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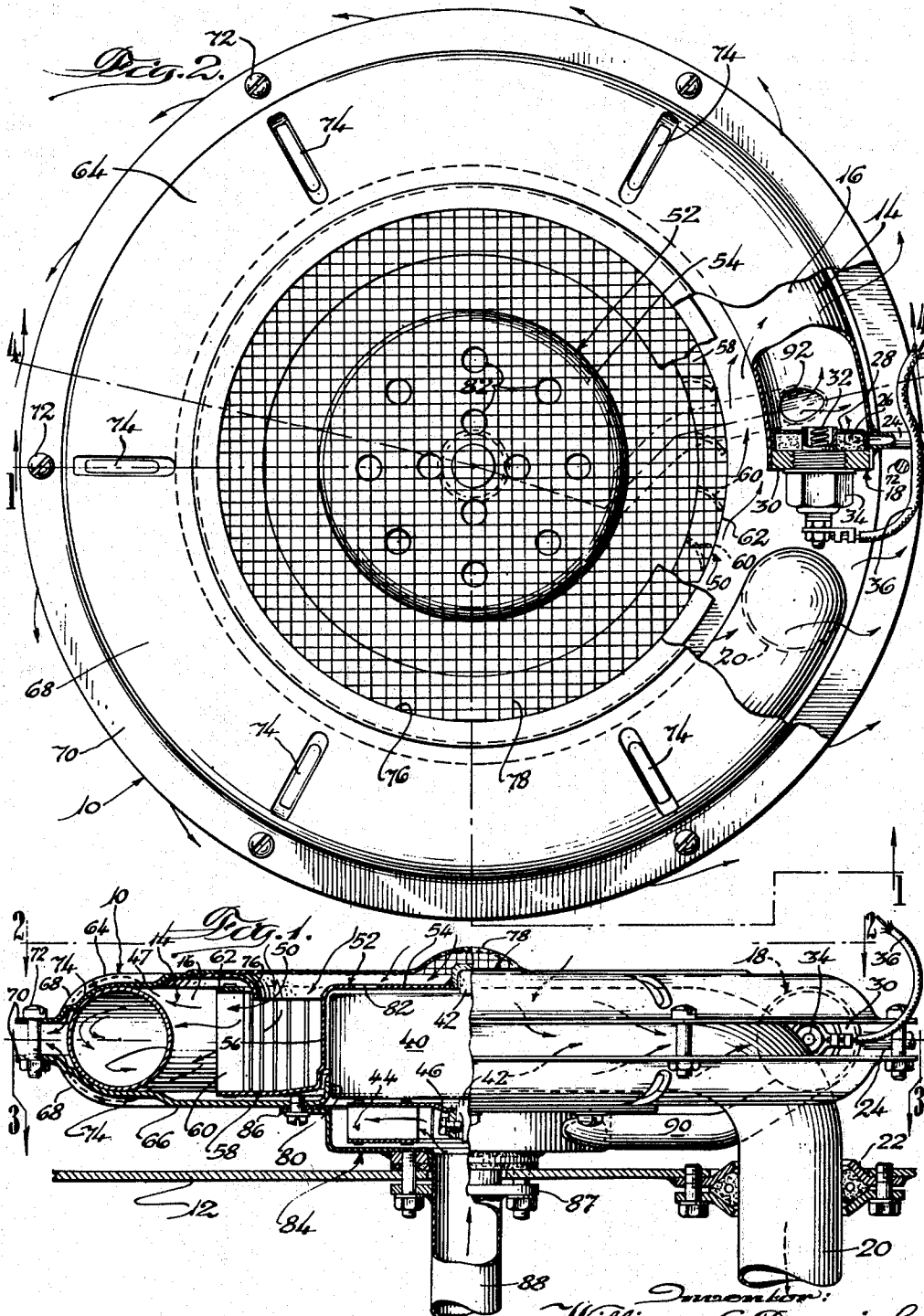
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COMPACT FORCED-AIR HEATER

Filed July 7, 1944

2 Sheets-Sheet 1



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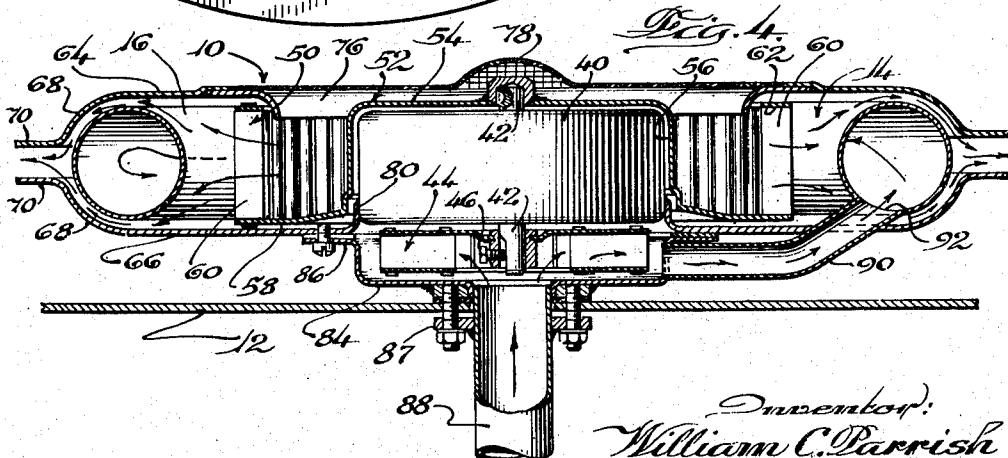
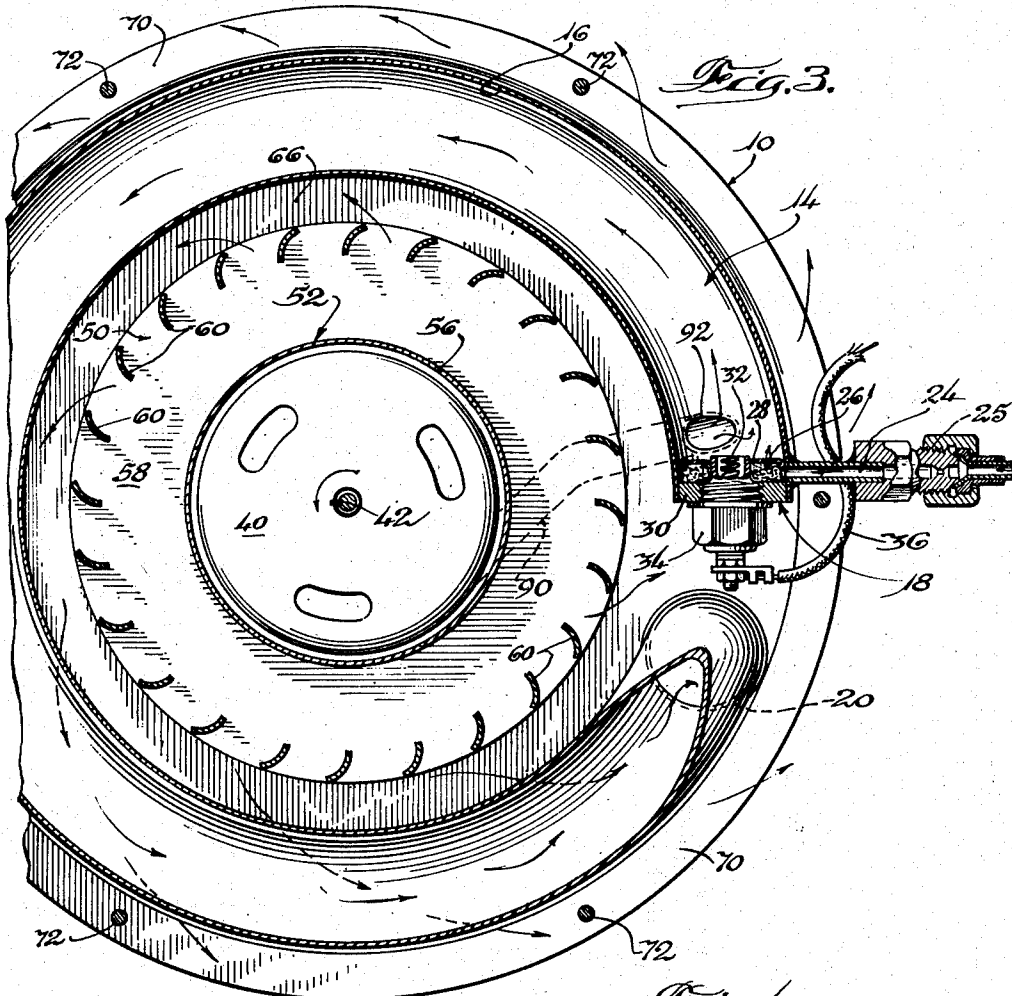
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COMPACT FORCED-AIR HEATER

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UNITED STATES PATENT OFFICE

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COMPACT FORCED-AIR HEATER

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3 Claims. (Cl. 126—110)

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The present invention relates generally to heating apparatus, and more particularly to improvements in gaseous or vaporized liquid fuel burners combined with heat exchange means.

An object of the present invention is to provide a new and improved unit type heater using a gaseous vaporizable liquid as a source of fuel, and more specifically, a heater of this character wherein combustion takes place in a stationary unit serving also as a heat exchanger.

Another object of the present invention is to provide a new and improved unit heater which is compact and which may be constructed readily and economically.

A further object of the present invention is to provide a new and improved combined combustion chamber and heat exchanger which is characterized particularly by its compactness.

Another object of the present invention is to provide a unit type heater including a single motor concentrically located relative to a combined combustion chamber and heat exchanger and adapted to supply combustion air to the heat exchanger and to create a flow of air past the heat exchanger, and, more specifically, also to create a flow of cooling air past the motor.

A further and more specific object of the present invention is to provide a new and improved heater which may readily be located in an out of the way place in an automobile or other vehicle, as under the driver's seat, and which is capable of supplying heated air in a plurality of directions relative to the seat, as both in front of and to the rear of the seat.

A further object of the present invention is to provide new and improved heating apparatus adapted to discharge heated air over a major portion of its periphery, and, more specifically, an apparatus wherein the air enters the apparatus axially and is discharged generally radially outward past a heat exchanger.

Other objects and advantages of the present invention will become apparent from the ensuing description, in the course of which reference is had to the accompanying drawings, in which:

Fig. 1 is a side elevational view, partly broken away, of heating apparatus constructed in accordance with the present invention;

Fig. 2 is a plan view, also partly broken away in order better to illustrate certain structural details thereof, of the apparatus illustrated in Fig. 1, the view being taken in the direction of line 2—2 of Fig. 1;

Fig. 3 is a fragmentary horizontal cross-sectional view through the heating apparatus, the view being taken along the line 3—3 of Fig. 1; and

Fig. 4 is a vertical cross-sectional view through

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the heating apparatus, the view being taken along the broken line 4—4 of Fig. 2.

The heating apparatus of the present invention is of the unit type using a gaseous vaporizable liquid as a source of fuel and it is characterized by its compact construction and the utilization of a single centrally located motor for the purposes of supplying combustion air to the combustion chamber, for creating a flow of the medium to be heated, such as air, past the heat exchanger, and of effecting the flow of air past the motor to cool it.

The embodiment of the invention illustrated in Figs. 1 to 4, inclusive, is adapted especially for installation under the front seat of an automobile or other vehicle. It takes up but little space and is constructed and arranged to effect a distributed flow of heated air to both the front and rear of the seat.

The heater unit, which is indicated generally and as a whole by reference character 10, is adapted to be supported underneath the front seat of a vehicle (not shown). If desired, it may be readily supported in this location upon the floor 12 of the vehicle which, for purpose of description, will be assumed to be the floor of an automobile.

The heater unit includes what may be termed a combined combustion chamber and heat exchanger, indicated as a whole by reference character 14. It is of compact construction and may be seen to include an annular single convolution coil 16, which may be made of stainless steel or aluminized iron tubing and which may have a diameter of approximately one and one-half inch. A burner 18, preferably of the wick type, is located at one end of the tube 16 so that the flame from the burner passes around the tube and the products of combustion pass out through a generally downwardly extending exhaust connection 20 extending below the floor of the vehicle through a suitable gland structure 22 secured to the floor and encircling the exhaust connection.

The burner 18 is supplied with liquid vaporizable fuel through a conduit 24 and metering orifice defining structure 25 (see Fig. 3) or the like connected to a suitable liquid fuel reservoir (not shown) whereby liquid fuel is supplied to a wick 26, which may be made of material such as glass wool. The wick is kept in place at the burner end by a screen, inverted, cup-like covering 28 and a closure cap 30 which may be secured, as by welding, to the end of the tube 16. The burner includes fuel vaporizing means, such as a centrally located igniter 32 extending through the wick material and held in place by a stud-like terminal 34 through which electrical

current is supplied to the igniter by a conductor 35.

The burner, fuel and igniter controls may be of conventional type and they have, therefore, not been illustrated. It is believed sufficient to say that the burner may be supplied with fuel and the igniter energized when desired, and so arranged that the igniter will be deenergized if the apparatus has been in operation for a length of time sufficient to heat the surrounding parts to a temperature sufficient adequately to vaporize the fuel supplied to the wick and to support combustion.

Combustion air is supplied to the combined combustion chamber and heat exchanger unit and the air to be heated is caused to flow past and in contact with the unit by suitable air circulating means, such as a pair of blowers or fans, centrally or concentrically located relative to the unit and driven by a single motor which is also centrally or concentrically located relative to the heat exchanger. The heat exchanger, blowers and motor are all located in substantially the same plane thereby to provide a compact construction.

Referring again to the drawings, it may be noted that the motor 40 is a comparatively small and flat electric motor. It is mounted with its shaft 42 located vertically and substantially centrally of the tubular coil 16.

The flow of combustion air to the combustion chamber is effected by a radial vane type blower 44 secured to the lower end of the motor shaft 42 and immediately adjacent the lower end of the motor by securing means 46 which may take the form of a hub and bolt.

The air to be heated enters the heater axially thereof and is discharged generally radially outward over substantially the full periphery of the heater. It is circulated past and in contact with the heat exchanger tube 16 by a sirocco blower 50 located concentrically relative to the motor and between the motor and the coil. It is secured to the upper end of shaft 42 by a flanged, generally cup-shaped support, indicated as a whole by reference character 52, including a horizontal portion 54 adjacent the upper end of the motor, a downwardly extending portion 56 adjacent the periphery of the motor and a flanged horizontally extending portion 58, to the outer edge of which the fan blades 60 are secured. The opposite ends of blades 60 are secured to a relatively narrow annular band 62.

The air to be heated is directed past and kept in intimate contact with the tube 16 by a pair of generally circular stationary plates 64 and 66, the outer edges of which are curved to be concentric to the tube 16, as indicated by reference character 68, and terminate in generally horizontal peripheral flanges 70, whereby the plates may be secured to each other and to the tube 16 in a simple manner by a plurality of angular spaced apart bolts 72.

In order that the plates 64 and 66 may be secured to the tube 16 so as not to impede the flow of air past the tube and so that air may be directed over substantially the entire periphery of the heater unit, the plates are supplied with a plurality of relatively short and narrow angularly spaced apart inwardly extending grooves 74 engaging only limited portions of the outer surface of the tube when the plates are secured to the tube.

The inlet for the air to be heated is located at the upper end of the motor and is defined by a

central annular inwardly extending flange 76 at the periphery of an aperture in the upper plate 64. In order to prevent foreign material from passing through the heater, the inlet may be covered by a suitable screen 78.

The motor is supported by the lower plate 66 which has a central upwardly extending annular flange 80 secured, as by welding, to the motor frame. The motor is spaced a short distance from the rotatable blower support 52 to provide a passage for air to flow past and to cool the motor. The cooling air is caused to flow past the motor by the sirocco type blower 50, the air entering the vicinity of the motor through a plurality of apertures 82 formed in the horizontal upper portion 54 of the blower support, contacting the upper end of the motor, flowing downwardly between the motor and vertical portion 56 of the blower support, and finally reuniting with the main stream of air flowing past the heat exchanger tube 16 through the space between the lower plate 66 and the flanged portion 58 of the blower support.

The apparatus as a whole is supported on the floor of the vehicle by a generally cup-shaped support 84 forming also a part of the combustion air blower housing. An upper horizontal peripheral flange 86 of the support 84 is secured, as by bolts, to the lower plate 66 and the support 84 is secured to the floor by a suitable securing and sealing structure indicated generally by reference character 87, which may take forms other than that specifically illustrated.

Combustion air is supplied through an intake conduit 88 extending underneath the floor of the vehicle and connected to the central portion of the combined support and blower casing 84. Combustion air thus flows axially upwardly through the conduit 88 to the blower and thence to the combustion chamber through a generally radial conduit 90 leading from the outer peripheral portion of the combustion air blower casing to an outlet opening 92 in the combined combustion chamber and heat exchanger. The opening 92 is preferably located a short distance above the wick type burner and is so disposed that the combustion air enters the tube 16 generally tangentially as best illustrated in Fig. 4.

From the foregoing detailed description of the unit type heater of the present invention, it may be noted that the device is compact, simple in construction, and may be readily assembled. In addition it may be easily installed wherever desired and it is particularly suitable for installation in out of the way places, especially underneath the driver's seat of an automobile where it directs heated air both to the front and rear of the seat.

In operation, the air to be heated is made to flow past the heat exchanger by the sirocco type blower 50. The air flows into the heater unit from the space to be heated axially downward through the inlet defined by the flanged opening 76. The air is forced radially outward in all directions by the blower and contacts substantially the entire peripheral surface of the combined combustion chamber and heat exchanger. The heated air is also distributed over a wide area because it is discharged horizontally and radially outward over substantially the entire periphery of the heater.

Combustion air is supplied to the combustion chamber by the blower 44. This air is taken from outside the vehicle through the axial downwardly extending inlet conduit 88 and flows through

conduit 90 and outlet 92 to the interior of the tube 16, it being directed tangentially and slightly upwardly therein.

During operation a metered amount of liquid fuel is supplied to the burner wick 28 through the inlet orifice structure 25. The fuel is initially vaporized by the electrically energized igniter 32. The vaporized fuel is ignited and the flame extends from the combustion chamber end of the tube toward the other end and heats the tube so that the air coming into contact with the exterior of the tube is heated. The igniter may be turned off after the apparatus has been in operation for some time. The motor 40 is cooled during operation by the air flowing past it through openings in the blower support 52.

The present invention is not limited to the precise details of the single embodiment of the invention described in detail above. Rather, it is contemplated that the principles of the present invention may be embodied in structures other than that specifically illustrated and described.

What I claim as new and desire to secure by United States Letters Patent is:

1. An internal combustion heater comprising in combination means forming a tubular arcuate C-shaped combination combustion chamber and heat exchanger, said C-shaped heat exchanger having an exhaust opening at one tip thereof, wall forming means sealing the opposite tip of said C-shaped combination combustion chamber and heat exchanger, said combustion chamber being located adjacent said wall forming means, a burner located in said combustion chamber adjacent said wall forming means, means including an inlet duct for supplying combustion air to said burner, means for supplying fuel to said burner, a removable igniter supported by said wall forming means, said combination combustion chamber and heat exchanger defining a closed arcuate shaped passageway from said burner to said exhaust outlet for the arcuate flow of burning gases and the products of combustion, power means located centrally with respect to said combination combustion chamber and heat exchanger and extending into the space encircled thereby, ventilating air circulating means axially disposed with respect to said power means and connected on one side thereof to be driven thereby, a combustion air circulating means on the other side of said power means and connected to be driven thereby for causing combustion air to flow through said inlet duct to said burner and said combustion chamber, and a generally circular housing enclosing said combination combustion chamber and heat exchanger, said power means, said ventilating air circulating means and said combustion air circulating means, said housing having an axially disposed inlet adjacent said ventilating air circulating means through which ventilating air is drawn and having a peripheral outlet adjacent and substantially coextensive of said combined combustion chamber and heat exchanger, said housing including means for directing cool ventilating air around said power means and against said combined combustion chamber and heat exchanger and warm ventilating air outwardly through said peripheral outlet.

2. An internal combustion heater comprising in combination means forming a tubular arcuate C-shaped combination combustion chamber and heat exchanger, said C-shaped heat exchanger having an exhaust opening at one tip thereof,

6 wall forming means sealing the opposite tip of said C-shaped combination combustion chamber and heat exchanger, said combustion chamber being located adjacent said wall forming means, a burner located in said combustion chamber adjacent said wall forming means, means including an inlet duct for supplying combustion air to said burner, means for supplying fuel to said burner, an igniter having its igniting end adjacent said burner, said combination combustion chamber and heat exchanger defining a closed arcuate shaped passageway from said burner to said exhaust outlet for the arcuate flow of burning gases and the products of combustion, an electric motor located centrally with respect to said combination combustion chamber and heat exchanger and extending into the space encircled thereby, ventilating air circulating means axially disposed with respect to said electric motor and connected on one side thereof to be driven thereby, a combustion air circulating means on the other side of said electric motor and connected to be driven thereby for causing combustion air to flow through said inlet duct to said burner and said combustion chamber, and a generally circular housing enclosing said combination combustion chamber and heat exchanger, said power means, said ventilating air circulating means and said combustion air circulating means, said housing having an inlet adjacent said ventilating air circulating means through which ventilating air is drawn and having a peripheral outlet adjacent and substantially coextensive of said combined combustion chamber and heat exchanger, said housing including means for directing cool ventilating air against said combined combustion chamber and heat exchanger and warm ventilating air outwardly through said peripheral outlet.

3. An internal combustion heater comprising in combination means forming a tubular arcuate C-shaped combination combustion chamber and heat exchanger, said C-shaped heat exchanger having an exhaust opening at one tip thereof, wall forming means sealing the opposite tip of said C-shaped combination combustion chamber and heat exchanger, said combustion chamber being located adjacent said wall forming means, a burner structure located in said combustion chamber contiguous with said wall forming means, means including an inlet duct for supplying combination air to said burner, means for supplying fuel to said burner, an igniter mounted in said wall forming means and having its igniting end disclosed centrally of said burner structure, said combination combustion chamber and heat exchanger defining a closed arcuate shaped passageway from said burner to said exhaust outlet for the arcuate flow of burning gases and the products of combustion, an electric motor located centrally with respect to said combination combustion chamber and heat exchanger and extending into the space encircled thereby, ventilating air circulating means axially disposed with respect to said electric motor and connected on one side thereof to be driven thereby, a combustion air circulating means on the other side of said electric motor and connected to be driven thereby for causing combustion air to flow through said inlet duct to said burner and said combustion chamber, and a generally circular housing enclosing said combination combustion chamber and heat exchanger, said power means, said ventilating air circulating means and

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said combustion air circulating means, said housing having an inlet through which ventilating air is drawn and having a peripheral outlet adjacent and substantially coextensive of said combined combustion chamber and heat exchanger, said housing including means for directing cool ventilating air against said combined combustion chamber and heat exchanger and warm ventilating air outwardly through said peripheral outlet.

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