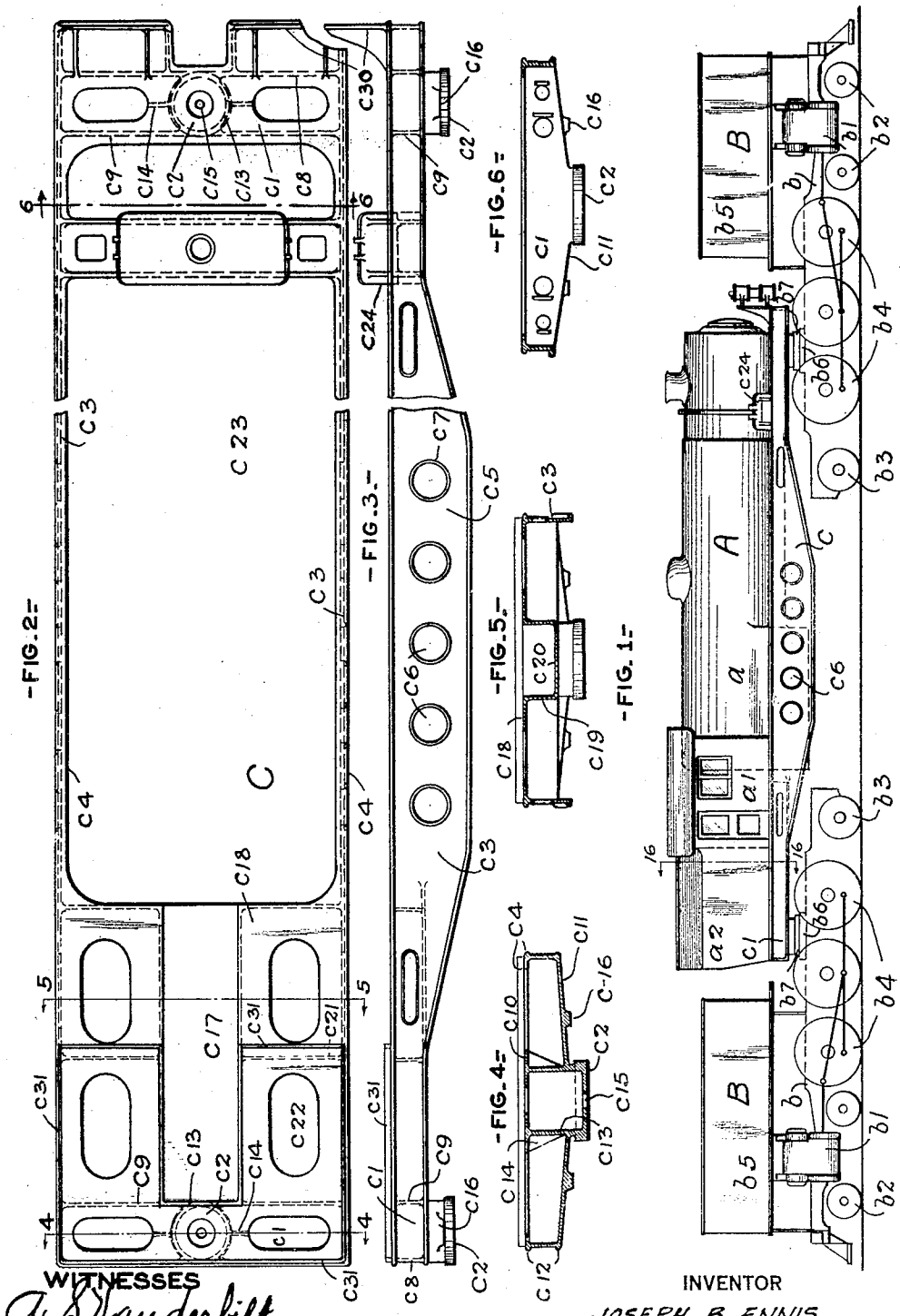
Nov. 24, 1931. J. B. ENNIS 1,833,673

ARTICULATED LOCOMOTIVE

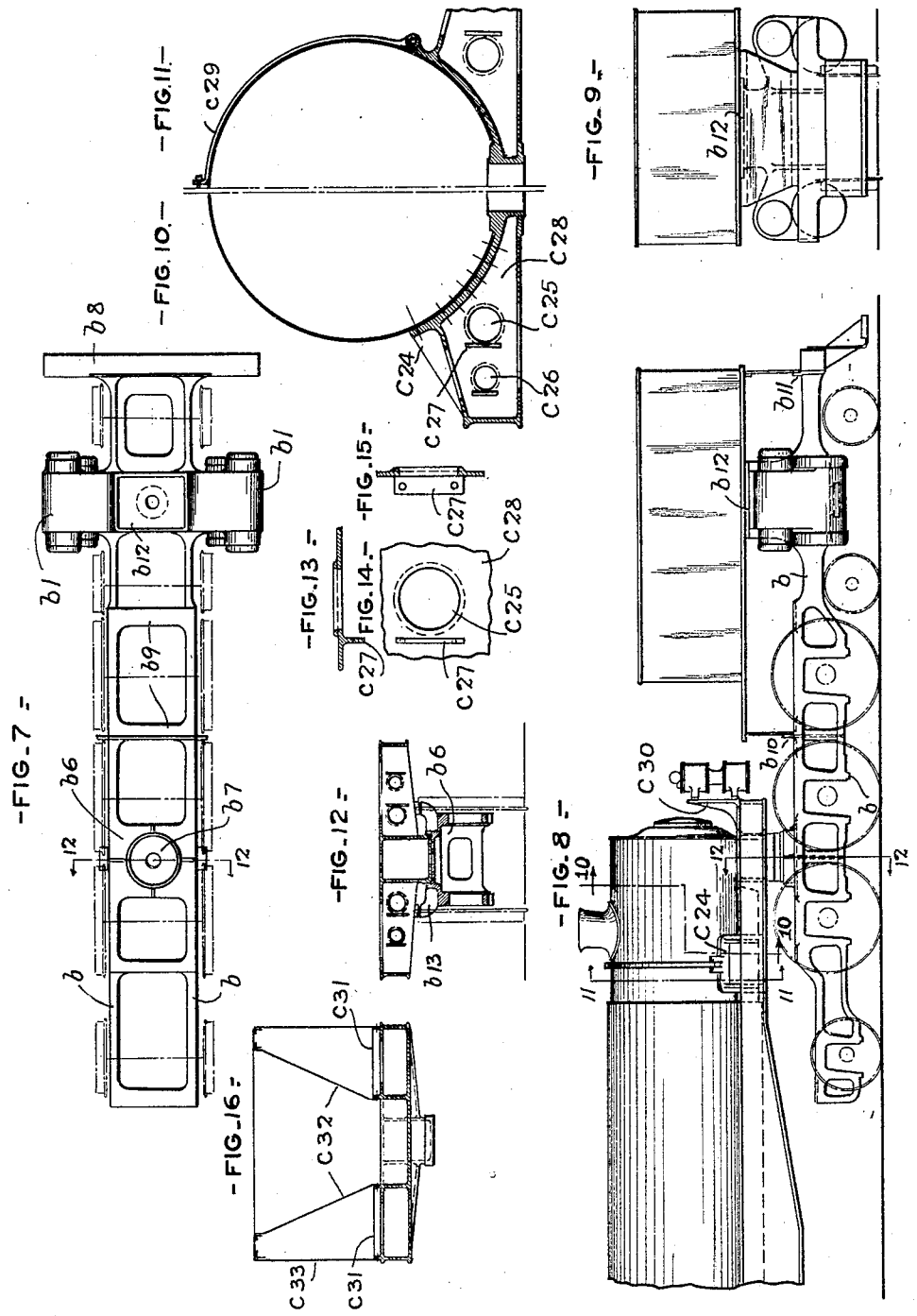
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WITNESSES

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ARTICULATED LOCOMOTIVE

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This invention more particularly relates to the power-generator-supporting frame of articulated locomotives of the type comprising two motor units, and a separate common power-generator unit flexibly connected at or near its ends respectively to the two motor units, the power-generator unit being thus a suspended unit free from the restrictions imposed by driving or carrying wheels.

An object of the invention is to provide a power-generator-supporting frame for a locomotive of the type above referred to, which in the case of a steam locomotive would constitute the supporting frame or bed for the boiler, possessing a higher degree of strength, rigidity and durability, in proportion to its weight, than has heretofore been known, and which will also materially increase the factor of safety, and effect a substantial economy in maintenance cost. With these objects in mind, and as a further object, the power-generator-supporting frame, as for instance, the boiler-supporting frame of a locomotive, is formed as an integral unit, which is preferably integrally combined with certain associated parts heretofore separately formed and applied, such parts being selected for integral formation and associated in each case as the special requirements of such case dictate.

While the present invention is not restricted to steam locomotives, but may be employed with equal advantage in similar types using other sources of power, as illustrative however, of the present invention, the steam locomotive is specially referred to for convenience.

Such locomotives, of the type of construction above referred to, limiting the present invention as to its broad aspects, are provided with three principal units, namely, two wheel supported end units, at least one of which being an engine unit, and the third being a boiler unit, this unit being flexibly connected at or near its ends with the respective end units. The invention has particularly to do with the provision of an integral frame or bed for supporting the boiler and its associated parts thereupon, and the integral formation and association of various parts with the frame, as will be hereafter more particularly described.

A further object of the invention is to provide the wheel supported end units with a frame formed as an integral unit which may be integrally combined with certain associated parts heretofore separately formed and applied, such parts being selected for integral formation and associated in each case as the special requirements of such case dictate.

Heretofore it has been the practice to form the parts of the several frames and attendant parts in such types of locomotives, separately, and to secure them together, and the attendant parts to the frame, by bolts or rivets. Such constructions are seriously disadvantageous, in that certain of the parts must be formed with flanges to effect the bolted or riveted connections, which involve a double thickness of metal at the joints, entailing a material increase in weight and cost of production. A further disadvantage is the expense involved in assembling the parts, and machining them to insure proper fits. Frequently the clearance between adjacent parts is so limited as to make the operation of applying the bolts or rivets an extremely difficult one. Other disadvantages are the cost of frequent inspection required to insure that the parts are tight, and the loss entailed by the withdrawal of the locomotive from service, for repairs. A further disadvantage is the comparatively low degree of rigidity and durability of the structure.

The various disadvantages noted, are overcome, in the present invention by forming an integral boiler-supporting frame or bed, and integrally forming and joining therewith certain or all of the usually associated parts, and in similarly forming, when found desirable, an integral frame for each of the end units and integrally forming and joining therewith certain or all of the usual associated parts.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a diagrammatic side view of a locomotive embodying the invention; Fig. 2, a top plan view of the boiler-supporting frame, and cer-

tain attendant parts; Fig. 3, a side elevation thereof; Figs. 4, 5, and 6, transverse sections taken on the respective lines, 4—4, 5—5 and 6—6, of Fig. 2; Fig. 7, a plan view of one of the engine units; Fig. 8, a side elevation of one of the engine units and a portion of the boiler unit; Fig. 9, an end elevation of Fig. 8; Fig. 10, a half section in elevation on the line 10—10, of Fig. 8 illustrating a modified means for supporting and securing the end of the boiler; Fig. 11, a half section in elevation on the line 11—11 of Fig. 8 illustrating the preferred means for supporting and securing the end of the boiler; Fig. 12, a section, in elevation on the line 12—12 of Figs. 7 and 8; Fig. 13, a horizontal central section of Fig. 14; Fig. 14, a view, in elevation, of a portion of the structure shown in Fig. 10; Fig. 15, a vertical central section of Fig. 14 and Fig. 16, a section in elevation of the fuel hopper and side tanks on the line 16—16 of Fig. 1.

In the practice of the invention, referring descriptively to the specific embodiment thereof which is herein exemplified, in a locomotive of the type set forth, wherein is shown diagrammatically, such parts only as are deemed necessary for a clear understanding of the invention, the boiler unit, A, is supported upon two end wheel-supported units, B. The two end units are shown similar in all respects, and except that they must essentially be each flexibly connected to the boiler unit, and one at least be a motor unit, their construction may vary as desired without affecting the present invention. In the present instance, both of the end units B, are shown for convenience and in conformity with the usual practice of this type of locomotive, as engine units, and while the locomotive, strictly, has no rear end, it being intended to run in either direction, nevertheless for convenience the smoke stack end will be considered the front and the cab end the rear of the boiler in the following description, while contrariwise, the outer end of each of the end units B, will be considered as their respective front ends. Accordingly each end unit, in the present illustration, comprises, in the main, a main frame b, supporting an engine on either side indicated generally with its associated parts by the reference b^1, and supported upon a four wheel leading truck, b^2, a two wheel trailing truck, b^3, and six driving wheels b^4, driven by the respective engines. The frames, b, are also shown, each as supporting a water tank, b^5, in the customary manner, and have mounted thereon at convenient locations bolsters, b^6, carrying the usual center pin plates, b^7, for flexible connection with the boiler frame as will presently more fully appear.

Of the features comprising the boiler unit A, are shown for convenience the boiler proper, a, the cab, a^1, coal bunker, a^2, and the supporting frame C therefor, which is suspended intermediate the end frames b, to be supported thereby and to afford articulation therewith by means of end bolsters, c^1, which cooperate with the bolsters, b^6, and are connected with the center pin plate b^7, thereof to form the flexible joint, by the center pin plate, c^2.

The carriage of the engine unit may be formed of built up parts, but is preferably constructed in whole or in part as a unitary casting, comprising the frames b, the cylinders b^1, the bumper b^8, the crossties b^9, the bolster b^6, the center pin plate b^7, the combined tank support and cylinder saddle b^{12}, and vertical flanges associated with the crossties and bumper respectively, b^{10} and b^{11}. Side bearings b^{13}, may also be formed on the bolster b^6, adapted to cooperate with the side bearings c^{16} of the boiler bed C.

The frame or bed C, which forms an important feature of the present invention is formed of an integral steel casting, comprising integrally formed side members, c^3, and integrally formed transverse members, spanning the side members and integrally connected therewith.

While, from the broad aspect of the invention, the side and transverse members may be of various designs of construction and the transverse members variously disposed relative to the side members and to each other, in the preferred embodiment, the side members, c^3, extend throughout the entire length of the boiler unit, are of increased depth at their central portions, that is to say, fish-belly shaped, to provide greater strength, and are reinforced top and bottom by outwardly and inwardly extending integral flanges, c^4, between which top and bottom flanges are the webs, c^5, reduced in weight by a plurality of openings, c^6, of suitable arrangement and configurations to produce a reduction in weight while retaining the required strength, the openings being reinforced by the outwardly extending flanges, c^7.

In the present instance, the transverse members already mentioned are comprised of two box shaped members, c^1, serving as bolsters, each of which comprises an outer wall c^8, constituting the ends of the frame, an inner vertical wall, c^9, a top wall, c^{10}, in the same plane with the top face of the side members, c^3, and a bottom wall, c^{11}, inclined downwardly toward the center of the bolster. The four sides of the bolster are integrally formed and connected together and to the side members, c^3, and the top and bottom walls, c^{10} and c^{11}, extend slightly beyond the outer wall, c^8, to form strengthening flanges, c^{12}.

A cylindrical wall, c^{13}, of integral formation is disposed at the longitudinal center of each bolster, its upper edge being integrally joined to the top wall, c^{10}, and its lower por-

tion being extended through and integrally joined to the bottom wall, c^{11}. The cylindrical wall is provided with integral ribs, c^{14}, integrally joined to the top wall, c^{10}. The cylindrical wall affords a support for the center pin plate, c^2, which is preferably but not necessarily formed integrally therewith. The plate is shown with a peripheral strengthening flange and the usual centrally disposed opening c^{15}, for the center pin (not shown) which is passed through the aligned opening shown in the top wall, c^{10}, and extends through the cooperating center pin plate b^7 of the bolster, b^6, whereby the boiler unit is suspended between and articulated to the two end units, B—B, to provide flexible joints therewith. Side bearings, c^{16}, are integrally formed on each of the bolsters, c^1, for engagement, with the side bearings b^{13} formed on the bolsters, b^6, on the end units in the usual manner.

The smoke box end of the boiler is preferably supported on the bed C by the member c^{24} formed integrally therewith, and preferably secured to the boiler by means of a strap, c^{29} shown in part in Fig. 11. This end of the boiler may also be secured by the customary bolting as illustrated in Fig. 10. Only one means of securing the boiler need be employed. An integral web c^{28}, forms a means of stiffening and supporting the member c^{24}, and on this web are integrally formed the flanges c^{27}, in proximity to perforations c^{25} and c^{26}, formed in the web to permit the passage of conduits therethrough, said flanges c^{27} forming abutments or means for securing clamps adapted to support the conduits passing through the holes or perforations c^{25} and c^{26}.

A deck, c^{17}, is provided for the support of the cab, a^1, and coal bunker, a^2, at the rear end of the frame C, adjacent the corresponding bolster at that end. It comprises a platform, c^{18}, shown flush with and integrally joined to the side members, c^3, and top wall of the adjacent bolster. It is opened throughout its longitudinal center to provide a space for the coal conveyor (not shown), which is enclosed at the sides and bottom by the respective walls, c^{19}, and c^{20}, integrally formed and connected together and to the inner wall, c^9, of the adjacent bolster, the sides being also integrally joined to the platform, c^{18}, and to integral strengthening ribs, c^{21}, which are in turn integrally joined to the platform and to the side members, c^3.

As will be seen, the deck structure, by spanning the side members, affords additional transverse strengthening means, and on account of its relatively large longitudinal dimension and the manner of strengthening it with the transverse ribs, c^{21}, and side and bottom walls, c^{19} and c^{20}, it affords great strengthening means for the frame to resist the various forces which it is subjected to in service, and provides a girder admirably constructed for transmitting the drawbar pull of the engine units. The side members, bolsters, and deck being constructed with respective upper faces in the same horizontal plane, afford an admirable base upon which to support the boiler and its attendant parts which are secured thereto in any desired manner.

Vertical flanges or brackets c^{30}, are also formed on one end of the bed C, serving as supports for air-pumps or other apparatus that may be desirably mounted in such location. Back of the firebox end of the boiler, and also supported by the bed C and the platform c^{18} formed thereon, is shown a hopper for fuel, having the inclined side plates c^{32} secured to the vertical flanges c^{31}, which latter may be formed integrally with the platform c^{18}. Said vertical flanges c^{31} may also extend transversely and longitudinally of the platform c^{18}, as shown in Fig. 2, forming abutments for other plates, such as the plates c^{33}, which, when properly assembled, may form, in conjunction with the inclined hopper sides c^{32}, a water-tank for feed water for the boiler. The top plate of the platform c^{18} may be cut away or provided with openings c^{22} so that communication may be had between the box-shaped structure of the platform and the water-tank located above it, forming, in effect, a water bottom for the tank.

The frame is made, preferably of cast steel, in a single piece, with great strength and rigidity, but of relatively light construction; the arrangement of the parts being such that a large open space c^{23}, in the frame, is provided, leaving the bottom of the boiler proper exposed, where it can be easily reached for repairs.

The invention claimed and desired to be secured by Letters Patent, is:

1. A boiler-supporting frame for a locomotive comprising side members adapted for supporting the boiler thereupon, and a deck spanning the side members provided with a space extending longitudinally thereof adapted for a stoker conveyor, said deck being integrally formed and integrally connected to said side members.

2. An integral boiler-supporting frame for a locomotive, comprising integrally formed side members; integrally formed members spanning the side members and integrally connected therewith, including vertically disposed apertured webs; and flanges formed integral with the webs, adjacent to the apertures for supporting conduits passing through the apertures.

3. In a locomotive, the combination of two engine frames, each comprising side members, crossties, a bolster, a center-plate, and a saddle for cylinders, all formed integrally in a unitary structure; an integrally formed boiler-supporting frame; means flexibly con-

necting the boiler-supporting frame to the center plates of the engine frames and supporting it thereon; supply tanks mounted on the engine frames; and a fuel hopper mounted on the boiler-supporting frame.

4. In a locomotive, the combination of two engine frames, each comprising side frames, crossties, a bolster, a center-plate, and cylinders, all formed integrally; an integrally formed boiler-supporting frame; means flexibly connecting the boiler-supporting frame to the center plates of the engine frames and supporting it thereon; supply tanks mounted on the engine frames; and a fuel hopper mounted on the boiler-supporting frame.

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