

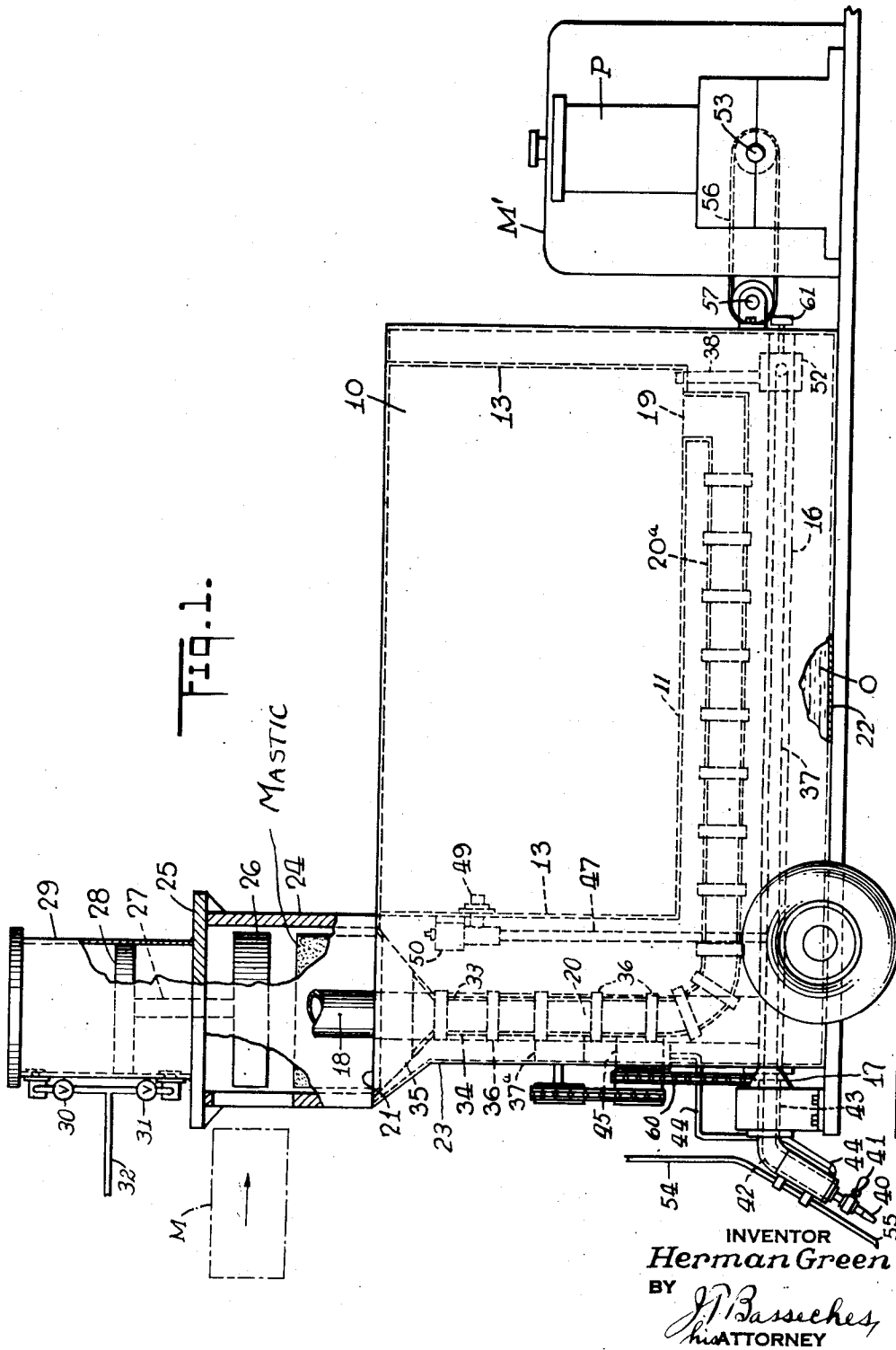
Aug. 11, 1953

H. GREEN
WATERPROOFING UNIT

2,648,264

Filed Nov. 1, 1946

4 Sheets-Sheet 1



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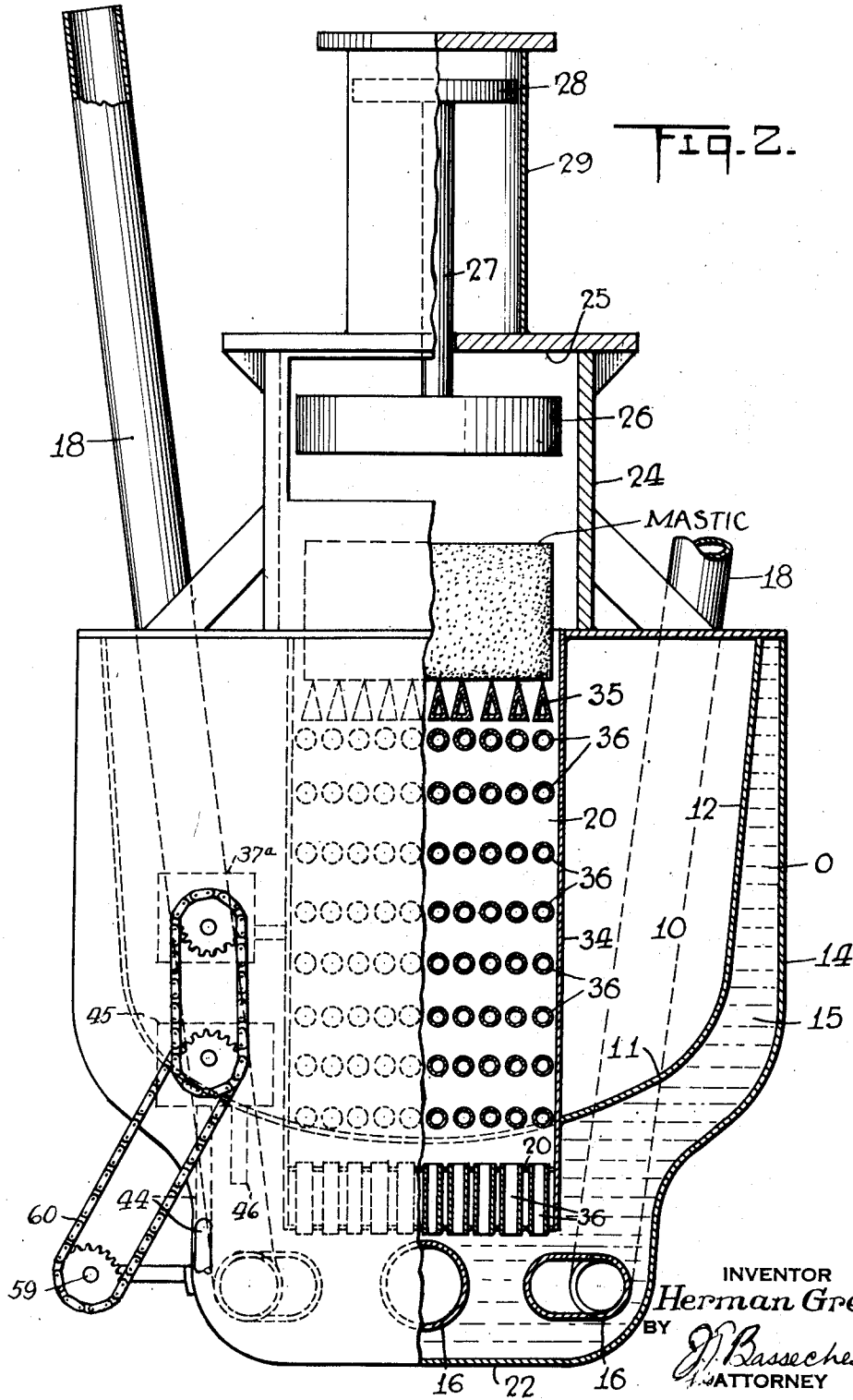
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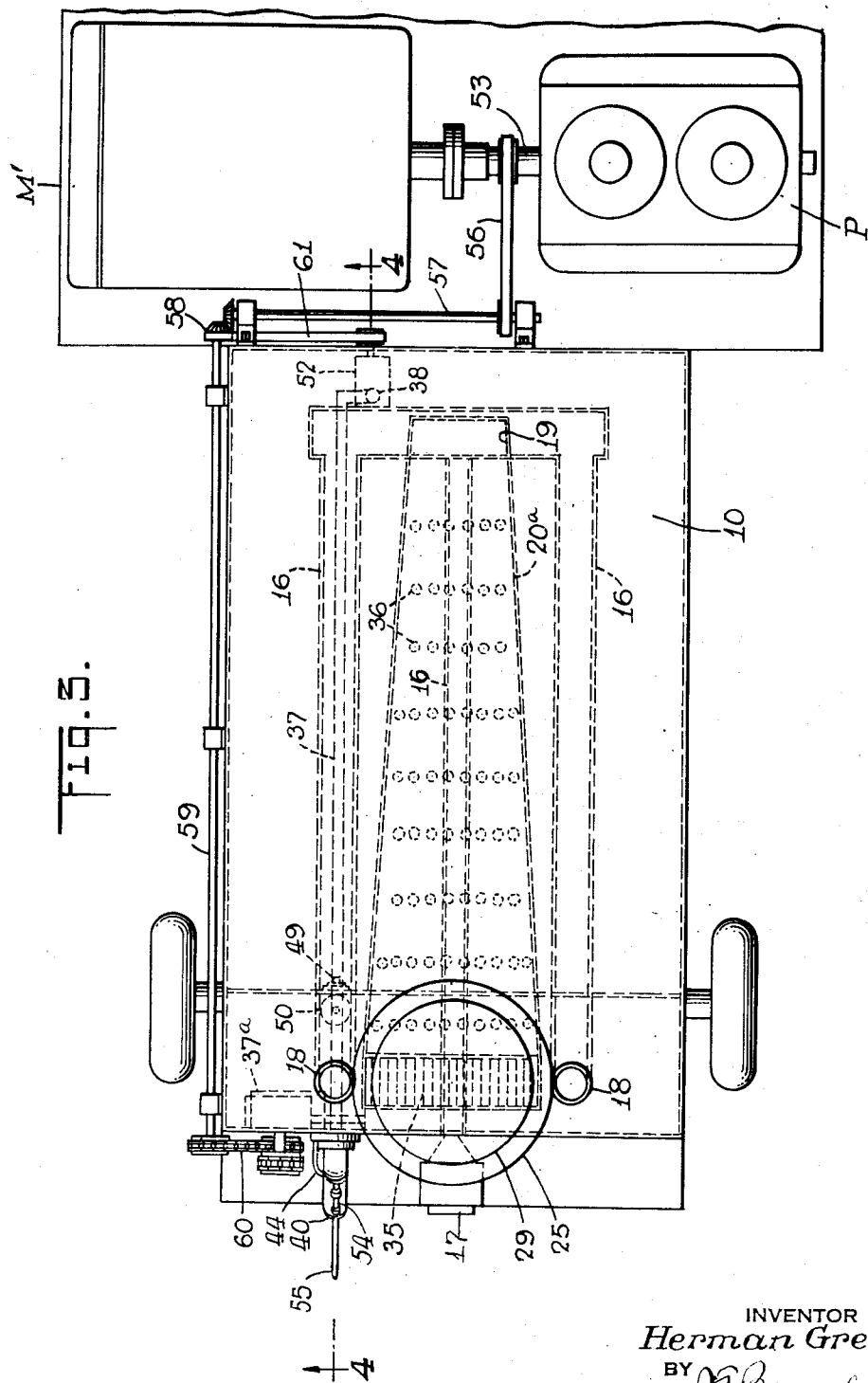
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4 Sheets-Sheet 3



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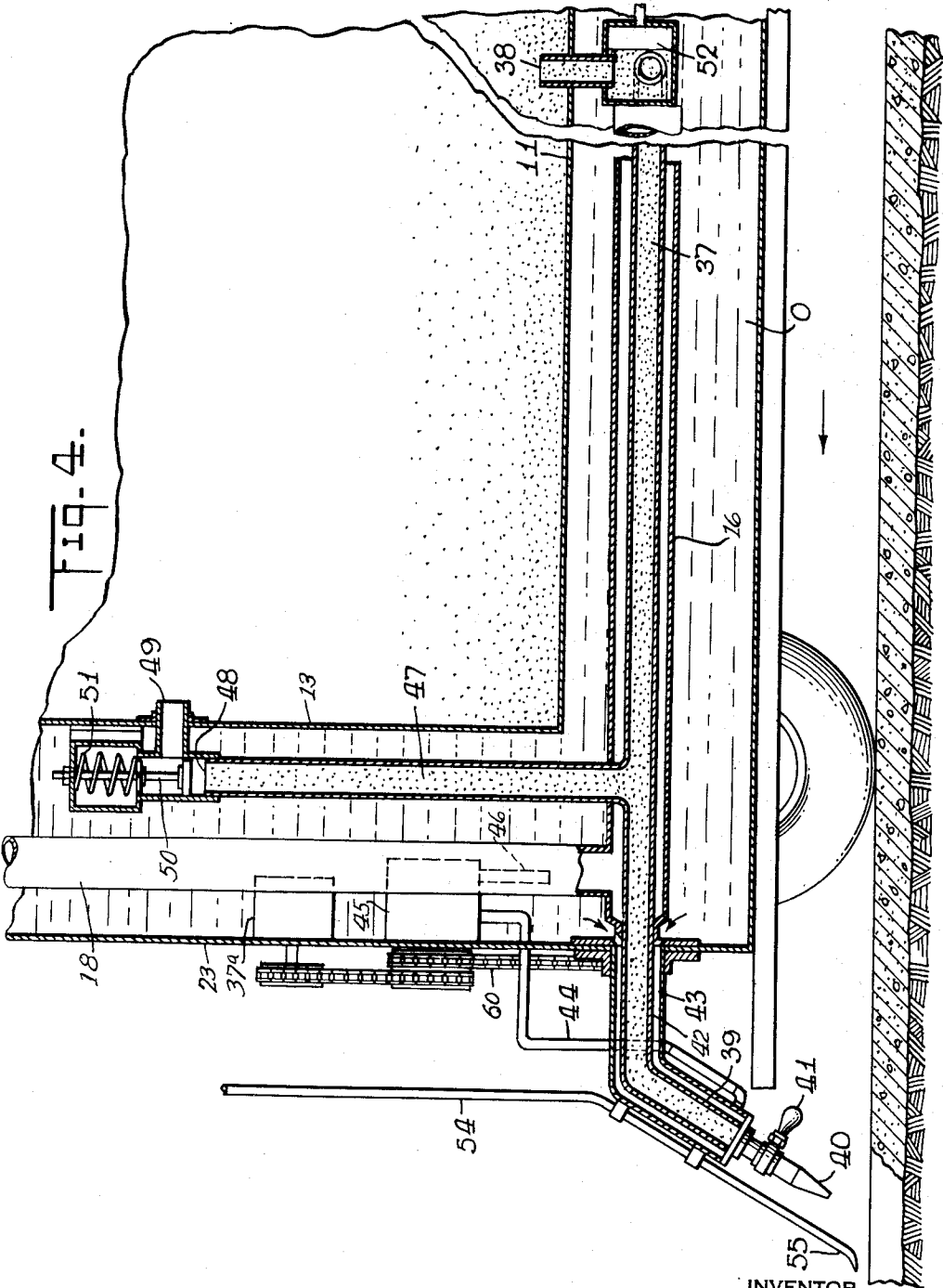
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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WATERPROOFING UNIT

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2 Claims. (Cl. 94—39)

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This invention relates to a waterproofing device; more particularly to a device for applying expansion joint material.

My invention relates to the field of applying waterproofing material to routed-out concrete, cracks in concrete, or the filling of joints in concrete slabs, pavements, to apply expansion joint compositions.

Known to me is the provision of a mastic which is believed to be a mixture of tarry or asphaltic material and rubber which has been found admirably suitable for sealing the cracks in concrete, pavements, air field runways or in the joints between blocks of concrete pavements, acting as expansion joint material. The mastic so employed is supplied to the trade in blocks, to be heated to the plastic or fluid condition and poured into the crevices to be luted. The nature of the mastic makes promiscuous heating to liquefy the mastic inadvisable, due either to what I believe to be the critical nature of the components of the mastic, or to the low heat conductivity of the mastic, which may cause a physical change in the mastic if carelessly handled by excessive local heat application.

It is accordingly an object of my invention to provide means for heating materials in the nature of mastic or low heat conductivity thermoplastic material, to convert them to a plastic or fluid consistency, while maintaining the same within a critical temperature limit, avoiding a deleterious effect upon the mastic or thermoplastic composition, whereby the change from the bulk form to the plastic or liquefied condition may be achieved rapidly, more economically to perform the luting operation.

It is further contemplated by my invention to provide apparatus more rapidly and economically than previously known to convert the mastic or thermoplastic material from the solid state to the plastic or liquefied condition, to perform the luting operation by the comminution of the mastic so that the low heat transmitting properties of the mastic may not be a factor to cause excessive heat transference of the heating medium to the mastic, whereby the conversion from the solid state to the condition suitable for luting may be achieved rapidly and economically, without destructive effects on the thermoplastic material and the luting operation performed continuously and without danger of break-down, which may tie up expensive apparatus and material.

To attain these objects and such further objects as may appear herein, or be hereinafter

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pointed out, I make reference to the accompanying drawings forming a part hereof, in which—

Figure 1 is a side elevation of my device;

Figure 2 is an end elevation thereof, with parts broken away to show details;

Figure 3 is a plan view of my device;

Figure 4 is a magnified section of the pouring unit, taken on the line 4—4 of Figure 3.

Before making reference to the drawing, it may be noted that it is contemplated by me to provide a device for luting cracks in roadways or runways or airfields and/or to insert expansion joint materials between the blocks of concrete highways. Thermoplastic materials or mastics have been devised, believed by me to be blended mixtures of asphalt and rubber, which are highly weather-resistant and have the proper nerve and resiliency to withstand the shock of rolling vehicles and the expansive and contractive forces of a wide range of changes in temperature.

Compositions for this purpose known to me are supplied to the trade in blocks by the manufacturer, shipped to the field for heating to a plastic or liquefied condition. The crevices or joints to be filled are routed-out, cleaned of debris and then filled with the mastic material.

The properties of these thermoplastic materials make promiscuous heating dangerous to the retention of the full life and desirable physical properties of the mastic. The change from the more or less solid phase to the liquid phase, unless accompanied by due care, may change the physical properties and possibly the chemical structure, to give no assurance of the retention of the desirable properties of the mastic, once it cools and reassumes the solid phase.

It is not my intention to explain the physical changes which occur in causing deterioration. It is my explanation that too great a gradient between the heated and the unheated sections of the mastic not only have a harmful effect upon the mastic but slow down the work of converting the thermoplastic material from the more or less solid phase to the liquid phase.

By a method of heating the normally solid mastic whereby the heat transfer is directed to the interior of the block as rapidly as possible, as by a comminution or filamentary formation of the solid, I have found that I can not only more rapidly liquefy or convert the mastic to a condition suitable for luting, but operation near the critical temperature for melting the mastic may be carried out, without danger of destroying the desirable physical properties of this waterproofing and luting material.

I have further found that by comminution of this solid material during the application of heat, pressure means may be applied to accelerate the flow of the normally solid material to the liquefied condition at greater speeds, without employing unduly heavy and expensive mechanism to effect the change, thereby permitting the operation to be conducted in the field and carry out the luting process quickly and efficiently.

Making reference to the drawing, my device comprises a principal kettle 10, forming a reservoir for the mastic in liquefied or plastic condition. The bottom wall 11, side wall 12, and end wall 13 are spaced from the casing 14 to provide a jacket 15, within which an oily fluid may be retained sealed from the kettle 10. The oily liquid serves as the heat transfer medium for transferring the high heat such as that of an oil burner flame or the like to the mastic under controlled limits. The selection of the oil for effecting this heat transference is not a part of my present invention and it is believed sufficient to state that it is selected to distribute the heat from a higher heating element to the mastic and will decompose before reaching a critical temperature with regard to the mastic. The skilled worker will make a judicious selection of the oil bath material in accordance with the critical temperature of the thermoplastic material to be softened or liquefied.

Ducts 16, longitudinally directed into the space 15, receive the heat from an oil burner 17 (more or less diagrammatically illustrated), to heat the oil O. Hot gases from burner 17 are directed into a central duct 16 and then into cross manifolds to side ducts 16 and out through stack 13. The cross manifolds at the forward end are headers appearing in an elliptical outline to pass off the products of combustion into the atmosphere. The oil O thus serves as the heat transfer medium from the ducts 16 to the bottom, side and end walls 11, 12 and 13, respectively, of the kettle 10.

The kettle 10 is filled through a channel 20 which has its walls 20a in heat transfer relationship with the fluid O from the discharge end 19 to the entrance end 21 between the bottom wall 22 of the casing 14 and the bottom wall 11 of the kettle, and between an end wall 13 of the kettle 10 and the end wall 23 of the casing.

The entrance end 21 is in communication with a feed hopper 24, the head 25 of which is in communication with a ram 26, connected to the ram shaft 27, linked to the piston 28, operating within the cylinder 29. The valves 30 and 31, diagrammatically shown, are connected with a compressed air line 32. Valve linkage (not shown) actuates the piston 28 by compressed air to provide resilient motive power to the ram 26.

A block of mastic M may be placed in the hopper 24, to be rammed within the entrance end 21 of the elbow shaped channel 20. The channel 20 is defined by side walls 33 and 34, forming headers for the hollow knives 35 and tubes 36. The knives 35 and tubes 36 are in a heat transfer relationship, with the liquid O in the space 15, so that the liquid O heats the knives 35 and the tubes 36 from within and provides an exposed heated surface interiorly thereof, no greater than the critical temperature to which the oil O can be heated and which is safe to the mastic.

The mastic block M is driven by the ram 26 into contact with the knives 35. The mastic is thereby shredded or formed into individual thin filaments corresponding to the spacing of the

knives by the combined action of the ram against the knives 35 and the heat applied to the knives. The comminuted material in the form of filaments progressively comes in contact with the rows of tubes 36, heating the mastic from within until discharged into the kettle 10 through the passage 19. The channel 20 tapers down from its entrance end adjacent the point 21 to its discharge end 19 as the incoming mastic is gradually reduced from the solid phase to the more or less liquefied condition. Heat transference of the oil O through the tubular knives 35 and tubes 36 is augmented by pumping means 37a to positively circulate the heat of the oil uniformly to all parts of the apparatus.

The temperature of the oil O in the space 15 is likewise transferred to the kettle or vat 10 where the plastic or liquefied mastic is stored for dispensing or for pressure luting.

For discharge purposes I prefer to lute under pressure and for this purpose, I provide a pipe line 37, leading from the bottom 11 through the intake end 38 and being directed through the oil O in the space 15 between the walls 12 and 14, to the discharge end 39 of the line 37 which is connected with the nozzle 42 controlled by the handle 41, providing means for manipulating the aperture to provide a stream which, as it is discharged, fans out or concentrates as the circumstances may find expedient.

The section 42 projecting from the main casing is housed within a concentric casing 43. The casing 43 has a pipe line 44, leading to the pump 45, having its low pressure side through the line 46, communicating with the space 15. Heat transfer oil is thereby circulated from the space 15, through the extension 42, to maintain this section of the discharge line at optimum temperatures.

The pipe line 37 has a by-pass section 47, whose upper end 48 is connected to the overflow line 49 desirably above the normal liquid level of the melted or liquefied mastic in the vat 10. A relief valve 50 normally is seated adjacent the end 48 by the spring 51. The section 47 is likewise conducted in the heat transfer oil O to keep this section during operation heated to the desired optimum temperature.

With this installation I may employ a positive means (as distinguished from gravitational flow) for directing the mastic from the vat 10 to the pouring unit 40. I have illustrated a pump 52 for this latter purpose. Should the pouring unit become obstructed under the influence of the pressure head of the pump 52, the mastic may be by-passed through the by-pass line 47, through the relief valve 50, to flow back to the reservoir.

The installation just described may be mounted upon the chassis of some power driven vehicle, to be rolled in the direction of the arrow shown in Figure 4. A power unit M' drives a compressor P through the shaft 53. The compressor P, through the line 54, may direct a jet of compressed air through the nozzle 55, in leading-position with respect to the pouring unit 40.

Power take-off from the shaft 53, through the chain or belt 56, is supplied to the shaft 57 and to the transmission 58 to the shaft 59. In this way, through the belt or chain 60 the pump 45 may be driven, as well as for driving the pump 37a for circulating the heat transfer oil in the space 15. The same transmission 58 supplies power for the pump 52 through the belt or chain 61.

By the installation described, the mastic or

like luting material may be heated in the kettle 10 within close tolerance limits of the critical temperature. The thermoplastic mastic may be fed quickly and efficiently from its block form to the kettle and the conversion from the solid phase to the liquid phase be effected quickly since the passage of the mastic through the heated knives 35 converts the mastic into filamentary form, which comminution process accelerates the heat transfer from the oil to convert the mastic in the channel to the liquefied condition. The low gradient between each filament of mastic, as secured by forcing the mastic through the heated knives 35 not only accelerates the liquefying process but avoids the dangerous localization of the application of heat.

By comminution of the block in passage of the same over the heated knives 35, the work of driving the ram 26 is made less dangerous. This factor, coupled with the air piston 28 which drives the ram, assures long life and maintenance of the pressure heat to be maintained in the hopper 24.

While I have shown the mastic in position to gravitate through the vertical segment of the conduit 20 and then a passage through a horizontal segment before entering the kettle, the filamentary mastic may be led directly into the kettle, with desirable results.

In use, the carriage for the chassis is directed adjacent the cracks or joints to be filled which, after suitable routing-out, are ready for luting or filling. The air-jet nozzle 55 is employed to blow out any detritus, dust and clear the crevice, crack or joint of any foreign body preparatory to its being filled. The air line 54 may likewise be heated so that maximum penetration may be secured by a preheating of the concrete walls of the joint to be filled.

It will be observed that by the apparatus which I have devised, liquefaction of the thermoplastic material within critical limits or the desired plasticity for luting may be effected quickly and the vessel filled without employing expensive power units to overcome the friction required to drive the progressively liquefied thermoplastic material from the ram mechanism to the dispensing receptacle.

In other respects I have provided a highly efficient device to provide for converting the thermoplastic waterproofing luting material, particularly the critically heat responsive rubber mastic, to the liquefied condition for luting purposes, which may be economically maintained.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent, is:

1. In a portable device for luting with waterproofing material comprising critically heat-responsive rubber mastic which is deleteriously affected at or above critical temperatures, a jacketed kettle for retaining quantities of said mastic, the combination therewith of pump means to circulate a heat transfer medium in the jacket of said kettle, a conduit leading to said kettle, a hopper leading to said conduit, pneumatic means for feeding mastic in block form into said conduit, tubes interiorly of said conduit about which the mastic may pass in transit to said kettle and said tube being in heat transfer relationship with said jacket for conducting said heat transfer medium through said tubes and said jacket of said kettle, power driven means for discharging liquid mastic into luting position, including a heating jacket and means to circulate the heat transfer medium from said last jacket to said kettle jacket.

2. In a portable device for luting with waterproofing material comprising critically heat-responsive rubber mastic, a jacketed kettle having a heat transfer oil to receive heat from a high source of heat, the combination therewith comprising a hopper for receiving blocks of said mastic, block ramming means for directing the mastic into said hopper comprising a pneumatically operated piston, comminuting means between said hopper and a conduit leading from said hopper to said kettle, said comminuting means being in heat transfer relationship with said jacket for conducting the heat transfer medium to said comminuted means, means for discharging said mastic into luting position, means for heating said discharge means including means for circulating the heat transfer medium from said kettle jacket about said discharge means.

HERMAN GREEN.

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