Oct. 19, 1937. R. LENSCH ET AL 2,096,119

METAL SPRAY GUN

Filed April 13, 1936 3 Sheets-Sheet 1

FIG. 1.

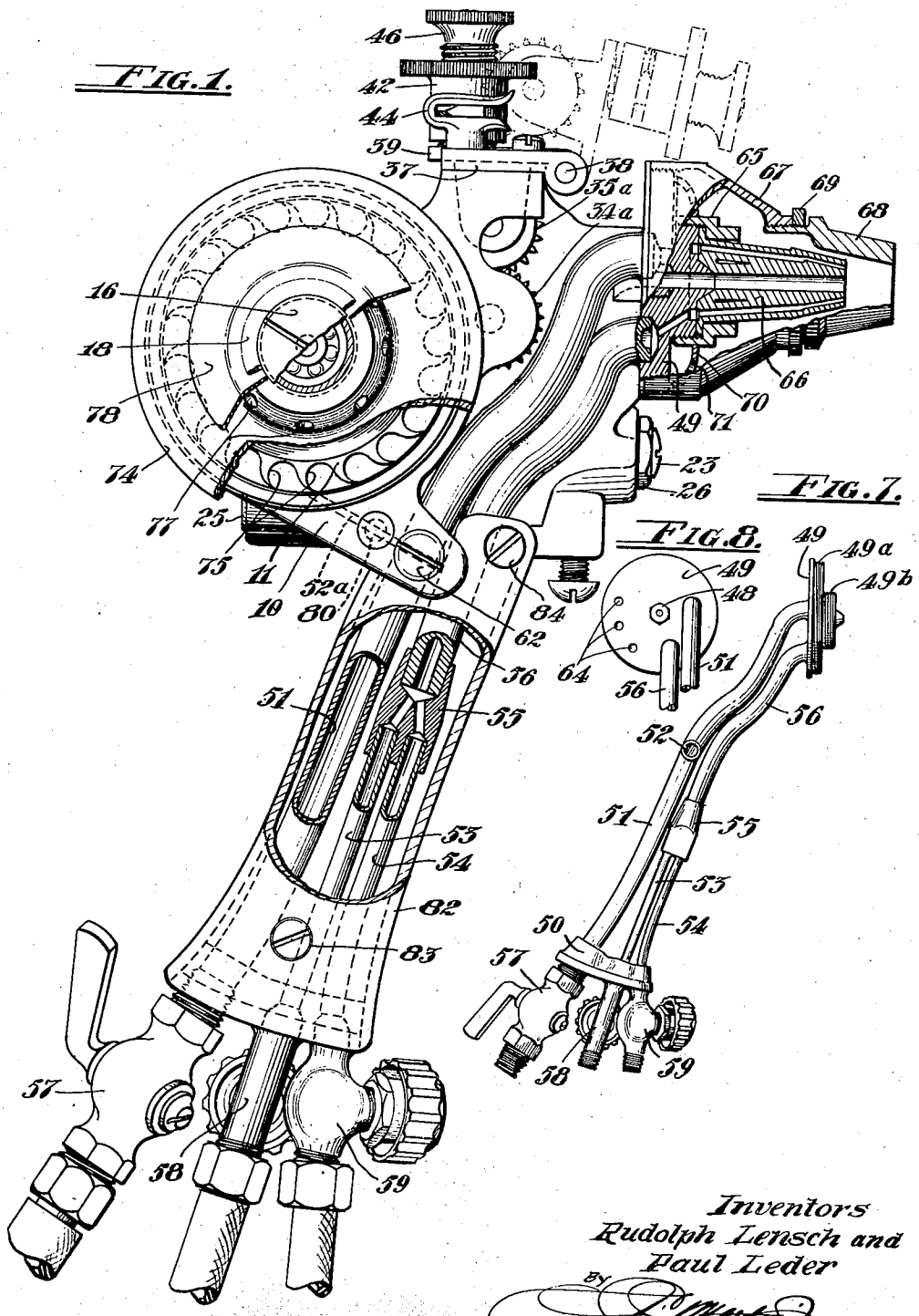


FIG. 7.

FIG. 8.

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METAL SPRAY GUN

Filed April 13, 1936 3 Sheets-Sheet 2

FIG. 2.

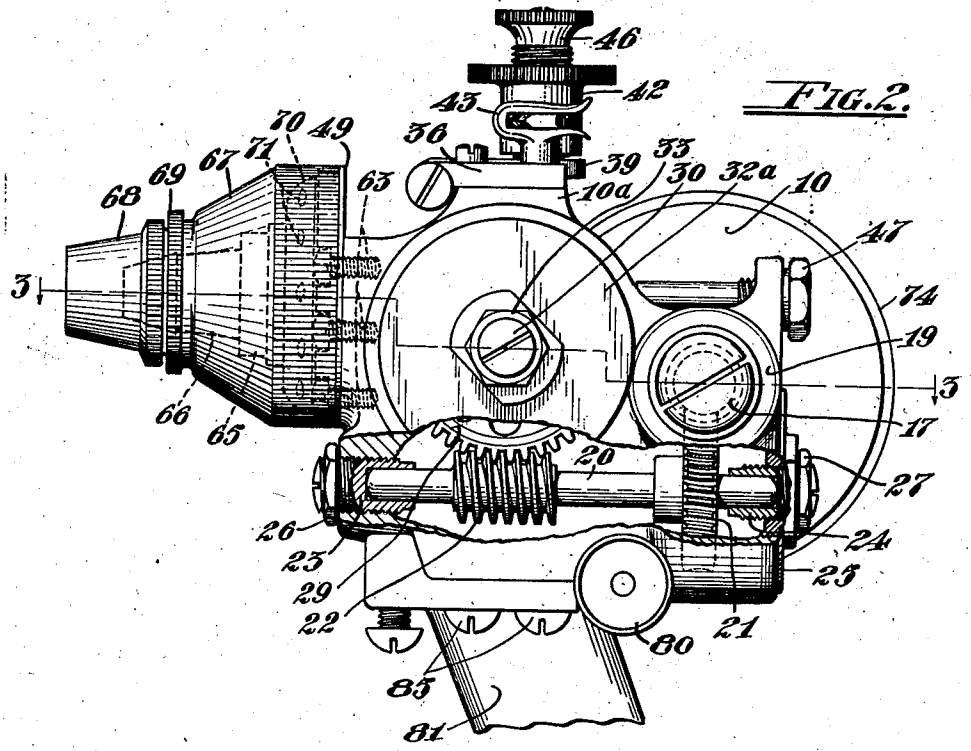
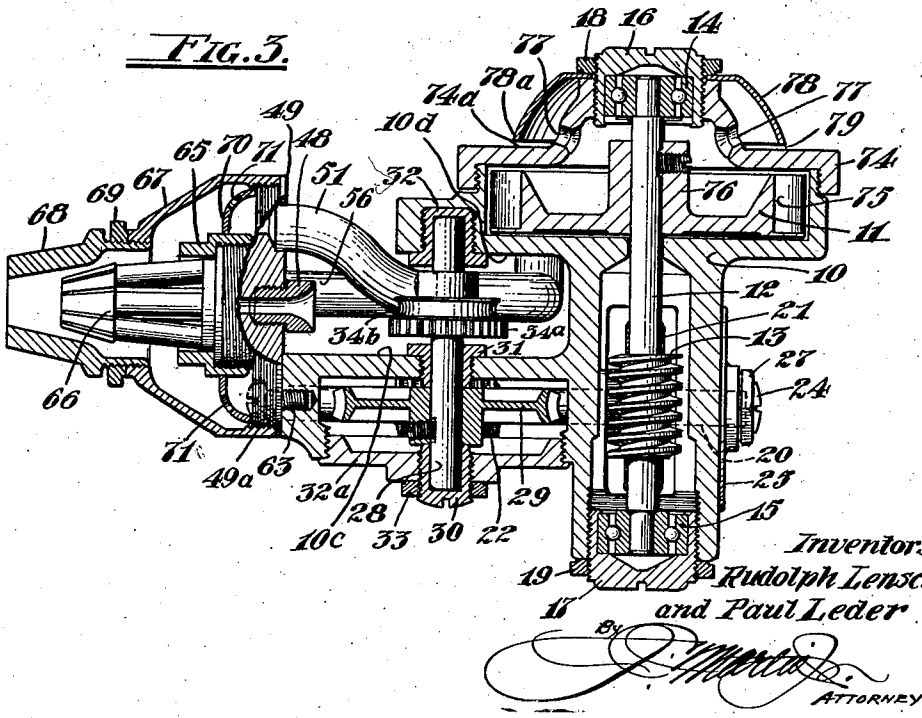


FIG. 3.



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METAL SPRAY GUN

Filed April 13, 1936 3 Sheets-Sheet 3

FIG. 4.

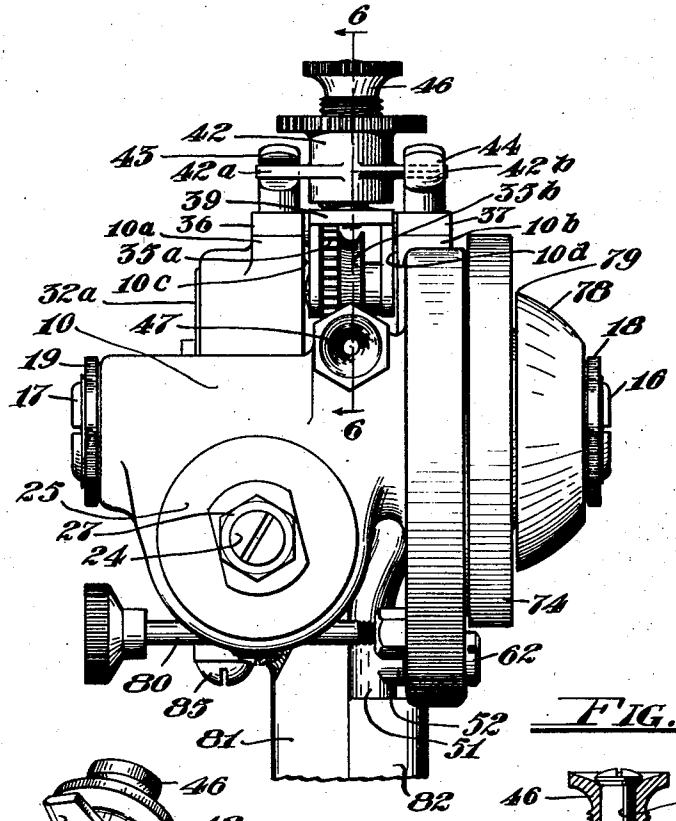


FIG. 5.

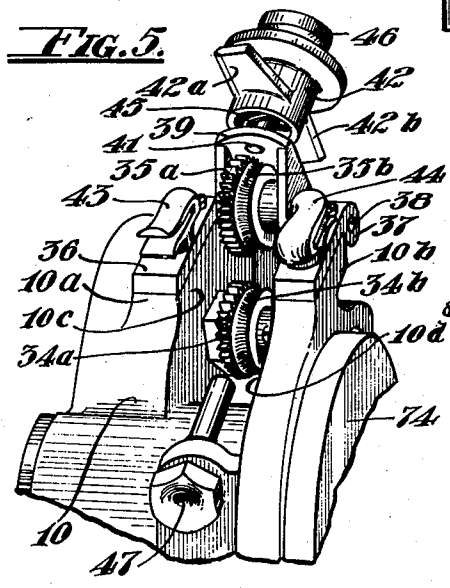
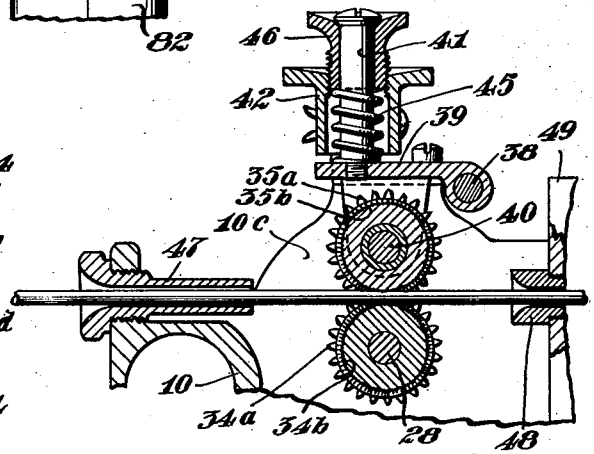


FIG. 6.



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UNITED STATES PATENT OFFICE

2,096,119

METAL SPRAY GUN

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Application April 13, 1936, Serial No. 74,028

4 Claims. (Cl. 91—12.2)

The hereinafter described invention relates to the spraying of molten metal, being characterized by improvements in devices for this purpose, which devices utilize gaseous fuels for melting the metal as fed through them in wire form and fluid pressure for atomizing and depositing the molten metal against a base or part to be metal coated.

Among the objects of this invention is the provision of certain new and novel features and advantages beyond the improvements in Metal spraying devices as set out in United States Letters Patent granted to Rudolph Lensch and Paul Leder, January 8, 1935, No. 1,987,016.

One of the objects of the present invention is to provide an improved arrangement of controlling the wire fed through the gun whereby any desired pressure may be exerted on the wire in its passage through the wire feeding wheels, thereby better preventing slippage of the wire and effecting through the uniformity of its feed an improved quality of the molten metal deposition.

Another object of this invention is to provide a hinged latch construction whereby the top wire feeding wheel is releasably confined so that during wire feeding it can be set to engage the wire and after or during wire feeding can be unlatched and lifted on its hinged connection out of the way.

Another object of this invention is to increase the efficiency of the power plant as employed for driving the wire feeding mechanism of the gun through improvements, (1) in the turbine used as the prime mover, and (2) in the gearing of the transmission, the housing of the transmission and the manner of setting the transmission gearing in its bearings.

A further object of this invention is to form the combustion unit of the gun as a separate and distinct entity from the the mechanical unit or power plant of the gun and to so provide conduits for carrying the fluid for atomizing the molten metal of the gun as well as the fuel for melting the metal that they will be contained in a single unit, one end of which terminates in a base to which the fuel nozzle of the gun is attached, and the opposite end of which terminates in the valve controlling means for the fluid pressure and fuel in its passage through the unit—thereby (1) condensing the space which these conduits occupy, eliminating joints subject to leakage and permitting of a construction of relatively light weight, and (2) making a construction for carrying fluid pressure and fuel which can be assembled in the gun as a unit as well as replaced as a unit for expeditious repair.

Another object of this invention is to provide in a metal spray gun a casting as an integral part which will contain the housings for encompassing the gears of the transmission as well as the turbine for driving the transmission gears and to so form the casting that it will have a channel way for the wire feed, free and clear of the interiors of the gear and turbine housings.

Another object of our invention is to provide a new and novel way of handling the turbine exhaust, so that the exhaust will be expanded between the cover of the turbine and the turbine impeller and released through openings in the turbine cover, and after passing through these openings will be baffled to effect its discharge circumferentially, thereby effecting a greater efficiency of the turbine through the improved means of governing its exhaust.

A further object of this invention is to improve the efficiency of the combustion unit of the gun through the provision of a baffling arrangement whereby the fluid pressure for atomizing the molten metal will be better distributed around the molten metal in its discharge through the air cap at the end of the gun.

In order to more fully understand our invention reference should be made to the accompanying drawings, in which Fig. 1 is a side elevation with portions broken away and certain parts in section to better illustrate the improvements. Fig. 2 is a side elevation of the upper portion only of the structure of our invention, this view showing the side directly opposite the side of the elevation of Fig. 1. Fig. 3 is a sectional plan view taken on line 3—3, Fig. 2. Fig. 4 is a rear end elevation of the upper portion only of our improved structure. Fig. 5 is a broken perspective view of the wire feeding mechanism of our improvements. Fig. 6 also shows in sectional side elevation another view of the improved wire feeding arrangement of our structure taken on line 6—6, Fig. 4. Fig. 7 is a side elevation showing the combustion unit only of our improved gun structure, while Fig. 8 is a rear end view of the upper portion thereof.

Referring to the drawings:—Description will first be made of the power plant of our structure in which numeral 10 denotes the casting which contains the chambers for housing the turbine 11, and the gear train cooperating therewith. Numeral 12 denotes the turbine shaft carrying the worm 13, this shaft being mounted in ball bearings 14 and 15. Ball bearings 14 and 15 are ad-

justably confined endwise by threaded containers 16 and 17 respectively. Containers 16 and 17 are locked in position after adjustment by lock nuts 18 and 19 respectively. Numeral 20 denotes a cross shaft substantially at right angles to turbine shaft 12. Shaft 20 carries a worm wheel 21 and a worm 22, and is mounted in bearings 23 and 24 at its opposite ends. The bearings 23 and 24 are aligned so as to bring the worm wheel 21 into meshed engagement with the worm 13 of turbine shaft 12. Shaft 20 is adjustably confined endwise through the threaded engagement of bearing 23 with casting 10 on the one end and through the threaded engagement of bearing 24 on the opposite end as provided in the gear chamber cover 25. Lock nuts 26 and 27 confine the bearings 23 and 24 respectively, in adjusted position. Numeral 28 denotes a shaft substantially at right angles to shaft 20. Shaft 28 carries a worm wheel 29, and is mounted in bearings 30, 31 and 32 so as to bring worm wheel 29 into meshed engagement with the worm 22 of shaft 20. Shaft 28 is adjustably confined endwise through the threaded engagement of bearing 30 as provided in the gear chamber cover 32*a*. A lock nut 33 confines the bearing 30 in adjusted position. Shaft 28, termed as the wire feed shaft, carries a wire feeding wheel comprising two portions, 34*a* and 34*b*. Portion 34*a* consists of a spur gear, while portion 34*b* consists of a grooved knurl wheel. Situated immediately over the wire feeding wheel of shaft 28 is another similar wire feeding wheel, comprising portions 35*a* and 35*b*. Portion 35*a* consists of a spur gear adapted to mesh with the spur gear 34*a*, while portion 35*b* consists of a knurled wheel adapted to cooperate with the knurled wheel 34*b* in the feeding of the wire through the gun as hereinafter described. The wire feeding wheels, comprised of the parts 34*a*—34*b* and 35*a*—35*b* are known as the lower and upper wire feeding wheels, respectively. The meshing of the gear portions of the wire feeding wheels is brought about only during the feeding of wire and through a new and novel arrangement of parts involving a latch device pivotally mounted in bearing plates 36 and 37 secured to lugs 10*a* and 10*b* of casting 10. The pivotal mounting is occasioned by a shaft 38 fitting bearings made in the plates 36 and 37. Shaft 38 carries a part 39, having depending portions containing bearings for carrying a shaft 40; upon which is mounted the upper wire feeding wheel 35*a*—35*b*. Secured to the top of part 39 by bolt 41 is a latch member 42 having wing portions 42*a* and 42*b* extending from its side. The member 42 is adapted to swivel on the bolt 41. Now, secured to the bearing plates 36 and 37, respectively, are two forked members 43 and 44. These forked members have open jaws, the jaws being set so that their open ends are opposed to each other. The jaws of members 43 and 44 are adapted to receive the wing portions 42*a* and 42*b* of latch member 42, the cooperating edges of the wings and jaws being beveled so that when the latch member 42 is swiveled in its connection a firm but releasably confined engagement of member 42 will be made in the jaws of members 43 and 44. In this latch construction it will be noted that the depending bearing portions of part 39 carrying the upper wire feeding wheel 35*a*—35*b*, are adapted to fit between the faces 10*c* and 10*d* of the main casting 10—a channel being formed between said faces of casting 10 to receive the part 39 when the latch member 42 is engaged in the forked jaws of members 43 and 44. At this time the gear portion 35*a* of the upper wire feeding wheel and the gear portion 34*a* of the lower wire feeding wheel are brought into meshed engagement for the feeding of wire through the knurled portions 34*b* and 35*b* of the respective wire feeding wheels. A spring tension device is provided in the latch member 42 which gives the ability to the latch structure to adjust the pressure applied upon the wire in its feed through the knurled portions 34*b* and 35*b* of the lower and upper wire feeding wheels, respectively. This device comprises a spring 45 chambered in latch member 42, the upper end of member 42 being tapped to receive a spring tension adjusting screw 46.

In the drawings, Fig. 1, the latch device is shown in dotted lines swung up in the out of service position, that is, when no wire is being fed through the gun. By our improved structure the operator has a full vision of the wire, from the time of its entrance through the rear wire guide 47 and across the face of the knurled portion 34*b* of the lower wire feeding wheel into the front wire guide 48, before the latch member 42 is dropped down on its pivotal mounting into the channel way of the main casting 10 and its wings 42*a* and 42*b* are locked in wire feeding position in the jaws of members 43 and 44. The improved wire feeding arrangement of our structure including the latch device and channel between the sides 10*c* and 10*d* of main casting 10, for receiving the latch member 42 and upper wire feeding wheel as depended therefrom, is well shown in perspective view Fig. 5, while the sectional illustration of Fig. 6 shows the structure in functioning position during the feeding of wire.

Having described the wire feeding structure of our invention we will proceed with the description of the combustion unit thereof and in this connection reference is made particularly to Fig. 1, Figs. 7 and 8, in which Fig. 1 shows this unit assembled in place in the gun structure, and Fig. 7 shows the combustion unit formed as a separate entity ready for insertion into the gun assembly. Numeral 49 denotes the nozzle base member and numeral 50 the compressed air and fuel manifold member—these members forming the termini of the combustion unit. The compressed air used as the atomizing element for the molten metal and as power for driving the turbine of the power plant is carried by conduit 51, the threaded side outlet thereof, 52, being adapted to carry off a portion of the compressed air to the turbine impeller 11 through the passage 52*a* in main casting 10. Conduit 53 and conduit 54 carry respectively the oxygen and acetylene used as fuel. Conduit 53 and conduit 54 are united together by a combining chamber 55—out of which a conduit 56 leads these mixed gases. The lower ends of the conduits 51, 53 and 54 are made up in fluid tight joint engagement to manifold member 50, while the upper ends of the conduits 51 and 56 are similarly made up in joint engagement with nozzle base 49. In this structure a definite distance is maintained between the nozzle base 49 and the manifold 50 and the conduits 51, 53, 54 and 56 may all be removed and replaced in the gun assembly at one time. This makes for an efficiency in a metal spray gun not heretofore possible through the ability to expeditiously replace the combustion unit of the gun in the event of failure of the gaseous passages thereof. Numerals 57, 58 and 59 denote respectively the compressed air, oxygen and acetylene valves used for controlling the gaseous fluids of the combustion unit, the same being made up to manifold 50. Furthermore by our improved unit assembly of the fluid

carrying conduits of the gun, a more compact and simplified gun structure is effected.

In the assembly of the unit in the gun a hollow screw 62, tapped into casting 10, through which compressed air leads into passage 52a, together with the screws 63 passing through the hole 64 in nozzle base member 49 and fitting tapped holes in casting 10, hold the unit in releasably confined position in the gun assembly.

Nozzle base 49 is threaded at 49a and 49b, the thread 49b being adapted to receive a threaded union nut 65 holding the gun nozzle 66 in position. Encompassing nozzle 66 and secured to threaded end 49a of nozzle base 49 is air funnel 67. The smaller end of funnel 67 is adapted to receive the air cap 68 through threaded engagement between these respective parts. Lock nut 69 retains the air cap 68 in adjusted position in its threaded engagement with funnel 67. It will be noted that a baffle plate 70 is carried by the union nut 65. Baffle 70 is provided with a plurality of openings 71 through which the compressed air from the conduit 51 of the combustion unit is checked and deflected around the nozzle 66 and through the funnel 67 and air cap 68 in a highly efficient manner in effecting the atomization of the molten metal.

In the improved turbine structure of our invention numeral 11 denotes the turbine impeller as fixed to the turbine shaft 12. Main casting 10 is chambered to receive impeller 11, a threaded rim being provided on the impeller chamber to receive the threaded turbine cover 14. Turbine impeller 11 is provided with a cavity between the inner circumferential edge bounding its buckets 75 and its hub 76—this space providing what we choose to term the turbine impeller expansion chamber. Now in the turbine casing cover 14 and directly opposite the expansion chamber of impeller 11, is a chamber portion carrying a plurality of openings around it as denoted by numeral 77. Openings 77 are preferably of like size and inclined upwardly. Numeral 78 denotes a cup-like baffle secured to turbine cover 14 through the medium of lock nut 18 of the ball bearing container 16. Baffle 78 is set so as to provide a circumferentially extending slot 79 between its cupped edge 78a and the face 14a of turbine cover 14, thereby providing a free discharge for the air as exhausted from impeller 11 through the openings 77 of turbine casing cover 14.

From the foregoing description it will be clear that the air as exhausted from the buckets 75 of turbine impeller 11 is held a relatively long time between the chambered portions of the impeller and the turbine cover 14 before its final release to the atmosphere through the slot 79. During this time an expansion of the air is occasioned without creating undue back-pressure. By retaining the air exhausted from the turbine impeller in this manner we have found that the initial air introduced through the passage 52a against the buckets of the impeller is utilized with high efficiency and that a much less pressure of compresed air is required to drive the turbine impeller than heretofore used, for example in the turbine structure of our invention as covered by Letters Patent No. 1,987,016.

The compressed air through the passage 52a as used for driving impeller 11 is controlled through needle valve 80.

The combustion unit of our structure is housed by the handle of the gun, the same being comprised of parts 81 and 82 removably confined by the screws 83, 84 and 85.

We desire it to be understood that reasonable modifications in the structural improvements of our invention, as shown by the illustrative embodiments herewith, may be made without departing from the spirit thereof and we therefore do not wish to restrict ourselves to the exact showing made, the scope of the invention being governed by the extent of the appended claims.

We claim:

1. In a metal spray gun, of the class described, in combination, a nozzle, a nozzle base, a union nut for securing said nozzle to the nozzle base, a baffle carried by said nut having a plurality of openings therethrough adapted to direct the flow of compressed air from said nozzle base, an air funnel encompassing said nozzle and baffle and an air cap secured to the end of said funnel.

2. In a metal spray gun, a power unit comprising a member adapted to carry a turbine, transmission gears, and wire feeding wheels, said member including housings for said turbine and gears and an open channel in its walls exteriorly of said housings, said wheels being adapted for rotation in said channel, a combustion unit comprising a member adapted to carry combustible gases and compressed air, and having control valves and a nozzle base, a metal spraying nozzle secured to said base and adapted to receive the gases and compressed air of the combustion unit, and means including an abutment between the nozzle base and the walls of said member for releasably confining said units in operative association whereby said wire feeding wheels are visibly disposed in said channel.

3. In a metal spray gun, a power unit comprising a member adapted to carry a turbine, transmission gears and a pair of wire feeding wheels, said member providing housings for said turbine and gears and having an open channel in its walls between said housings, one of said wire feeding wheels being mounted on a shaft extending from the transmission gears beyond the housing thereof and adapted to rotate in said channel, the other of said wire feeding wheels being pivotally mounted on said member and adapted for rotation in said channel, and means for holding the said wire feeding wheels in cooperative engagement during the feeding of wire.

4. A wire feeding mechanism for a metal spray gun comprising a member having a turbine, transmission gears, and a pair of wire feeding wheels, means for effecting the visible feed of wire through said wheels comprising: an open channel in the walls of said member between the turbine and gear housings thereof, a wire feeding wheel mounted between the sides of said channel and actuated by said transmission gears, a wire feeding wheel hingedly mounted on said member and adapted for rotation in said channel, and a spring latch for holding said hingedly mounted wire feeding wheel in engagement with said first wire feeding wheel during the feeding of wire.

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PAUL LEDER.

DISCLAIMER

2,096,119.—*Rudolph Lensch*, Los Angeles, and *Paul Leder*, Alhambra, Calif. METAL SPRAY GUN. Patent dated October 19, 1937. Disclaimer filed October 3, 1942, by the inventors.

Hereby enter this disclaimer to claims 2, 3, and 4 in said specification.

[*Official Gazette November 3, 1942.*]