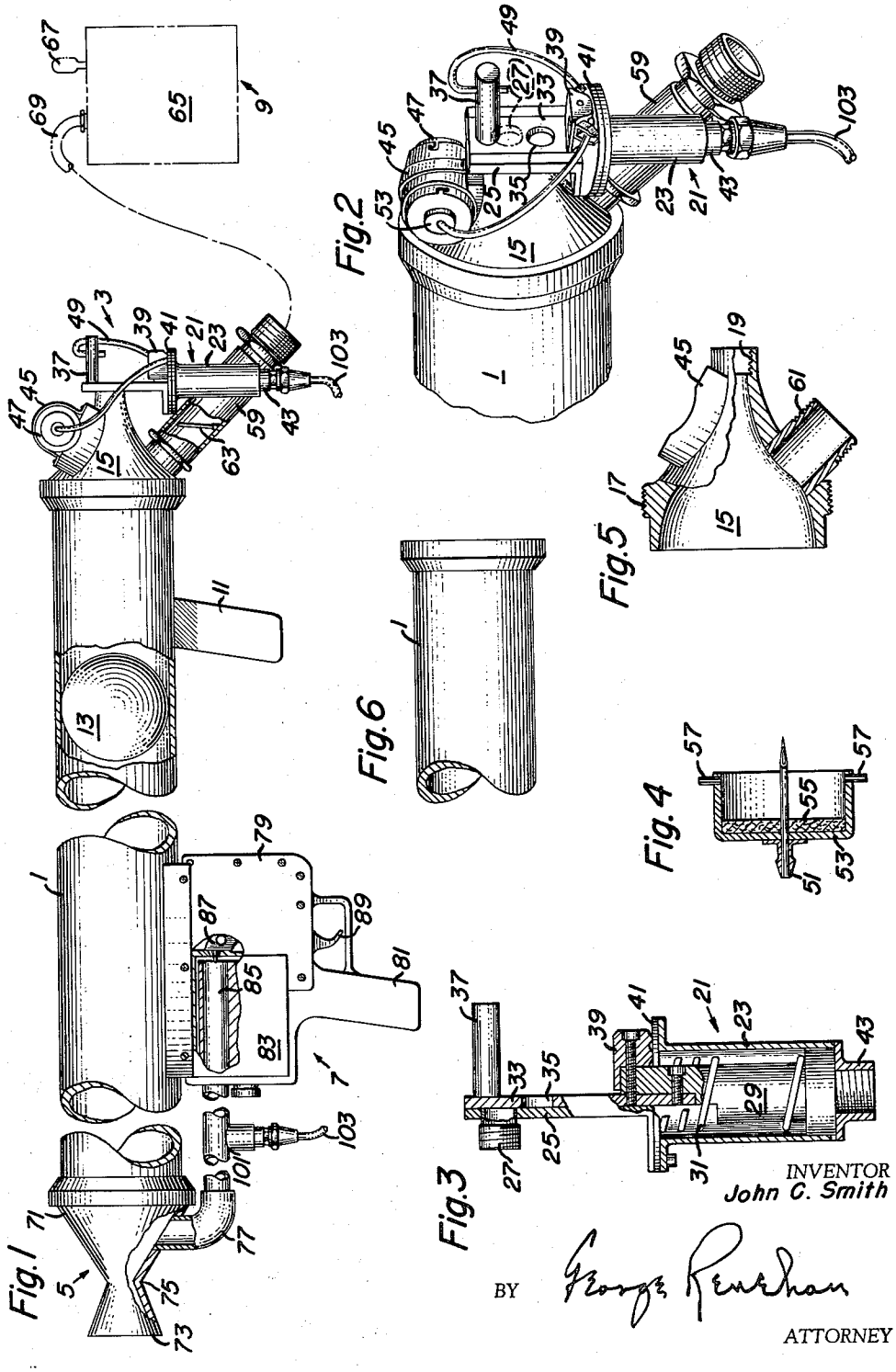
Jan. 9, 1962 J. C. SMITH 3,016,086

RECOILLESS FLAMETHROWER

Filed Sept. 24, 1959 2 Sheets-Sheet 1



INVENTOR
John C. Smith

BY George Rentham

ATTORNEY

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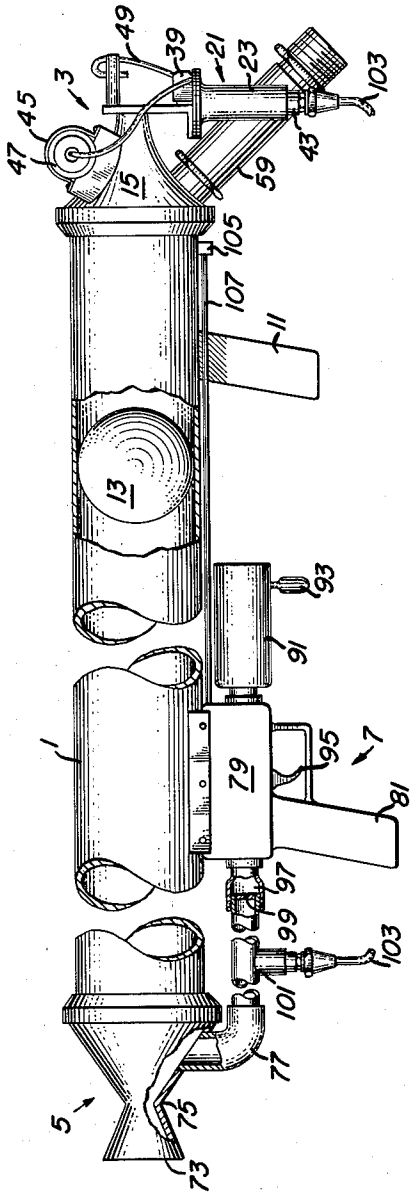


Fig. 7

INVENTOR
John C. Smith

BY George Rencham
ATTORNEY

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1

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RECOILLESS FLAMETHROWER

John C. Smith, 123 McCormick St., Bel Air, Md.

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1 Claim. (Cl. 158—28)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment to me of any royalty thereon.

This invention relates to a recoilless, multi-shot, chemically ignited, portable flamethrower.

The primary object of this invention is to provide a portable multi-shot flamethrower having a range comparable to the usual vehicle-mounted or "mechanized" flamethrowers.

Another object is to provide a versatile recoilless projector suitable for projecting either a stream of liquid or a container a considerable distance.

In the drawing,

FIG. 1 is a side view of one modification with parts shown in section and with the fuel supply shown diagrammatically.

FIG. 2 is a perspective view of the muzzle assembly of the flamethrower of FIG. 1.

FIG. 3 is a section of the fuel discharge valve forming a part of the muzzle assembly of FIG. 2.

FIG. 4 is a section of the igniter discharge cap forming a part of the muzzle assembly of FIG. 2.

FIG. 5 is a view partially in section and partially in elevation of the fuel discharge nozzle.

FIG. 6 is an elevation of the muzzle end of the flamethrower with the fuel discharge nozzle removed to convert the flamethrower to a mortar or projector for hurling containers of incendiary fuel or the like.

FIG. 7 is an elevation of a second modification of the flamethrower, partially in section.

Flamethrowers are important military weapons, particularly for use in assaults on fortified positions. They are also very effective weapons for use by infantry against tanks. The flamethrowers which are standard equipment at present comprise a pressurized tank of fuel connected to a projector or "gun." The pressurized tank is supplied with gas from a pressure bottle under still higher pressure. These flamethrowers are quite heavy for carrying by an individual soldier in combat, yet they are not readily handled by a team. The effective range of the portable flamethrowers is comparatively low, on the order of 60 to 70 yds. The so-called mechanized flamethrowers attain a range up to 200 yds. but, because of their weight and heavy recoil, must be mounted on tanks or other vehicles. These flamethrowers require rather complicated pressure reduction valves between the pressure bottle and the fuel tank and are relatively expensive. One-shot flamethrowers which utilize a positive displacement piston have been developed which have a somewhat greater range than the conventional portable flamethrower. But, as their name indicates, they will fire only a single burst of burning fuel.

The flamethrower constituting the invention herein described has a range comparable to that of the mechanized flamethrower, yet is readily portable and is therefore suitable for use by infantry. Since the fuel supply is readily disconnected from the flamethrower it can be

2

carried by another man, or by several men, thus making it practical to provide a relatively large source of fuel. Because of the recoilless construction the fuel can be projected over a long range while the flamethrower is held by an individual. The ignition system which is employed is simple and also positive in its operation and only simple valves are required. The entire apparatus is simple and easily constructed.

Referring to the drawing the flamethrower includes a barrel 1, a muzzle assembly indicated geenrally at 3, mounted at the first or muzzle end of the barrel, a convergent-divergent nozzle 5 at the second end of the barrel, a propellant gas supply means indicated generally at 7 and a fuel supply indicated generally at 9.

The barrel 1 is a cylindrical tube which may be, for example, four inches inside diameter and six feet long. The propellant gas supply means 7 and hand-grip 11 are rigidly mounted on the barrel 1. Within the barrel is a free plunger 13 which is preferably a ball formed of oil resistant synthetic rubber.

The muzzle asesmbly 3, best shown in FIG. 2, will now be described. It includes a discharge nozzle 15 which is shown separately in FIG. 5. The discharge nozzle 15 is removably attached to barrel 1 by means of screw threads 17. The smaller end of nozzle 15 is threaded at 19 to receive the valve assembly 21 which is separately shown in FIG. 3.

Valve assembly 21 includes a cylinder 23, carrying a fixed plate 25. Plate 25, in turn carries a threaded discharge nipple 27 which is screwed into threads 19 and nozzle 15. Within the cylinder 23 is piston 29 which is urged downwardly by spring 31. Piston 29 carries a valve plate 33 having an aperture 35. It also carries an igniter tube support 37. Pinch valve 39 is also mounted on piston 29 and in its closed position, shown in FIG. 3, engages top plate 41 of cylinder 23. A threaded connection 43 completes the valve assembly.

The discharge nozzle 15 also carries an igniter support 45 which receives a pressurized container 47. The container 47 contains a chemical ignition material, e.g., chromyl nitrate, and is removable from support 45. Flexible igniter tube 49 serves to deliver the chemical ignition material into contact with the fuel upon discharge. The tube 49 is connected to a hollow needle 51 which is mounted in a cap 53 provided with sealing means 55. The cap 53 is provided with pins 57 which form part of a bayonet type connection with support 45. Container 47 is likewise held in place by a bayonet type connection. The tube 49 is engaged by pinch valve 39 and is accordingly closed when the valve 21 is in the closed position shown in FIGURE 3. The end of tube 49 passes through an opening in tube support 37 and is thereby held in the desired position.

A liquid supply line connector 59 is joined to nozzle 15 by threads 61. The liquid supply line connector 59 contains a check valve 63 so constructed as to open inwardly only.

The fuel or other liquid supply means 9 includes a tank 65 which is pressurized by, for example, a carbon dioxide bottle 67. The tank 65 is joined to connector 59 by a flexible hose 69. The hose 69 is preferably joined to connector 59 and tank 65 by conventional quick-disconnect couplings.

The convergent-divergent nozzle 5 has one end 71 of the same diameter as barrel 1 and joined thereto by a

threaded connection. The other end 73 is open to the atmosphere. Between the two ends of the nozzle is a constriction 75. A propellent gas inlet connection 77 joins the nozzle 5 at a point between the constriction 75 and its junction with barrel 1.

The propellent gas supply 7 may be of either one of two types. One type is shown in FIGURE 1 and the other in FIGURE 7. The type shown in FIGURE 1 will be described first.

This supply means includes a housing 79 which is provided with a hand-grip 81 and encloses a cylinder 83 having a plurality of chambers 85. A firing mechanism including a striker 87 and a trigger 89 is also included. The cylinder 83, the striker 87 and the trigger 89 are constructed in the same manner as the corresponding parts of an ordinary double action revolver, except that the cylinder and its chambers are of considerably larger size. Any conventional trigger and striker mechanism may be employed and the details form no part of my invention.

Cartridges containing a propellant charge and a primer are inserted in chambers 85 and will be fired in the usual manner by mechanism 87, 89, thereby supplying the propellent gas to inlet connection 77.

In FIGURE 7 I have shown a different type of propellent gas supply which makes use of a decomposable liquid propellant. The propellant is contained in a replacable tank 91 which is pressurized by means of a carbon dioxide bottle 93. The trigger 95 operates a valve, not shown, which admits propellant to the decomposing unit 97. This unit contains a catalyst 99 which decomposes propellant forming large quantities of propellent gases.

Near the muzzle end of barrel 1 is a limit switch 105 which is actuated by plunger 13 and which operates, through connector 107, to cut off the flow of propellant. This serves to prevent forward recoil due to the continued generation of propellent gases after the projected fuel is exhausted.

In each of the modifications there is a T connection 101 between the propellent gas generator means 7 and the propellent gas inlet 77. This T is joined to a tube 103 which is connected at 43 to the cylinder 23. Thus when propellent gas is admitted to convergent-divergent nozzle 5 it is also admitted to cylinder 23, actuating piston 29.

The propellants used in this device have the same characteristics as to speed of reaction as typical rocket fuels.

The liquid propellant utilized in the embodiment of FIG. 7 is one which spontaneously decomposes under the desired conditions without detonation to give large volumes of gases and/or vapors. One such liquid is concentrated (70% to 100%) hydrogen peroxide. The catalyst 99 is preferably silver, in such form as to give a large surface area, or a silver-activated metal, such as copper, iron, or cobalt. Such catalysts are disclosed in the following patents: 2,887,476 to T. B. Halford et al., 2,811,490 to B. J. Sherwood, 2,809,940 to J. P. Crum, 2,750,346 to B. J. Sherwood, and 2,849,408 to Bente. Another class of suitable catalysts make use of permaganates, particularly calcium permanganate, as disclosed in U.S. Patents 2,584,127 to W. M. Harcum et al. and 2,605,609 to R. B. Bush. A suitable catalyst of this type may be very simply prepared by soaking fragments of pumice or other porous stone in a saturated solution of calcium permanganate and allowing it to dry.

Still another suitable liquid propellant is nitromethane, used in combination with a catalyst formed of manganese, copper, cobalt and silver oxides as disclosed in Patent 2,433,932 to A. Stozick or lithium aluminum tetrahydride as disclosed in U.S. Patent 2,648,190 to Maisner.

The solid propellants used in the embodiment of FIG. 1 are of the relatively slow-burning type. They should burn continuously at pressures in the range of about 300 to 1000 pounds per square inch. Those used in rocket assisted take off units (often popularly termed jet assisted takeoff or JATO units) are suitable. For example, I have successfully used a mixture of about 80% potassium perchlorate and 20 percent asphalt, by weight. Other propellants of this type are described in "Solid Propellant Rockets" by A. J. Zaehringer published 1958 by the American Rocket Co., Box 1112, Wyandotte, Michigan, pages 58–78 and 194–228.

The propellants and catalysts as such are not my invention.

Operation

It will be assumed that the device is charged with fuel and in condition to be fired. The plunger 13 will be at the extreme left-hand end of the barrel 1 in FIGS. 1 and 7, and resting against the inner conical surface of nozzle 5. The entire barrel is filled with an incendiary fluid, ordinarily gelled gasoline. The operator pulls the trigger 89 (FIG. 1) or 95 (FIG. 7), admitting a large burst of propellent gases into nozzle 5. At the same time gas is admitted through tube 103 into cylinder 23. This raises piston 29, bringing valve opening 35 into registry with discharge nipple 27. At the same time pinch valve 39 is opened. The propellent gases admitted to nozzle 5 expand in both directions, propelling plunger 13 toward the muzzle end of barrel 1 and at the same time rushing out through constriction 75 and open end 73 of nozzle 5. Since aperture 35 is in registry with nipple 27 the nozzle 15 is open and the incendiary fluid is ejected at high velocity. Since tube 49 is open, the chemical igniter in pressurized container 47 flows out and contacts the stream of incendiary fuel, thus igniting it. The accelleration of gas through open end 73 of nozzle 5 creates a reaction which modifies the recoil which would otherwise result from the accelleration of the fuel through nozzle 15. When the plunger 13 has reached its extreme right-hand position any remaining propellent gas exhausts through nozzle 5 until substantially atmospheric pressure is attained. When the pressure in barrel 1 falls below that in fuel container 65, fuel flows through tube 69, connector 59 and check valve 63 into barrel 1, pushing plunger 13 back to its original position. At the same time spring 31 pushes piston 29 downward, closing discharge nipple 27 and pinch valve 39. The apparatus is then in condition to be fired again.

Since nozzle 15 is readily separable from barrel 1 the latter may be left open at its nozzle as shown in FIG. 6. The apparatus may then serve as a recoilless mortar or projector for hurling containers a considerable distance.

Furthermore the device may be used with the muzzle assembly 3 attached, but omitting the ignition mechanism, to project non-bruning liquids. For example, it may be used to project a stream of water for use in fire fighting.

Because of the combination of the cylindrical barrel, the external generator of a sudden burst of propellent gas, and the anti-recoil nozzle the device is extremely versatile.

While I have described certain embodiments of my invention in detail, it will be obvious that various changes are possible. I therefore wish my invention to be limited solely by the scope of the appended claims.

I claim:

A multi-shot, recoilless flamethrower comprising a cylindrical barrel, a discharge nozzle at a first end of said barrel, a convergent-divergent nozzle at the second end of said barrel, a piston actuated valve arranged to open and close said discharge nozzle and comprising a spring urging said valve toward its closed position; said convergent-divergent nozzle comprising a first end having the same diameter as said barrel and joined thereto, a second end open to the atmosphere, and a construction between said ends; trigger operated generating means exterior of said barrel and said nozzles for generating propellent gases under pressure, means for introducing said propellent gases into said convergent-divergent nozzle between said constriction and said barrel, means for simultaneously applying the propellent gas to said piston to open said valve against the force of said spring: a freely movable

plunger within said barrel and substantially closing the same adapted to be moved by said propellent gas toward said first end of said barrel to eject fuel from said discharge nozzle when said valve is open, means responsive to the opening of said valve for igniting said fuel as it is ejected from said nozzle; a fuel supply line connector mounted on an opening into said discharge nozzle, and comprising a check valve opening inwardly only, a fuel supply tank adapted to contain fuel under pressure, and a detachable fuel supply line joining said tank and said connector.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,016,086 January 9, 1962

John C. Smith

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 48, for "non-bruning" read -- non-burning --; line 67, for "construction" read -- constriction --.

Signed and sealed this 8th day of May 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents