

Oct. 6, 1931.

H. W. SNYDER ET AL

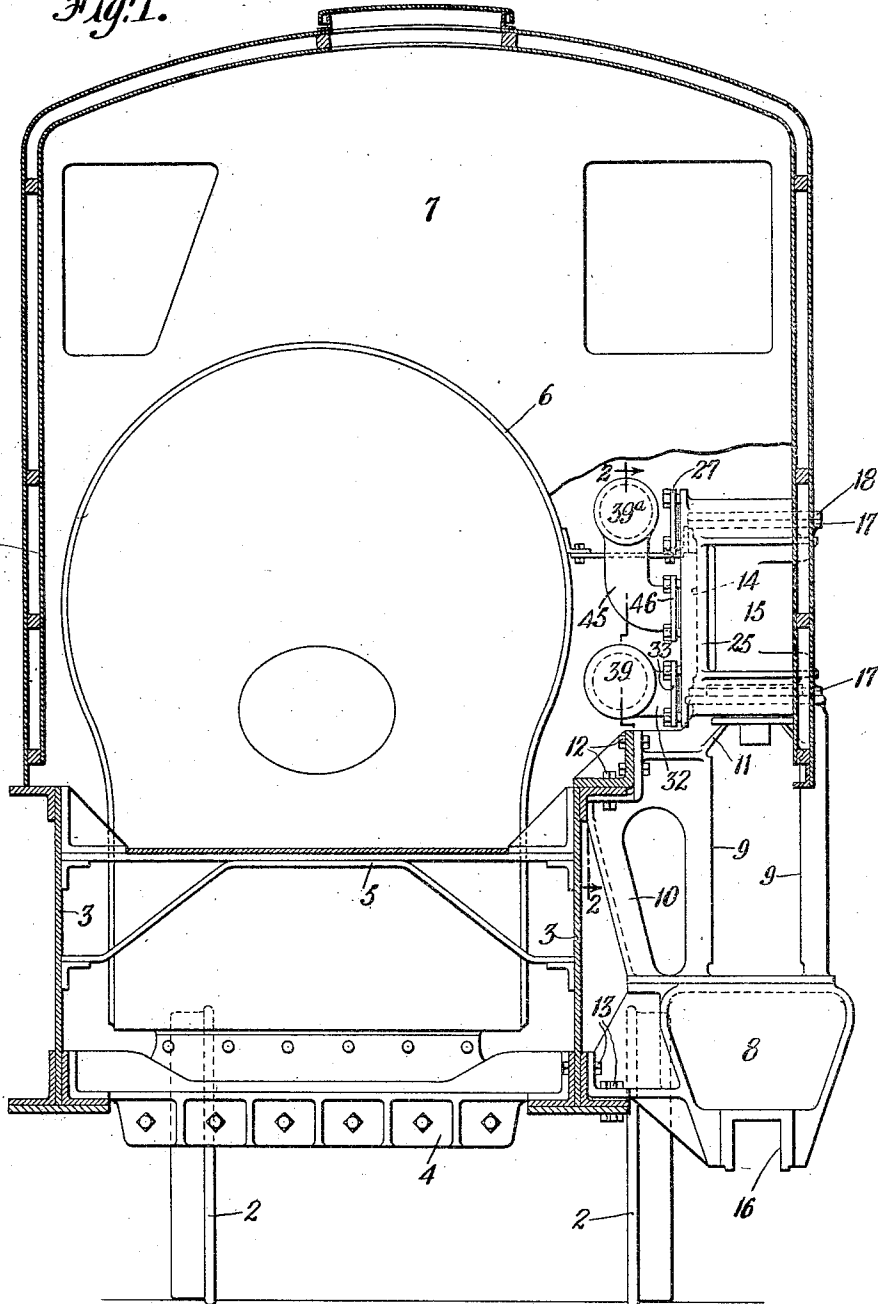
1,826,290

LOCOMOTIVE STEAM DISTRIBUTION

Filed June 15, 1928

3 Sheets-Sheet. 1

Fig. 1.



INVENTORS
Herbert W. Snyder
BY Robert B. Snyder
Snyder & Rechner
ATTORNEYS

Oct. 6, 1931.

H. W. SNYDER ET AL

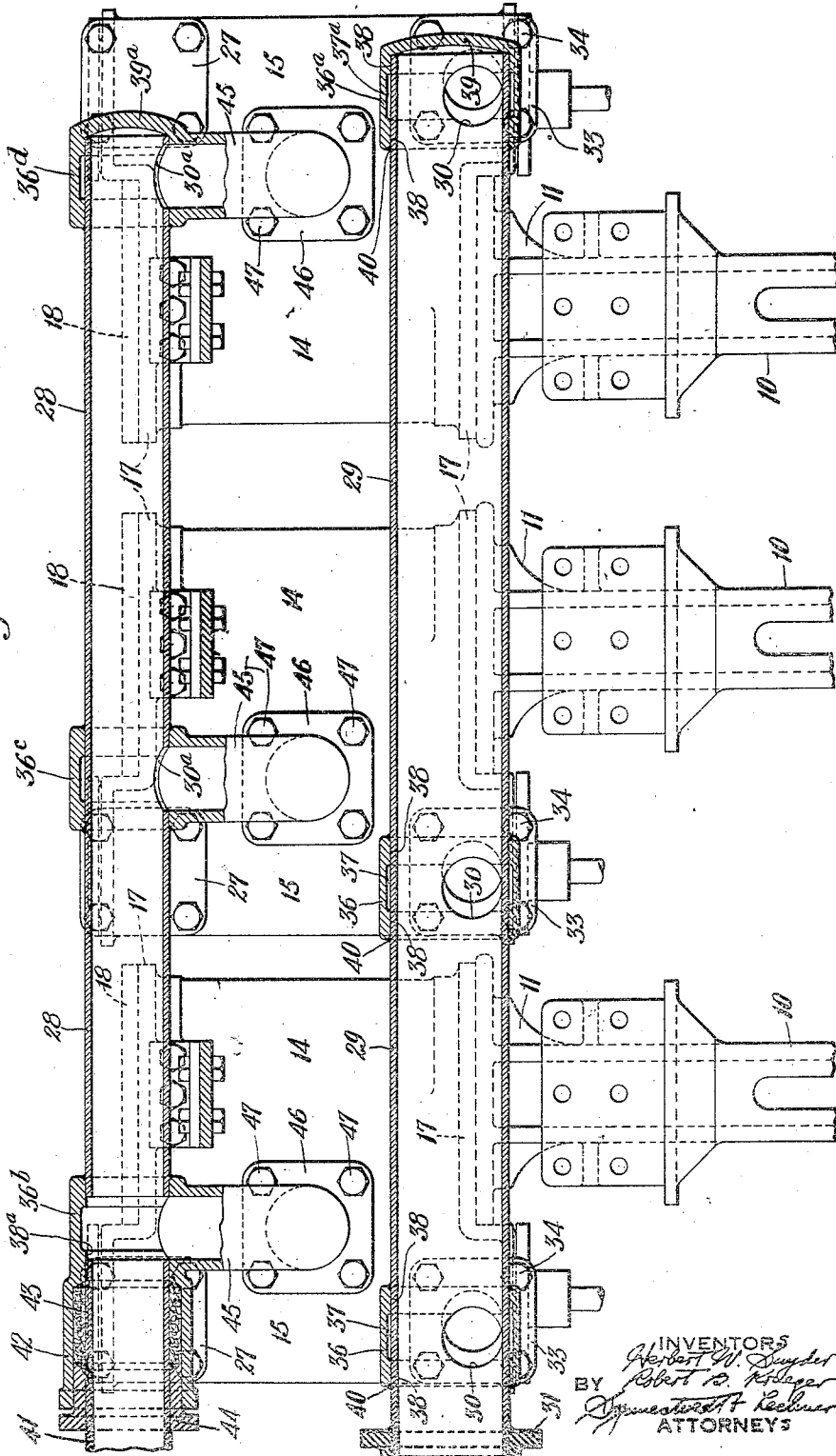
1,826,290

LOCOMOTIVE STEAM DISTRIBUTION

Filed June 15, 1928

3 Sheets-Sheet. 2

Fig. 2.



INVENTORS
Herbert W. Snyder
Robert C. Kellner
BY
Sprentwood & Rechner
ATTORNEYS

Oct. 6, 1931.

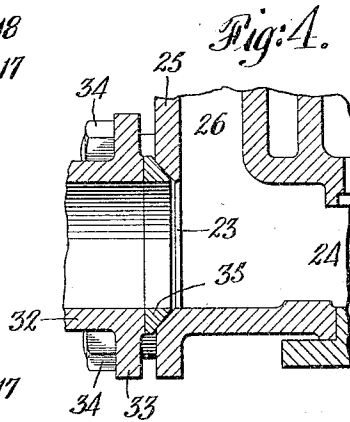
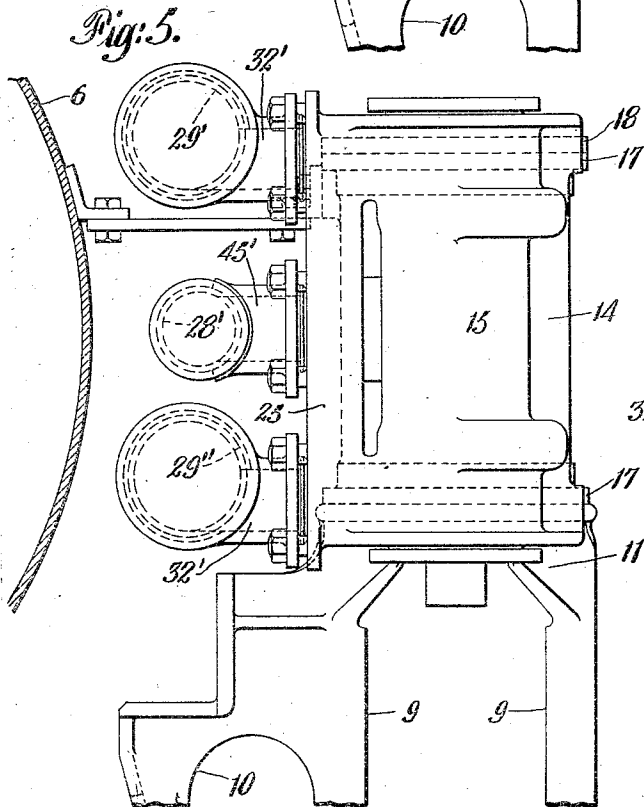
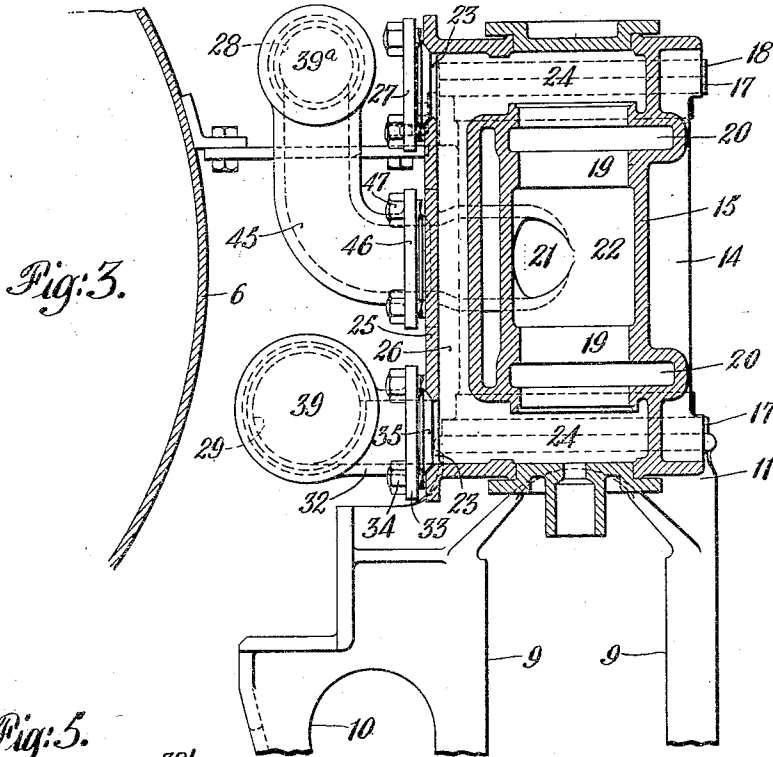
H. W. SNYDER ET AL

1,826,290

LOCOMOTIVE STEAM DISTRIBUTION

Filed June 15, 1928

3 Sheets-Sheet. 3



INVENTOR'S
Herbert W. Snyder
BY Robert L. Kueper
Symon & Peckham
ATTORNEYS

UNITED STATES PATENT OFFICE

HERBERT W. SNYDER AND ROBERT B. KRUEGER, OF LIMA, OHIO

LOCOMOTIVE STEAM DISTRIBUTION

Application filed June 15, 1928. Serial No. 285,541.

This invention relates to locomotive steam distribution, and particularly to the conducting of the steam to and the exhaust from the cylinders of Shay geared locomotives.

Among the primary objects of the present invention are: the simplification of the steam and exhaust distribution of steam engines, particularly of the character above-mentioned; the elimination of cumbersome steam distributing castings heretofore employed, such, for example, as the "steam brackets" usually rigidly secured between the cylinders and the boiler to support the former and to provide steam and exhaust passages thereto; the reduction of the weight of the steam conduits; the minimization of strains due to excessive weight of the parts and also to temperature changes, and in consequence thereof the obviation of the necessity of substantial and more or less permanent supports or brackets between the cylinders and the side of the boiler as heretofore employed in Shay locomotives; the elimination of crossing of the steam and exhaust pipes with its consequent complication of connections and wastage of space; the provision of means whereby the spacing of the connections to the cylinders may be determined to suit the erecting shop, as required; the provision of flexibility for the steam pipes to compensate for temperature changes in service; and the entire separation of the steam and exhaust lines.

How these, and such other objects and advantages as are incident to the invention or will occur to those skilled in the art, are attained, will be evident from the following description, taken together with the accompanying drawings, in which:

Figure 1 is a transverse sectional view through a Shay geared locomotive, looking forward, with certain parts broken away and certain others omitted to illustrate the application of the invention;

Figure 2 is an enlarged sectional view taken approximately on the line 2—2 of Fig. 1;

Figure 3 is an enlarged sectional view through the valve-chest shown in Fig. 1, with associated parts in elevation;

Figure 4 is an enlarged fragmentary section of Fig. 3; and

Figure 5 is a view similar to Fig. 3, but with the valve-chest in elevation, illustrating a modification of the invention.

Referring first to Fig. 1, it will be seen that we have illustrated a Shay geared locomotive having the usual wheels 2, 2, longitudinal frame members 3, 3, transverse frame members, 4, 5, boiler 6, and cab 7 the boiler being offset laterally with respect to the longitudinal centre line of the wheel base as is usual, to provide for the mounting of the engines and other parts at the right hand side thereof.

A supporting structure comprising a crank-shaft bearing support member 8, cross-head guides 9, 9, diagonal bracing web 10, and bracket structure 11, is secured preferably to the right frame member 3, as by bolts 12 and 13, beneath each cylinder of the engine, each cylinder 14 with its valve-chest 15 being preferably mounted on one of the bracket-like supports 11. The bottom of each bearing-support member 8 is provided with a suitable recess 16 for receiving a bearing of the crankshaft (not shown), said crank-shaft, in accordance with the usual practice, being connected by bevelled gears to the axles or wheels, and being driven by the usual connecting-rods from the cross-heads (not shown) which are slidable vertically in the guide-ways 9, 9. A more detailed description of this structure is unnecessary to a clear comprehension of the present invention.

The cylinders 14, as will be seen from Fig. 2, are located in a row, longitudinally of the locomotive, one end cylinder and valve-chest unit, 14, 15, being reversed with respect to the others in order to bring them as close together as possible so as to maintain the common crank-shaft as short as is practicable.

While the cylinder and valve-chest construction is not per se a part of the present invention, we have illustrated in the drawings (particularly in Fig. 3) a construction in which each chest 15 is formed integral with its cylinder 14, the cylinder being mounted, by one of its ends 17, on the base or bracket 11, and the other end thereof being covered by a head-plate 18. The chest 15 has a bore 19 adapted to receive suitable bushings and a

piston valve, the ports 20 each extending laterally into an end of the cylinder. The steam inlet connection 21 opens into the central cavity 22, and the exhaust outlets or connections 23 communicate with the end exhaust cavities 24. In the construction shown, (Figs. 1 to 4), a conduit 25 forming a passage 26 connects the two exhaust cavities, so that the exhaust from both ends may be discharged at either end outlet 23, the other being closed by a suitable cover plate 27.

In accordance with the present invention there is provided a main steam pipe or conduit 28, preferably of steel tubing, extending longitudinally of the boiler and lying between the same and the row of cylinders, and a similar main exhaust pipe or conduit 29 similarly positioned.

The exhaust pipe has three apertures 30 cut therein, one for the exhaust from each cylinder, and at the forward end is provided with a flange 31 or other suitable means for connecting it with a pipe leading forwardly to the nozzle in the smoke-box (not shown). Cast steel elbows 32 (see Figs. 1, 3 and 4), having flanges 33 for securing the same by bolts 34 to the engine castings, provide communication between the several units of the engine and the main exhaust pipe 29. The juncture of each elbow with the respective exhaust outlet 23 is constructed to provide a certain degree of movement or flexibility, by means of the joint ring 35, which, as will be seen in Fig. 4, has one flat face and one convex or rounded face; and, for the purpose of permitting sufficient rotative movement to compensate for expansion and contraction in the main and branch conduits, the apertures for bolts 34 may each be made somewhat larger in diameter than the shank of the bolt.

The juncture of the elbows 32, for the forward and middle cylinders, with pipe 29 is by means of an annular band 36, provided with an internal peripheral groove or channel 37 forming on each side thereof annular engaging portions or seats 38. Elbow 32 for the rear cylinder (at the right of Fig. 2) has a similar band 36*a* with groove 37*a* providing bearing faces 38, and in addition an end closure 39 for the rear end of pipe 29.

These three cast steel elbows, with their integral bands, are positioned along the pipe to suit the erecting shop, so as to register accurately with the exhaust outlets 23, and each is shrunk and welded on the tube 29, the separated bearing or engaging surfaces 38, 38, providing a good firm seating of the band on the pipe, and the welds 40 providing an absolutely tight joint.

The main steam pipe 28 is similarly equipped with apertures 30*a*, 30*a*, but we have in the present construction ended the pipe at the front cylinder (the left cylinder in Fig. 2), providing a connection to the pipe 41

leading from the superheater header in the smoke-box (not shown) by means of an extension 42 of the band 36*b*, which forms a stuffing box around pipe 41. The packing 43 is retained by a flanged ring 44, and the expansion and contraction of pipe 41, carrying the live steam, is taken care of by the sliding connection which this pipe makes with ring 44 and surface 38*a*. The three admission elbows 45 (as in the case of the exhaust elbows 32) are made of cast steel, and their respective bands 36*b*, 36*c* and 36*d*, are shrunk and welded on pipe 28 as shown, the rear elbow being provided with a closure 39*a* for pipe 28. Connection to each valve-chest inlet 21 is made by a flange 46 and bolts 47, and suitable joint rings are provided, similar to the rings 35 employed in the exhaust joints, allowing sufficient movement at the joints to compensate for expansion of pipe 28 by the heat of the steam.

In the construction shown in Fig. 5, we have employed a separate main exhaust pipe 29' for the upper ends of the cylinders and a separate main exhaust pipe 29'' for the lower ends thereof, with an intermediate main steam pipe 28'. The elbows 32' and 45' are somewhat altered in form, but the whole construction embodies exactly the same principles as that first described.

We prefer to make all of the elbow castings, and particularly the admission elbows (since the steam supply line is subject to a very substantial degree of expansion and contraction) each with a bend either horizontally or vertically (as seen in Figs. 2 and 3) and with the axial line of its flanged end sufficiently offset from the axial line of the main conduit as to insure the translation of longitudinal movement of the conduit, under expansion or contraction, into a slight rotative movement at the point of juncture with the chest. An added advantage of the bent elbow construction is that it makes for convenient access to the bolts securing the flanges to the chests.

From the foregoing description it will be evident that we have simplified the distribution of steam to, and the carrying away of the exhaust from, the usual row of cylinders at the side of a geared locomotive, by a construction which is light in weight and easily adaptable to various cylinder spacings and arrangements, which provides tight connections and yet compensates for expansion and contraction, and which eliminates the necessity for the usual heavy castings directly mounted on the boiler with their attendant inconvenience of access to the joints.

What we claim is:—

1. Steam distribution means for the cylinders and valve-chests of a geared locomotive comprising main steam conduit means extending along a row of cylinders, main exhaust conduit means extending along said

row, and branch conduits having flexible means of connection to the chests of said cylinders.

2. Steam distribution means for the cylinders and valve-chests of a geared locomotive comprising main steam conduit means extending along a row of cylinders, main exhaust conduit means extending along said row, and branch conduits adapted to be connected to the chests of said cylinders, each of said branch conduits being in the form of a bent elbow to accommodate expansion movements of the main conduit means.

3. Steam distribution means for the cylinders and valve-chests of a geared locomotive comprising unitary main steam conduit means extending along a row of cylinders, unitary main exhaust conduit means extending along said row, and branch conduits adapted to be connected to the chests of said cylinders, each of said branch conduits comprising an elbow casting having a ring shrunk on a main conduit.

4. Steam distribution means for the cylinders and valve-chests of a geared locomotive comprising unitary main steam conduit means extending along a row of cylinders, unitary main exhaust conduit means extending along said row, and branch conduits adapted to be connected to the chests of said cylinders, each of said branch conduits comprising an elbow casting having a ring shrunk on a main conduit and welded thereto.

5. Steam distribution means for the cylinders and valve-chests of a geared locomotive comprising unitary main steam conduit means extending along a row of cylinders, unitary main exhaust conduit means extending along said row, and branch conduits adapted to be connected to the chests of said cylinders, each of said branch conduits comprising an elbow casting having a ring with spaced internal peripheral ribs engaging a main conduit and shrunk thereon.

6. Steam distribution means for the cylinders and valve-chests of a geared locomotive comprising main steam conduit means extending along a row of cylinders, main exhaust conduit means extending along said row, and branch conduits each having a ball connection for attachment to a chest of a cylinder.

7. Steam distribution means for the cylinders and valve-chests of a geared locomotive comprising main steam conduit means extending along a row of cylinders, main exhaust conduit means extending along said row, and branch conduits adapted to be connected to the chests of said cylinders, each of said branch conduits being rigidly attached to its main conduit and having means of flexible connection to a valve-chest.

8. In locomotive apparatus of the character described, a unitary main steam-con-

veying conduit with lateral ports, and a row of branch conduits each registering with a port and having an annular band securing it to the main conduit, the branch conduit at the end of the row having means providing an end closure for the main conduit, said bands being internally peripherally recessed.

9. In apparatus of the character described, a main steam conduit, a main exhaust conduit, and a row of branch conduit castings on each main conduit, an end casting of each row having means forming a closure for the end of the respective main conduit, and the opposite end casting on the main steam conduit having means forming a sliding joint for a main steam delivery pipe.

10. In apparatus of the character described, a main steam conduit, a main exhaust conduit, and a row of branch conduit castings on each main conduit, an end casting of each row having means forming a closure for the end of the respective main conduit, and the opposite end casting on the main steam conduit having means forming a sliding joint for a main steam delivery pipe and providing a packing recess therearound.

11. In steam-conveying apparatus for a plurality of cylinders, a unitary main steam conduit of steel tubing, and a row of cast steel elbows spaced therealong each to deliver to a cylinder, each of said elbow castings having an integral band encircling the main conduit.

12. In steam-conveying apparatus for a plurality of cylinders, a unitary main steam conduit of steel tubing, and a row of cast steel elbows spaced therealong each to deliver to a cylinder, each of said elbow castings having an integral band encircling the main conduit and shrunk thereon.

13. In steam-conveying apparatus for a plurality of cylinders, a unitary main steam conduit of steel tubing, and a row of cast steel elbows spaced therealong each to deliver to a cylinder, each of said elbow castings having an integral band encircling the main conduit and shrunk and welded thereon.

14. In steam-conveying apparatus for a plurality of cylinders, a main conduit with spaced lateral apertures, and a row of elbow castings spaced therealong each to connect to a cylinder, each of said castings having a band with an internal peripheral groove in registry with one of said apertures and forming at each side thereof an annular rib adapted to engage the main conduit when the casting is shrunk thereon.

15. In steam-conveying apparatus for a plurality of cylinders, a main conduit with spaced lateral apertures, and a row of elbow castings spaced therealong each to connect to a cylinder, each of said castings having a band with an internal peripheral groove in

registry with one of said apertures and forming at each side thereof an annular rib adapted to engage the main conduit when the casting is shrunk thereon, together with a welded joint along the line of engagement of each rib with the main conduit.

16. In steam-conveying apparatus for a plurality of aligned locomotive cylinders, the combination of a substantially straight main conduit extending along the row of cylinders, and a branch conduit for each cylinder connected to the main conduit and having an end with means of connection to a cylinder, the axial line of said end being offset with respect to the axis of the main conduit.

17. In steam-conveying apparatus for a plurality of aligned locomotive cylinders, the combination of a substantially straight main conduit extending along the row of cylinders, and a branch conduit for each cylinder connected to the main conduit and having an end with means of connection to a cylinder, the axial line of said end being offset with respect to the axis of the main conduit, and said means of connection including a ball-like joint member.

18. In combination with a locomotive and its boiler, a horizontal row of substantially vertically positioned cylinder and valve chest units disposed along one side of the boiler, a main steam pipe and a main exhaust pipe extending along the row between the units thereof and the boiler, and branch pipes connecting each main pipe with each unit.

19. In combination with a locomotive and its boiler, a horizontal row of substantially vertically positioned cylinder and valve chest units disposed along one side of the boiler, a main steam pipe and a main exhaust pipe extending along the row between the units thereof and the boiler, and branch pipes connecting each main pipe with each unit, said branch pipes being constructed and positioned to accommodate longitudinal expansion and contraction of said main pipes.

In testimony whereof we have hereunto signed our names.

HERBERT W. SNYDER.
ROBERT B. KRUEGER.

55

60

65