Oct. 22, 1946. M. P. BLOMBERG ET AL 2,409,730

LOCOMOTIVE UNDERFRAME

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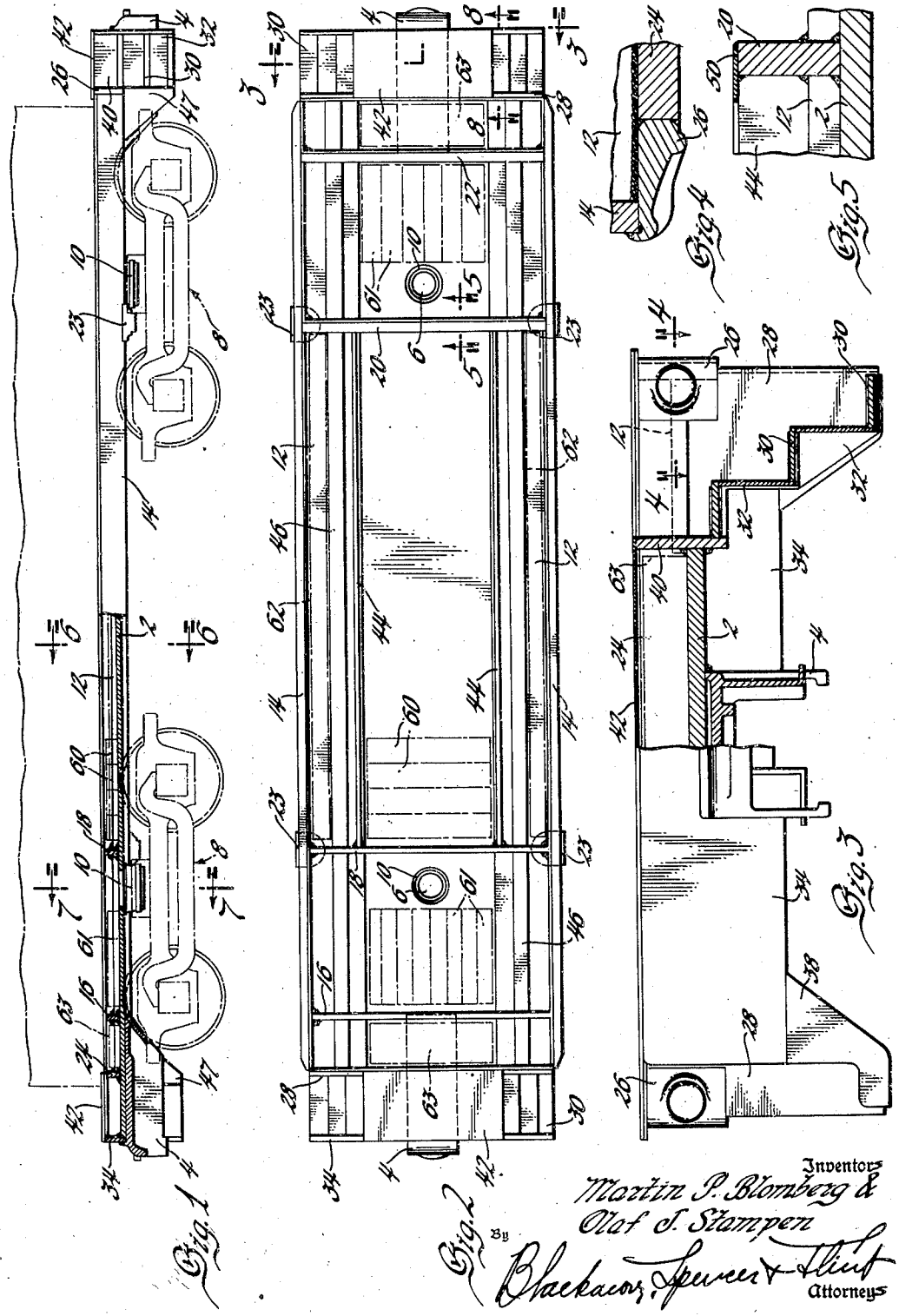


Fig. 1

Fig. 2

Fig. 4

Fig. 5

Fig. 3

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LOCOMOTIVE UNDERFRAME

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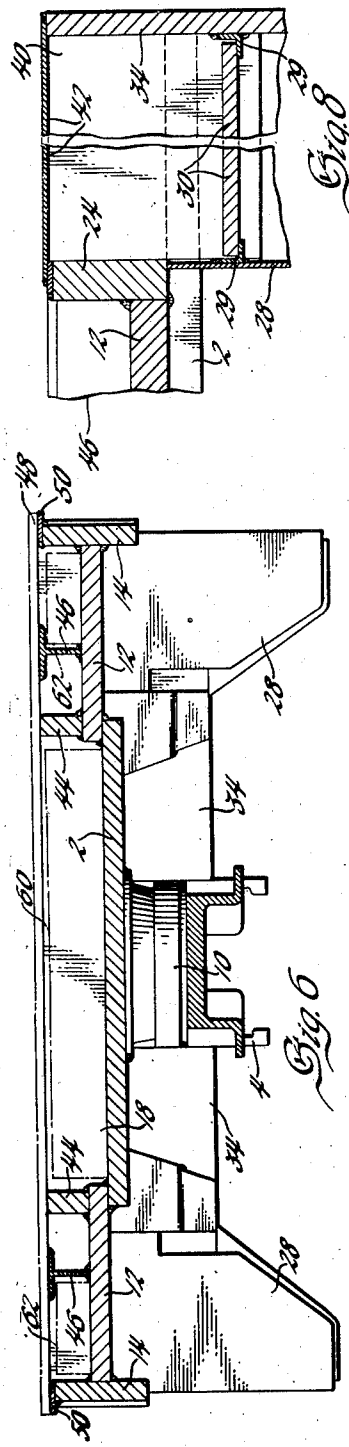


Fig. 6

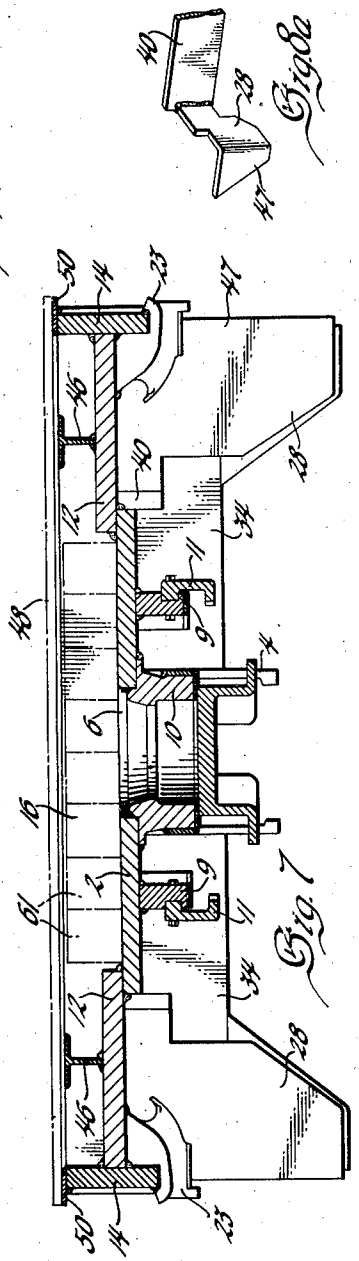


Fig. 7

Fig. 8a

Fig. 8

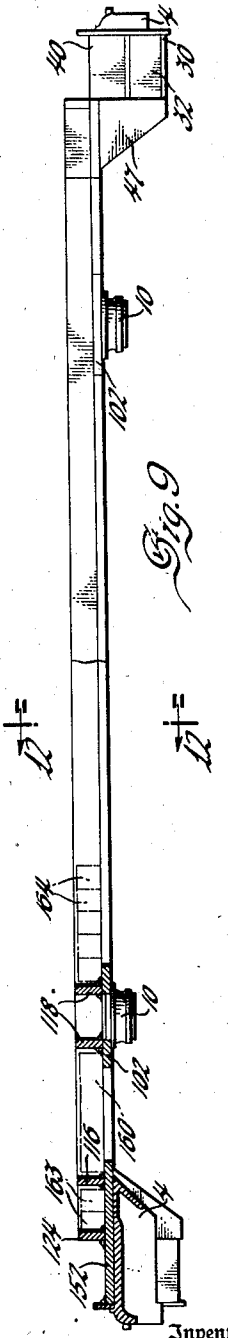


Fig. 9

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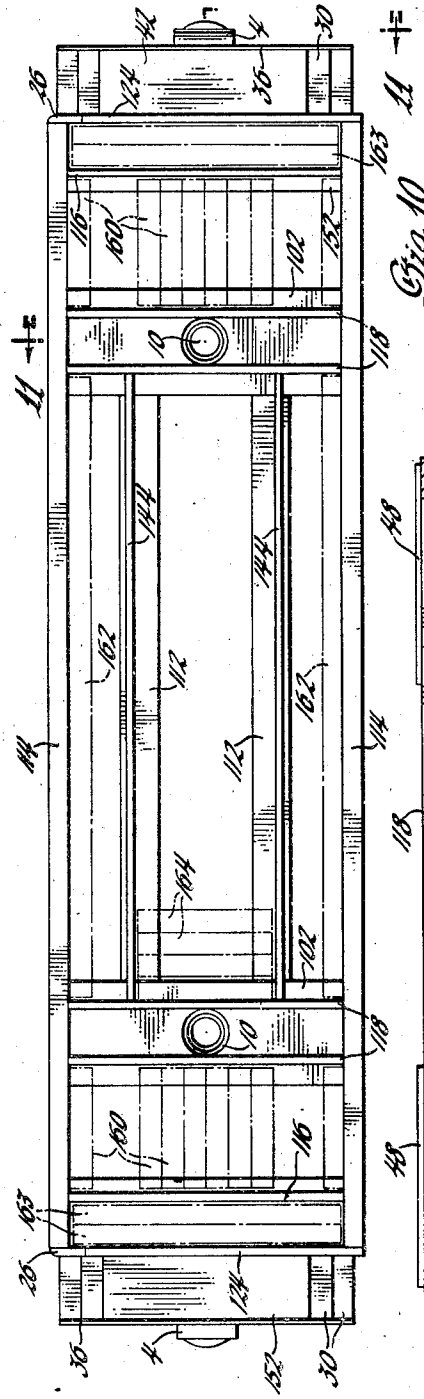


Fig. 10

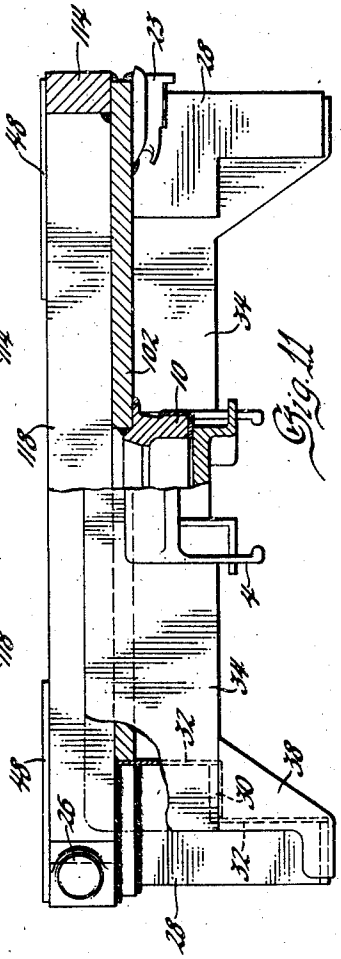


Fig. 11

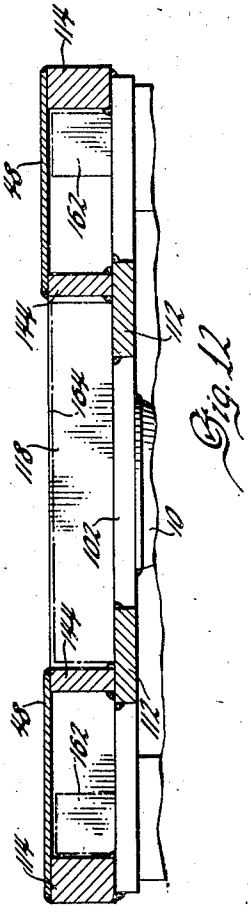


Fig. 12

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LOCOMOTIVE UNDERFRAME

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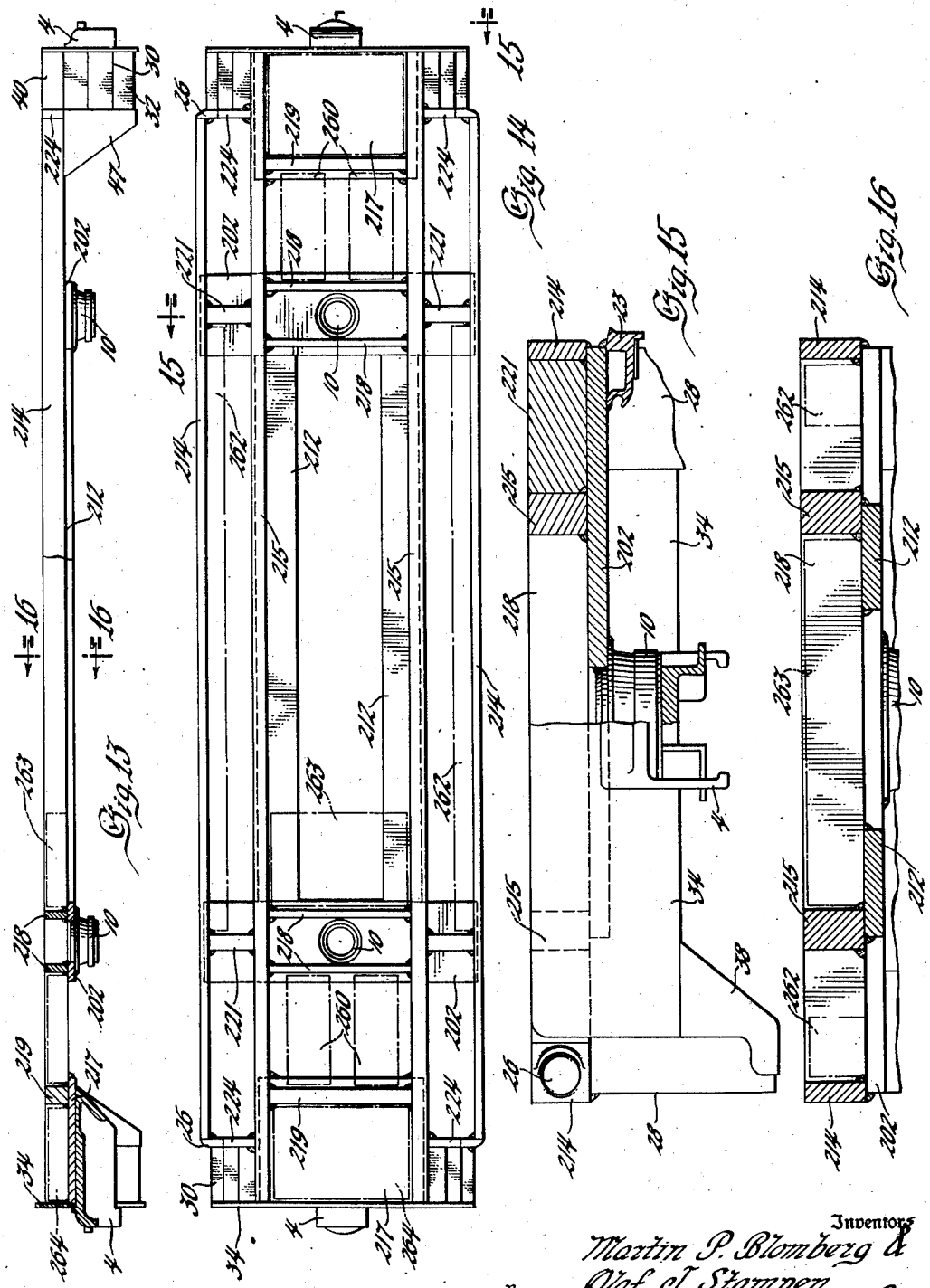


Fig. 13

Fig. 14

Fig. 15

Fig. 16

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UNITED STATES PATENT OFFICE

2,409,730

LOCOMOTIVE UNDERFRAME

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Application December 13, 1943, Serial No. 514,070

16 Claims. (Cl. 105—172)

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This invention relates to the construction of underframes for locomotives of the Diesel-electric type, and more particularly those employed for switching purposes.

Such locomotives are built in several different sizes, depending upon the amount of horsepower they are intended to produce, usually being rated as 600 H. P., 1000 H. P., and higher capacity locomotives. Heretofore it has been the practice to design and build different types of underframes for each size of locomotive, for one reason because it is necessary to put considerably more weight into a higher horsepower locomotive than in a lower rated one, in order to provide the necessary traction to properly utilize the additional power when starting or pulling heavy loads or up grades. Also, it has generally been the practice to produce such underframes by the casting method, which necessitated the building of separate patterns for each size of locomotive underframe, and required different jigs and equipment for machining each size of underframe. This of course increased greatly the cost of manufacture of such underframes, and slowed down the rate of production thereof.

It is therefore an object of our invention to provide an underframe structure which may be made the same size and design for several different rated capacity Diesel-electric switching locomotives, and which may be used as it is built for the lowest powered type, and is adapted to have weight added to it in the form of ballast bars when it is to be used for a higher powered locomotive, the amount of weight added being variable to produce just the desired amount of traction for the power available. Since only one size of underframe need be built, production of it may be standardized, resulting in greatly reduced costs of production, and since it is a further object of the invention to build such underframes of steel plates and bars welded together, rather than to make them of castings, a still further reduction in the cost of making them is brought about, and the rate at which they may be produced is greatly speeded up.

The weight added in the form of ballast bars may also be utilized to balance the amount of load carried by each of the trucks. This may be accomplished by placing more of the ballast bars in the underframe at the lighter end of the locomotive.

Furthermore, since the underframes are constructed of steel plates and bars welded together, sub-assemblies consisting of certain groups of these plates and bars may be built up and joined

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together at any convenient location and on special jigs and fixtures designed to insure greater accuracy and to speed up production, and thereafter these various sub-assemblies may be brought together and welded to each other to produce the complete underframe.

Further objects of the invention will be apparent upon reference to the following description and accompanying drawings, in which:

Fig. 1 is a side elevational view of a locomotive underframe embodying our invention, with parts broken away to show certain features of the structure in section;

Fig. 2 is a plan view of the construction shown in Fig. 1;

Fig. 3 is a sectional view, taken on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view, taken on the line 4—4 of Fig. 3;

Fig. 5 is a sectional view, taken on the line 5—5 of Fig. 2;

Fig. 6 is a sectional view, taken on the line 6—6 of Fig. 1;

Fig. 7 is a sectional view, taken on the line 7—7 of Fig. 1;

Fig. 8 is a sectional view, taken on the line 8—8 of Fig. 2;

Fig. 8a is a view showing one of the details of construction in perspective;

Fig. 9 is a view similar to Fig. 1, but showing a modified form of construction;

Fig. 10 is a plan view of the form of structure shown in Fig. 9;

Fig. 11 is a sectional view, taken on the line 11—11 of Fig. 10;

Fig. 12 is a sectional view, taken on the line 12—12 of Fig. 9;

Fig. 13 is a view similar to Fig. 1, but showing another modified form of construction embodying our invention;

Fig. 14 is a plan view of the construction shown in Fig. 13;

Fig. 15 is a sectional view, taken on the line 15—15 of Fig. 14;

Fig. 16 is a sectional view taken on the line 16—16 of Fig. 13.

The reference numeral 2 indicates a relatively wide and thick base plate which extends the entire length of the locomotive, but which is not as wide as the underframe, being of the width indicated in Figs. 3, 6 and 7. Connected to the lower surface of this plate at each end thereof by welding is a coupler pocket 4. Circular openings 6 are formed through the plate in line with the centers of the trucks which are indicated generally

at 8, and which are shown in Fig. 1 in dot-and-dash lines since they form no part of the present invention. Center bearing members 10, which serve to connect the trucks to the underframe in the usual manner, project into these openings and are welded therein and to the lower surface of the plate. 9 are side bearing members welded to the under surface of plate 2, and 11 are stops bolted thereto, which serve to limit the swiveling movement of the trucks relative to the underframe and also interlock the body and trucks to prevent the separation of the trucks from the body when the latter is lifted by a crane or jack, or in case of a derailment.

As best shown in Figs. 2, 6 and 7, resting on top of the plate 2 at each side thereof and welded to its edges are relatively narrow base plates 12, which extend almost the full length of the underframe, terminating short of the ends thereof to provide room for steps at each corner of the underframe, which step construction will be described presently. Abutting against the outer side edges of the plates 12 and welded thereto are vertically extending side members 14, which are of the same length as the plates 12. Transversely extending members 16, 18, 20 and 22 are welded at their ends to the side members 14, and have their lower edges welded to the plates 2 and 12. Jacking pads 23, which are provided to accommodate a jack or a crane cable used to lift the locomotive, are welded to the underside of the plates 12 and the side members 14 adjacent to the transverse center line of each truck.

Secured to the end edges of the plates 12 and extending almost the full width of the underframe at each end thereof are end members 24, there being push pole pockets 26 welded to the ends of these members, the opposite side of such pockets being welded to the ends of the side members 14 as shown in Fig. 4. Secured to the lower edge of the members 24 are plates 26 which have angle members 29 welded to them to support horizontally extending tread plates 30 and vertically extending riser plates 32 which form the steps. As best shown in Fig. 3, vertically extending end plates 34 are cut to fit around the draft gear pockets 4 and are welded to the ends of the plate 2.

The tread and riser plates of the steps are supported at their opposite end by being secured to the end plates 34. A plate 38 serving to support the lowermost tread and riser plate is welded to the lower edge of the end plate adjacent the outer end thereof, as shown in Fig. 3, or this may be formed as an integral part of the end plate 34. A relatively heavy plate 40 extends from the end plate to the member 24, being welded at each end to these members and serving as the top riser of the steps. Platform plates 42 are supported on top of the plates 40, the end plates 34 and the members 24, being welded in position thereon.

As best shown in Figs. 2 and 6, relatively heavy bars 44 extend between the cross members 18 and 20, having their ends welded thereto and their lower edges welded to the upper surfaces of the plates 12 adjacent the inner edges thereof. T-shaped members 46 extend between the cross members 16, 18, 20 and 22, being welded thereto and having their lower edges welded to the upper surface of the plates 12 adjacent the middle portion thereof. Adjacent the ends of the side members 14, triangular portions 47 bent from the plate 28, as shown in Fig. 8a, are welded to the lower edge of the side members to form gusset sections serving to brace the step structure.

Floor plates 48 rest on top of the bars 44, the T-members 46 and strips 50 welded to the upper edges of the side members 14. These plates may extend over the entire area of the underframe, or may only cover certain portions thereof, leaving other portions open to permit supporting the engine, generator and other heavy equipment directly on the plate 2. In the sections where the floor plates may have to be removed to permit access to piping or wiring, the plates will be secured to the members they are supported on by screws or other fastening means, while in the positions where they do not need to be removable, they may be welded to the supporting members.

As shown in Figs. 6 and 7, the strips 50 project outwardly beyond the side members 14. This serves to provide a flange or ledge to which grab irons or railings may be bolted, and in addition results in bringing the outer faces of the side members well within the over-all width of the locomotive, thereby eliminating the necessity for machining these faces.

In the form of the invention shown in Figs. 9 to 12, since several of the elements used are substantially the same as those in that just described, they are given the same reference numerals in Figs. 9 to 12, and it will be understood that they are assembled and function in the manner previously described. In this construction, the center bearings 10 are mounted in transversely and horizontally extending relatively thick base plates 102, to the upper surface of which are welded transversely extending members 118 spaced on opposite sides of the center bearings. The plates 102 are tied together by heavy side members 114 to which the plates 102 and members 118 are welded at their ends, and by longitudinally extending base plates 112 and members 144, the ends of the former being welded to the side edges of the plates 102, and the ends of the members 144 being welded to the side faces of the members 118, the lower edges of the members 144 being welded to both the plates 102 and 112.

Adjacent the ends of the underframe, transversely extending end members 124 are provided, and these are welded to the ends of the side members 114. Transversely extending base plates 152 are welded both to the side bars and to members 124, and extend outwardly between the steps to the end plates 34. The plate 152 may be formed of a single piece, the corners of which are cut out to accommodate the steps, or may be formed of two plates of different lengths welded together. The construction of the steps and associated structure is substantially the same as in the previously described form. Transversely extending members 116 have their lower edges welded to the plates 152 and their ends welded to the side members 114.

In the form of the invention illustrated in Figs. 13 and 16, the same reference numerals are again used to refer to elements which are substantially the same as those used in the other two forms previously described. Here the heavy transverse base plates 202 carrying the center bearings 10 have heavy longitudinally extending members 215 welded to their upper surfaces. These members are spaced inwardly from the ends of the plates 202, and extend the entire length of the underframe, there being longitudinally extending base plates 212 welded to the lower surfaces of these members, the ends of the plates 212 being welded to the plates 202. Spaced on opposite sides of the center bearing are transversely extending members 218, the lower edges of which are welded to

the plates 202 and the ends of which are welded to the members 215. Side members 214 are welded to the upper surfaces of the plates 202 at the ends thereof and extend to the region of the steps, where they have the push pole pockets 26 welded to them, short end members 224 being welded at one end to the push pole pockets, the opposite end of these members being welded to the members 215.

Adjacent the ends of the underframe, horizontally extending base plates 217 are welded to the lower surfaces of the members 215, and serve to support the end plates 34 and the step structure, which is of substantially the same construction as that previously described. Heavy transverse members 219 have their lower surfaces welded to the top of the plate 217 and their ends welded to the members 215. Relatively short heavy members 221 are welded to the top of the plates 202 adjacent the center thereof, one end of each of these members being welded to the side members 214 and the other to the members 215.

In each of the forms of underframe described, certain sections may be put together as sub-assemblies, the parts thereof being held in proper relation to each other on jigs by suitable fixtures while they are being welded toegther. This permits distributing portions of the work to various parts of the shop and makes it possible to employ as many men on the job as desired, which would not be the case if the whole underframe had to be assembled piece by piece in one place. After the various sub-assemblies have been made, they are brought together, and may be quickly welded to each other to form the complete underframe, thereby reducing the amount of labor required and lowering considerably the cost of production and speeding up the rate thereof.

It will be noted that in all three forms of underframe described, there are numerous longitudinally and transversely extending passageways which are either open at their tops or are covered by relatively light floor plates which may easily be removed, which passageways may be utilized to house the piping and wiring of the locomotive, thus simplifying the installation of such equipment and making it readily accessible for inspection or repairs. Since many of these passageways are open at their tops, the piping or wiring carried in them may be readily brought up to the power equipment or controls without requiring the drilling of holes through the floor, as is the case with cast underframe structures.

Each of the forms of underframe structure disclosed is intended for use when constructed as described for the lowest rated horsepower locomotive of a given range, the construction being designed to have the proper amount of weight to produce the necessary traction for the available power. For example, the structures shown are designed for use on 600 H. P. switching locomotives. They may also be used, however, on 1000 H. P. or even larger switching locomotives by simply adding sufficient weight to them to produce the necessary amount of traction to take care of the additional power.

In the form of underframe shown in Figs. 1 to 8, this weight may be added in the form of ballast consisting of billets 60 of relatively low cost iron or steel placed on top of the plate 2 between the members 44, and billets 61 placed between the members 16—18 and 20—22. Relatively long billets 62 may be placed in the spaces between the T-members 46 and the side members 14, and other billets 63 inserted in the spaces between the members 24 and the members 16 and 22. All of these billets added to increase the weight may be secured in position by welding or in any other suitable manner, to prevent them from shifting during operation of the locomotive.

Similarly, in the underframe structure shown in Figs. 9 to 12, billets 160 may be placed between the members 116 and 118, their ends resting upon the plates 102 and 152, and long billets 162 may be placed adjacent the side members 114, being supported at each end upon the plates 102. Other billets 163 may be inserted in the spaces between the members 116 and 124, being supported on top of the plates 152, and shorter billets 164 may be placed between the members 144, their ends resting upon the plates 112.

In the form shown in Figs. 13 to 16, the billets 260 may be placed between the members 218 and 219, their ends resting upon the plates 202 and 217, billets 262 being disposed alongside the side members 214 with their ends supported upon the plates 202, and other billets 263 may be placed between the members 215 with their ends resting upon the plates 212. If additional weight is desired, other billets 264 may be placed on top of the plates 217 between the members 215 at each end of the underframe.

As shown in the drawings, all of the aforementioned billets are made somewhat smaller than the spaces they are intended to fit into, because they are merely rough pieces which do not have finished surfaces and consequently may vary considerably in size and shape. By having them of a nominal size, quite a bit smaller than the spaces they are adapted to be received in, billets which run oversize or which are of slightly curved shape will fit into the spaces provided for them in the underframe structure.

Another purpose the ballast elements may be used for is to balance the weight on the trucks of the locomotive. Since it is usually considered desirable to have approximately the same amount of weight on each of the trucks, if it is found that with a particular arrangement of power apparatus and equipment, there is considerably more weight at one end of the locomotive than at the other, the billets may be shifted toward the lighter end in order that the weight distribution may be equalized.

It will be seen that we have thus provided alternative forms of underframe structures, any of which may be built in quantity production with resulting lower costs, and which may be used for locomotives of different horsepower ratings, simply by adding the necessary amounts of ballast in spaces available for that purpose.

While specific embodiments of our invention have been shown and described, it will be understood that various changes in design or assembly of the parts may be made without departing from the spirit and scope of the appended claims.

We claim:

1. In an underframe structure, the combination of a plurality of horizontally extending base plates having their contacting edge portions welded together, center bearings secured to certain of said base plates, longitudinally extending members welded to the edges of certain of said base plates, transversely extending end and intermediate members welded to certain of said base plates, said intermediate members having their end edges welded to the longitudinally extending members.

2. In an underframe structure, the combination of a plurality of horizontally extending base

plates having certain of their adjacent edge portions welded together, longitudinally extending members welded to some of said base plates, transversely extending end and intermediate members welded to some of said base plates, and floor plates resting on top of the longitudinally extending and the end and intermediate members and secured thereto.

3. In an underframe structure, the combination of a plurality of horizontally extending base plates having their contacting edge portions welded together, longitudinally extending members welded to the edges of some of said base plates, transversely extending end members welded to some of said base plates, and step structures located inside of said end members at the corners of the underframe, said step structures being supported by said base plates and said end members.

4. In an underframe structure, the combination of a plurality of horizontally extending base plates having their contacting edge portions welded together, transversely extending end members welded to some of said base plates, and coupler pockets welded to and supported solely from said base plates and end members.

5. In an underframe structure, the combination of a plurality of horizontally extending base plates having their contacting edge portions welded together, side members welded to the edges of the outermost base plates, transversely extending end and intermediate members welded to some of said base plates, and longitudinally extending bracing members spaced inwardly from the side members and welded to certain of said transversely extending intermediate members.

6. In a locomotive underframe structure, the combination of a plurality of horizontally extending base plates having their contacting edge portions welded together, longitudinally extending members welded to the edges of some of said base plates, and transversely extending end and spaced intermediate members welded to some of said base plates, the spaces between the longitudinally extending, end and intermediate members being adapted to receive ballast bars which may be added to increase the weight of the locomotive.

7. In a locomotive underframe structure, the combination of a plurality of horizontally extending base plates having their contacting portions welded together, longitudinally extending members welded to the edges of some of said base plates, transversely extending end and spaced intermediate members welded to some of said base plates, said intermediate members being welded to the longitudinally extending members, the spaces between the longitudinally extending, end and intermediate members being adapted to receive billets which may be added to increase the weight of the locomotive, said billets being supported on top of said base plates.

8. In a locomotive underframe structure, the combination of a plurality of horizontally extending base plates having their contacting edge portions welded together, side members welded to the edges of the outermost base plates, transversely extending end members welded to the ends of some of said base plates, spaced intermediate members welded to the upper surfaces of the base plates and to the side members, the spaces between the side, end and intermediate members being adapted to receive ballast bars which may be added to increase the weight of the locomotive, and floor plates secured to the upper surfaces of the side, end and intermediate members serving to cover the spaces in which the ballast bars are placed.

9. In an underframe structure, the combination of a horizontally extending main base plate, supplementary base plates located at each side of the main base plate and resting on top of and welded to the edges thereof, side members welded to the outer edges of the supplementary base plates, and transversely extending members welded to the upper surfaces of both the main and supplementary base plates, the end edges of said transversely extending members being welded to the side members.

10. In an underframe structure, the combination of a horizontally extending main base plate, supplementary base plates located at each side of the main base plate and resting on top of and welded to the edges thereof, side members welded to the outer edges of the supplementary base plates, transversely extending members welded to the upper surfaces of both the main and supplementary base plates, the end edges of said transversely extending members being welded to the side members, and longitudinally extending members spaced inwardly from the side members and being welded to the upper surfaces of the supplementary base plates and to the intermediate members.

11. In an underframe structure, the combination of a horizontally extending main base plate, supplementary base plates located at each side of the main base plate and resting on top of and welded to the edges thereof, side members welded to the outer edges of the supplementary base plates, transversely extending members welded to the upper surfaces of both the main and supplementary base plates and to said side members, said main base plate extending beyond said transversely extending members, end plates welded to the outer ends of said main base plate, and step structures located at each side of the underframe between said transversely extending members and said end plates and supported thereby.

12. In an underframe structure, the combination of a plurality of transversely extending plates, center bearings carried by two of said plates, side members welded to the outer ends of said plates, transversely extending members welded to the upper surfaces of said plates and having their ends welded to the side members, longitudinally extending plates having their ends welded to the plates carrying the center bearings, and longitudinally extending members welded to the upper surfaces of the longitudinally extending plates and having their ends welded to the adjacent transverse members.

13. In a locomotive underframe structure, the combination of a pair of transversely extending base plates carrying center bearings, end base plates spaced from the first named plates, side members welded to the ends of all of the base plates, and transversely extending members welded to the upper surfaces of the base plates, the spaces between the side and transversely extending members being adapted to receive ballast bars which may be added when it is desired to increase the weight of the locomotive, said bars being supported on said base plates.

14. In an underframe structure, the combination of a pair of transversely extending plates carrying center bearings, side members welded to the outer ends of said plates, longitudinally extending bracing members spaced inwardly from the side members, said bracing members ex-

tending the full length of the underframe and being welded to the upper surfaces of said plates, and longitudinally extending plates welded to the lower surfaces of said bracing members between the transversely extending plates and being welded to the latter.

15. In an underframe structure, the combination of a pair of horizontally extending base plates located at opposite ends of the underframe, a pair of horizontally and transversely extending intermediate base plates carrying center bearings, side members welded to the upper end surfaces of said intermediate base plates, longitudinally extending bracing members spaced inwardly from the side members and welded to the upper surfaces of said end and intermediate base plates whereby ballast bars may be supported at the ends on said base plates and alongside said side members and said longitudinally extending bracing members.

16. In a locomotive underframe structure, the

combination of a pair of base plates located at opposite ends of the underframe, a pair of transversely extending intermediate base plates carrying center bearings, side members welded to the ends of said intermediate base plates, longitudinally extending bracing members spaced inwardly from the side members and welded to the upper surfaces of said end and intermediate base plates, and transversely extending members welded to the upper surfaces of the end and intermediate base plates and having their ends welded to the bracing members, the spaces between the latter and the transverse members being adapted to receive ballast bars which may be added when it is desired to increase the weight of the locomotive, said ballast bars being supported on top of said end and intermediate base plates.

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