Dec. 15, 1931. C. W. METZGAR 1,836,929

DRAIN VALVE FOR COOLERS

Filed Dec. 16, 1929

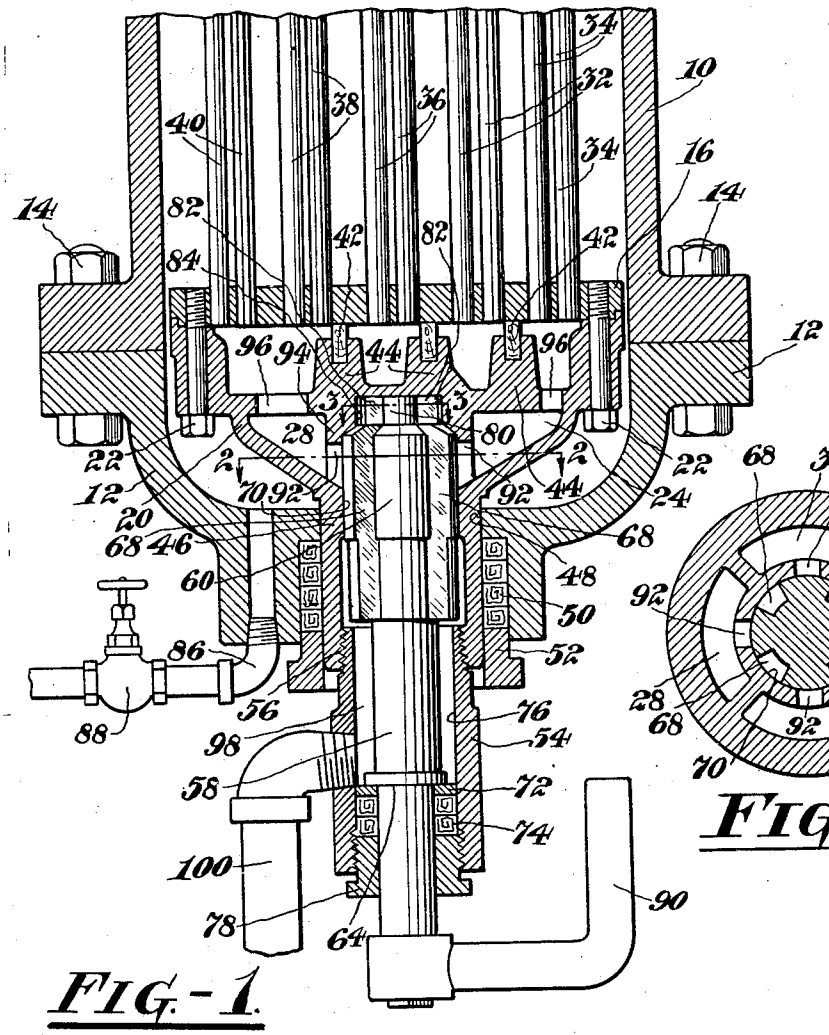


FIG.-1.

FIG.-2.

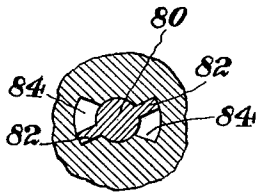


FIG.-3.

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Patented Dec. 15, 1931 1,836,929

UNITED STATES PATENT OFFICE

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DRAIN VALVE FOR COOLERS

Application filed December 16, 1929. Serial No. 414,418.

This invention relates to air coolers for air compressors but more particularly to a valve for draining the water tubes of air coolers.

One object of this invention is to construct a valve which will facilitate the draining of all the water passes in a multiple pass cooler simultaneously.

Another object is to construct a valve so that expansion and contraction of the tubes may take place without placing strains upon the shell or tubes of the cooler.

A still further object is to provide a draining valve which will permit the removal of the tubes and the tube sheets as a unit for cleaning, inspection, or repairing.

Other objects will be in part obvious and in part pointed out hereinafter.

All of the above mentioned objects are obtained by the mechanism shown in the accompanying drawings, in which

Figure 1 is a vertical cross-sectional view of so much of an air cooler as will serve to make clear the invention.

Figure 2 is a cross-sectional view of Figure 1 taken on the line 2—2 looking in the direction indicated by the arrows, and

Figure 3 is a cross-sectional view of Figure 1 taken on the line 3—3 looking in the direction indicated by the arrows.

Referring more particularly to the drawings 10 is a shell of an air cooler provided with a head 12 secured to the shell by bolts 14. A tube sheet 16 receives the ends of tubes, designated according to groups, as 32, 34, 36, 38 and 40, in any suitable manner, not shown in detail since it forms no part of this invention. A water head 20 fits over the end of the tube sheet 16 and is secured thereto by bolts 22. The water head 20 is so formed that it is connected with each of the tubes or groups of tubes in the cooler. The method of connecting the water tubes with a single drain tube is illustrated in Figure 2 wherein separate groups of double passes are led into each of the chambers 24, 26, 28 and 30 respectively. Assuming that tubes 34 constitute one pass of the cooler and for convenience of explanation, that each pass comprises only two tubes although each pass may include any suitable number of tubes, the cooling water from one tube will flow into the chamber 24 and leave the chamber by way of the other tube in group 34 during the normal operation of cooling the air flowing through the cooler. Likewise, water from one of the tubes of the group 36 will flow into a chamber 30 and leave the said chamber by the other tube and water from one of each of the tubes comprising the groups 38 and 40 will flow into chamber 28 and leave by the remaining tube of each group. A fourth pass would drain into the chamber 26.

Strips of wood 42 supported by projections 44 on the water head 20, bear against the tube sheet 16 to serve as a packing for separating the various water passes from each other and to divert the water into the proper tubes.

A hollow cylindrical extension 46 of smaller diameter than the water head of which it may be an integral part extends through an aperture 48 in the air head 12 and is sealed against leakage of air by the packing 50 and a gland nut 52. An extension 54 threaded onto the extension 46 as shown at 56 provides a means of securing the valve stem 58 and the integral valve member 60 in the desired assembled position. Valve stem and valve member 58 and 60 respectively are preferably formed integrally and intermediate the ends of the stem 58 is a shoulder 64. Slots 68 in the portion of the largest diameter of the valve member 60 define wings 61 for which the inner surface of the wall 70 of the extension 46 serves as a bearing.

A washer 72 placed under the shoulder 64 on the valve stem 58 forms a seat for packing 74 in the bore 76 of the attached extension 54. The packing 74 is squeezed into place by gland nut 78 which also serves to hold the valve and valve stem in place.

The upper end of the valve is reduced as shown at 80 and wings 82 cooperate with a slot 84 in the drain tube to limit the rotation of the valve.

A pipe 86 connected to the air head 12 and controlled by a valve 88 serves as a drain to remove moisture which condenses from the compressed air in the cooler.

The operation of the valve is as follows: During the normal operation of the cooler the valve 60 is in the closed position shown in Figure 2. With this position of the valve it is impossible for water to escape from the tubes by way of the water head 46 or to by-pass from one section of tube nest to another section. When it is desired to remove the tubes and the head 16 together with the associated drain tube for inspection, repair or other purpose, and in such cases where suitable equipment is not available to lift the weight of both the cooling element and the water therein the load may be greatly reduced by first draining the water from the cooler. To accomplish this with the type of valve contemplated by this invention, it is only necessary to turn the valve 60 a partial revolution, as for instance one-eighth of a turn in the proper direction. This causes the slots 68 to register with the ports 92 in the valve seat 94 and which ports are normally sealed by the wings 61. The water will then pass out of all the tubes through the passages 96 into the chambers 24, 26, 28 and 30 through ports 92 and the slots 68 into the chamber 98, thence through the pipe 100 to the drain or suitable receptacle (not shown).

It will be seen that the valve and the drain tube do not interfere with free expansion and contraction on the cooling tubes and that no strains are placed upon the shell or tubes by expansion and contraction for the extension 46 will slide in the aperture 48 and at the same time an air-tight joint will be maintained by the packing 50 and the gland nut 52. It will also be observed that when the handle 90 and the pipe 100 are removed that the tubes, tube sheet and drain tube may be withdrawn from the upper end of the cooler (not shown) as a unit, and if desired, without first draining the cooling water from the tubes. This is desirable in some cases, particularly when it is contemplated to inspect the apparatus to ascertain causes and sources of leakage, and eliminates the necessity of refilling the cooling system after its removal from the casing.

I claim:

1. In a multi-pass air cooler, the combination of a shell, an air head forming a closure for the shell, a nest of water tubes comprising a plurality of water passes in the shell, a tube sheet for supporting said tubes, a drain tube in communication with each of said passes and having ports therein, means between the tube sheet and the drain tube for separating the passes, a valve for simultaneously opening and closing all of the passes, a stem for the valve, slots in the valve adapted to register with the ports in the drain tube when the valve is open, a passage communicating with the slots in the valve for leading water from the tubes to a drain pipe, packing means forming an air-tight slidable joint between the drain tube and the air head, means for preventing leakage of water past said valve stem, and means for securing the valve and valve stem in position.

2. In a multi-pass air cooler, the combination of a shell, an air head forming a closure for the shell, a nest of water tubes comprising a plurality of water passes in the shell, a tube sheet for supporting said tubes, a drain tube in communication with each of said passes and having ports therein, means between the tube sheet and the drain tube for separating the passes, a valve for simultaneously opening and closing all of the passes, a stem for the valve, slots in the valve adapted to register with the ports in the drain tube when the valve is open, a passage communicating with the slots in the valve for leading water from the tubes to a drain pipe, packing means forming an air-tight slidable joint between the drain tube and the air head, means for preventing leakage of water past said valve stem, means for securing the valve and valve stem in position, and means for limiting the amount of movement of the valve, said valve being adapted to prevent leakage or by-passing of cooling water from one section of the cooler to another.

3. In an air cooler, the combination of a shell and cooling tubes therein, a water head for the tubes having a plurality of chambers, each chamber being in communication with distinct groups of tubes, a drain tube integral with the water head for draining water from the chambers, and a valve in the drain tube for placing all the chambers in communication with the drain tube.

4. In an air cooler, the combination of a shell and cooling tubes therein, a water head for the tubes having a plurality of chambers, each chamber being in communication with distinct groups of tubes, a drain tube integral with the water head for draining water from the chambers, and a valve in the drain tube and guided thereby for placing all the chambers in communication with the drain tube.

In testimony whereof I have signed this specification.

CHESTER W. METZGAR.