

Oct. 6, 1931.

D. B. THORBURN ET AL

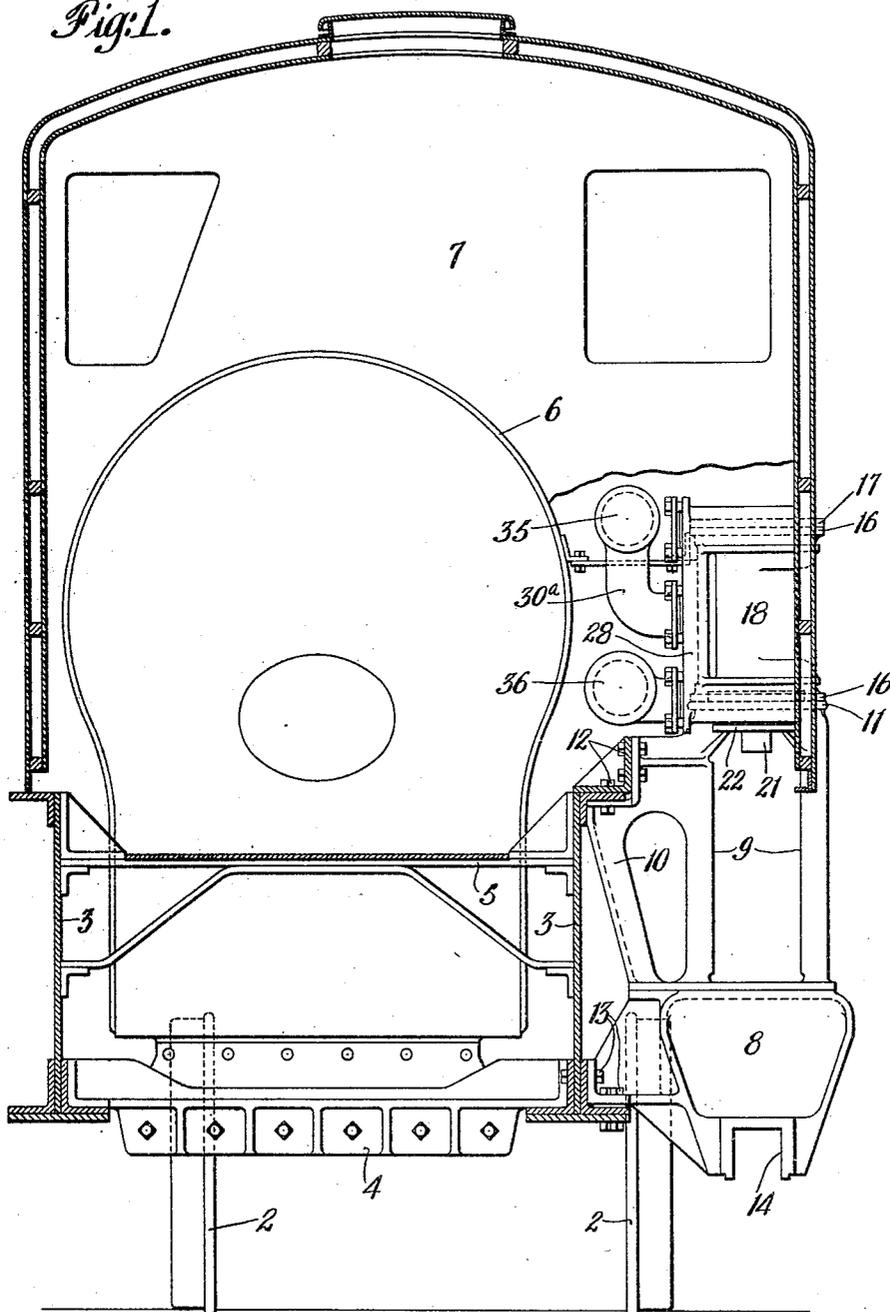
1,826,292

GEARED LOCOMOTIVE ENGINE CONSTRUCTION

Filed June 15, 1928

3 Sheets-Sheet 1

Fig. 1.



INVENTORS  
David B. Thorburn  
BY Robert G. Kueger  
Sprentwood & Redner  
ATTORNEYS

Oct. 6, 1931.

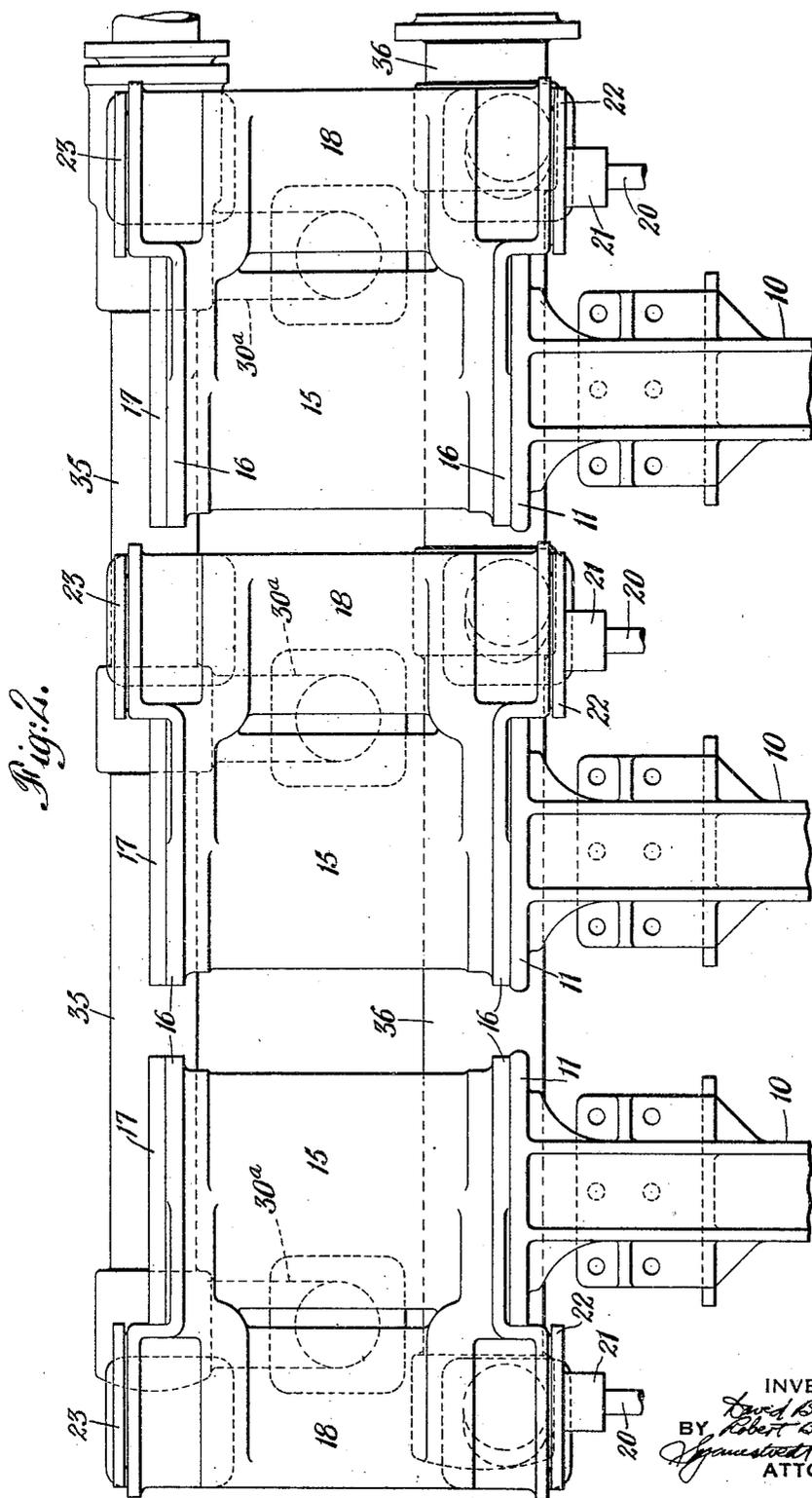
D. B. THORBURN ET AL

1,826,292

GEARED LOCOMOTIVE ENGINE CONSTRUCTION

Filed June 15, 1928

3 Sheets-Sheet 2



INVENTOR'S  
*D. B. Thorburn*  
BY *Robert S. Kruger*  
*James H. Keenan*  
ATTORNEYS

Oct. 6, 1931.

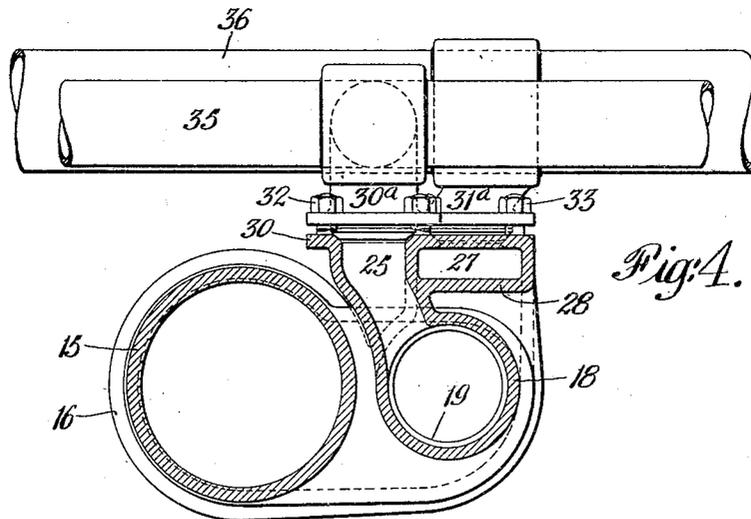
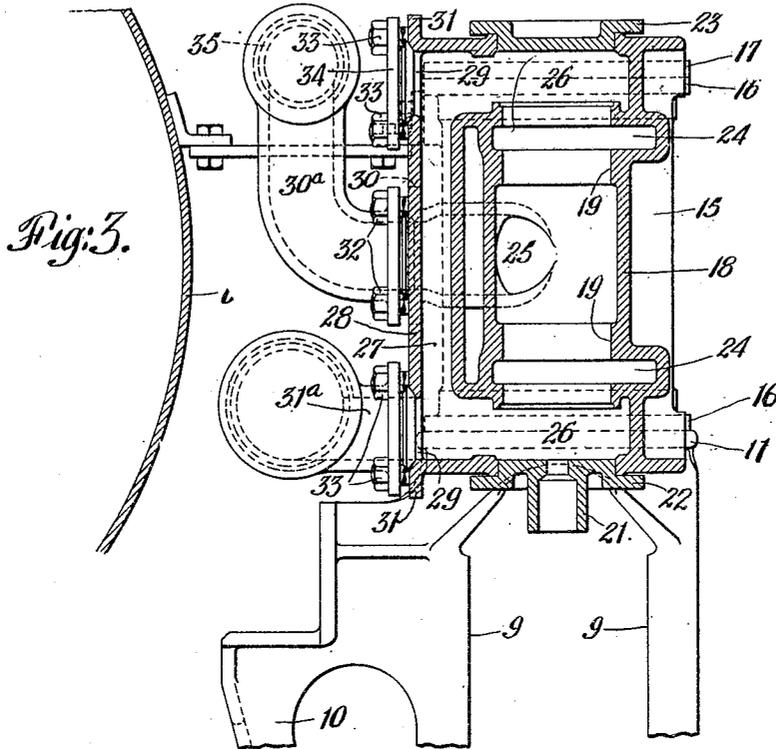
D. B. THORBURN ET AL

1,826,292

GEARED LOCOMOTIVE ENGINE CONSTRUCTION

Filed June 15, 1928

3 Sheets-Sheet 3.



INVENTORS  
David B. Thorburn  
Robert B. Knepper  
BY  
Symonds & Peckham  
ATTORNEYS

# UNITED STATES PATENT OFFICE

DAVID B. THORBURN AND ROBERT B. KRUEGER, OF LIMA, OHIO

## GEARED LOCOMOTIVE ENGINE CONSTRUCTION

Application filed June 15, 1928. Serial No. 285,560.

This invention relates to engine construction and is particularly applicable to geared locomotives. In such locomotives, the engine ordinarily comprises several cylinders mounted vertically on one side of the boiler to drive a common crankshaft having geared connections to the several axles of the trucks.

Heretofore, in such engines, steam distribution to, and exhaust from, the cylinders has presented certain problems which have necessitated the use of slide-valves instead of the more efficient and desirable piston-valve construction, the admission and exhaust connections to the valve-chests being by way of a so-called "steam bracket". This bracket, as ordinarily used, is a long casting secured to the side of the boiler, longitudinally thereof, on which the cylinders and valve-chests are mounted, having a plurality of passages therein with lateral openings into the valve-chests for steam admission and exhaust from the ends of the cylinders. The whole construction has been heavy and cumbersome, and inconvenient of access, and has complicated the steam and exhaust connections.

We aim by our invention to obviate the foregoing and other disadvantages, and in general to improve geared locomotive engine construction. More specifically, we provide a cylinder and valve-chest construction capable of readier application to and removal from the locomotive than those heretofore employed, one of which lends itself to the employment of piston valves and provides a high degree of flexibility of arrangement as regards the location or positioning of the steam and exhaust connections, and one which is invertible, thus avoiding the necessity of providing the usual "right" and "left" constructions, the former for the forward and middle cylinders, and the latter for the rear cylinder.

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

Figure 1 is a transverse sectional view of a geared locomotive of the vertical engine type, with certain parts broken away to illustrate the application of the present invention, some portions of the locomotive structure being omitted to avoid complication of the drawing;

Figure 2 is an enlarged side elevation of the cylinder and valve-chest structure of the present invention, taken from the right of Fig. 1;

Figure 3 is a longitudinal section through the valve-chest of the cylinder at the left of Fig. 2 (the rear cylinder), showing certain associated parts; and

Figure 4 is a transverse mid-section through the middle cylinder of Fig. 2, with certain associated parts in elevation.

In Fig. 1 we have illustrated (somewhat diagrammatically) a geared engine having wheels 2, 2, side frame members 3, 3, transverse frame members 4, 5, boiler 6, and cab 7, the boiler being off centre with respect to the wheels in order to provide for the mounting of the engines and driving mechanism at the right side. Any suitable supporting structure such as the crank-shaft bearing support 8, cross-head guides 9, 9, strengthening rib 10, and bracket-like structure 11, is secured to the locomotive (beneath each cylinder), preferably by attachment directly to the frame structure by bolts 12, 13. The cross-heads (not shown) move vertically in the guides 9, 9, and are connected by the usual connecting rods to the cranks of a crank-shaft (not shown) the bearings of which are mounted in the recesses 14 at the bottom of the member 8, said latter member usually extending as a frame-like piece along the length of the row of cylinders. Power is applied to the wheels, in a manner well known in this art, through the intermediation of bevelled gears. To position the cylinders as close together as possible, so as to shorten the crank-shaft common to them all, the valve-chest of one of the end cylinders (as shown in Fig. 2) must be reversed in position with respect to the other chests, which ordinarily requires two different cylinder and chest constructions.

The cylinder and valve-chest construction of the present invention illustrated in Figures 1 to 4 inclusive, is as follows:

Each cylinder 15 has flanged ends 16, 16, or other means whereby it may conveniently be secured to or mounted on the bracket or support 11, by either end, the end not so mounted being closed by a head or cap 17. Extending laterally from the cylinder, and preferably formed integral therewith is a valve-chest 18 having a bore 19 adapted to receive any suitable bushing structure and piston valve (not shown), each valve being operable by a valve rod 20 (see Fig. 2) extending down through the packing gland 21 formed in the valve-chest bottom end cover plate 22. The opposite end of the chest is closed by a cover plate 23. The valve chest communicates with the cylinder at each end thereof through a port 24.

Intermediate the ends of the chest is a steam inlet 25, and beyond each end of the bore 19 is an exhaust space 26, the two exhaust spaces or cavities being connected by a longitudinal passage 27 in the conduit-like portion 28 of the casting. At each end of the exhaust connecting passage 27 is a port 29. The outside ends of inlet 25 and outlets 29 it will be observed are all positioned in one plane on one side of the cylinder and valve-chest unit, so that the machining thereof may all be accomplished in one operation. Suitable flanges 30 (see Fig. 4) and 31 (see Fig. 3), or other connecting means, may be provided for connecting the steam and exhaust elbows 30a, 31a, respectively, by bolts 32 and 33. We preferably connect an exhaust elbow to but one of the ports 29, the other being closed by a cover plate 34. However, a pair of exhaust pipes, or a double exhaust connection, may be employed if desired, or if an extremely low exhaust pressure is necessary.

The steam and exhaust elbows for each cylinder may be connected to main steam and exhaust pipes 35 and 36 extending longitudinally of the boiler between the latter and the row of cylinders, or any other suitable means of steam and exhaust distribution may be employed, it being evident that our improved cylinder construction provides for great flexibility of arrangement of such connections.

It will now be further evident that this cylinder and valve-chest construction provides a device capable of inversion in position, so that the same casting may be used for the rear cylinder (the one at the left of Figure 2) as for the middle and forward cylinders, or, in other words, that the cylinder may be mounted on its support by either end, the chest end plate 22 being secured on the bottom and the chest and cylinder end plates 23 and 17 being secured on the top, and the exhaust being connected either at top or bot-

tom as found most desirable, or at both ends, at will.

In brief, we have provided an engine made up of counterpart units capable of reversal with means for taking the exhaust of both ends off at either end, and thereby made actually practicable the use of inside-admission and outside-exhaust piston valves in a geared locomotive.

Various modifications may, of course, be made without departing from the spirit and scope of the invention, as, for example, the reversal of the cylinders so as to bring the inlet and exhaust connections to the outer side of the row of cylinders instead of the inner, in which case it might be desirable to mount the cylinders closely adjacent to the boiler and at an angle from the vertical.

What we claim is:—

1. A steam engine cylinder and valve-chest construction having means whereby the exhaust from both ends may be discharged laterally at either end.

2. In a locomotive, a plurality of counterpart cylinder and valve-chest units, one of which is reversed with relation to the rest whereby its cylinder portion is brought into juxtaposition with the cylinder portion of an adjacent unit.

3. A geared locomotive engine construction including a plurality of cylinders with their valve-chests, positioned vertically side by side, each cylinder with its chest being reversible end for end.

4. A geared locomotive engine construction including a plurality of cylinders with their valve-chests, each cylinder with its chest being reversible end for end and having means for conducting the exhaust from both ends off laterally at either end.

5. A geared locomotive engine construction including a plurality of cylinders with their valve-chests, each cylinder with its chest being reversible end for end and having means for mounting the same at either end.

6. In a locomotive, a row of counterpart cylinder and valve-chest units positioned side by side, one of which is reversed with relation to the rest, and means whereby steam and exhaust connections may be secured to each unit in the same relative positions with relation to said row regardless of the reversal of a unit.

7. A geared locomotive engine construction with vertically positioned juxtaposed cylinders each having a central admission and end exhaust piston-valve chest with means for taking off laterally at either end thereof the exhaust of both ends.

8. A geared locomotive engine construction with vertically positioned juxtaposed cylinders each having a central admission and end exhaust piston-valve chest with means for taking off at either end thereof the exhaust of both ends, said cylinders being

counterpart units one of which is reversed with relation to the others to shorten the length of the engine.

9. A cylinder and valve-chest construction having end exhaust cavities and an inlet cavity intermediate said cavities, together with means interconnecting the exhaust cavities and means for taking off the exhaust at either end of the interconnection, the inlet cavity having an inlet connection lying between the cylinder and said exhaust inter-connecting means.

10. A cylinder and valve-chest construction having end exhaust cavities and an inlet cavity intermediate said cavities, together with a conduit interconnecting the exhaust cavities and means whereby an exhaust connection may be made at either end of said conduit.

11. A cylinder and valve-chest construction having end exhaust cavities and an inlet cavity intermediate said cavities, together with a passage interconnecting the exhaust cavities, and a plurality of exhaust outlets lying in one plane each having means adapted to receive either an exhaust connection or a closure cap.

12. A locomotive cylinder with a valve-chest having a bore to receive a piston valve and a fluid passage system including a cavity at each end of the bore and an interconnecting passage between said cavities with a port at each end for making a pipe connection at either end adjacent said chest.

13. A cylinder and valve-chest construction having admission and exhaust connection openings lying in the same plane on one side thereof, said plane substantially paralleling a longitudinal central plane through the cylinder and chest.

14. A cylinder and valve-chest construction having admission and exhaust openings lying in the same plane on one side thereof, an inlet opening being positioned intermediate two exhaust openings and to one side thereof.

15. An engine cylinder having means for mounting it upon either end, a valve chest positioned laterally of the cylinder, portage between each end of the cylinder and said chest, interconnected cavities, one at each end of the chest, adapted in turn to be connected to a port, and means of communication from the outside of said chest to either end of the interconnection.

16. A cylinder and valve chest integral casting with the cylinder and chest portions thereof in parallel juxtaposition, the chest being of lesser diameter than the cylinder, said casting having admission and exhaust connection passages positioned laterally of the chest portion and lying in large part within the space determined by the difference in diameter of the chest and cylinder.

17. A cylinder and valve chest integral casting with the cylinder and chest portions thereof in parallel juxtaposition, the chest being of lesser diameter than the cylinder, said casting having admission and exhaust connection passages positioned laterally of the chest portion and lying in large part within the space determined by the difference in diameter of the chest and cylinder, the outer ends of said connection passages lying in substantially the same plane, said plane substantially paralleling a longitudinal central plane through the cylinder and chest.

18. A cylinder and valve chest integral casting with the cylinder and chest portions thereof in parallel juxtaposition, the chest being of lesser diameter than the cylinder, said casting having admission and exhaust connection passages positioned laterally of the chest portion and lying in large part within the space determined by the difference in diameter of the chest and cylinder, together with means for mounting said casting at either end.

19. In a geared locomotive, a substantially horizontal row of vertically extending counterpart cylinder castings, each casting having a piston valve chest formed integrally therewith, and steam connection passages formed with each of said chests and all on the same side of the row.

20. In a geared locomotive, a substantially horizontal row of vertically extending counterpart cylinder castings, each casting having a piston valve chest formed integrally therewith, and steam connection passages formed with each of said chests and all on the same side of the row, one of said castings being inverted, end for end, with respect to others of the row.

In testimony whereof we have hereunto signed our names.

DAVID B. THORBURN.  
ROBERT B. KRUEGER.

70

75

80

85

90

95

100

105

110

115

120

125

130