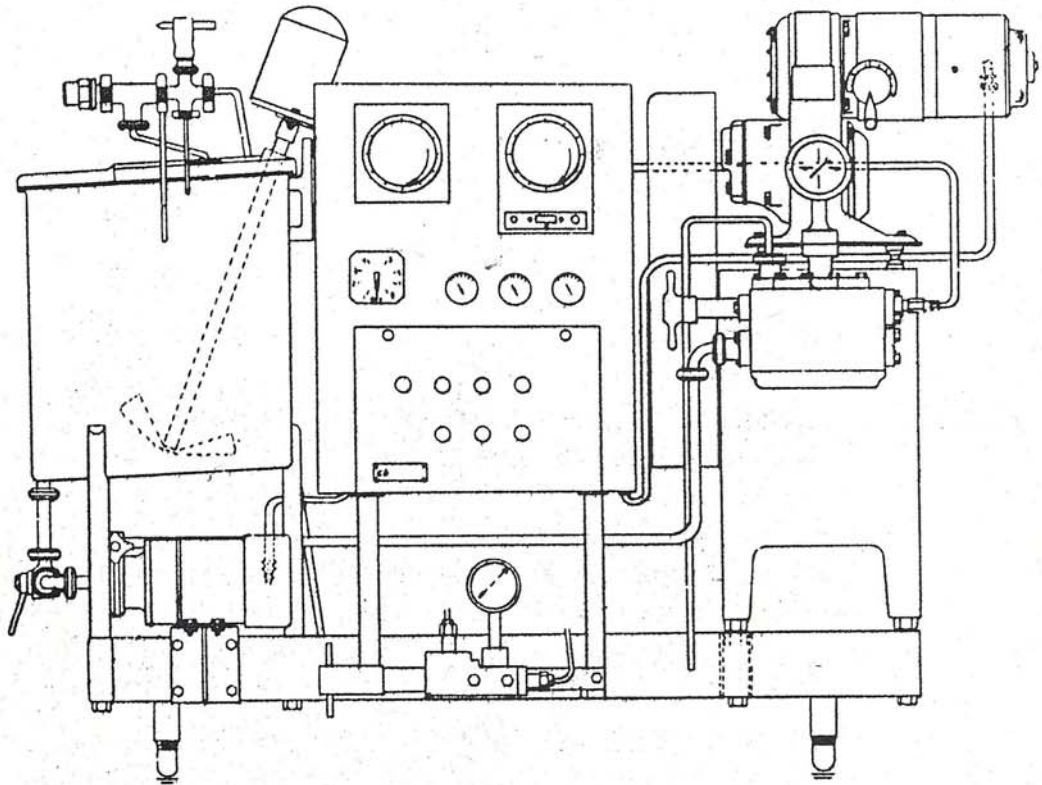


operator's manual om-5313-05



Robac[®] unitherm[®]
processing systems

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SECTION I - INTRODUCTION

The No-Bac Unitherm is a complete unitized system for sterilizing fluid products at temperatures up to 300° F. It consists of two surge tanks, a centrifugal supply pump, a high pressure timing pump, Spiratherm heat exchangers, an aseptic homogenizing valve, a product divert valve and a control panel all mounted on a rigid frame. All product contact surfaces are stainless steel. All equipment is of sanitary design and construction.

One surge tank is used to supply product to the system. It is equipped with a motor driven agitator, and has a hinged cover. The other tank is used for water for start-up, sterilization, flushing, and circulation cleaning.

The high pressure timing pump may be adjusted to any desired capacity within the operating range - 30 to 80 gallons per hour on the Model VIII and 80 to 210 gallons per hour on the Model XXI. Homogenizing pressures up to 3200 lbs. are available. Either one or two stage homogenizing valves are available.

Heating, holding, and cooling are done in Spiratherm heat exchangers. Steam is used for heating. The product temperature from the final heater is automatically controlled and recorded by the electronic Controller-Recorder.

The product is held for 2 seconds (at 300° F. and maximum rated capacity) in the next Spiratherm, then cooled to 170° (or the desired temperature) in the precooling tube. After homogenization, final cooling is accomplished with well or city water and 34° ice water in the cooling Spiratherms. Glycol solution may be used in the final two cooling sections if a lower product temperature is desired.

A manually operated flow diversion valve permits flow of product to either the sterile packaging equipment or to the supply tank. It also provides a means of directing the flow of cleaning or sterilizing solution to all the product piping.

Both the remote homogenizing valve and the flow diversion valve are equipped with steam seals to prevent product contamination.

Thermocouples are provided at the important product temperature locations. By means of a selector switch, the operator can monitor or record these temperatures, as desired, on a separate recorder.

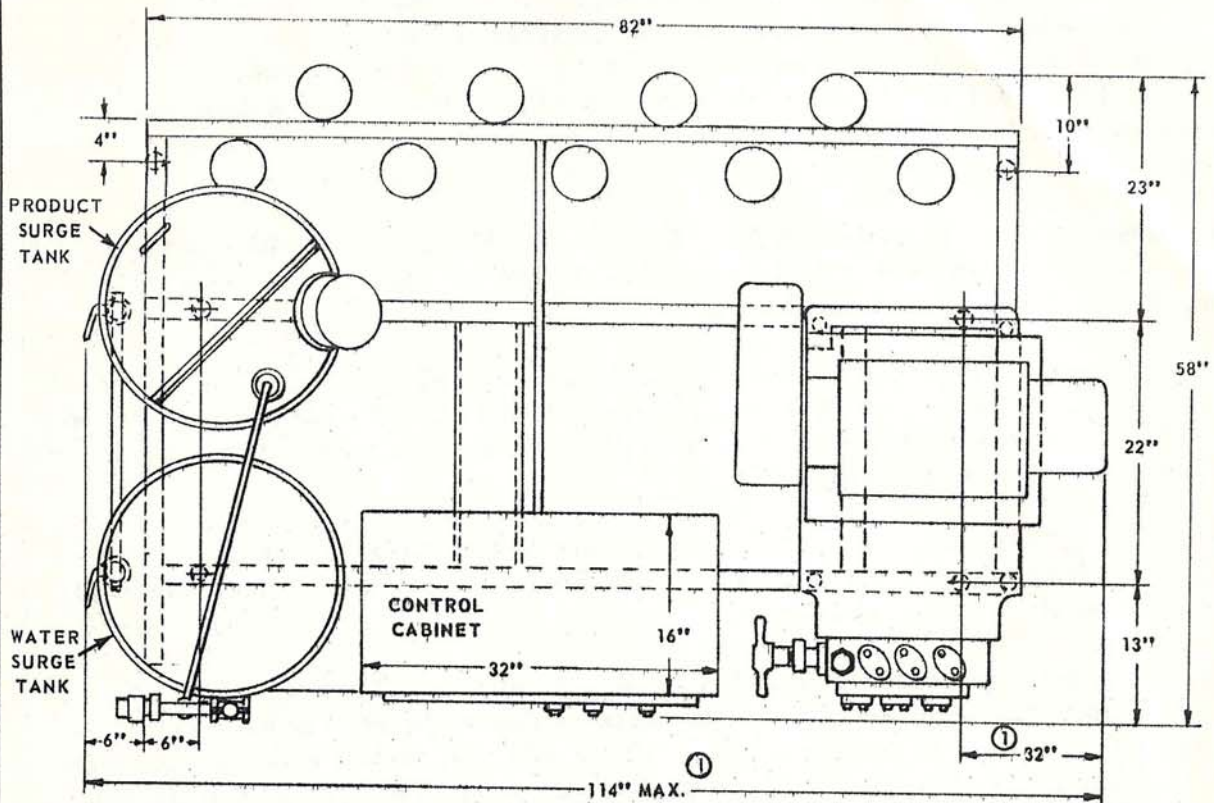
An aural alarm signal is provided to notify the operator if the product temperature at the holding section falls to a preset minimum, so that corrections can be made before the product temperature reaches the reject point.

It must be emphasized that satisfactory performance of the Unitherm is determined by product quality and operating conditions (chiefly temperature). These must be established and carefully followed.

The operating procedures and suggestions given in the manual are, of necessity, rather general. The specific temperatures and conditions for a particular product may necessitate certain changes and deviations.

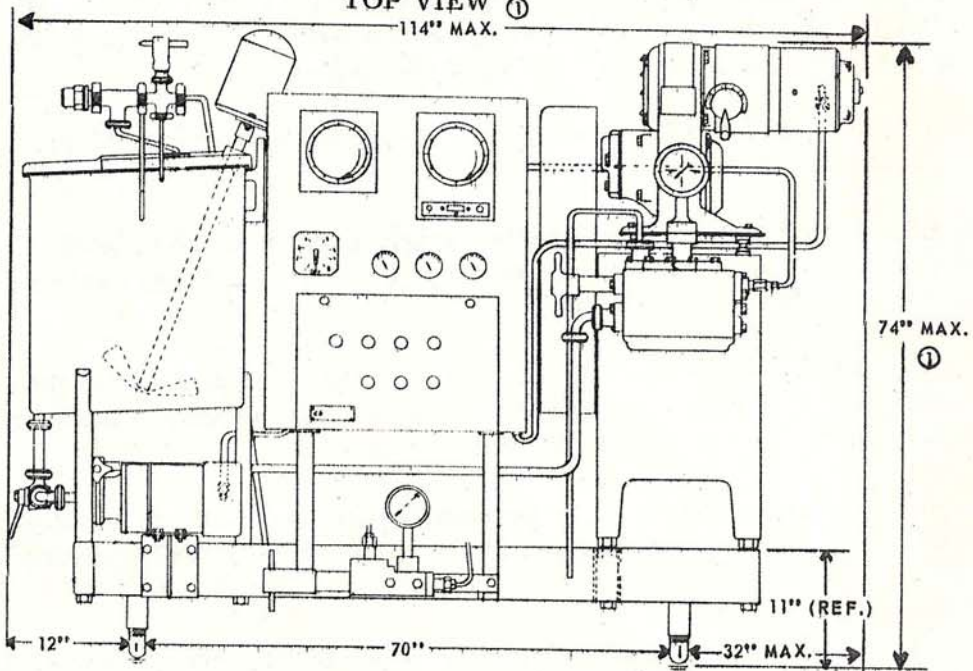
INTRODUCTION (Cont'd)

DIMENSION DRAWINGS



NOTE: ① - VARIES WITH MOTOR H.P.

TOP VIEW ①



FRONT VIEW

SECTION II - INSTALLATION

INSPECTION UPON ARRIVAL

This equipment has received a careful final inspection. It has been crated securely to insure delivery without damage or loss of any parts. At the time of delivery, please inspect the equipment for any visual damage or shortage. If damage or shortage has occurred, record on freight bill accordingly and have the driver sign. Unpack the equipment as soon as possible, and if you find any concealed damage, hold all packaging material and call the delivering carrier for inspection and to fill out inspection report which is furnished by the transportation company. File a claim with the transportation company as they are responsible for any damage that may have occurred in shipment. For our records, we will appreciate your advising us of any damage or loss claims you file so we may assist you in every way.

The following items are packed separately:

Agitator and two piece cover for the product surge tank, tools, and spare gaskets and V-seals for the timing pump. Gaskets and seals for the product centrifugal pump. Steam pressure reducing valve(s) - 1 for Model VIII, 2 for Model XXI.

Air operated steam valve for temperature control. 18 feet of 3/8" O.D. stainless steel tubing and 4 unions for product line to the filler.

Surge line for product return tank,

Extra charts, ink, oil, and instructions for the Honeywell Recorders are packed in the control cabinet.

LOCATION

The Unitherm should be located as close to the filling machine as is practical to minimize the length of lines that need to be sterilized. Eighteen feet of 3/8" stainless tubing is supplied for connection between the three-way divert valve and the filler.

LEVELING

The machine should be left on the skids until it has been moved to its desired location. After removal of the skids, it may be leveled by adjusting the threaded feet.

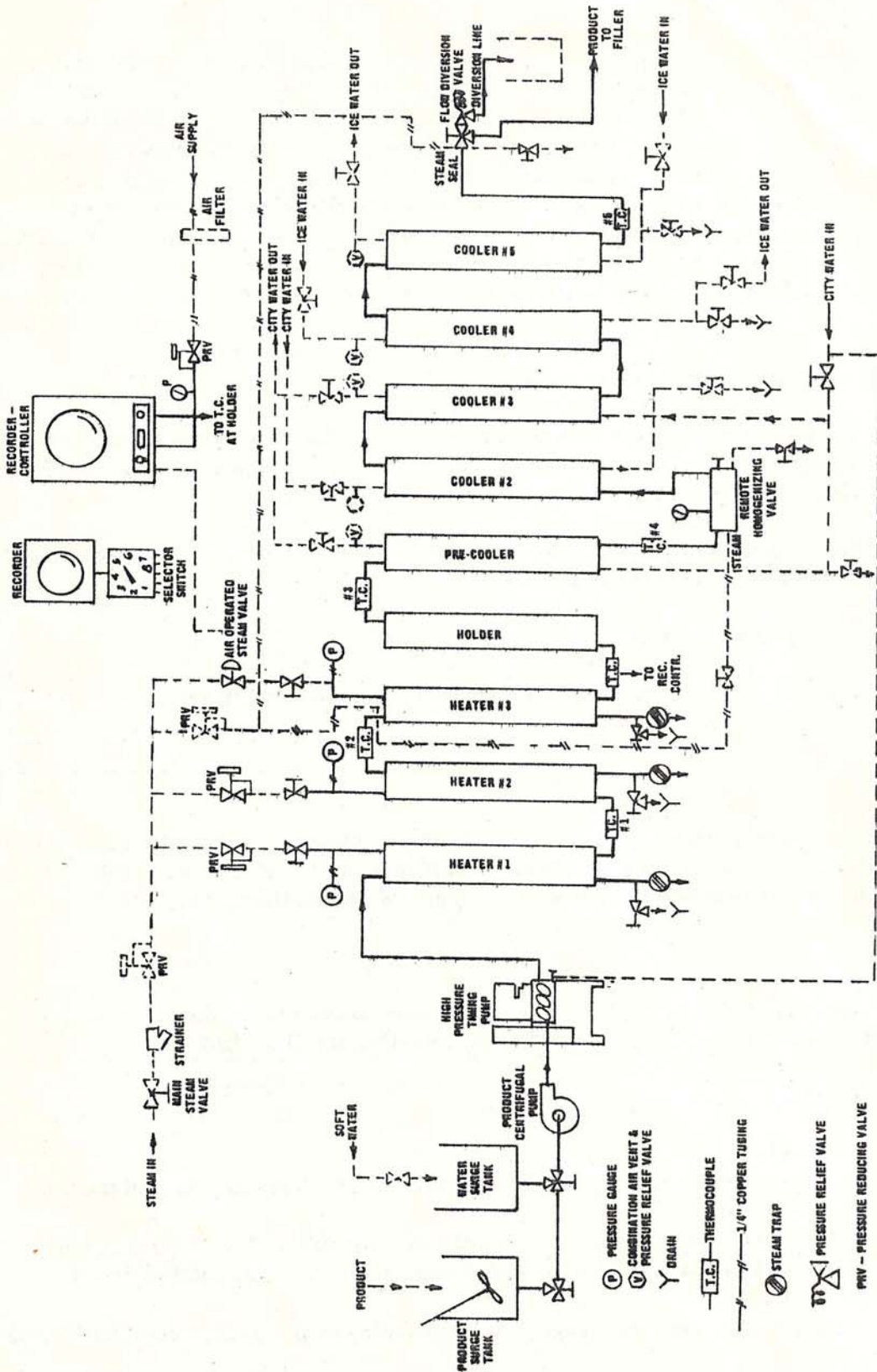
FACTORY ASSEMBLY

Factory assembly includes:

1. All electrical connections from control panel to motors, instruments and thermocouples.
2. All product lines from surge tanks through the system to the flow diversion valve. As noted above, 18 feet of 3/8" tubing and 4 unions are supplied for the product line to the filler.
3. The Spiratherm heaters are equipped with steam inlet stop valves, drain valves, and steam traps.

INSTALLATION (Cont'd)

FIELD PIPING SCHEMATIC - NO-BAC UNITHERM XXI



ALL COMPONENTS SHOWN IN DOTTED LINES TO BE SUPPLIED BY CUSTOMER

INSTALLATION (Cont'd)

4. Steam Pressure Reducing Valves and one air-operated steam valve are supplied but not installed on the system (see pages 4 and 6).

UTILITIES REQUIRED

Steam: A 1½" main line at not less than 125 lbs. pressure. Steam must be clean and free of boiler compound. Where sudden changes in line pressure occur, a separate line from the boiler or main line should be run.

City Water: 1/2 GPM for the timing pump pistons and approximately 10 GPM maximum for each cooling Spiratherm (two on Unitherm VIII, three on XXI). If tower water is used, it should be clean and free of iron to reduce scale build-up on the cooling coils.

Soft Water: The water used for start-up, sterilizing and cleaning must be treated, filtered water to prevent any deposit on product contact surfaces.

Refrigerated Water: Should be supplied to the two final coolers. 6 to 10 GPM is required for each. The water passages are rated at 150 lbs. maximum working pressure, so no pump is required to return the water to the storage or chilling unit.

Electrical service to the panel must be 230 volt, 60 cycle, 3 phase, except on special or export orders. Wire size should be chosen to carry 5 amps, plus the current for the high pressure (timing) pump. See motor nameplate.

Air: An air supply of 50 lbs. or higher at a rate of 0.5 cu. ft. of free air per minute.

FIELD ASSEMBLY

It is recommended that all piping and electric wiring be done by experienced journeymen so that it meets the requirements of local codes as well as insurance specifications.

Electrical Wiring: As shown on pages 14 and 15, one fused line switch should be provided for the Unitherm VIII or two for the Model XXI. Magnetic starters are provided for the centrifugal supply pump and the timing (high pressure) pump motors. The agitator motor is fused, as is the 110 V.A.C. control and instrument circuit.

Check the rotation of both the centrifugal pump and the timing pump - as described in the operator's manuals for these machines. Be sure that the electrician checks out the control panel as described on page 9.

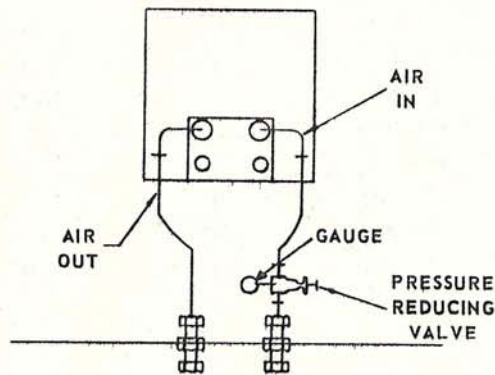
Steam Piping: Installation piping for the Unitherms is shown on pages 4 and 6. The incoming steam line should be equipped with a shut-off valve and a strainer.

Where excessive line pressure variations occur - an additional pressure reducing valve should be used ahead of the air-operated steam valve (V1) to assure accurate temperature control.

INSTALLATION (Cont'd)

Drain lines from the condensate traps may be run as desired. Note that the trap on the final heater discharges very hot (300°) condensate, which should not be emptied on the floor. If desired, the condensate may be returned to a feed water tank - if such return does not cause a back pressure against the steam traps. This would cause product temperature variations and might accelerate product burn-on in the heaters.

1/4" copper tube lines with needle valves can be used to supply 15 lbs. steam to the steam seals on the remote homogenizing valve and the flow diversion valve. Petcocks can be used on the steam outlet connections from these two seals, to build up a small pressure in the steam passages, or the end of the tubing can be pinched together.



Air Supply: The air line to the panel may be 1/4" copper tubing, and should include a filter to remove any moisture and a shut-off valve. Inside the cabinet, a pressure reducing valve lowers the pressure to 20 lbs. for the temperature controller. A 1/4" copper tube line must be run from the outlet air fitting to the air-operated steam valve.

After connecting the air supply and valve, check the air pressure at the reducing valve. Reset the valve, if necessary, until there is 20 lbs. air pressure to the controller.

Refer to the operator's manual on the Honeywell 111 Controller. Turn it on manual control, apply air to the steam valve, and check its operation with 3 to 15 lbs. applied air, to make sure it opens and closes properly.

Water Lines: For maximum cooling with the least water, flow of water through the coolers must be opposite to the product flow. The piping diagrams show separate water lines to each cooler. In some installations, depending upon water volumes and temperatures, the water can go through two Spiratherms in series, instead of individually.

Pipe size will depend upon water volume and allowable pressure drop. 3/4" IPS is recommended, especially on the sweet water coolers, although 1/2" IPS may be used on most model VIII or where not over 8 GPM water is to be circulated.

As shown, a drain valve must be installed on each cooler, since all water must be drained out during the sterilizing cycle. In addition, each cooler should have an air vent and pressure relief valve on the line at the top - to eliminate air pockets and to protect the jacket (150 lbs. working pressure) in case of failure to drain water during sterilizing.

Where the water enters the top of the cooler, a valve in the outlet line at the bottom is desirable to build up enough pressure to flood the jacket and remove any air.

INSTALLATION (Cont'd)

Sweet Water Lines: Should follow the same principles. The water may be returned to another location without a separate pump since the jackets may be operated under pressure (150 lbs. max.).

The following tables give approximate water temperature rises for the water flows shown:

UNITHERM VIII
Product @ 80 Gallons Per Hour

<u>Cooling Unit</u>	<u>Product Temp. Range</u>	<u>Temp. Change</u>	<u>BTU's Per Hr.</u>	<u>Water GPM</u>	<u>Water Temp. Rise</u>
Pre-Cooler	290°-180°	110°	80,000	4.0	40°
Pre-Cooler	290°-180°	110°	80,000	8.0	20°
Cooler 2	180°-120°	60°	43,000	4.0	21½°
Cooler 2	180°-120°	60°	43,000	8.0	11°
Cooler 3	120°- 80°	40°	29,000	4.0	14½°
Cooler 3	120°- 80°	40°	29,000	8.0	7°
Cooler 4	80°- 45°	35°	25,000	4.0	12½°
Cooler 4	80°- 45°	35°	25,000	8.0	6°

UNITHERM XXI
Product @ 210 Gallons Per Hour

<u>Cooling Unit</u>	<u>Product Temp. Range</u>	<u>Temp. Change</u>	<u>BTU's Per Hr.</u>	<u>Water GPM</u>	<u>Water Temp. Rise</u>
Pre-Cooler	290°-180°	110°	209,000	6.0	70°
Pre-Cooler	290°-180°	110°	209,000	10.0	42°
Cooler 2	180°-135°	45°	85,500	6.0	28½°
Cooler 2	180°-135°	45°	85,500	10.0	17°
Cooler 3	135°-105°	30°	57,000	6.0	19°
Cooler 3	135°-105°	30°	57,000	10.0	11½°
Cooler 4	105°- 65°	40°	76,000	6.0	25°
Cooler 4	105°- 65°	40°	76,000	10.0	15°
Cooler 5	65°- 45°	20°	38,000	6.0	13°
Cooler 5	65°- 45°	20°	38,000	10.0	7½°

The pipe size of the incoming manifolds and sweet water return lines may be determined from the total water volumes and the available pressure.

INSTALLATION (Cont'd)

Soft Water: A supply of filtered and softened water must be available for sterilizing and flushing. To maintain clean product contact surfaces, it is essential that water free of iron, minerals, or any hardness be used. A 1/2" line will be adequate and should be piped to the water surge tank with a shut-off valve at a convenient point. In some installations, particularly where tower water is used on the first cooling Spiratherms, the soft water should also be piped to the high pressure pump for the plunger rinse (1/2 gallon per minute required).

Product Piping: Three 6' sections of 3/8" stainless steel tubing and four unions are supplied for the product line from the lower port of the flow diversion valve to the filler(s).

The line location and outlet fittings will depend on the type and number of fillers. In most installations, the product line goes through a cross or tee and then loops back to the product surge tank. This provides a constant feed at constant pressure to the filler(s) and permits sterilization and C-I-P cleaning of the product piping.

For suggestions on your particular installation, consult your Cherry-Burrell Process Engineer.

PREPARATION FOR TEST RUN

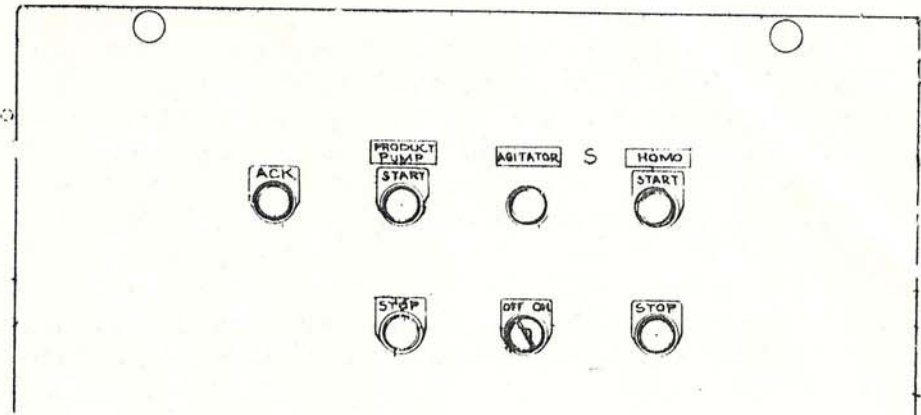
To check out the operation of all the equipment and controls, and to familiarize the operator with the system, a test run should be made on water. This also permits adjustment of the temperature controls, speed of the high pressure timing pump and allows measurement of the elapsed time for product from surge tank to diversion valve, at the desired operating capacity.

It is recommended that the Honeywell Service Engineer be present during this initial operation to instruct the operator and maintenance man on the controlling and recording instruments.

CHECKOUT OF CONTROL PANEL

1. With power connected and fuses in place, close the line switch (two of them on Model XXI). The horn should sound. Push the "acknowledge" button and it should stop.
2. Push Product Pump "Start" Button. The centrifugal pump under the surge tank should start and the pilot light should glow. Push the "stop" button. Pump should stop and the light should go out.
3. Check the plungers and head parts in the high pressure pump for proper assembly. Push the homogenizer "start" button. The pump should start and the pilot light should glow. Push the "stop" button. Pump should stop and light should go out.

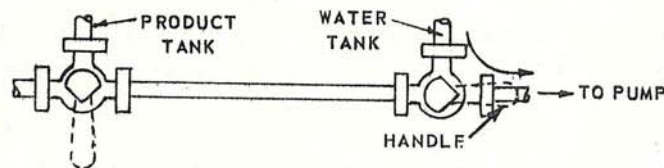
INSTALLATION (Cont'd)



4. Make sure the agitator is tight in the motor drive shaft on the product surge tank, and that no spare parts are in the tank. Turn the agitator switch to "on". The agitator should turn and the pilot light glow. Turn the switch off.
5. Throw the controller-recorder power switch on. The chart motor should run. The temperature indicator should show the thermocouple temperature.
6. Adjustment of the alarm contacts should be made when circulating water during the test run (see Recorder-Controller manual).
7. Lubricate the plugs on the valves under the surge tank with a little Orange Solid Oil so they will turn readily.

TEST RUN PROCEDURE

1. Turn the handle on the plug valve under the water tank horizontally, to the right. Fill the tank with soft water.



Back off the handle on the remote homogenizing valve and the timing pump relief valve.

Close the flow diversion valve. Open the drain valves on all the Spiratherm heaters and coolers. Change the product outlet line from the relief valve (above the water tank) so that it discharges on the floor. Open the water valve to the timing pump plungers.

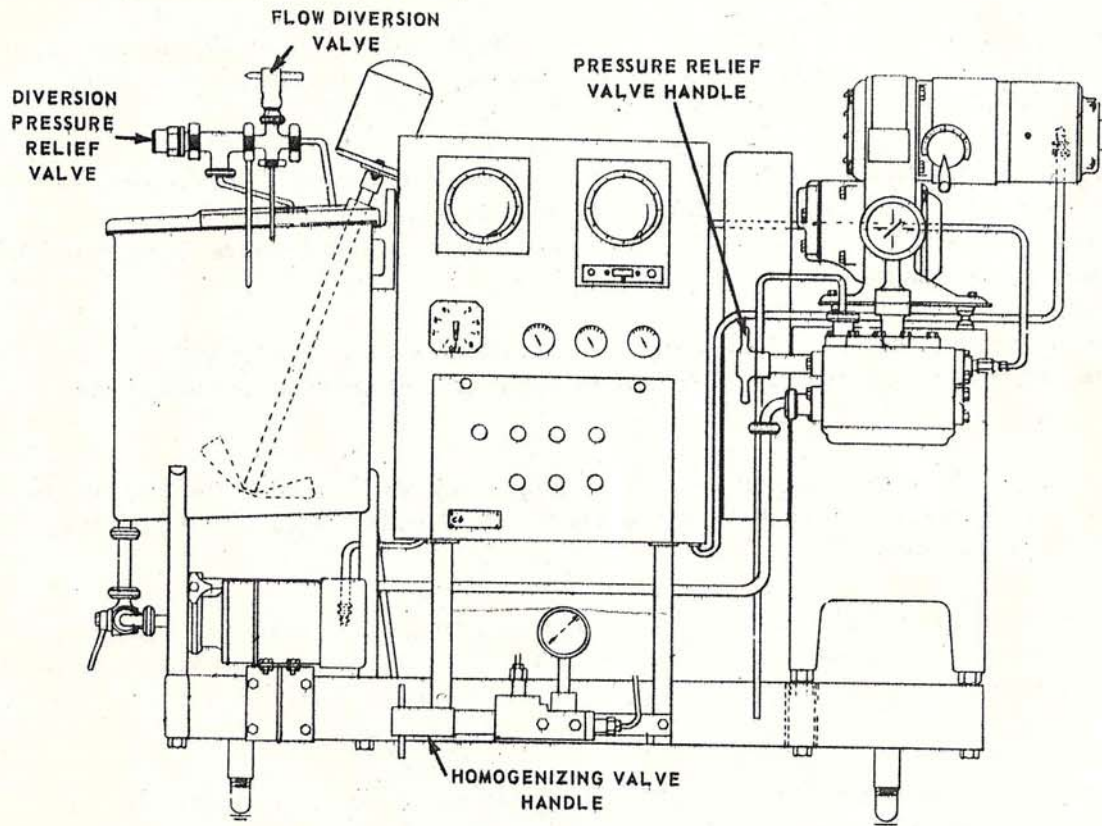
INSTALLATION (Cont'd)

2. Start the product pump (centrifugal). When all the air is out of the line to the cylinder block, start the timing pump. Crank it down to low speed (for rapid heating and to save water).

Close the pressure relief valve on the timing pump until water stops flowing out the relief line.

Switch on power to the two recorders (toggle switch inside recorder doors).

Set thermocouple switch to #1.



3. Open the steam valve to the first heater. When initial condensate is drained out, close the drain valve.

Set the pressure reducing valve (to #1 heater) so that panel gauge just moves off the 0 pin. As temperature rises and levels out, both recorders should show 190° to 200° F.

Adjust the remote homogenizing valve to show 500 lbs. pressure on the gauge.

Set the thermocouple switch to the second position.

Paragraph 4 is for Model XXI only - for Model VIII go to paragraph 5.

INSTALLATION (Cont'd)

4. Open the steam valve to the second heater. Drain the condensate and close the drain valve. Set the pressure reducing valve to show 15 lbs. pressure on the #2 heater gauge (on the panel). As the recorder temperatures rise, tighten the pressure relief valve (above the water tank) so that hot water is kept under pressure and discharges in a steady stream. The temperature on both recorders should be 230 to 240° and should be the same on both.
5. Open the steam valve to the final heater (#2 on VIII, #3 on XXI). Drain the excess condensate and close the drain valve. Set the temperature control on the right recorder for 300° and turn the auto-manual switch to auto.

If a separate pressure reducing valve is used ahead of the air operated steam valve (for the final heater), set it to give 80 - 90 lbs. steam. Turn the thermocouple switch to position 3.

Set the temperature control to maintain 300° on the recorders. If the temperature varies, have the Honeywell man adjust the proportional band. Turn on the steam to the steam seals (remote homogenizing valve and flow diversion valve) and adjust the pressure reducing valve to supply 15 lbs.

6. When the temperature has stabilized, check readings on thermocouples from outlet of precooler and final cooler. They should approach the final heater and holder readings.

Note that the right hand recorder-controller is always connected to the final heater outlet thermocouple. The left hand recorder may be switched to any of the other couples, as desired.

7. When the sterilizing water has been discharging through the pressure relief valve for 5 minutes or so, open the flow diversion valve one turn, allowing hot water to sterilize the filler line. Tighten the pressure relief valve a turn or two to close it off.

Sterilize the system for 20 minutes at 300°, or the desired temperature - adding water to the surge tank as required.

If the entire product line to the filler is to be sterilized, some provision must be made to maintain a back pressure on the line.

8. Close the drain valves on the cooling sections. Open the water valve to the pre-cooler. Set the selector switch to the thermocouple at the pre-cooler outlet.
9. When the temperature drops to 170°-180°, crank up the timing pump to normal capacity. Turn on the water to the intermediate coolers. Open the flow diversion valve another turn or so, to maintain a small back pressure on the product side.

INSTALLATION (Cont'd)

10. Measure the product flow rate by measuring the time into a calibrated container or by weighing. Set the timing pump to get the exact capacity desired (allowing for the specific gravity correction on the product). Note the timing pump speed dial setting so that it can be reset to this speed during product runs.

Increase the homogenizer pressure to the normal amount (on product) and recheck the capacity.

11. Now lower the temperature control setting to obtain the desired product temperature to the holding tube. Adjust the proportional band and reset controls in the control instrument to obtain an even temperature line. These adjustments must be made at normal operating capacity. Note the air pressure to the air operated steam valve.

Mark this air pressure and the settings of the proportional band and reset inside the recorder cabinet and in the service manual for future reference.

12. Reduce the controlled temperature and set the alarm switch contacts (LS-2 in the right hand instrument) to close and sound the horn at 1° or 2° above the minimum holding temperature.

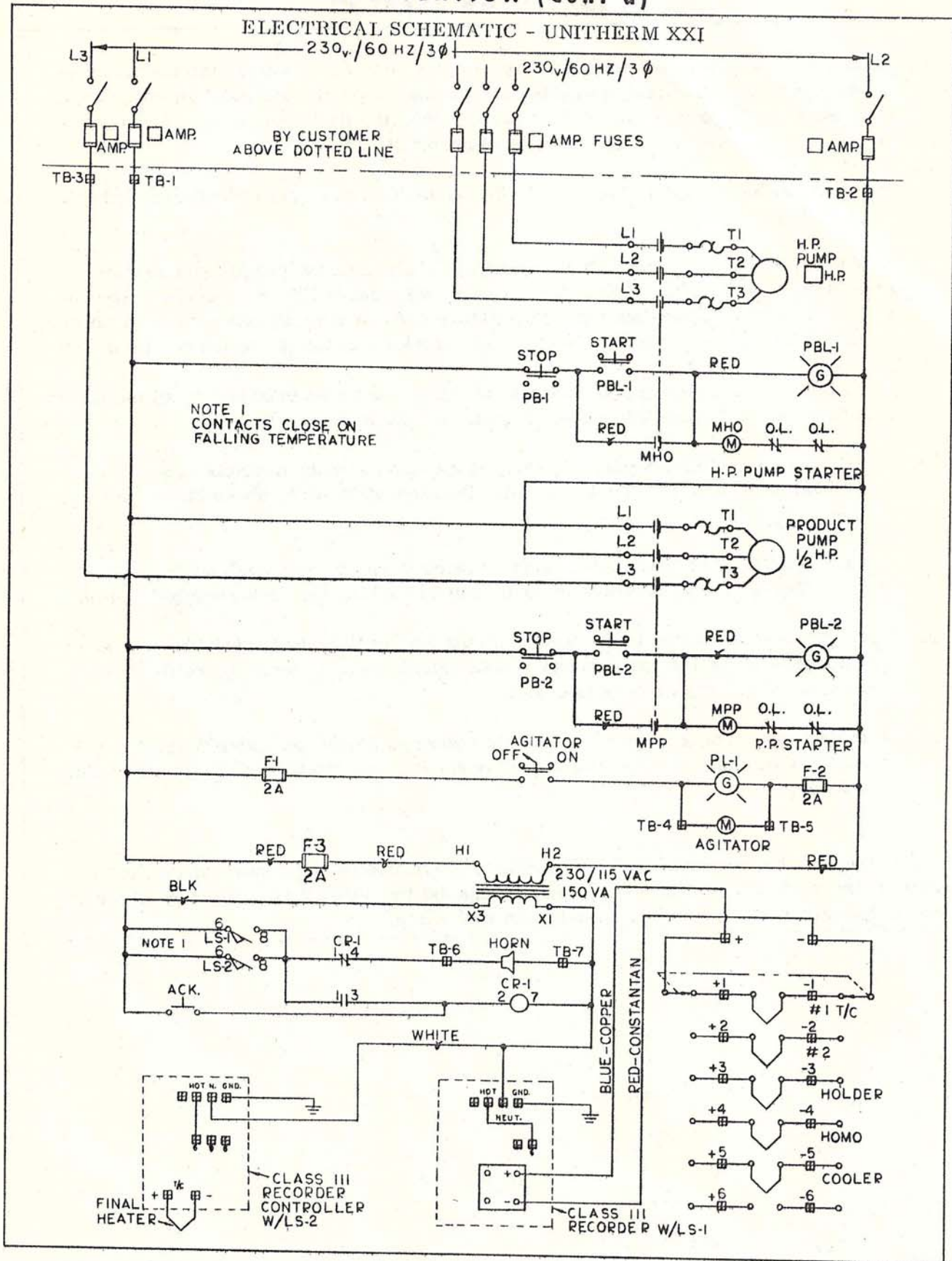
Run the temperature down and up once or twice to check the switch setting and alarm. The horn may be silenced each time by pushing the "acknowledge" button.

13. Turn the selector switch to the homogenizing temperature and adjust the alarm switch (LS-1 in the left instrument) to sound the horn at 1° or 2° above the minimum desired homogenizing temperature.

14. When the adjustments are completed, shut down as described under "operation" - page 20. Circulate cleaning solution as described on page 20 and flush with clean, soft water.

To insure that the jackets of cooling Spiratherms are flooded with water and all air is vented, there should be some back pressure against the water flow, either by closing the outlet valves slightly or from the return water line.

INSTALLATION (Cont'd)



SECTION III - OPERATION

The Unitherm must be operated continuously at or above the normal holding temperature to maintain sterility. If this temperature drops below the predetermined minimum, then the unit must be resterilized. Under normal conditions, if the horn sounds, corrective measures can be taken by the operator, except in cases of power failure or pump stoppage. Suitable procedures are described on pages 19 and 20.

STERILIZATION

The unit is usually started up on soft water at reduced capacity, heated up to sterilizing temperature (290°-300° F.) and operated until all product contact surfaces, after the final heater through the flow diversion valve, have been held at that temperature for 20 minutes. Steam to the remote homogenizing valve and the flow diversion valve should be turned on before the 20 minute period starts.

A small amount of water should be allowed to bleed through the pressure relief valve for five minutes during this time. If provision is made, then the product lines to the filler inlet(s) and the return line may be sterilized at the same time.

Be sure that the cooling units have their drain valves open during the heating and sterilizing period.

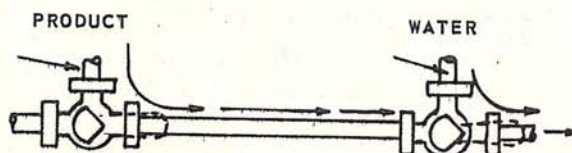
During sterilization, set the selector switch to the last thermocouple (coming out of the cooling section) and leave it in that position. This gives a printed record of the sterilizing time for future reference.

After sterilization, close the drain valves on the cooling tubes, open the water valves, speed up the timing pump to the normal capacity and reset the product temperature control to the desired temperature. When the temperature at the final thermocouple is down to the desired value, the unit is ready for product.

Note that if the filler is not ready, operation can be continued on water for an indefinite period, at reduced capacity if desired.

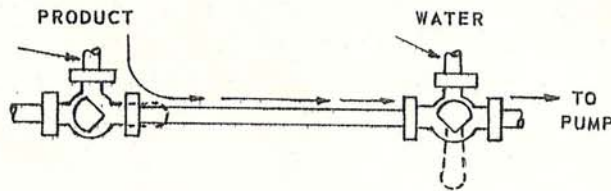
OPERATION ON PRODUCT

Before bringing product into the surge tank, turn the plug valve (under the product tank) so the handle is to the right (see illustration). Run the first product in slowly so it will fill the pipe and push the air back into the product tank. When all the air is expelled, fill the tank and start the agitator.



OPERATION (Cont'd)

To start product into the system, turn the water valve handle straight down.



Time the product through the system and when all water and diluted product has been drained, set the valves to direct it to the filler or to return it to the surge tank.

The flow rate can be adjusted to match the filler by changing the speed of the timing pump.

As the product reaches the halfway point in the system, the remote homogenizing valve can be set to the desired pressure. The setting will not be exactly the same as when running on water.

CAUTION: Never allow the surge tank to run empty nor attempt to process product which is foaming or has excessive air. Any appreciable air may damage the valves or cylinder block of the high pressure timing pump. It might also cause enough burn-on to necessitate a shut-down. Never run the agitator in the product tank unless it is completely covered.

SHUT-DOWNS

In the event of a temporary filler shut-down or shortage of product, open the water valve and close the product valve. Refill the water tank as required. The timing pump may be slowed down, if desired.

Where glycol solution is used in the final coolers, it may be necessary to valve down the flow to prevent freezing.

When product is again available, the valves can be changed to process product instead of water.

All these changes should be logged or marked on the recorder charts for future reference.

EMERGENCY SHUT-DOWN

In case the power fails and the pumps stop, close the flow diversion valve so hot product will not go to the filler. Close the steam inlet valves as soon as possible. The hot product cannot back up through the timing pump, but it will try to go the other way and will be held, to a certain extent, by the remote homogenizing valve.

When power is restored, start up on water, flush out the system, and check the steam pressure required on the final heater. If burn-on has not occurred, and the temperature

OPERATION (Cont'd)

has not dropped below the minimum, reesterilization should not be required.

LENGTH OF RUN

The length of product run is determined by burn-on or solids throw-down in the heating sections. It may be as little as three hours in some cases but usually six to ten hour runs are possible. High acidity, air in the product, seasonal changes in dairy products, or poor quality may cause excessive burn-on and reduce the length of run.

This condition does not occur instantaneously; it is gradual and can be predicted by watching the air pressure to the steam valve (as shown on the recorder-controller) or the steam gauge for the final heater. The air to the valve during initial operation may be 5 to 6 pounds and the steam pressure 45 pounds or so. In some instances, the increase in product pressure can be observed on the timing pump gauge.

As the burn-on increases, so will the air and steam pressures. When the air pressure gets to 15 pounds or more, the steam valve will be wide open and the product temperature will start down, blowing the horn when it reaches the preset alarm temperature. Pushing the "acknowledge" button will quiet the horn, but it won't stop the falling temperature.

Open the water valve and shut off the product valve, under the surge tanks. Time out the product to the filler and then run the rest of the product and water to the drain. Shut off the sweet water to the final coolers.

If additional product is to be processed and filled, a "quick clean" will remove the burn-on and permit further operation.

QUICK CLEAN PROCEDURE

Leave the timing pump at operating capacity. Do not change the temperature setting, as you want to keep the unit in sterile condition. Allow the system to flush with water for several minutes until it is clear.

Let the water in the tank drop to a low level (1/4" to 1/2" at the outlet). Pour in 10 to 15 gallons of acid cleaning solution, as recommended by the supplier.

When the water is timed through the system, open the relief valve and close the diversion valve so the acid runs back into the water tank. Adjust cooling water flow so acid into tank is not over 170° F.

Circulate acid solution for 5 to 10 minutes. As the burn-on is cleaned out, the air pressure to the steam valve will drop to normal.

Change discharge line so acid goes to drain. When water tank is almost empty, add water.

Flush with clear water for 2 to 3 minutes.

OPERATION (Cont'd)

Open sweet water valve and cool the water to normal temperature.

Switch back to product, time out the water, and resume operation.

SHUT-DOWN AT END OF PRODUCTION

When product run is completed, turn plug valves to supply water to the system. Divert the product flow to the drain and flush until water is clear. Reset the temperature controller to 170° and close the steam valve to the initial heater. Open its drain valve.

Shut off the cooling water to all coolers and open their drain valves.

Back off the homogenizing valve to 500 pounds pressure. When unit is flushed, divert the water back into the water tank.

CLEAN-UP

To assure a satisfactory clean-up with no deleterious effects on the stainless surfaces, the cleaning compounds should be recommended by your chemical supplier and must be used according to his specifications.

The use of organic acids or other corrosive compounds will damage the stainless surfaces and would eventually cause tube failure. The machine warranty does not cover damage from improper use.

Compounds containing chlorine are not recommended and under no circumstances should the system be sterilized with a chlorine solution.

The cleaning sequence varies with different cleaning suppliers - some recommend the caustic solution first, then a water rinse and the acid solution, followed by a final rinse.

The cleaning procedure used in many instances is similar to that used for plate heat exchangers: an acid cleaning solution for 20 minutes @ 170° F, then a short rinse with water, followed by a 170° caustic solution (1½ to 2% A. A.) and a 5 to 10 minute final water rinse with the steam shut off.

Several times during the circulation of each solution and the rinses, the homogenizing valve, timing pump pressure relief valve, and the flow diversion and product relief valve should be opened and closed to clean the O-rings and stems.

If provision is made for circulation cleaning, the product piping to the filler inlet may also be circulated with the Unitherm while it is being cleaned.

OPERATION (Cont'd)

INSPECTION

The timing pump suction and discharge valves and cylinder block parts are the largest areas in the system and are, therefore, the most difficult to clean. If visual inspection and swab tests prove that these surfaces are sterile, then it is evident that the small diameter tubing used for piping and in the heat exchangers will also be clean.

After circulation is complete, the timing pump cylinder block parts and the remote homogenizing valve should be removed, as described in the operator's manual for these units, and washed by hand.

SECTION IV - MAINTENANCE

DAILY

Drain condensate from crankcase of timing pump and add oil as required.

Drain condensate from filter in air line.

Check perforated caps in remote homogenizing valve. These should be replaced at frequent intervals so that they do not fail during a product run.

Check plunger V-seals and replace - as noted above.

Put a thin coating of Orange Solid Oil or approved lubricant on the valve plugs before installing them in the water and product valves (under the surge tanks).

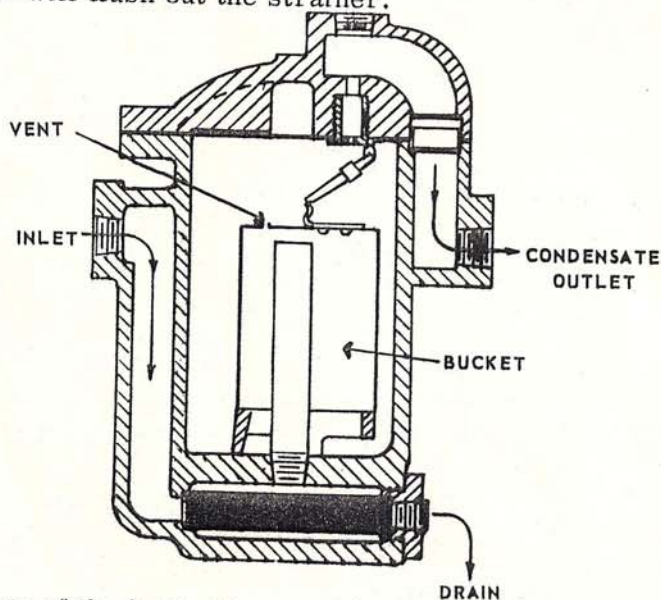
WEEKLY

Examine gaskets in sanitary line unions, O-ring seals, carbon ring on rotary seal of product centrifugal pump and other replaceable parts and renew as required. Refer to the operator's manuals on pumps and recorders for details on these parts.

Pump and agitator motors should be lubricated as recommended in the manufacturer's instructions.

CLEANING STEAM TRAPS

The inlet strainer in the bottom of each trap should be cleaned by back-flowing once a week. During the clean-up or when there is some load on the heater and condensate is discharging at intervals - close the inlet steam valve to that heater and open the drain valve. The condensate will flush out the strainer.



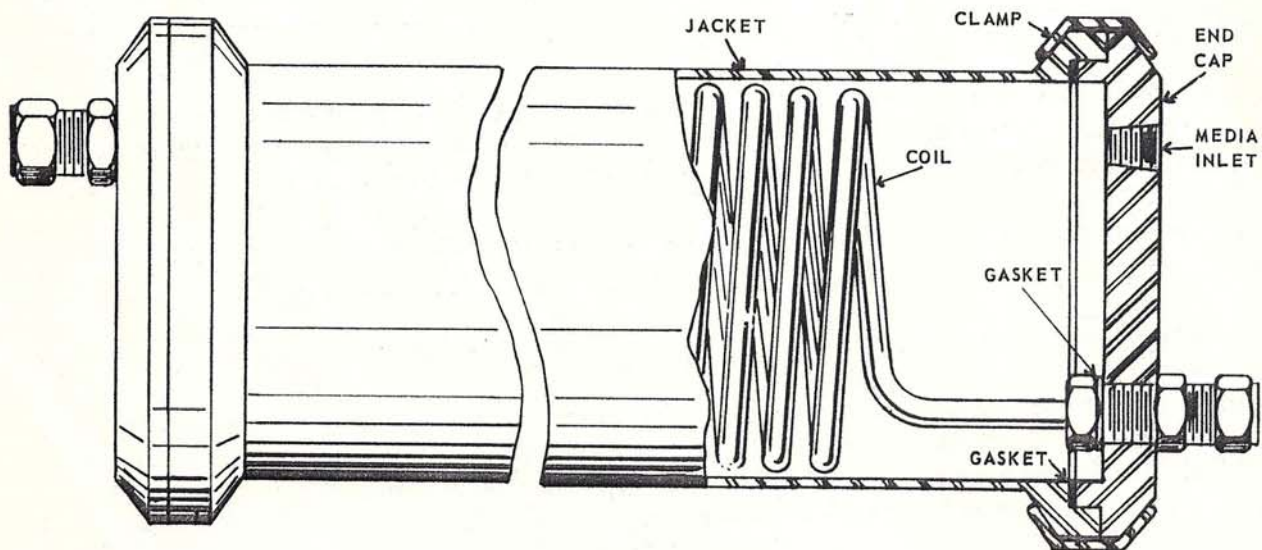
Should the vent in the top of the bucket become plugged, it may be opened by removing the top of the trap and clearing the hole with a piece of wire.

MAINTENANCE (Cont'd)

SPIRATHERM HEATERS AND COOLERS

Details of construction are shown below. Each is made up of a spiral coil of stainless steel tubing mounted in a stainless shell. The cooling coils are supported on a stainless core which restricts the flow of water to the area between the core and the jacket.

No maintenance is normally required. If the heating or cooling efficiency of one of the Spiratherms gradually decreases over a period of days or weeks, it indicates that the outer surface of the coil is becoming coated by scale (in the heater or precooler) or by lime or silt in the cooling water.



SPIRATHERM HEATER

Any of these units may be readily opened for inspection, as follows:

Open the union in the piping above the Spiratherm.

Remove the connecting product tubing loop from the top. If there is a thermocouple in the loop, leave the end connected to the adjacent tube and swing it out of the way.

Remove the lock nut and the clamp, and lift off the cap. You can now see the upper part of the coil.

If the tubing is coated or covered with scale, the quickest method of cleaning is to replace the end cap, lock nut, and clamp and circulate acid cleaning solution through the jacket (using the steam or water pipe connections).

MAINTENANCE (Cont'd)

Contact your local boiler repair shop. They are experienced in this work and have a pump and supply tank as well as the necessary acid.

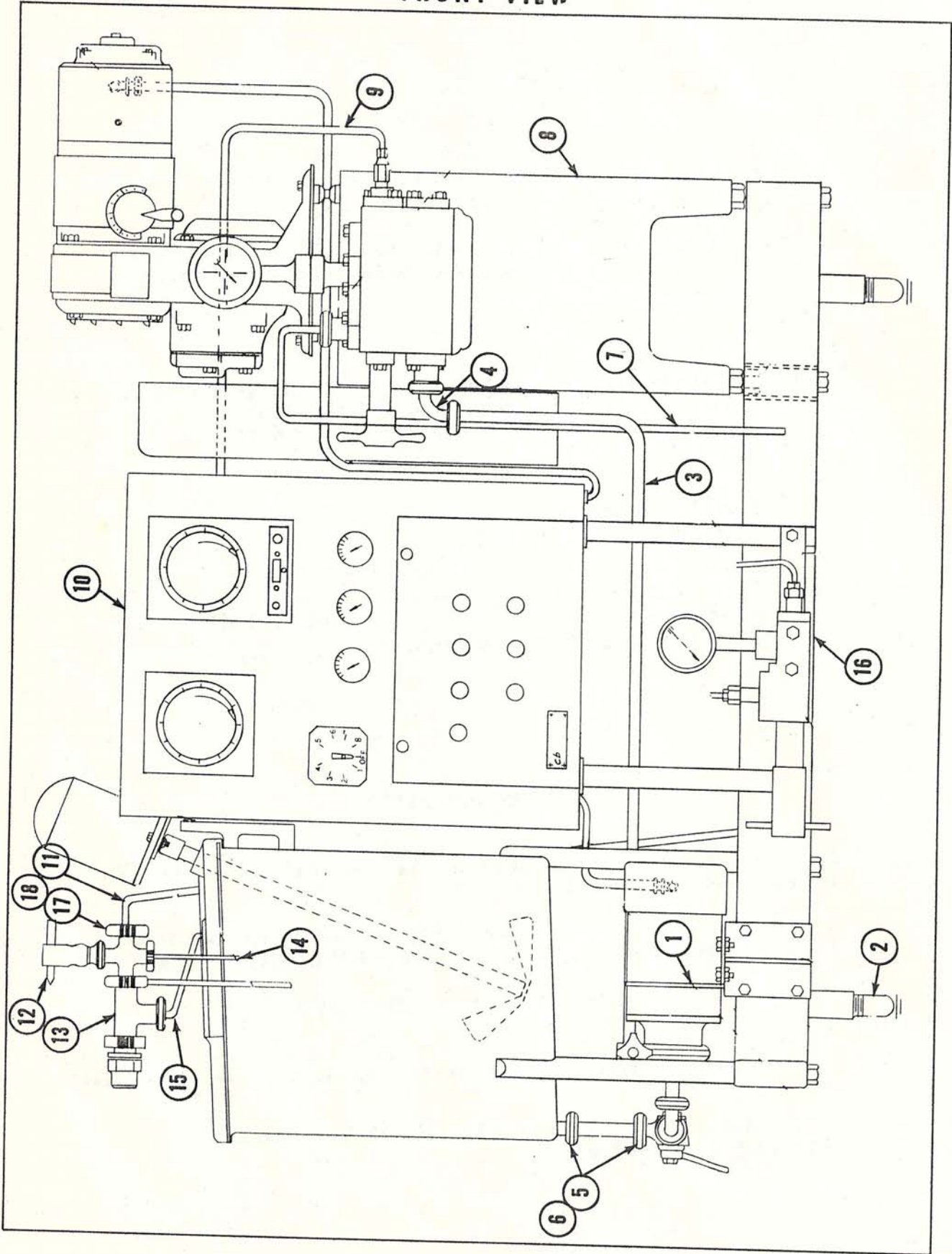
Several Spiratherms may be connected in series and circulated at one time, since the only large pressure drop is through the pipe connections.

Flush the jacket thoroughly with water after cleaning and pump through a weak caustic solution to neutralize any acid residue.

PRESSURE REDUCING VALVES & TEMPERATURE CONTROL VALVE

Instructions for maintenance and servicing of these contrivances are packed in the instruction envelope inside the control cabinet.

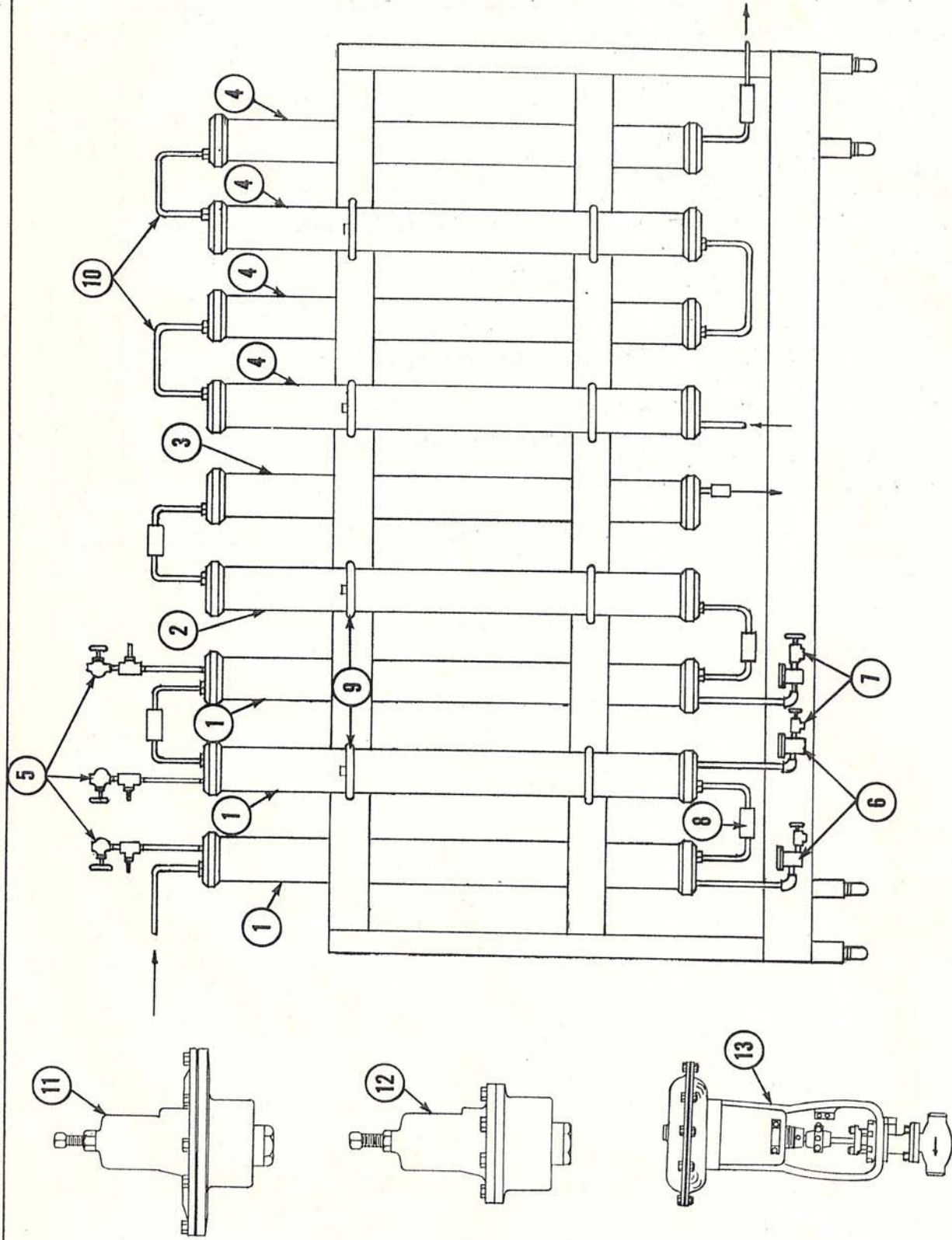
FRONT VIEW



FRONT VIEW (Cont'd)

INDEX NO.	PART NO.	DESCRIPTION	QTY.
1	680-3044	PUMP, Product Centrifugal (see IP-5141)	1
2	220-0053	FOOT, Adjustable	6
3	300-0698	TUBING, S. S. Product	1
4	300-0438	ELBOW, S. S.	1
5	024-2232	CLAMP, 13QT - 1½"	13
6	554-0399	GASKET, 40QH - 1"	13
7	220-0080	TUBE, Relief	1
8		PUMP, High Pressure Timing (see pump operator's manual)	
9	936-0160	TUBING, S. S. Product	1
10		CABINET, Control - see page 37	
11	300-0436	TUBING, S. S. Product	1
12	302-0040	VALVE, Flow Diversion - see page 43	1
13	024-2684	VALVE, Product Relief - see page 42	1
14	300-0193	TUBING, S. S. Product	1
15	220-0078	TUBING, Divert Line	1
16		VALVE, Remote Homogenizing - see page 41	
17	034-2223	CLAMP, 13I - 1½"	3
18	554-0398	GASKET, 40QN - 1"	3

UNITHERM XXI - HEAT EXCHANGER



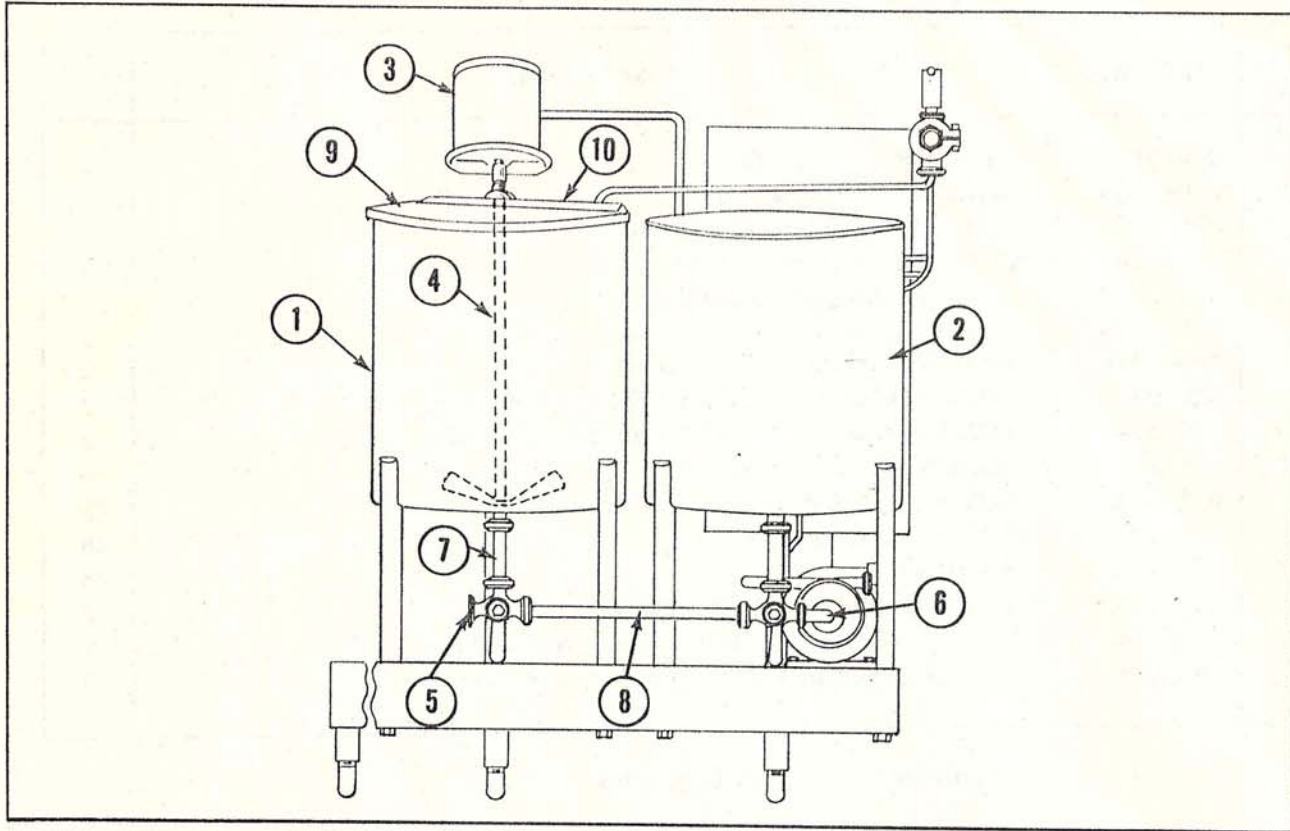
REAR VIEW

UNITHERM XXI - HEAT EXCHANGER (Cont'd)

INDEX NO.	PART NO.	DESCRIPTION	QTY.
1	300-0161	HEATER - see page 38	3
2	300-0162	HOLDER - see page 39	1
3	300-0168	PRE-COOLER - see page 40	1
4	300-0167	COOLER - see page 40	4
5	556-0221	VALVE, Inlet, Steam - 3/4" IPS	3
6	555-2456	TRAP, Steam	3
7	556-0222	VALVE, Drain - 3/8" IPS	3
8	300-0190	THERMOCOUPLE COMPLETE - 3/8" tube	6
9	300-0175	BRACKET, Mounting	18
*	951-0045	NUT - 3/8" S. S.	36
*	957-0031	WASHER, Lock	36
*	957-0151	WASHER	36
10	936-0157	TUBE, Connecting, Product	3
11	555-2443	VALVE, Reducing, Pressure, Steam (95L)	1
12	555-2444	VALVE, Reducing, Pressure, Steam (95H)	1
13	555-2445	VALVE, Steam, Operated, Air (Honeywell)	1

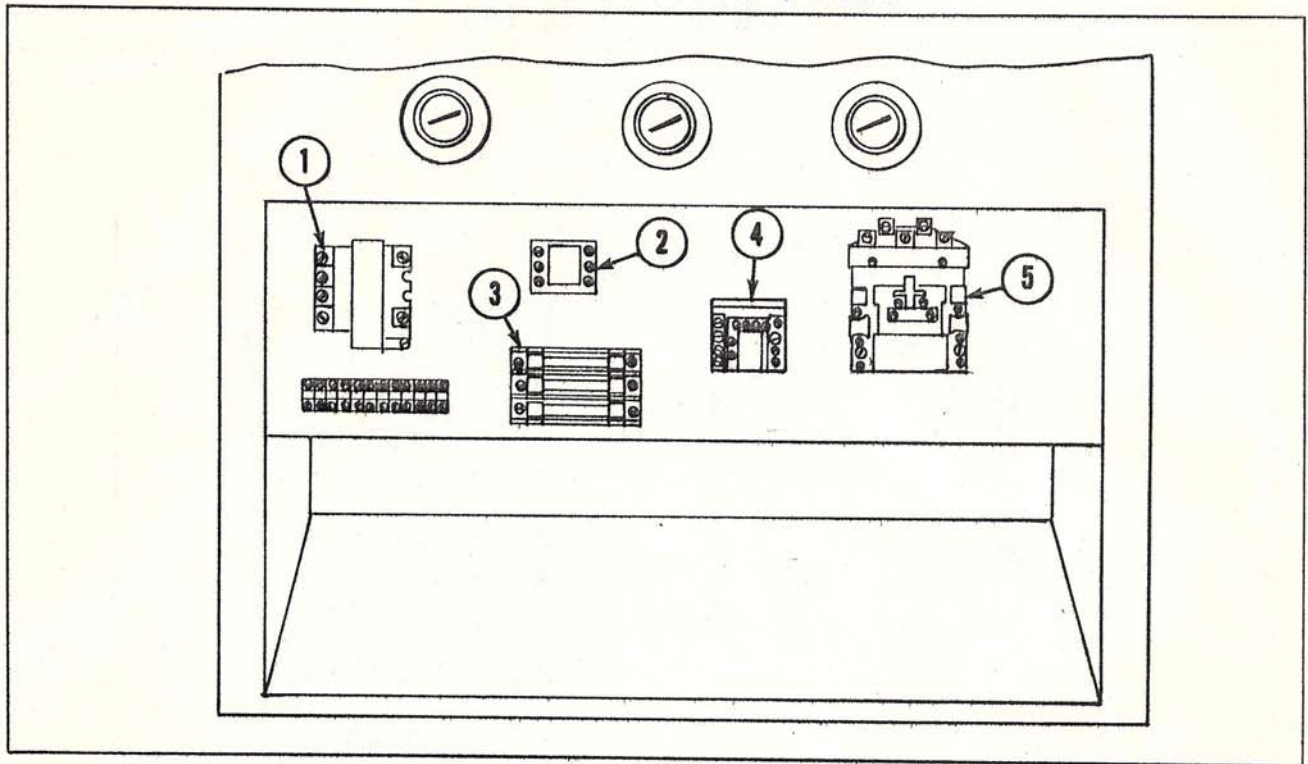
* Indicates part not illustrated.

UNITHERM VIII-XXI - SIDE VIEW



INDEX NO.	PART NO.	DESCRIPTION	QTY.
1	680-3049	TANK, Surge, Product	1
2	680-3050	TANK, Surge, Water	1
3	550-0002	MOTOR, Drive, Agitator	1
4	485-0043	AGITATOR, Product	1
5	024-1199	VALVE, Product/Water Selector	2
6	024-1006	ELBOW, 2CQ - 1"	2
7	220-0081	CONNECTION	2
8	220-0082	CONNECTION	1
9	680-3043	COVER, Hinged, Front	1
10	680-3040	COVER, Fixed, Rear	1

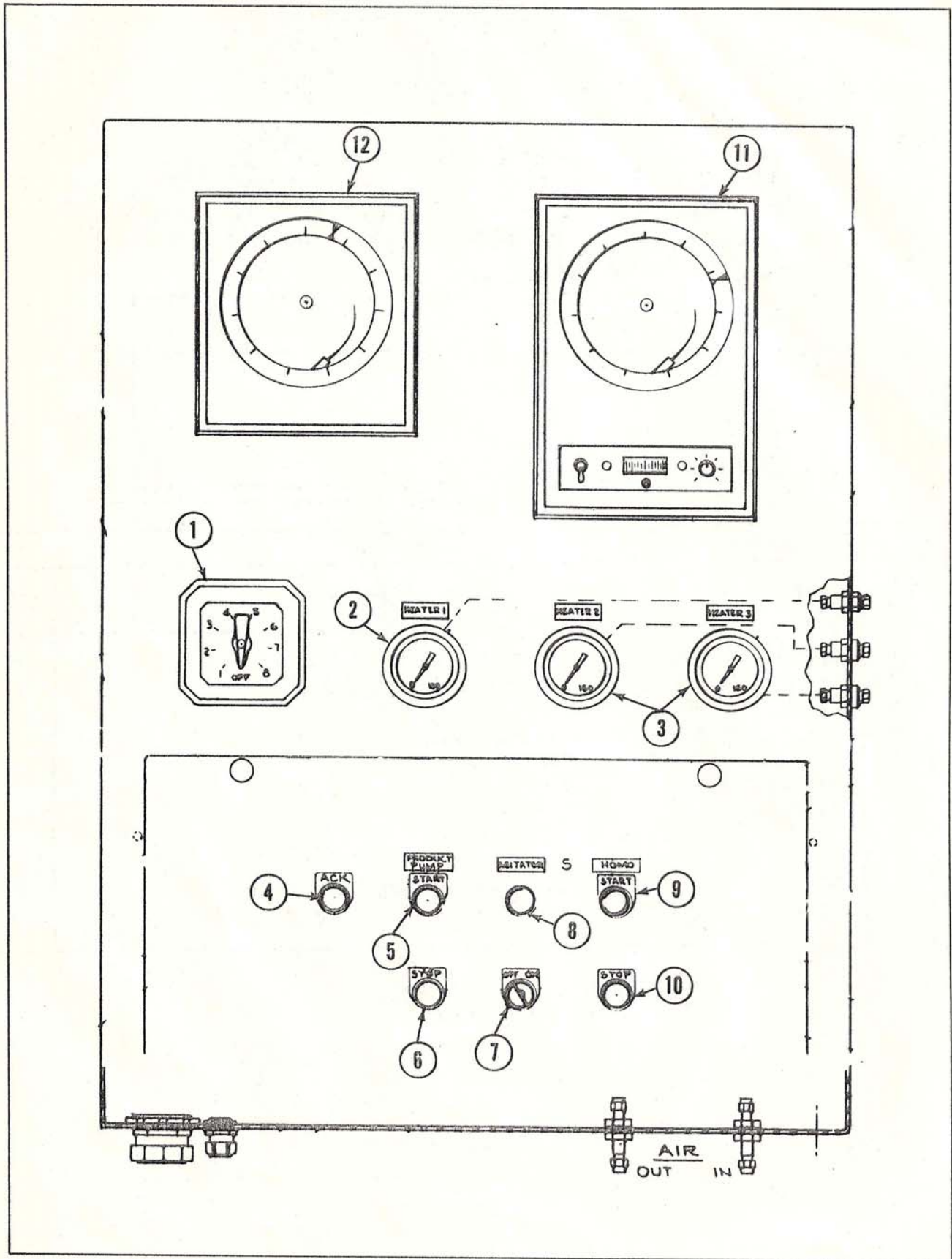
CONTROL CABINET PARTS



INDEX NO.	PART NO.	DESCRIPTION	QTY.
1	551-1016	TRANSFORMER, G. E. , 230 to 115 VAC	1
2	551-0653	RELAY, P. & B. KRP11AG - 115 VAC coil	1
3	551-1108	FUSE, 2 Amps	3
4	551-1550	STARTER, Centrifugal Pump	1
5	551-1550	STARTER, Timing Pump	1
	551-1550	3 HP	
	551-1551	5, 7½, or 10 HP	
	551-1552	15 HP	
*	557-0158	VALVE, Air Pressure Reducing - with gauge	1
*	551-0470	HORN	1

* Indicates part not illustrated.

CONTROL CABINET

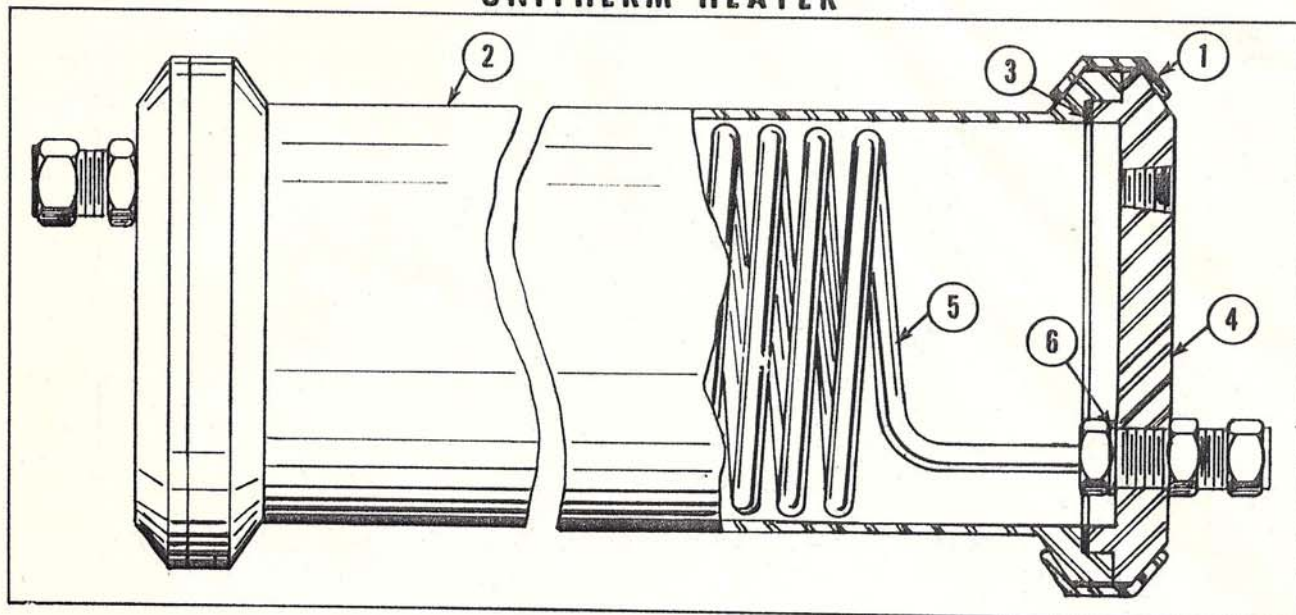


CONTROL CABINET (Cont'd)

INDEX NO.	PART NO.	DESCRIPTION	QTY.
1	551-1338	SWITCH, Selector, Temperature	1
2	557-0011	GAUGE, Pressure, Steam - 0-100 PSI	1
3	555-2291	GAUGE, Pressure, Steam - 0-160 PSI	2
4	551-0230	PUSH BUTTON - Acknowledge	1
	551-0512	BLOCK	1
	551-0497	OPERATOR	1
		PRODUCT PUMP CONTROL	
5	551-0202	PUSH BUTTON - Start	1
	551-0512	BLOCK	1
	551-0526	OPERATOR (220 volt)	1
	551-0520	LENS (green)	1
6	551-0203	PUSH BUTTON - Stop	1
	551-0512	BLOCK	1
	551-0498	OPERATOR (red)	1
		AGITATOR MOTOR CONTROL	
7	551-0223	SWITCH, Off-On	1
	551-0512	BLOCK	1
8	551-0474	LAMP (220 volt)	1
	551-0482	LENS (green)	1
		TIMING (HIGH PRESSURE) PUMP CONTROL	
9	551-0202	PUSH BUTTON - Start	1
	551-0512	BLOCK	1
	551-0526	OPERATOR (220 volt)	1
	551-0520	LENS (green)	1
10	551-0203	PUSH BUTTON - Stop	1
	551-0498	OPERATOR (red)	1
	551-0512	BLOCK	1
		RECORDER-CONTROLLERS	
11	557-0248	Honeywell Class 111 Recorder-Controller	
12	557-0245	Honeywell Class 111 Recorder	
		See instrument service manual for Honeywell parts.	
*	590-1163	CHART, Recorder - Range 25 to 325° F. - 24 hour	

* Indicates part not illustrated.

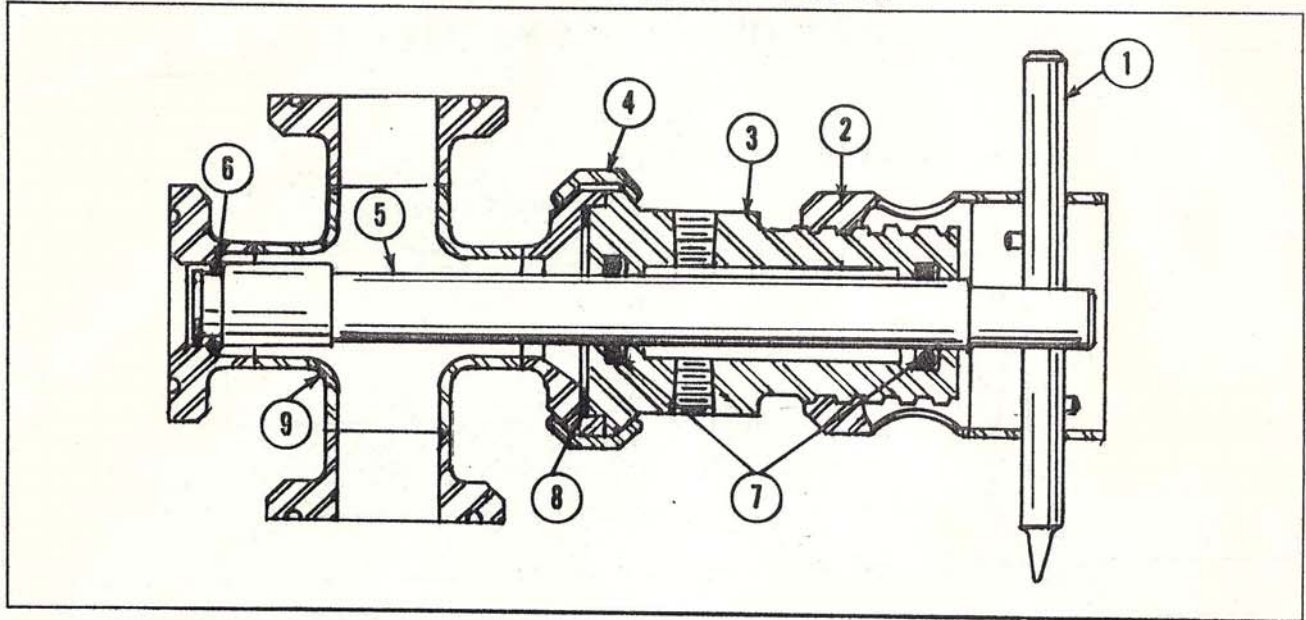
UNITHERM HEATER



INDEX NO.	PART NO.	DESCRIPTION	QTY.
	300-0157	HEATER COMPLETE - VIII	
	300-0161	HEATER COMPLETE - XXI	
1	034-6223	CLAMP - 13QT - 4"	2
2	300-0170	JACKET	1
* 3	554-0529	GASKET, Jacket	2
4	300-0171	HEAD, Unitherm VIII	2
	300-0172	HEAD, Unitherm XXI	2
5	300-0159	NEST, Tube - Unitherm VIII	1
	300-0163	NEST, Tube - Unitherm XXI	1
* 6	300-0173	WASHER, Tube - Unitherm VIII	2
*	300-0174	WASHER, Tube - Unitherm XXI	2

* Indicates limited life part. On-hand spares are recommended.

FLOW DIVERSION VALVE

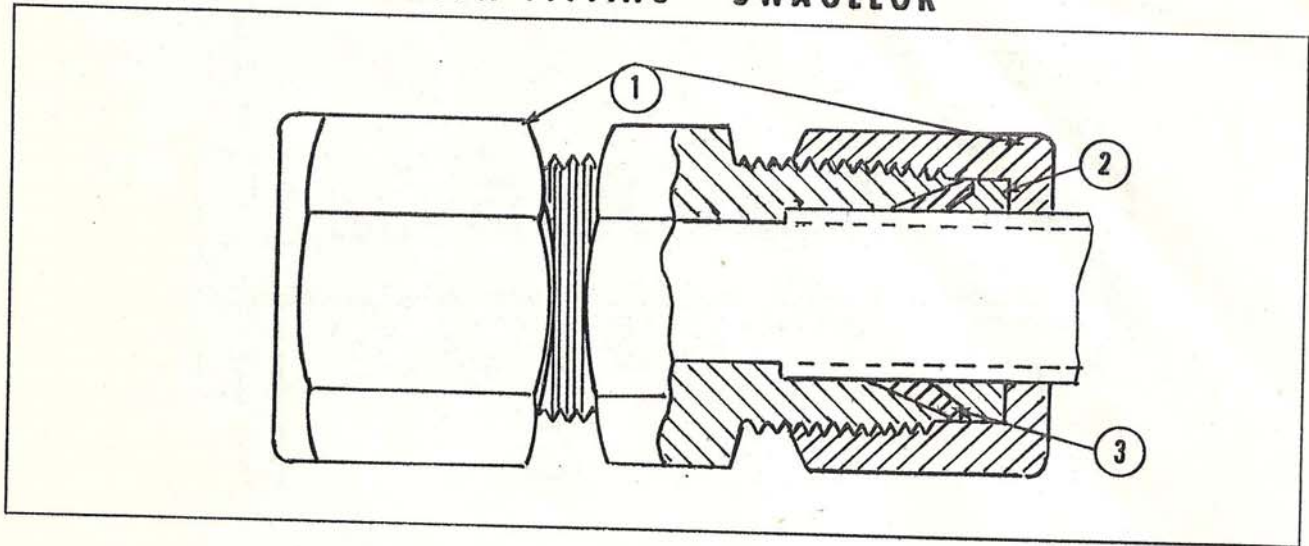


INDEX NO.	PART NO.	DESCRIPTION	QTY.
	302-0040	VALVE COMPLETE, 90CTQ - 1"	
1	302-0391	HANDLE	1
2	302-0042	NUT, Adjusting	1
3	302-0043	BONNET	1
4	024-2232	CLAMP - 13QT - 1½"	1
5	302-0389	STEM	1
**6	554-0074	O-RING - Seat	1
**7	554-0078	O-RING - Stem	2
**8	554-0525	GASKET	1
9	302-0387	BODY, Cross	1
*	555-2294	FITTING, Steam - 1/8" MPT x 1/4" tube	2

* Indicates part not illustrated.

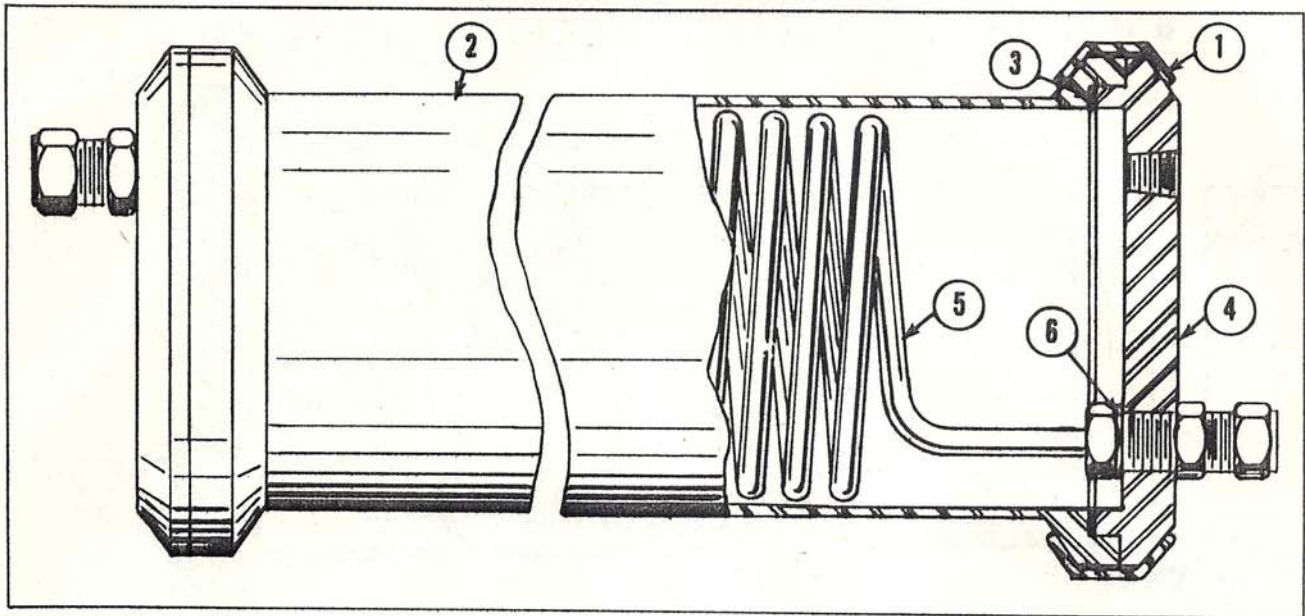
** Indicates limited life part. On-hand spares are recommended.

UNION FITTING - SWAGELOK



INDEX NO.	PART NO.	DESCRIPTION	QTY.
	555-3029	UNION FITTING - SWAGELOK - for 3/8" O.D. S.S. Tube	
1	555-3032	UNION COMPLETE	
2	555-3031	NUT	2
3	555-3030	FERRULE, Back	2
		FERRULE, Front	2
		UNION FITTING - SWAGELOK - for 1/4" O.D. S.S. Tube	
1	555-3035	UNION COMPLETE	
2	555-3034	NUT	2
3	555-3033	FERRULE, Back	2
		FERRULE, Front	2

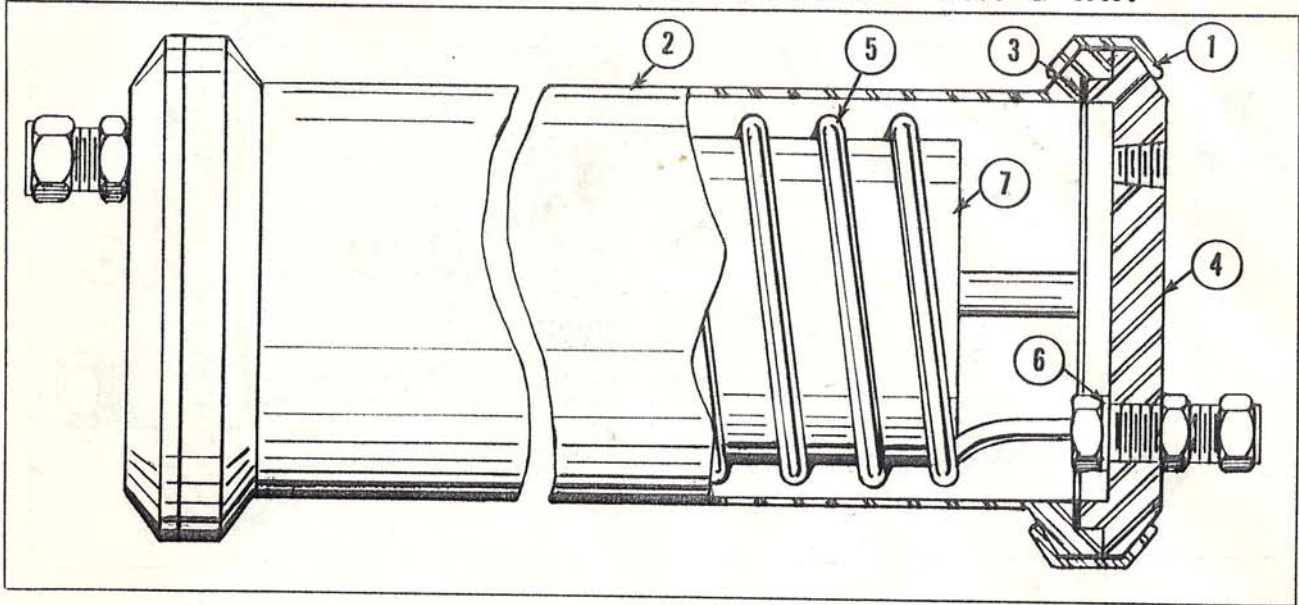
UNITHERM HOLDER



INDEX NO.	PART NO.	DESCRIPTION	QTY.
	300-0158	HOLDER COMPLETE - VIII	
	300-0162	HOLDER COMPLETE - XXI	
1	034-6223	CLAMP, 13QT - 4"	2
2	300-0170	JACKET	1
* 3	554-0529	GASKET, Jacket	2
4	300-0172	HEAD	2
5	300-0160	NEST, Tube - Unitherm VIII	1
	300-0164	NEST, Tube - Unitherm XXI	1
* 6	300-0174	WASHER, Tube	2

* Indicates limited life part. On-hand spares are recommended.

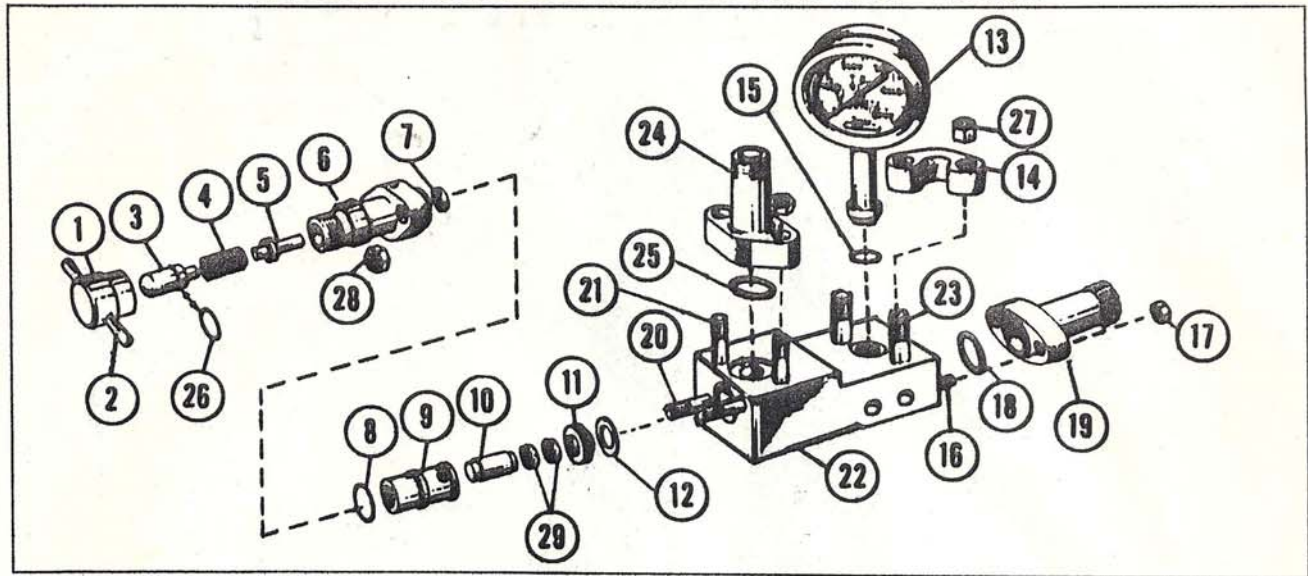
UNITHERM PRE-COOLER AND COOLER - VIII & XXI



INDEX NO.	PART NO.	DESCRIPTION	QTY.
	300-0168	PRE-COOLER COMPLETE	
	300-0167	COOLER COMPLETE	
1	034-6223	CLAMP, 13QT - 4"	2
2	300-0170	JACKET	1
* 3	554-0529	GASKET, Jacket	2
4	300-0172	HEAD	2
5	300-0212	NEST, Tube - Pre-Cooler	1
	300-0211	NEST, Tube - Cooler	1
* 6	300-0174	WASHER, Tube	2
7	300-0218	CORE	1

* Indicates limited life part. On-hand spares are recommended.

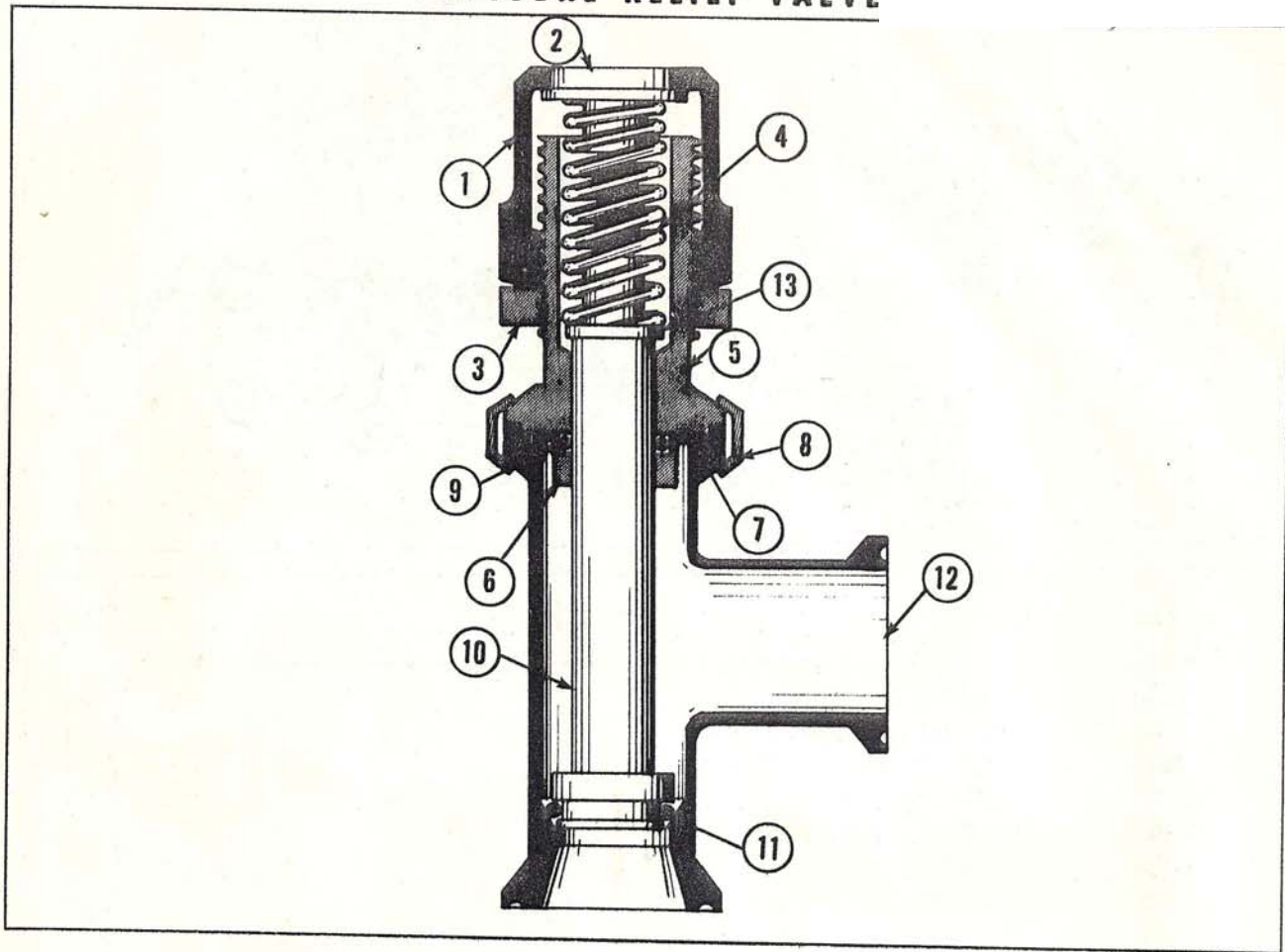
REMOTE ASEPTIC HOMOGENIZING VALVE



INDEX NO.	PART NO.	DESCRIPTION	QTY.
1	7980	NUT, Regulating	1
2	7981	HANDLE, Nut	1
3	6203	STEM, Upper Valve	1
4	7402	SPRING	1
5	6202	STEM, Lower Valve	1
6	6229	BONNET	1
* 7	37081	GASKET, Lower Stem	1
* 8	AA10509-A	O-RING, Adapter	1
9	6200	ADAPTER	1
10	7409-A	PLUG, Valve	1
11	7410	SEAT, Valve	1
*12	37080	GASKET, Seat	1
13	37111	GAUGE, Pressure - 0-5000 PSI	1
14	37195	FLANGE, Gauge	1
*15	36966	O-RING, Gauge	1
16	7982	STUD, Inlet Connection	2
17	7406	NUT, Hex - 1/2"-13	2
*18	43339	O-RING, Inlet Connection	1
19	7933	FITTING, Inlet	1
20	6230	STUD, Valve Bonnet	2
21	8033	STUD, Discharge Fitting	2
22	6228	BODY	1
23	7201	STUD, Gauge Flange	1
24	7917	FITTING, Discharge	1
*25	44858	O-RING, Discharge Fitting	1
*26	35224	O-RING, Upper Stem	1
27	7324	NUT, Hex	2
28	7406	NUT, Hex	2
*29	37123	CAP, Perforated	2

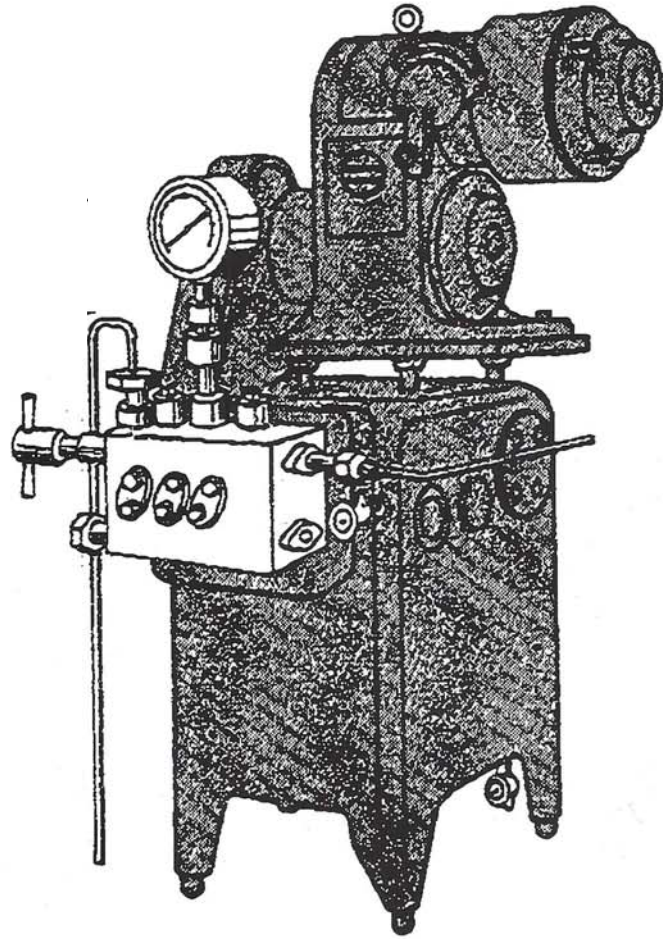
* Indicates limited life part. On-hand spares are recommended.

PRESSURE RELIEF VALVE



INDEX NO.	PART NO.	DESCRIPTION	QTY.
	024-2684	VALVE, Product Pressure Relief	1
1	302-0248	NUT, Adjusting	1
2	302-0246	GUIDE, Spring	1
3	100-4000	NUT, Lock	1
4	590-1106	SPRING - 100 lb. operation	1
5	302-0245	BONNET	1
6	302-0212	RETAINER, Seal	1
* 7	554-0325	GASKET (Hycar)	1
8	024-2232	CLAMP - 13QT - 1½"	1
* 9	554-0118	O-RING (rubber)	1
10	302-0403	STEM, Valve	1
* 11	554-0138	O-RING (Teflon)	1
12	302-0268	BODY, Valve	1
13	302-0249	WASHER, Spring	1

* Indicates limited life part. On-hand spares are recommended.



high pressure pump
stellar-flo[®] model hd-6
series 400



**Waukesha
Fluid Handling**

A United Dominion Company

DRIVE ASSEMBLY

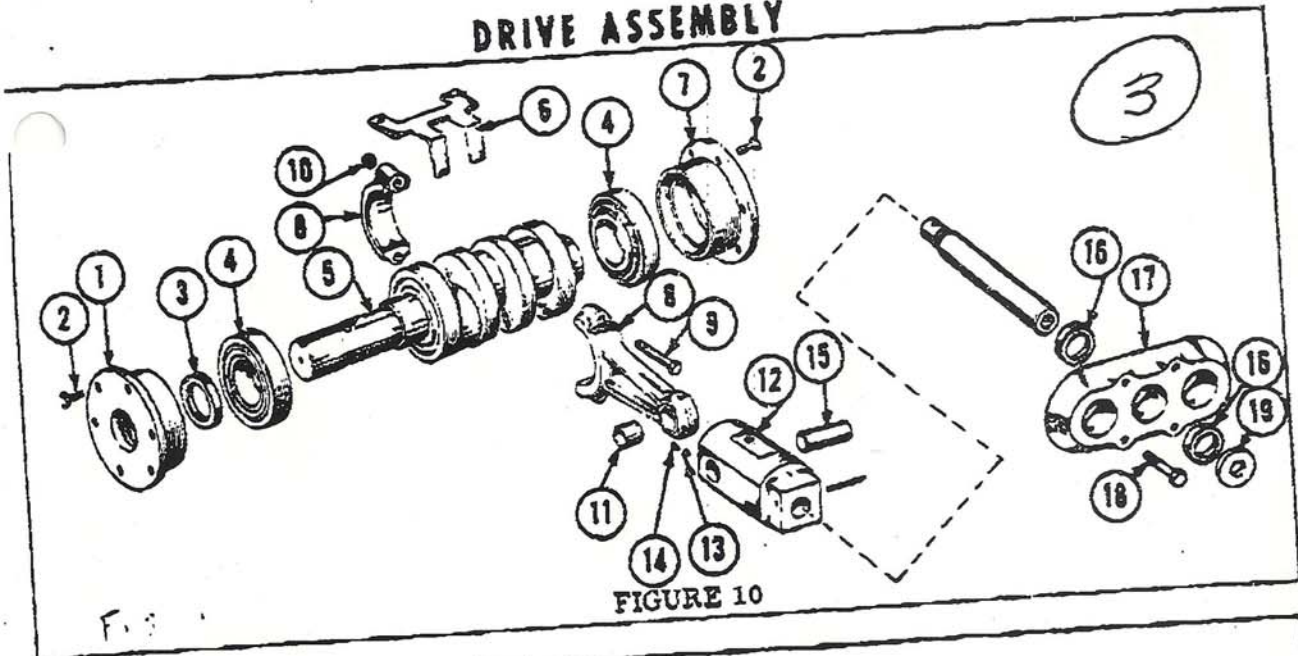


FIGURE 10

INDEX NO.	PART NO.	QTY.	DESCRIPTION
1	447-4910	1	CAP, Extension and Bearing
2	952-2304	12	SCREW, Cap
3	443-7015	1	SEAL, Drive Shaft Oil
4	446-0830	2	BEARING, Timken
5	447-4930	1	ECCENTRIC
6	447-5060	1	DEFLECTOR, Oil
7	447-4920	1	CAP, Outer End Bearing
8	447-4940	3	#ROD, Connecting, Complete with Bushing, Nuts and Bolts
9	447-4950	6	#BOLT, Connecting Rod (furnished with connecting rod Index #8)
10	951-0326	6	#NUT, Castle - 1/2" 13 (furnished with connecting rod Index #8)
11	447-4960	3	#BUSHING, Connecting Rod
12	448-7440	3	CROSSHEAD, Complete with Set Screw and Hex Nut
13	951-0040	3	NUT
14	954-0516	3	SET SCREW
15	447-4980	3	PIN, Wrist
16	442-8902	6	SEAL, Plunger Stub
17	447-5010	1	PLATE, Plunger Stub Seal
18	952-1712	4	SCREW, Cap - Hex Nut
19	447-5020	3	FLINGER, Water
*	447-4880	4	FOOT, Adjustable
*	447-4890	1	GAUGE, Oil, Gits No. 4031
*	446-3390	1	SHEAVE, Pump
*	448-7470	1	COVER, Crank Case Inspection
*	448-7460	1	COVER, Crank Case
*	448-7480	1	PLATE, Bottom
*	448-7810	1	CAP, Sheave Hub
*	448-7620	1	COVER, Belt Guard

CYLINDER BLOCK ASSEMBLY

4

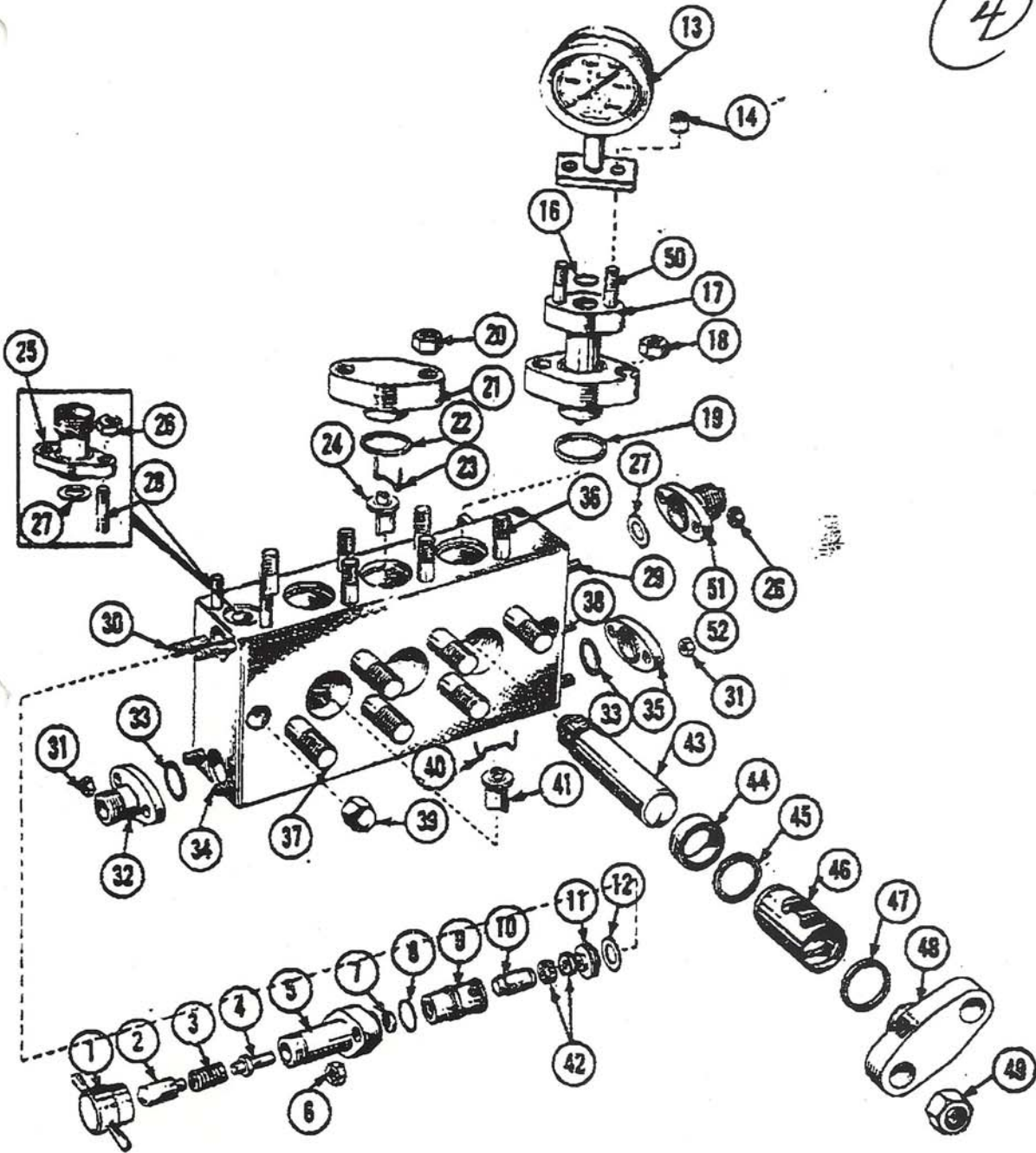


FIGURE 9

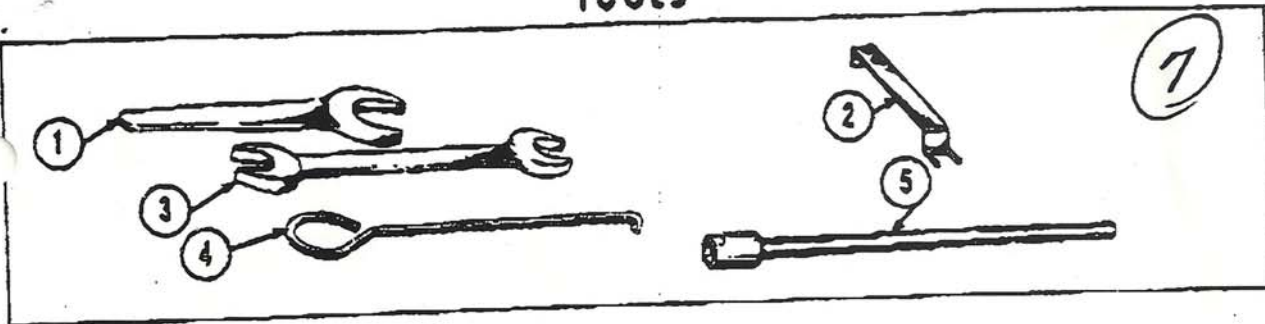
INDEX NO.	PART NO.	QTY.	DESCRIPTION
			(5)
			PRESSURE RELIEF VALVE
1	447-4000	1	HANDLE, Valve Regulating
2	447-4010	1	STEM, Valve - Upper
3	447-4020	1	SPRING, Homogenizing Valve
4	447-4030	1	STEM, Valve - Lower
5	447-7400	1	BONNET, Valve
6	951-0025	2	NUT, Hex
7	443-7081**	1	GASKET, Lower Valve Stem - Rubber
8	554-0134**	1	GASKET, Valve Adapter - Rubber (O-Ring)
9	447-4130	1	ADAPTER, Valve
10	447-4092	1	PLUG, Valve - Reversible
11	447-4100	1	SEAT, Valve - Reversible
12	443-7080	1	GASKET, Valve Seat - Bakelite
			CYLINDER BLOCK PARTS
13	448-6610	1	GAUGE, Volumetric Pressure - Sanitary - 1,000#
	443-7111	1	GAUGE, Volumetric Pressure - Sanitary - 5,000#
	448-6620	1	GAUGE, Volumetric Pressure - Sanitary - 10,000#
14	951-0025	2	NUT, Hex
16	443-6966**	1	GASKET, Gauge Well
17	446-4981	1	WELL, Gauge Assembly (446-4980 Well Only)
18	951-0029	2	NUT, Hex
19	443-7077**	1	GASKET, Discharge Valve Cover
20	951-0029	4	NUT, Hex
21	446-3440	2	COVER, Discharge Valve
22	443-7077**	2	GASKET, Discharge Valve Cover
23	447-5030**	3	SPRING, Discharge Valve
24	447-8020	3	VALVE, Discharge - Stellite (447-4530 Stn. Stl.)
25	446-4720	1	CONNECTION, Relief Valve Discharge
26	951-0025	2	NUT, Hex
27	443-7080**	2	GASKET, Discharge Connection
28	447-4210***	2	STUD, Discharge Connection - Short
29	447-7500***	2	STUD, Discharge Fitting
30	447-2010***	2	STUD, Pressure Relief Valve
31	951-0017	4	NUT, Hex
32	447-8590	1	FITTING, Suction
33	554-0162	2	GASKET, Blank and Suction Connection Flange
34	447-4210***	4	STUD, Blank and Suction Connection Flange
35	447-4240	1	BLANK FLANGE, Suction Connection
36	447-9960***	6	STUD, Discharge Valve Cover
37	446-3410***	6	STUD, Plunger Port Cover
38		1	BLOCK, Cylinder
	<u>Homogenizer</u>		
	448-7280		Integral
	448-7290		Stellite

**Indicates Limited Life Part. On-Hand Spares Recommended.
 ***Indicates Part Included in Item 38.

INDEX NO.	PART NO.	QTY.	DESCRIPTION
	Pump		
	448-7300		Integral
	448-7310		Stellite
39	447-6870	2	NUT, Cap
40	447-5030	3	SPRING, Suction Valve
41	447-8020	3	VALVE, Suction - Stellite (447-4530 Stn. Stl.)
42	443-7123	2	Cap, Perforated (Homogenizer Only)
43			PLUNGER
	448-5400	3	5/8" Dia. - Chrome Plate
	448-5520	3	11/16" Dia. - Chrome Plate
	446-3460	3	13/16" Dia. - Chrome Plate
44			THROAT, Plunger
	448-5420	3	5/8" Dia.
	448-5510	3	11/16" Dia.
	446-3480	3	13/16" Dia.
45			V-SEAL
	443-7082	3	5/8" I.D.
	443-7083	3	11/16" I.D.
	443-7084	3	13/16" I.D.
46			SLEEVE, Cylinder
	446-4990	3	5/8" I.D.
	448-5530	3	11/16" I.D.
	446-3470	3	13/16" I.D.
47	443-7077**	3	GASKET, Plunger Port
48	446-3430	3	COVER, Plunger Port
49	951-0037	6	NUT, Hex
50	448-1600	2	STUD, Gauge Flange (included in item 17)
51	446-5010	1	CONNECTION, Discharge 3/4" Parker
52	446-5050	1	CONNECTION, Discharge 1/2" I. P. S.

**Indicates Limited Life Part. On-Hand Spares Recommended.

TOOLS



INDEX NO.	PART NO.	QTY.	DESCRIPTION
3	447-5140	1	WRENCH, For Plunger
3	448-7380	1	WRENCH
1	448-7380	1	WRENCH, Plunger Port Cover Nut, Bonney No. 1248
	447-5130	1	WRENCH, Valve Cover Nut, Bonney No. 1236
2	447-5110	1	LIFTER, Valve
3	447-5150	1	WRENCH, Suction & Discharge Connection Pressure Relief Valve Nut, Williams No. 1033C Special
3	447-6550	1	GAUGE & VALVE NUT, 1-1/8" Williams No. 1735
4	447-5080	1	HOOK, Valve Seat
5	447-5093	1	TOOL, Valve Regrinding

MISCELLANEOUS PARTS

INDEX NO.	PART NO.	QTY.	DESCRIPTION
*	447-5170	2	STUD, Cylinder Block Tie Rod
*	447-5190	1	COVER, Plunger Stub
*	447-5200	1	VALVE, Water Control
*	447-5210	1	PET COCK, Oil Drain
*	447-5230	1	GUARD, V-belt drive
			*Indicates Part Not Illustrated.
			WHEN ORDERING V-BELTS OR DRIVE SHEAVES, BE SURE TO SPECIFY SERIAL NUMBER, SERIES, CAPACITY, AND PLUNGER SIZE OF YOUR STELLAR-FLO PUMP AND THE COMPLETE MOTOR SPECIFICATIONS. THIS INFORMATION IS ABSOLUTELY NECESSARY TO FILL THE ORDER CORRECTLY.