Said end works and fits frictionally in a cylindrical chamber in the cap 12‴ which is screwed into the sprayer barrel. The whirling chamber 21‴ is formed by the free or unoccupied portion of this chamber, and varies in size according to the position of the spindle 8‴. The said regulating passages terminate at their front ends at different points along the axis of the spindle 8‴ which has a screw thread at 39 engaging with a screw thread in a fixed part 40 in or on the sprayer barrel, so that by rotation of the regulating spindle 8‴ its grooved end may be more or less advanced into or withdrawn from the chamber in the cap, whereby the end or ends of one or more of the regulating passages 1‴, 2‴, 3‴, 4‴, 5‴, 6‴ may be successively shut off from or brought into communication with the interior of the barrel of the sprayer for regulation of the flow of fuel to the whirling chamber. In the said Fig. 16 the parts are shown in the relative positions they occupy when the entry ends of all the said regulating passages are within the cap chamber and thus cut off from the interior of the barrel of the sprayer and closed to the passage of fuel therefrom. The end part 38 of the regulating spindle 8‴ within the cap chamber may be conical as shown or of other shape.

We claim:—

1. A spray burner comprising a barrel, the interior of which is in communication with a fuel supply; a part fitted in the mouth of the barrel and having a discharge orifice formed in one face and a seat formed in the other face; and an axially rotatory

part having one end received in said seat, one of said parts having a series of fuel passages communicating with said orifice, the other part having a series of ports adapted to successively open communication between the interior of said barrel and said passages when the rotatory part is rotated in one direction.

2. A spray burner comprising a barrel, the interior of which is in communication with a fuel supply; a part fitted in the mouth of the barrel and having a discharge orifice formed in one face and a seat formed in the other face; and an axially rotatory part having one end received in said seat, one of said parts having a series of fuel passages communicating with said orifice, the other part having a series of ports adapted to successively open communication between the interior of said barrel and said passages when the rotatory part is rotated in one direction, said ports being of different widths, to maintain such communication open during the continuation of rotation of said part in that direction.

3. A spray burner comprising a barrel, the interior of which is in communication with a fuel supply; a part fitted in the mouth of the barrel and formed with a discharge orifice, a whirling chamber opening thereinto, and a seat; and an axially rotatory part having one end received in said seat, one of said parts having a series of fuel passages opening into said chamber, the other part having a series of ports adapted to successively open communication between the interior of said barrel and said passages when the rotatory part is rotated in one direction.

4. A spray burner comprising a barrel, the interior of which is in communication with a fuel supply; a cap fitted in the mouth of the barrel and formed with a discharge orifice, a whirling chamber opening thereinto, and a seat; and an axially rotatory spindle provided at one end with a boss received in said seat, said boss having a series of fuel passages opening into said chamber, and said cap having a series of ports adapted to successively open communication between the interior of said barrel and said passages when said spindle is rotated in one direction.

5. A spray burner comprising a barrel, the interior of which is in communication with a fuel supply; a part fitted in the mouth of the barrel and formed with a discharge orifice, a whirling chamber opening thereinto, and a seat; and an axially rotatory part having one end received in said seat, and having formed in said end a cavity opening into said chamber and constituting an extension of the same, one of said parts having a series of fuel passages opening into said chamber, the other part having a series of ports adapted to successively open communication between the interior of said barrel and said passages when the rotatory part is rotated in one direction.

6. A spray burner comprising a barrel, the interior of which is in communication with a fuel supply; a cap fitted in the mouth of the barrel and formed with a whirling chamber having a discharge orifice at one end; and an axially rotatory spindle having one end seated in said cap and closing one end of said chamber, said spindle having formed in said seated end a series of tangential fuel passages opening at one end into said chamber, and said cap having a series of ports of different widths adapted to successively open communication between the interior of said barrel and the other ends of said passages, when said spindle is turned in one direction.

7. A spray burner comprising a barrel, the interior of which is in communication with a fuel supply; a cap fitted in the mouth of the barrel and formed with a discharge orifice; a tubular spindle for spraying fuel through the orifice; means for axially rotating the spindle; additional spraying means comprising a spindle fitted in the bore of the first spindle, one end of the second spindle extending through said orifice and having a shoulder adapted to coöperate with the outer edge thereof to cause outward spraying and atomization of the fuel; and means for withdrawing said second spindle while the first spindle is in operation.

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