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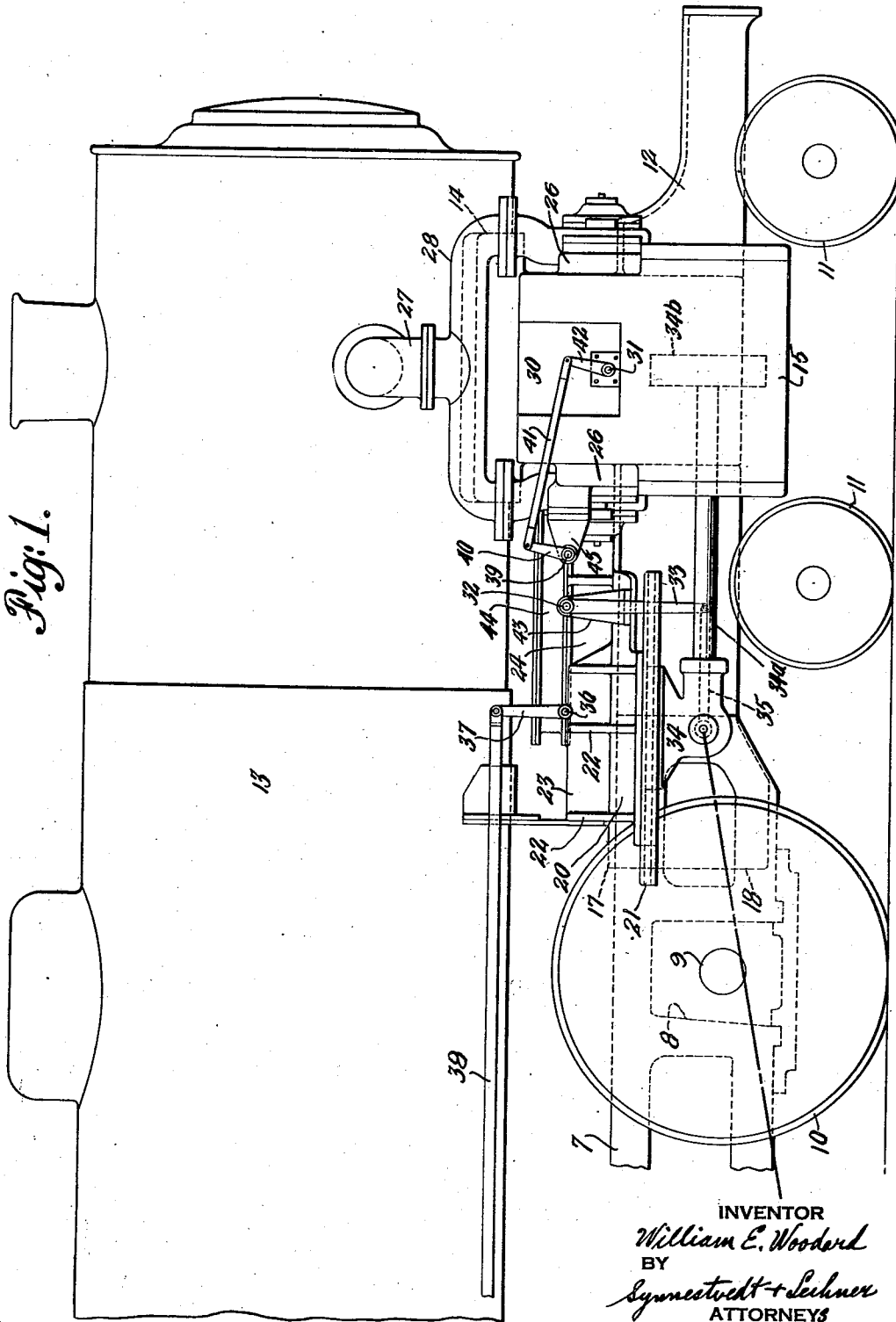
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2,183,327

LOCOMOTIVE

Filed Feb. 19, 1937

4 Sheets-Sheet 1



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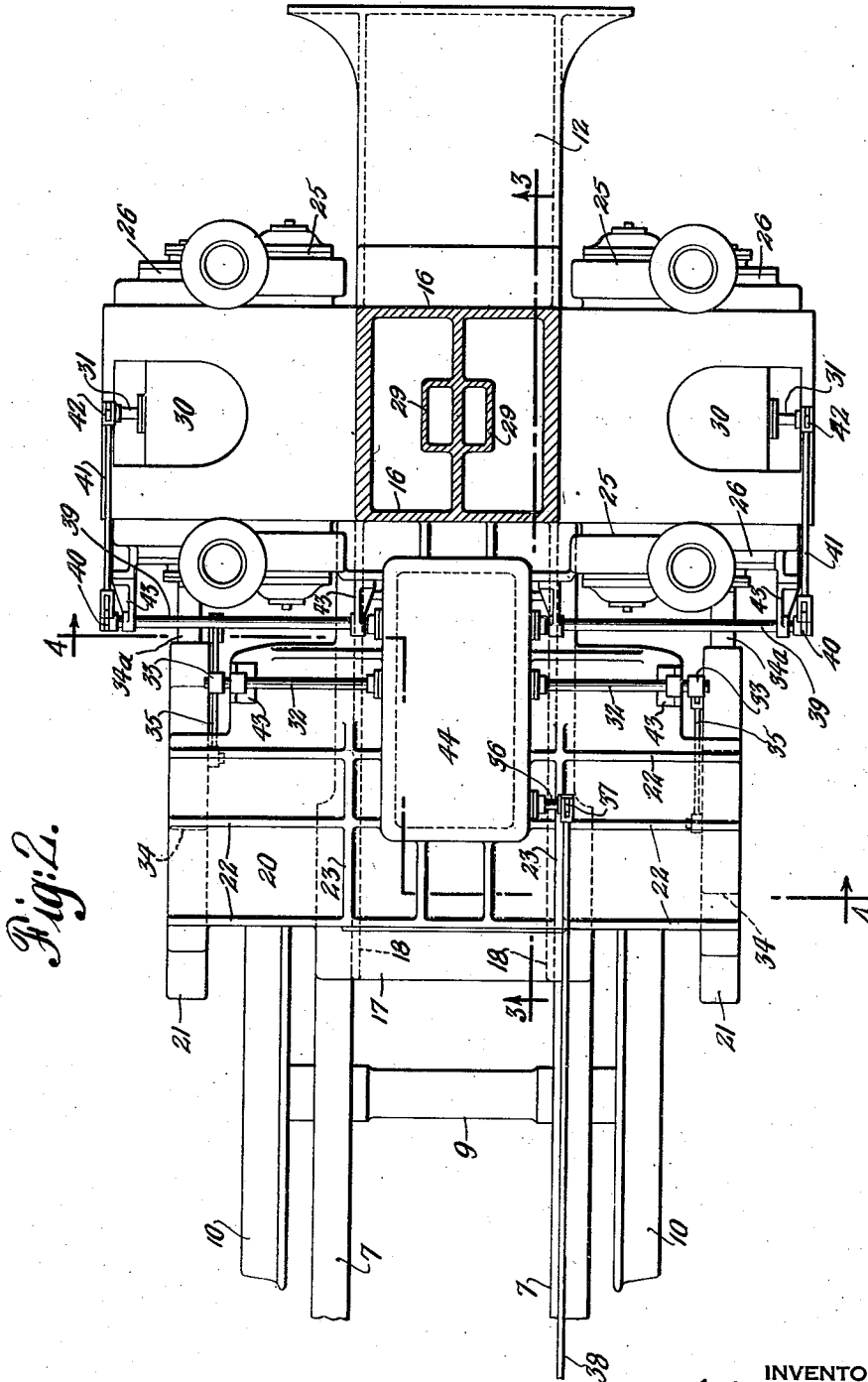
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Fig. 3.

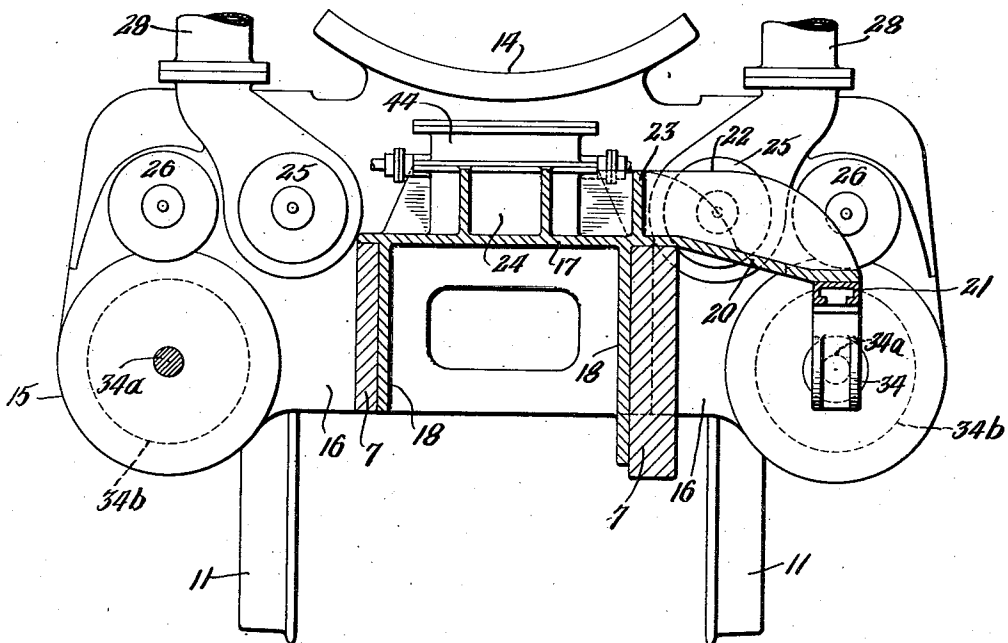
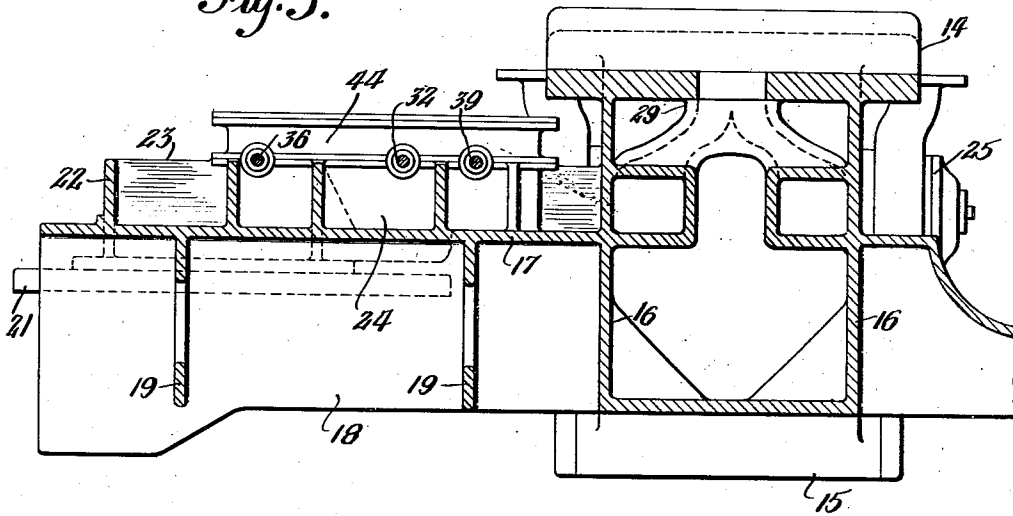


Fig. 4.

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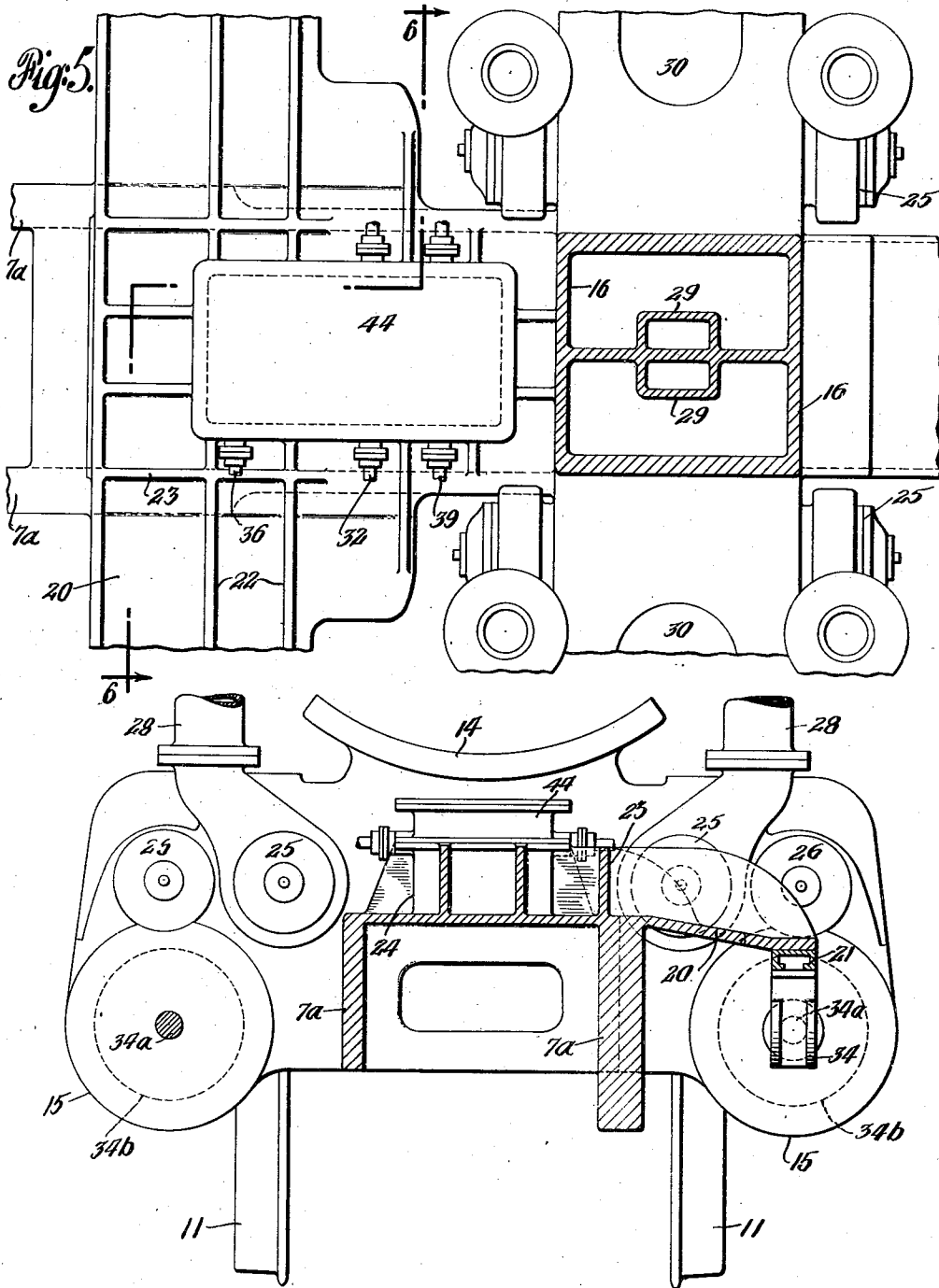


Fig. 6.

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UNITED STATES PATENT OFFICE

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LOCOMOTIVE

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Application February 19, 1937, Serial No. 126,588

16 Claims. (Cl. 121—116)

This invention relates to locomotives and is more particularly concerned with engine mechanism therefor, especially a novel arrangement of valve motion and other working parts.

One of the outstanding objects of the invention is to provide for the maintenance of more strict and accurate alignment of interconnected working parts, such as the steam distribution valves for the cylinders and the variable cut-off valve motion mechanism therefor.

The invention further has in view the arrangement of a number of devices incorporated in the engine structure as a separately handleable unit which may be brought to the erecting shop with virtually all of the operating parts of the engine portion of the locomotive already assembled, this unitary type of structure also being of advantage in repair or rebuilding work.

More specifically the invention contemplates a cylinder casting for a locomotive incorporating interbracing means for the cylinders, preferably in the form of a deck or web cast integrally therewith and extended rearwardly of the cylinders to serve as a support for a valve motion casing and desirably also as a support for the crosshead guides. It is here noted that various features of this invention, including the arrangement just mentioned, are of especial advantage when employed in combination with a variable cut-off valve mechanism of the character disclosed in my copending application Serial No. 58,504, filed January 10, 1936 (issued November 15, 1938, as Patent No. 2,136,405), in accordance with which operating parts for the steam distribution valves of both cylinders are arranged as a compact unit housed within a casing which is conveniently located intermediate the sides of the locomotive and preferably approximately centrally thereof, in longitudinal alignment with the saddle. The valve gear mechanism unit, in accordance with the present invention, is housed and mounted in a casing rigid with, and preferably cast integrally with, the cylinder and cylinder interbracing structure. Such arrangement is of advantage in providing permanently strict alignment of the several operating parts, including the actuating connections extended between the valve mechanism itself and the steam distribution valves for the two cylinders.

In accordance with another arrangement contemplated, the cylinder, cylinder interbracing and valve motion casing structures are all cast integrally with main frame members for the locomotive, this casting thus constituting a complete engine bed. Substantially all of the engine, driv-

ing and running gear parts are thereby maintained in rigid relative alignment.

How the foregoing, together with other objects and advantages, are attained will be more apparent from a consideration of the following description referring to the accompanying drawings, in which—

Figure 1 is a side elevational view of the forward portion of a locomotive constructed in accordance with this invention;

Figure 2 is a top plan view of the forward portion of the cylinder casting, engine frame and portions of the running gear, with some parts shown in horizontal section;

Figure 3 is a longitudinal sectional view of certain parts of the cylinder casting taken as indicated by the section line 3—3 of Figure 2;

Figure 4 is a broken transverse sectional view of portions of the structure shown in Figure 2, this view being taken approximately as indicated by the section line 4—4 on Figure 2, and

Figures 5 and 6 are views similar respectively, to Figures 2 and 4, but illustrating a modified construction, Figure 6 being taken approximately on the line 6—6 of Figure 5.

In Figures 1 to 4 inclusive, the main frame members are designated by the numeral 7, these frame members being provided with jaws 8 to receive axles such as shown at 9 for driving wheels 10. A leading truck incorporating wheels 11 is positioned under the forward extension 12 of the main frame. The forward end of the boiler 13 is supported by the saddle 14 constituting a part of the cylinder casting now to be described.

The cylinder and saddle structure includes cylinders 15 and intervening bracing or saddle structure 16 which is extended upwardly, as clearly appears in Figures 3 and 4, to form the saddle 14 proper for the boiler.

The cylinder interbracing structure further includes a deck or web 17 extended generally horizontally from the rear of the saddle structure 16, this deck being provided with depending plates 18 which are spaced from each other and transversely braced as at 19 (see Figure 3). The plates 18 are preferably so spaced as to lie adjacent the inside surfaces of the main frame members 7 as is clearly seen in Figure 4, and the deck 17 is provided with lateral extensions 20 overlying the upper edges of the main frame members (see Figures 2 and 4) and carrying crosshead guides 21. The lateral extensions 20 preferably have reinforcing ribs 22 and 23.

For the purpose of mounting and supporting

the major portion of the operating parts of the variable cut-off valve motion mechanism, the arrangement provides for the casting of a casing 24 integrally with the deck 17 and the remainder 5 of the cylinder and saddle structure. As shown in the drawings, the bottom and upstanding walls of the casing structure 24, as well as the deck 17 and ribs 22 and 23, serve to substantially stiffen the casting.

10 Although many features of the improved cylinder or engine casting are suitable for use with steam distribution valve means and variable cut-off valve motion mechanism of various types, numerous features of the invention are of especial 15 advantage when used in combination with the type of valve motion discussed in my copending application above referred to, and further with steam distribution valves of the poppet type. While the variable cut-off valve gear mechanism 20 in said copending application is shown as applied to poppet valves arranged for vertical lifting, the valve arrangement here shown is of the horizontally movable poppet type, and by reference to Figures 1, 2 and 4 it will be seen that the 25 engine and cylinder casting includes opposed pairs of inlet and outlet valve chests 25—25 and 26—26 for each cylinder. Steam is delivered from the steam pipes 27 to the admission valves by means of branch pipes 28—28. The exhaust passages 30 from the chests 26—26 are desirably extended internally through the saddle structure, portions of these passages being shown at 29 in Figures 2 and 3, the exhaust steam being ultimately delivered to the draft nozzle, not shown.

35 For the purpose of actuating the admission and exhaust valves for each cylinder, a cam or other suitable mechanism is associated therewith and preferably positioned between the opposed admission and exhaust valves, a casing for such an 40 actuating mechanism appearing at 30 in Figures 1 and 2. A rock shaft 31 projects from the casing 30 and constitutes the actuating element for the cam mechanism therein.

Various operating parts of the variable cut-off valve mechanism form no part of the present 45 invention per se (the same being fully disclosed in my copending application Serial No. 58,504), but it is to be understood that these parts are mounted and housed in the closed-bottom casing structure 24 which is cast integrally with 50 the cylinder and saddle structure. The actuating connections for the valve mechanism include a rock shaft 32 projecting at each side thereof and actuable by a depending arm 33, the lower 55 end of which is coupled with the crosshead 34 for the cylinder at that side by means of the crosshead link 35. The crosshead 34 is reciprocated by the piston rod 34a extended into the cylinder for connection with piston 34b.

30 A rock shaft 36 is coupled by means of arm 37 and the reach rod 38 with the reverse lever in the locomotive cab, in order to provide for reversal of operation of the engine.

65 The connections between the valve motion mechanism and the distribution valves themselves for each cylinder include a rock shaft 39, arm 40, link 41 and arm 42 which is mounted on the rock shaft 31 of the cam actuating mechanism for the valves. Shafts 39 and 32 may be provided 70 with supporting brackets 43, these brackets all being carried on parts of the cylinder casting.

For the purpose of providing convenient access and for facilitating replacement of valve gear parts, a removable cover 44 is provided for the 75 casing 24. Preferably the cover and the casing

proper are joined on a line containing the axis of the several projecting rock shafts 32—32, 36 and 39—39. By virtue of this arrangement, even though the variable cut-off valve motion mechanism is maintained in strict alignment with the 5 distribution valves and other operating parts, the valve motion parts may still conveniently be inspected, removed or replaced.

From the foregoing, it will be seen that the engine structure, including the cylinders, steam 10 distribution valves, variable cut-off valve mechanism, crosshead guides, crossheads and other associated parts, are arranged as a separately handleable unit. As a result, the valve motion mechanism and the valves themselves, together with 15 the interconnections therebetween, may be assembled and adjusted with maximum convenience and then the complete unit brought to the erecting shop for assembly with the main frame, boiler and other parts of the locomotive. Similar ad- 20 vantages are provided in repair or rebuilding work.

With regard to the foregoing, particular attention is called to the fact that employment of the 25 type of variable cut-off mechanism illustrated, specially contributes toward providing the unitary characteristics desired, for the reason that the crosshead linkage constitutes the only actuating connections necessary for operation of the 30 valve mechanism, there being no direct connection thereof to the locomotive wheels. Thus, when assembling the engine unit with the remainder of the locomotive, the only valve gear operating connection required to be made is the 35 reach rod 38 for effecting reversal.

Turning now to the arrangement shown in Figures 5 and 6, it is first pointed out that the 40 variable cut-off valve gear mechanism, the steam distribution valves, and the like, are all arranged in essentially the same manner as that described above. In Figures 5 and 6, however, the cylinders, saddle, crosshead guide supports, valve motion casing, and the like, instead of being cast 45 as a unit separate from the main frame structure of the locomotive, are cast integrally with the main frame structure. As seen in these views, the main frame members 7a—7a are, in effect, 50 combined with the upright plates 18—18 of the engine casting of the form first described, this difference appearing clearly from comparison of Figures 4 and 6.

The arrangement of Figures 5 and 6, therefore, 55 provides a complete engine bed serving to rigidly mount and maintain in strict relative alignment not only all of the valve and valve gear parts fully described above, but also the driving axles and the connecting and side rods.

I claim:

1. In a locomotive having a cylinder casting and steam distribution valve means for the cylinders, variable cut-off valve motion mechanism, including operating parts for actuating the valves of both cylinders arranged as a compact unit, and a closed-bottom casing structure for housing and supporting said mechanism cast 65 integrally with the cylinders in a position to rigidly brace said casting.

2. In a locomotive having cylinders and steam distribution valve means therefor, variable cut-off valve motion mechanism common to both 70 cylinders, a bracing structure interconnecting the cylinders and including a stiffening web, a closed-bottom casing structure for housing and supporting said mechanism carried by said web in position to stiffen the same, and crosshead 75

guides also carried by said web, whereby accurate alignment of the locomotive engine parts is maintained.

3. In a locomotive having cylinders and steam distribution valve means therefor, variable cut-off valve motion mechanism common to both cylinders, and a closed-bottom casing structure for said mechanism cast integrally with the cylinders and extending rearwardly thereof.

4. In a locomotive having cylinders and an intervening saddle, steam distribution valve means for the cylinders, a variable cut-off valve motion mechanism, and a closed-bottom casing structure for housing and supporting said mechanism cast with interbracing ribbing integrally with said saddle.

5. For a locomotive, a cylinder casting incorporating a pair of cylinders and interbracing means therefor projecting away from the cylinders at one end thereof and incorporating a closed-bottom casing structure for housing and supporting valve motion mechanism, said structure being configured and positioned to stiffen the casting in a plurality of planes.

6. For a locomotive, a cylinder casting incorporating a pair of cylinders, an intervening saddle, and bracing webbing for the casting projecting rearwardly of the cylinders and saddle in a generally horizontal plane and incorporating a valve motion casing structure having a closed bottom and upstanding walls serving to stiffen said webbing.

7. A locomotive bed casting including spaced longitudinal frame members, cylinders arranged at one end of the bed, a saddle interconnecting the cylinders, and generally horizontal bracing means also cast integrally with said bed in position to interbrace the frame members and saddle and incorporating a valve motion casing structure located adjacent said cylinders, formed with an integral closed bottom and having upstanding walls serving to vertically stiffen said horizontal bracing means.

8. For a locomotive having spaced main longitudinal frame members, an engine casting including cylinders and an intervening bracing structure, the bracing structure extending rearwardly of the cylinders in a generally horizontal plane and incorporating a valve motion casing structure with a closed bottom, and further having depending wall elements engaging the main frame members, said casing and wall elements being configured to vertically stiffen the casting.

9. In a locomotive having cylinders, pistons, crossheads, steam distribution valve means, and variable cut-off valve motion mechanism; a bracing structure interconnecting the cylinders and cast therewith, a casing for said mechanism, connections for actuating the valve motion mechanism extending from the crossheads to said mechanism, and actuating connections for the steam distribution valve means extending laterally outwardly from said mechanism and thence longitudinally of the locomotive for connection with the distribution valve means, said casing and connections being in large part carried on said bracing structure.

10. In a locomotive having main framing members, an engine structure separable therefrom and comprising cylinders, crossheads and guides, and bracing means interconnecting the cylinders and guides, variable cut-off valve motion mechanism driven by said crossheads for actuating the valve means, and a closed-bottom casing structure for said mechanism cast integrally with the cylinders

in a position to lie intermediate the main framing members of said locomotive and forming a part of said bracing means, whereby there is provided a rigidly interconnected and unitary engine structure which is handleable separately from the rest of the locomotive.

11. In a locomotive having driving wheels and main framing and steam boiler mounted thereon, a unitary engine structure for actuating said driving wheels, said unit being handleable separately from the boiler, the framing and the driving wheels, and comprising: cylinders with steam distribution valves therefor, cylinder interbracing structure formed also to interconnect said boiler and framing, reciprocating parts including pistons and rods with cross-heads, and variable cut-off valve motion mechanism actuated solely by said reciprocating parts and coupled to said valves.

12. In a locomotive having driving wheels and main framing and steam boiler mounted thereon, a unitary engine structure for actuating said driving wheels, said unit being handleable separately from the boiler, the framing and the driving wheels, and comprising: cylinders with steam distribution valves therefor, cylinder interbracing structure formed also to interconnect said boiler and framing, crosshead guides, reciprocating parts including pistons and rods with crossheads working in said guides, and variable cut-off valve motion mechanism actuated solely by said crossheads and coupled to said valves.

13. For a locomotive, an engine casting including cylinders and an intervening integral bracing structure which extends from thence longitudinally of the locomotive and incorporates an integral closed-bottom casing structure, for housing and supporting valve motion mechanism, located in the mid-region and configured to vertically stiffen the bracing structure.

14. A locomotive bed casting, adapted to journal the axles of driving wheels positioned at each side thereof, comprising longitudinal framing with integral cylinders and intervening saddle, and a closed-bottom casing structure for housing and supporting valve motion mechanism, said casing structure being formed integrally with said bed, in a location between the planes of the driving wheels and in longitudinal alignment with said saddle, and configured to stiffen said casting both horizontally and vertically.

15. In a locomotive having cylinders, pistons, crossheads, steam distribution valve means, and variable cut-off valve motion mechanism; a bracing structure interconnecting the cylinders and including at least saddle means cast therewith, a casing for said mechanism, connections for actuating the valve motion mechanism extending from the crossheads to said mechanism, and actuating connections for the steam distribution valve means extending laterally outwardly from said mechanism and thence longitudinally of the locomotive for connection with the distribution valve means, said casing and connections being in large part carried on said bracing structure, and a removable top cover forming part of said casing, to give ready access to the mechanism therein.

16. In a locomotive having cylinders, pistons, crossheads, steam distribution valve means, and variable cut-off valve motion mechanism; a bracing structure interconnecting the cylinders and including at least saddle means cast therewith, a casing for said mechanism, connections

for actuating the valve motion mechanism extending from the crossheads to said mechanism, and actuating connections for the steam distribution valve means extending laterally outwardly
 5 from said mechanism and thence longitudinally of the locomotive for connection with the distribution valve means, said casing and connec-

tions being in large part carried on said bracing structure, and a removable top cover forming part of said casing, to give ready access to the mechanism therein, said cover and the casing proper having their adjacent edges meeting on planes
 5 containing the axes of said connections.
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