

Oct. 20, 1942.

H. G. CRAM

2,299,530

SIPHON FOR DRIER DRAINAGE SYSTEMS

Filed Dec. 9, 1940

3 Sheets-Sheet 1

Fig. 1.

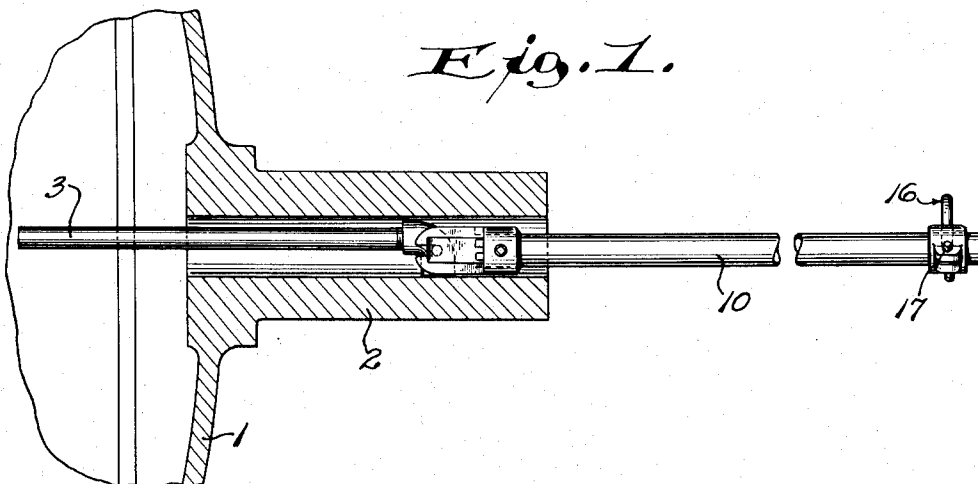


Fig. 2.

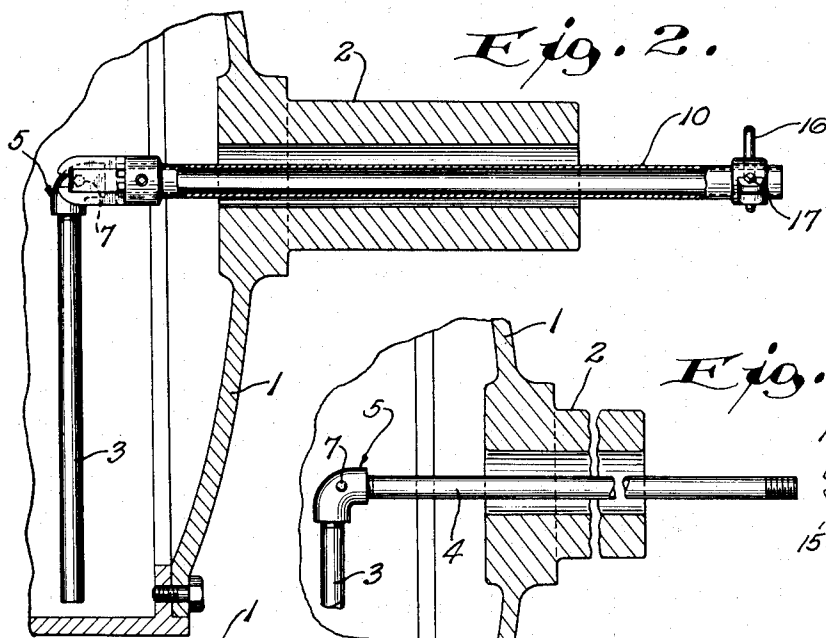


Fig. 4.

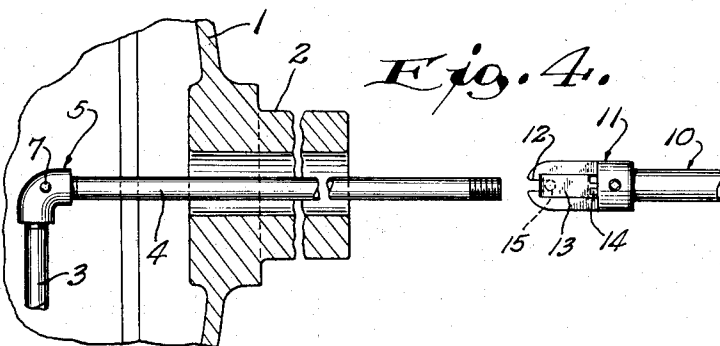
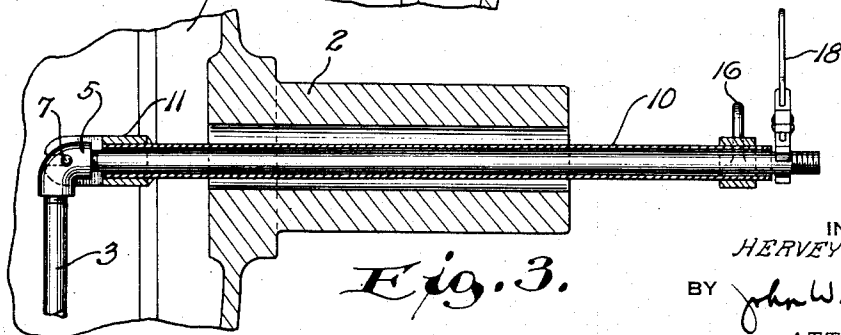


Fig. 3.



INVENTOR
HERVEY G. CRAM.

BY *John W. Michael*
ATTORNEY.

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Fig. 5.

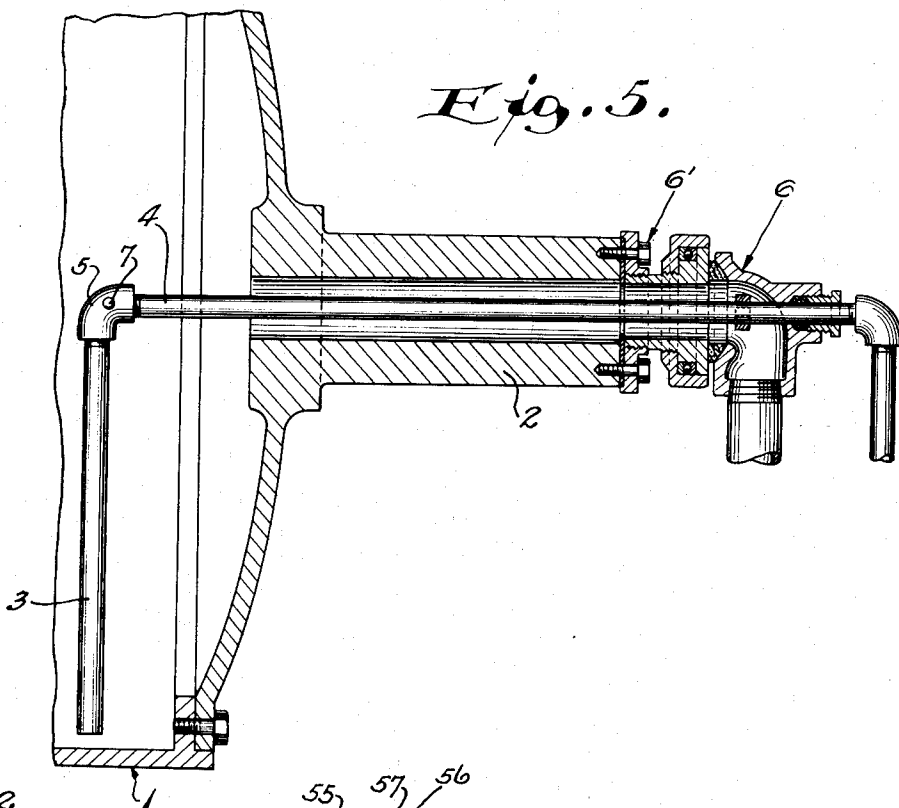
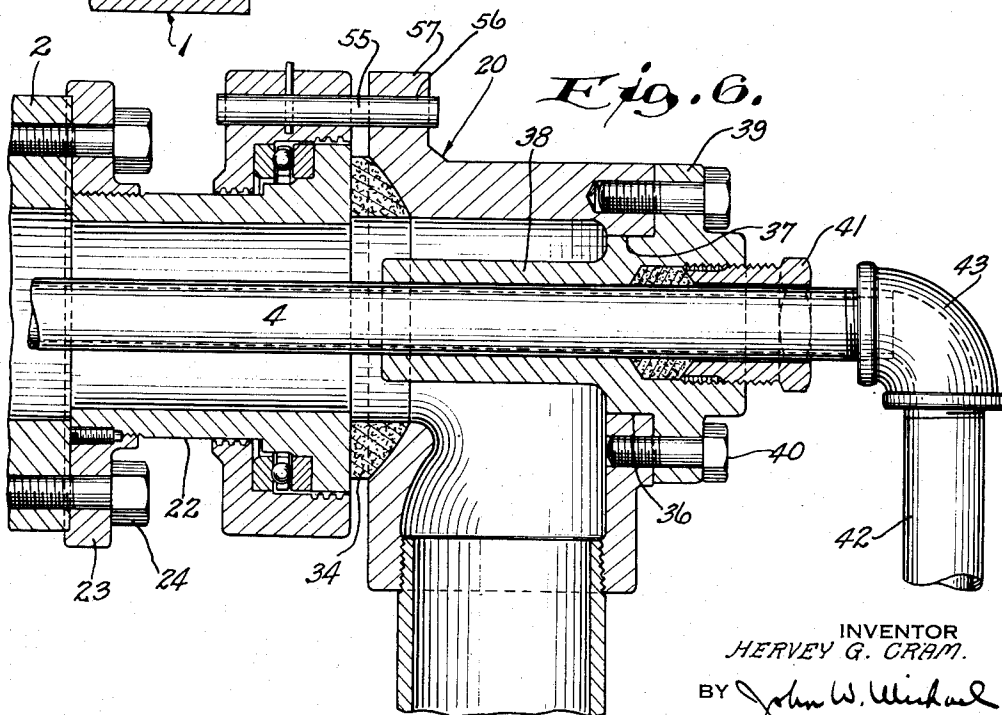


Fig. 6.



INVENTOR
HERVEY G. CRAM.
BY *John W. Michael*
ATTORNEY

Oct. 20, 1942.

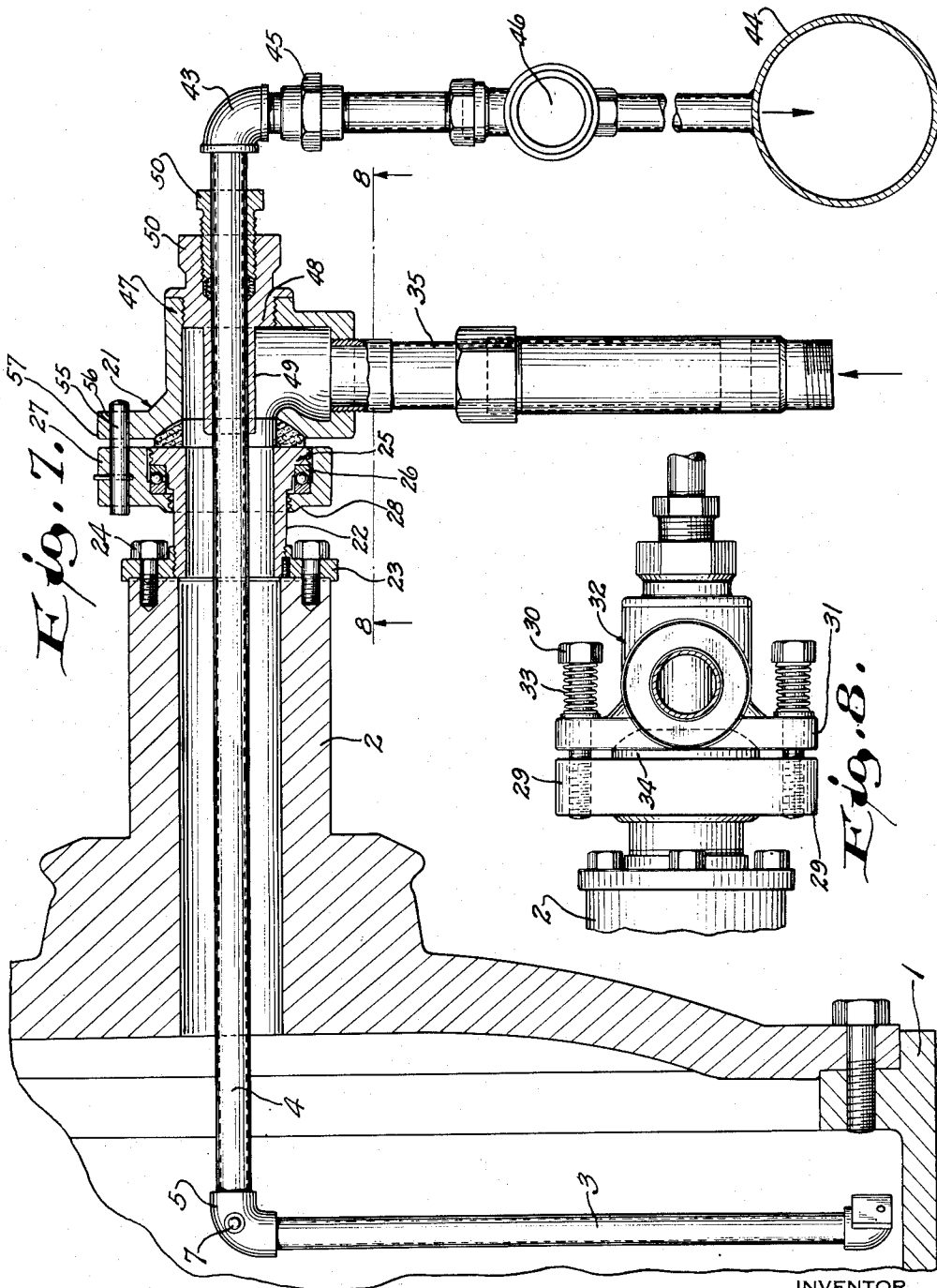
H. G. CRAM

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SIPHON FOR DRIER DRAINAGE SYSTEMS

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3 Sheets-Sheet 3



INVENTOR
HERVEY G. CRAM.

BY *John W. Michael*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,299,530

SIPHON FOR DRIER DRAINAGE SYSTEMS

Hervey G. Cram, Appleton, Wis.

Application December 9, 1940, Serial No. 369,244

1 Claim. (Cl. 285-10)

This invention relates to an improvement in siphons for drier drainage systems.

The present application is a continuation in part of my application for Tool for use in assembling and disassembling siphons of drier drums, filed September 16, 1937, Ser. No. 164,182, now Patent No. 2,224,857, granted December 17, 1940, in that the present case discloses and claims the siphon for drier drainage systems disclosed and originally claimed in said application, and the present case also covers improved means for mounting the siphons for coaction with the drier drum and for effecting their quick and convenient assembly therewith and disassembly therefrom.

In paper making machinery it is customary to employ a battery of driers. Each drier has a drier drum to the interior of which steam is supplied for the purpose of heating the drum. Naturally, the steam condenses and efficient operation requires that this condensate be removed. For this purpose it has been the practice to provide each drier drum with some form of siphon usually in the form of a curved pipe extending through a steam joint in the outer end of one of the hollow trunnions of the drier and then curved down to a low point in the drier. Where such a pipe is employed it must be curved on a large enough radius and be of such length that it may be inserted through the rather long hollow trunnion of the drier and yet have its low inlet end close to the low point in the drier drum. Where such an arrangement is resorted to a number of difficulties are encountered. In the first place, any oscillation of the steam joint, and the vibrations incidental to the operation of the machine always result in some oscillation, will be transmitted in the low or inlet end of the siphon pipe due to the lever arm between the low or inlet end of the siphon pipe and the point of its support on the steam joint. Consequently, there is danger of the inlet end of the siphon pipe contacting the rotating drier drum. Such contact will result in damage to the siphon or closing of its inlet end thereby preventing it from functioning to remove the condensate. Furthermore, the necessary long length of the siphon pipe increases its weight and also increases the leverage with which this weight is applied to the point of its support to the steam joint thereby putting excessive strain on the siphon at the point of its support.

Any other arrangements that have been proposed, and which do not involve the use of a long curved pipe, require the installation of a siphon arrangement through hand holes in the

head of the drier and working them back through the trunnion from the inside of the drier. These are difficult and expensive expedients and especially so as the driers are generally at a high temperature.

The present invention proposes a siphon which in the assembly is made up of a vertical pipe leg disposed within the drier drum adjacent the inner end of one hollow trunnion of the drier and extending from a point close to the axis of rotation of the drier down to a low point in the drier drum. A horizontal pipe leg extends through the steam joint and through the hollow trunnion and has its inner end disposed adjacent the upper end of the vertical pipe leg. An elbow threadedly interconnects the inner end of the horizontal leg with the upper end of the vertical leg. The elbow is provided with projections which may take the form of diametrically opposed horizontal pins projecting laterally from the sides of the elbow.

Along with this siphon arrangement the present invention proposes a tool designed to facilitate its assembly and disassembly with the drier drum. The tool comprises an elongated barrel provided at its inner end with a hollow head. The head and barrel are so dimensioned as to be susceptible of convenient insertion in through the hollow trunnion of the drier drum. The head of the tool is provided with diametrically opposed slots adapted to receive the pins of the elbow and is also equipped with spring devices engageable with the outer ends of the pins to retain them in the slots while permitting them to pivot therein about their own axes.

The tool per se forms no part of the present invention but is claimed as subject matter of my Patent 2,224,857 above referred to.

With such a tool and a siphon constructed in the manner described, the siphon may be assembled with the drier drum as follows:—The elbow is first securely threadedly engaged with the upper end of the vertical leg of the siphon. The horizontal leg is left disconnected. The pins of the elbow are then introduced into the slots of the head of the tool and snapped under the spring device thereof. The vertical leg and elbow are then swung into horizontal alinement with the tool and are introduced while so positioned through the hollow trunnion of the drier drum, the steam joint having been removed. As the vertical leg of the pipe and elbow pass through the trunnion and into the drum they swing about their pins around to a position where the vertical leg is vertically disposed in

the drum. The horizontal leg of the siphon is then introduced through the barrel. The barrel is provided with means whereby it may be held against rotation and a Stillson wrench or other suitable tool is utilized to turn the horizontal leg up into firm and secured threaded engagement with the elbow. The tool is then pulled back off of the siphon arrangement and the steam joint assembled. The reversal of this operation will effect disassembly of the parts.

This arrangement has the distinct advantage of greatly facilitating the assembly and disassembly of the siphon. When the siphon is installed it avoids the disadvantages of the previous arrangements. It is firmly supported through a very short lever arm.

The effect of vibration on it is minimized. Consequently the inner end of the vertical leg of the pipe may be disposed at a low point in the drier and close to the drum without danger of damage and with the advantage of more efficient operation.

Another object of the invention is to so constitute and combine the steam joint and the mounting and packing of the siphon as to make it practical and convenient to install or remove the siphon without breaking the joint in the steam supply line and accomplishing this while improving and enhancing the support for the siphon.

Other objects and advantages reside in certain novel features of the construction, arrangement, and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claim, reference being had to the accompanying drawings forming a part of this specification, and in which:

Figure 1 is a view partly in side elevation and partly in vertical cross section, showing the manner in which the vertical leg of the siphon and its elbow is inserted through the hollow trunnion of a drier drum by means of the special tool provided;

Figure 2 is a view similar to Figure 1 but showing the manner in which the vertical leg swings around to vertical position after the insertion operation has been completed;

Figure 3 is a view similar to Figures 1 and 2, but illustrating how the horizontal leg of the siphon is coupled with the elbow;

Figure 4 is a fragmentary view partly in vertical section and partly in side elevation, showing how the tool is removed from the assembled legs of the siphon;

Figure 5 is a view similar to Figure 4 but showing the steam joint assembled with the trunnion of the drier drum and with the siphon arrangement;

Figure 6 is a fragmentary view, partly in side elevation and partly in longitudinal vertical cross section, showing an improved form of the invention wherein the steam joint connected to the outer end portion of the trunnion of the drier drum is of such special construction as to greatly facilitate the installation and removal of the siphon, the arrangement being such as to accomplish this without breaking the steam joint in the steam supply pipe and at the same time improve and enhance the support for the siphon;

Figure 7 is a fragmentary view, partly in side elevation and partly in central vertical longitudinal section, showing still another form of the invention of the type of Figure 6; and

Figure 8 is a view in horizontal cross section, 75

taken on line 8—8 of Figure 7 and looking in the direction of the arrows.

Referring to the drawings it will be seen that in all embodiments of the invention the numeral 1 designates the drier drum provided with the usual trunnions, one of which is shown at 2. The siphon arrangement in all embodiments of the present invention includes a vertical leg 3, a horizontal leg 4, and an elbow 5 threadedly interconnected with the upper end of the vertical leg 3 and with the inner end of the horizontal leg 4. In all forms of the invention the siphon when assembled with the drier drum has its horizontal leg 4 passing through and supported on a steam joint.

In the form of the invention shown in Figures 1 to 5, inclusive, the steam joint, designated at 6, is of conventional construction, and is detachably secured as at 6' to the other end of the hollow trunnion of the drier. Where the steam joint is of conventional construction it must be removed to install or remove the siphon, but where the joint is of the special construction shown in Figures 6 to 8, inclusive, it need not be removed to effect installation or removal of the siphon, as will hereinafter more fully appear.

In all forms of the invention the elbow 5 is provided with diametrically opposed pins 7 which are fixed to the elbow and project laterally therefrom.

The tool used for assembling and disassembling the siphon with the drier includes an elongated barrel 20. A hollow bifurcated head 11 is fixed to the inner end of the barrel and has diametrically opposite slots 12 designed to receive the pins 7. Springs 13 are secured by screws 14 to the head 11 and overlie the slots 12. The inner faces of these springs 13 are formed with indentations or recesses 15 into which the outer ends of the pins 7 snap. In this way the pins 7 and the elbow 5 are releasably secured in the slots 12 although they may pivot therein about their own axes.

In assembling the siphon with the drum in the form of the invention shown in Figures 1 to 5, the steam joint 6 is first removed from the trunnion of the drum. The elbow 5 is securely threadedly interconnected with the upper end of the vertical leg 3. Pins 7 of the elbow 5 are then introduced into the slots 12 of the head 11 and are snapped into engagement with the recesses 15 of the spring 13. The leg 3, elbow 5, and the tool are then passed in through the hollow trunnion 2, as shown in Figure 1, until the leg 3 drops down to the vertical position shown in Figure 2. The horizontal leg 4 of the siphon is then introduced in through the barrel 10 of the tool, and its inner end is threaded into the elbow 5. For the purpose of facilitating turning the horizontal leg 4 of the siphon into screw-threaded engagement with the elbow 5 thereof, a handle 16 is clamped, as at 17, to the outer end of the barrel 10, and provides a means whereby the barrel 10 may be held against rotation. A suitable tool, such as a Stillson wrench 18, may be engaged with the outer end of the horizontal leg 4 which projects beyond the barrel 10 to effect the desired tight threaded engagement between the inner end of the leg 4 and the elbow 5. The wrench 18 is then disengaged and the tool pulled back off of the leg 4, the springs 13 yielding to allow the spring 13 to be disengaged from the pins 7. The outer end of the leg 4 is held against axial movement at this time. The steam joint 6 is then assembled and the siphon is ready for use.

By removing the steam joint 6 and reversing the operation just described, the siphon may be readily removed.

The modified forms of the invention, illustrated in Figures 6 to 8, are identical with that just described except that the steam joints, designated generally at 20 in Figure 6, and 21 in Figures 7 and 8, are of special construction to facilitate installation and removal of the siphon in the manner described, without, however, breaking or removing the steam joint, and in addition also affords a more effective and rigid support for the horizontal leg of the siphon.

In the major features of their construction the steam joints 20 and 21 are identical, in that each includes a sleeve 22 having a flange 23 threaded on one end thereof and secured by stud bolts 24 to the outer end of the adjacent trunnion 2. The outer end of each sleeve 22 has an outwardly directed annular flange 25 integral therewith. A thrust ball bearing assembly 26 abuts the inner face of this flange 25. One of the sections of the steam joint, designated at 27, surrounds the ball bearing assembly 26 and the flange 25, and has an inwardly directed flange 28 at its inner end which bears against one of the race members of the thrust ball bearing assembly. The body portion of this section 27 of the steam joint has laterally and outwardly directed ears 29 at each side which are provided with internally threaded openings to receive the threaded shanks of stud bolts 30. The stud bolts 30 also pass through aligned openings provided in the peripheral projections 31 of the adjacent end of the elbow section 32 of the joint. Springs 33 are interposed between the heads of the stud bolts 30 and the projections 31. An anti-friction and packing disk 34 is interposed between appropriately finished surfaces of the elbow 32 and of the end of the sleeve 22, and sealing engagement between the surfaces of this disk and of the end of the sleeve and of the elbow is had by virtue of the action of stud bolts 30 and their springs 33. The elbow receives the steam supply from the steam inlet pipe 35. The outer wall of the elbow, in the forms of the invention shown in both Figures 6 and 7, is provided with a relatively large opening. In the form of the invention shown in Figure 7 this opening is designated at 36 and is machined smooth to be adapted to have interfitting and supporting engagement with an annular shoulder 37 formed at the juncture of and integral with a supporting sleeve 38 and a closure cap 39. Stud bolts 40 releasably secure the closure cap 39 and its connected shoulder 37 and sleeve 38 in position, the said bolts 40 being threaded into the elbow section 32 of the steam joint. With this construction the horizontal leg of the siphon is supported in the elongated sleeve 38. This sleeve may be of considerable length, and, in fact, if desired, may be made even longer than is shown in Figure 6. It may be projected well into the sleeve 22, or even into the trunnion 2, if desirable. A stuffing box or packing gland 41 is provided between the horizontal leg or bore of

the siphon and the cap or closure 39. The outer end of the horizontal leg 4 of the siphon projects beyond its stuffing box 49 and is connected to the condensate return line 42 by means of an elbow 43. This condensate return line leads to a condensate header 44 and is provided with a union 45 and other conventional fittings and equipment, such as a sight glass 46.

The form of the invention shown in Figure 7 differs from that shown in Figure 6 only in the specific way of interengaging and supporting the closure cap and its siphon-supporting sleeve with the elbow section of the steam joint. In the construction shown in Figure 7 the elbow has its outer end provided with a relatively large opening as before, but the internal wall of this opening in lieu of being smooth is internally threaded as at 47. A shoulder 48, which is integral with a supporting sleeve 49 and a closure cap 50, as before, is externally threaded so that it may be threadedly interengaged with the elbow. As in the other construction, the stuffing box or packing gland, designated at 50, is provided between the horizontal leg of the siphon and the closure plate 50.

With the construction shown in Figures 6 and 7 the steam joint need not be broken to install or remove the siphon.

The present invention improves the construction and operation of the device in the forms shown in Figures 6 and 7 by virtue of the provision of a supporting pin 55 which has a portion fitted and supported in an opening in the section 27 of the steam joint and has a portion projecting outwardly therefrom and slidably interfitted with an opening 56 provided in the lug 57 formed as an integral part of the elbow section 32 of the steam joint.

While I have shown and described several constructions in which the invention may be advantageously embodied, it is to be understood that the constructions shown have been selected merely for the purpose of illustration or example, and that various changes in the size, shape, and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claim.

I claim:

A siphon for drier drainage systems utilizing a drier drum having a hollow trunnion and comprising a vertical pipe leg extending from a point close to the axis of rotation of the drier drum to a low point therein, a horizontal pipe leg extending from the exterior through the hollow trunnion of the drier drum to a point adjacent the upper end of the vertical leg, a rigid elbow threadedly connected to the inner end of the horizontal leg and the upper end of the vertical leg, and pins projecting laterally from the elbow and adapted to freely pass through said hollow trunnion and to coact with a suitable tool to facilitate insertion and removal of the parts of the siphon through the hollow trunnion of the drier drum.

HERVEY G. CRAM.