Oct. 3, 1944. B. SMITH ET AL 2,359,589

SUPERHEATER HEADER

Filed Sept. 17, 1942

Fig. 1

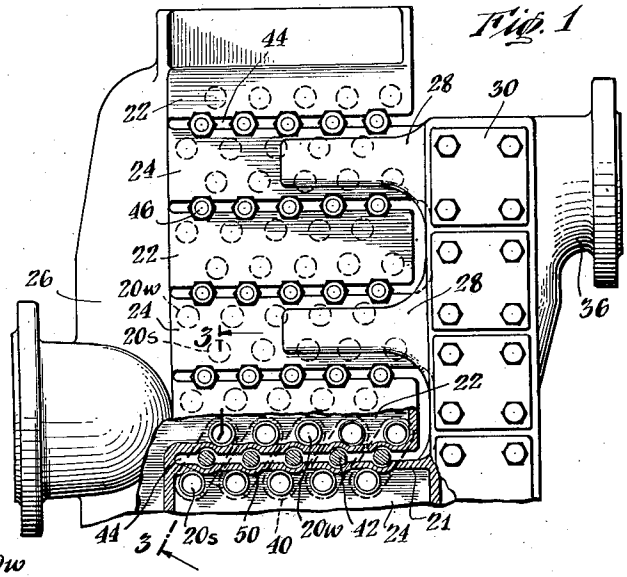


Fig. 3

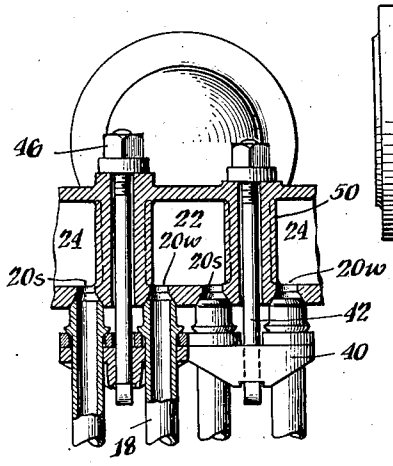
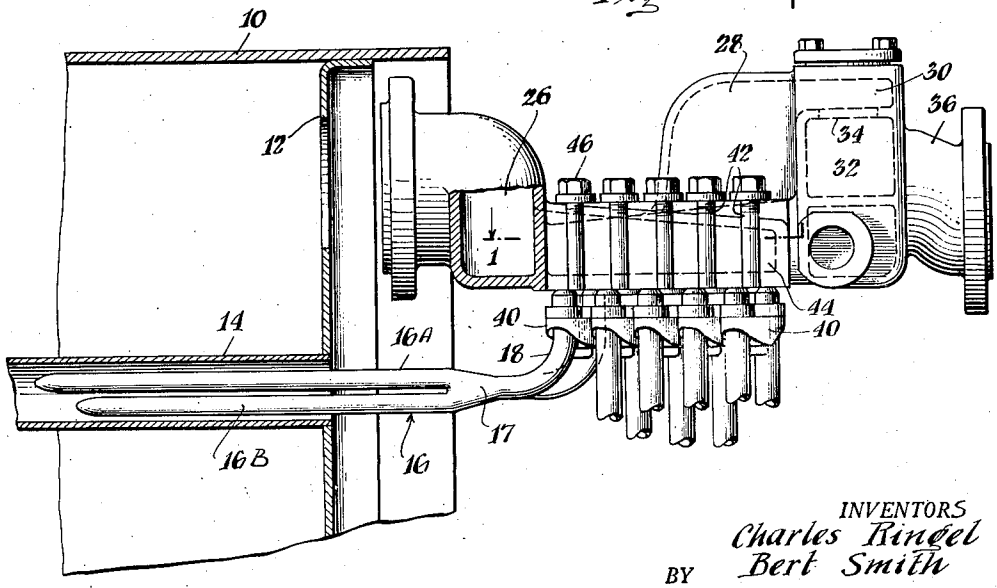


Fig. 2



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SUPERHEATER HEADER

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2 Claims. (Cl. 122—462)

The present invention relates to superheaters for locomotives and particularly to an improved header construction therefor.

In modernizing locomotives it is frequently desirable to provide a superheater of increased efficiency or greater capacity. One way of achieving this is to enlarge the size of the boiler flues and install therein double loop superheater elements connecting in parallel to subheaders or end sections which must be larger in cross-sectional area than either tube to accommodate the volume of steam flowing through the two loops of the element. In may instances the available space in the locomotive smoke box does not permit installation of a superheater header of a width great enough to accommodate in rows transversely thereof a number of subheaders or element ends of larger diameter than provided in the header initially installed in the locomotive while at the same time maintaining the required spacing of the elements and the necessary wall thickness adjacent the slots provided for the bolts which secure the tube ends or subheaders to the under side of the subsidiary manifolds in the superheater header.

To overcome the above disadvantages, the present invention contemplates staggering the respective openings for the inlet and outlet ends of each superheater element and also reducing the transverse dimension of the slot between the adjacent subsidiary manifolds of the header throughout the major portion of the slot length but maintaining it at the required width to accommodate the clamp bolts by offsetting parts of the walls of the subsidiary manifolds at the location for the bolts so that the wall thickness of the header chambers is not decreased.

The present invention will be best understood upon consideration of the following detailed description of an illustrative embodiment thereof when read in conjunction with the accompanying drawing in which:

Figure 1 is a plan view of part of a superheater header embodying the present invention as viewed along the line 1—1 in Fig. 2;

Figure 2 is an elevational view, partly broken away, showing the relation of the header of Fig. 1 to the front flue sheet of a locomotive boiler; and

Figure 3 is a section on line 3—3 in Fig. 1.

In Figure 2 the numeral 10 designates the forward portion of the shell of a locomotive boiler having a front tube sheet 12 into which the fire tubes and flues 14 are connected. The flues 14 receive superheater tubes 16 which at the forward ends are connected either directly through their ends 18 or through subheaders into tube openings 20 formed in the under sides of the subsidiary manifolds 22, 24 for saturated and superheated steam, respectively.

Saturated steam from the locomotive dry pipe is supplied through the main inlet manifold 26 to the saturated subsidiary headers 22, while the superheated steam subsidiary manifolds 24 are connected by means of risers 28 with the superheated steam collecting manifold 30 from which the steam passes to the outlet manifold 32 and thence to the locomotive engines through the main steam pipe connection 36 when throttles at 34 are opened. One end of each superheater element 16 or its subheader 18 is connected to a saturated steam manifold 22 while the other end of the superheater element is connected to the adjacent steam manifold 24, the manifolds 22 and 24 being constructed as shown in Fig. 1 to provide for independent expansion or contraction. The units are held against the under side of the header by clamps 40 with bolts 42 that project upwardly through slots 44 located between an adjacent pair of subsidiary manifolds 22, 24 for saturated and superheated steam. At their upper ends the bolts 42 are threaded to receive nuts 46 bearing against the top face of the subsidiary manifolds adjacent the slots 44.

In the form illustrated the elements 16 comprise two loops 16A, 16B connected in parallel through the breeches pieces 17 to integral end portions 18 which are of larger diameter than the tubing forming the loops so as to accommodate the aggregate volume of steam flowing through the two loops. As mentioned above, the increase in size in the end portions 18 of the elements makes it frequently impossible to arrange the tube openings 20 for the saturated and superheated ends of the elements in a row extending transversely of the header because the width of the latter cannot be increased sufficiently to accommodate the full row of larger openings while maintaining the required spacing of tubes and clamp bolts and also the necessary thickness for the walls 21 of the subsidiary manifolds 22 and 24.

Therefore, in accordance with the present invention, to accommodate the necessary number of tube openings at feasible spacings, the openings 20W in the under side of the header for the saturated ends of the superheater elements 16 are arranged in rows transversely of the header while the openings 20S for the ends of the elements that connect with the superheated sub-

sidiary manifolds are arranged in other rows and staggered in relation to the openings for the saturated ends of the elements. The walls **21** of the subsidiary manifolds **22** and **24** are maintained of the usual thickness necessary for safety by forming the usual slots **44** between these manifolds narrower in width than the diameter of the bolts **46** except on the center lines between the openings for the saturated and superheated ends of each element; there the slots are increased in width to receive the bolts by offsetting the wall inwardly towards the steam space of the subsidiary manifold at **50** (Fig. 1) so that the wall surfaces bounding the slots appear sinuous as a consequence of the depressing of the outer faces of the walls **21** to receive the bolts while at the same time bulging the interior wall surface into the subsidiary chamber to maintain the requisite wall thickness bordering the entire length of the slot separating adjacent subsidiary manifolds. The dwells or recesses in the inner wall surface adjacent the projections at **50** also assure full access to the entire cross-sectional area of each tube opening in the bottom wall of the header. As a result the required spacing for the tube openings (which is unalterable because fixed by the spacing of the flues) may be maintained, as may be that for the bolts, while permitting the formation of larger sized tube openings in the bottom wall. In addition the larger sized clamps required may be installed without the ends of the clamps for laterally adjacent units overlapping in such manner that a clamp for one would interfere with free removal of a unit at the side thereof.

With the arrangement described, it is possible to modernize superheaters on already equipped locomotives by enlarging the size of the superheater tubing and connecting two or more loops in parallel for each element while enlarging the subheader portion sufficiently to accommodate the increased volume of steam. This results in reducing the flow resistance through the elements. The sinuously waved slot walls between subsidiary manifolds and the staggering of the openings for the saturated and superheated ends, respectively, of the elements makes it possible to maintain the necessary ligament or spacing between tube openings and at the same time provide the necessary thickness for the walls of the subsidiary manifolds adjacent the points where the clamp bolts pass.

What we claim is:

1. A header for a locomotive superheater having a main steam distributing manifold along its rear edge and a main steam collecting manifold located forwardly thereof; a plurality of subsidiary manifolds located intermediate said main manifolds and provided on their undersides with a plurality of tube openings formed close to their inner side wall surfaces and arranged in parallel rows extending longitudinally and transversely of the header with the openings of adjacent rows disposed in staggered relation, said header being formed with narrow longitudinal slots mid-way between adjacent rows of tube openings with opposite walls of said slot being recessed on lines joining the centers of relatively staggered pairs of tube openings so as to form widened slot portions between said pair of tube openings and the inner wall surfaces of the adjacent subsidiary manifolds having correspondingly located projections so as to maintain the header wall thickness bounding said slot at the location of said bolt recesses, said projections creating recesses in the inner surfaces of the side walls of said manifolds for affording clear access to said tube openings, superheater tubes communicating with said tube openings; and bolts extending freely through said widened portions of said slots for holding said tubes in place.

2. A header for a locomotive superheater having a main steam distributing manifold along its rear edge and a main steam collecting manifold located forwardly thereof; a plurality of subsidiary manifolds located intermediate said main manifolds and provided on their undersides with a plurality of tube openings formed close to their inner side wall surfaces and arranged in parallel rows extending longitudinally and transversely of the header with the tube openings of adjacent rows disposed in staggered relation, said subsidiary manifolds being spaced to form narrow longitudinal slots between them, the inner and outer surfaces of the subsidiary manifold walls that define said slots being offset along lines that include the centers of said tube openings to provide recesses for affording clear access to the latter and also to widen slot portions for the reception of bolts; superheater tubes communicating with said tube openings; and bolts extending freely through said widened portions of said slots for holding said tubes in place.

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