July 22, 1958 C. WEBER ET AL 2,844,325

RAILWAY TRACK CONSTRUCTION

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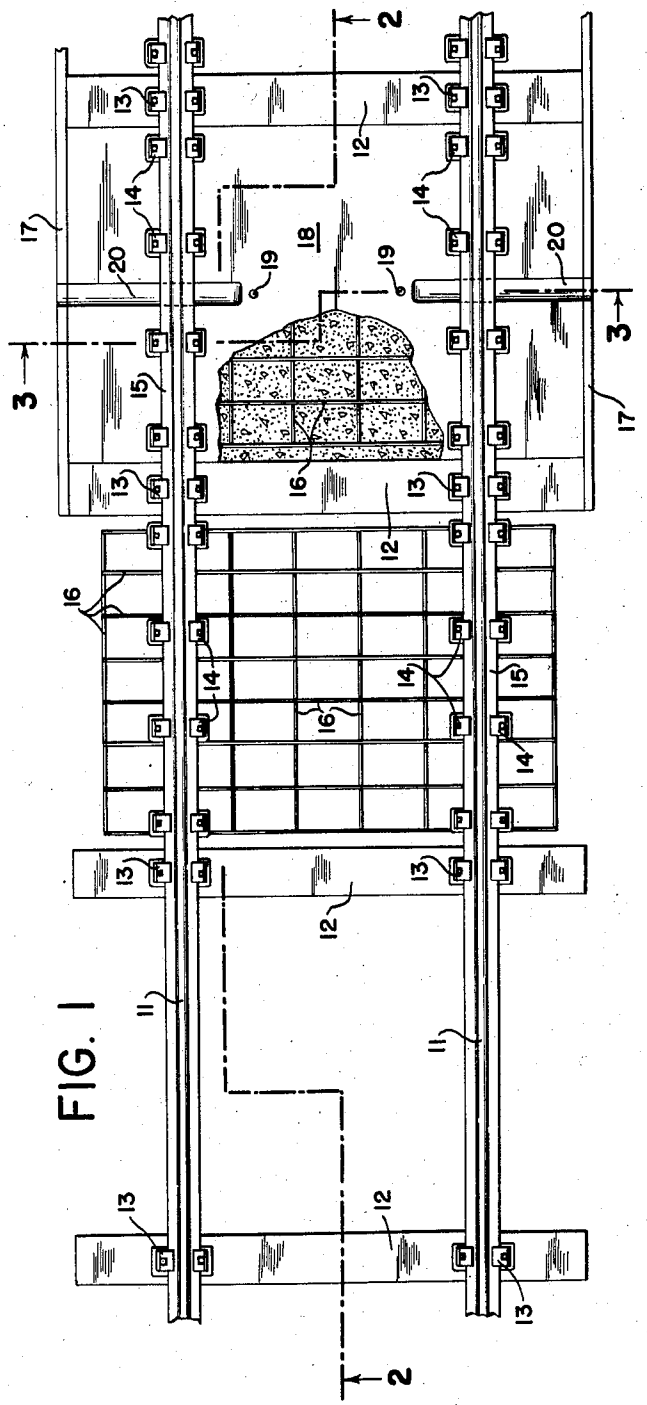

FIG. 1

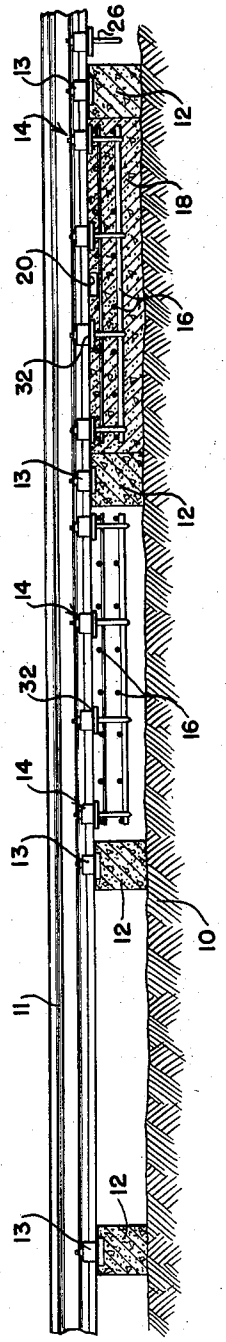

FIG. 2

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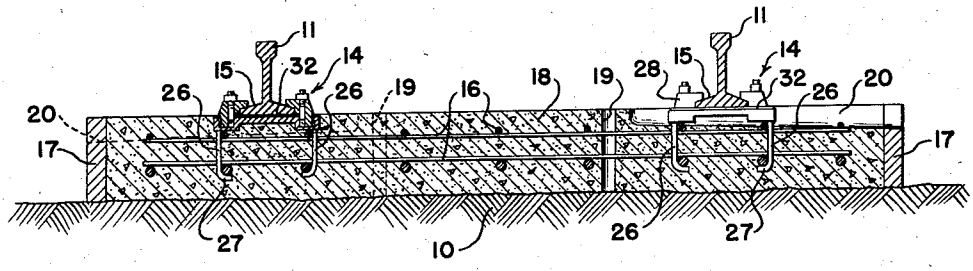
FIG. 3



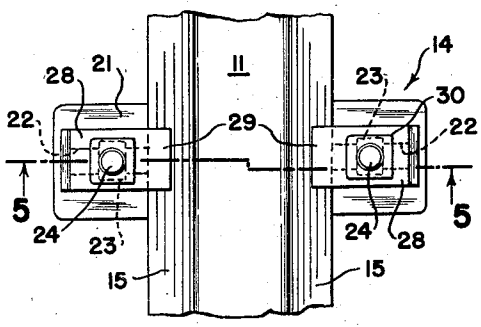
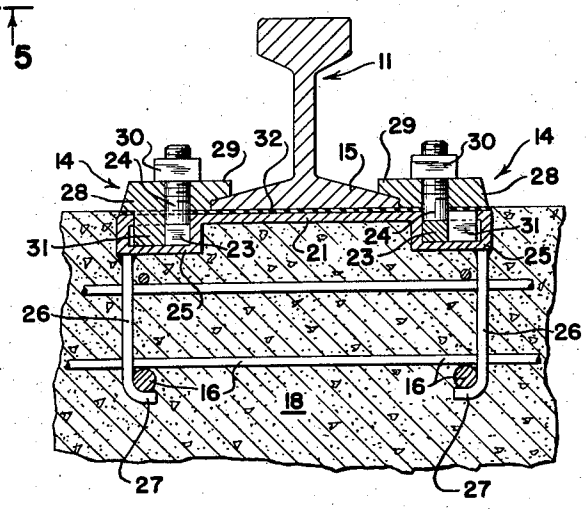


FIG. 4

FIG. 5



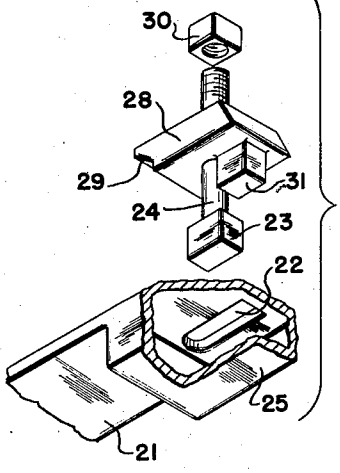


FIG. 6

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RAILWAY TRACK CONSTRUCTION

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Application January 13, 1955, Serial No. 481,585

4 Claims. (Cl. 238—7)

This invention relates to the construction of railway tracks, and is particularly directed to the provision of an improved track construction in which the rails are supported on concrete rather than on conventional wooden crossties.

In our copending application Serial No. 457,406, filed September 21, 1954, we have described an improved railway track in which prefabricated concrete slabs are used in place of wooden crossties to support the rails and hold them at the correct gauge spacing. Tracks thus constructed are available for use substantially as soon as the rails have been laid. However, to construct track in this fashion, provision must be made for precasting the concrete slabs, and they must be transported from the place where they are made to the place where they are installed on the railway roadbed. Our present invention is directed to an alternative method of railway track construction which disposes of the need for precasting and handling large concrete rail-supporting slabs, by providing for the casting of such slabs in place.

In accordance with the method of our present invention, the railway roadbed is first prepared, and rails are laid thereon in desired alignment. For the purpose of temporarily supporting the rails, widely spaced rail supports are advantageously emplaced on the roadbed, and the rails are laid on such supports in desired alignment and at the desired gauge spacing. Rail chairs are then attached to the underside of the rail bases, and concrete reinforcing elements are secured to the rail chairs, between the preliminary rail supports. Thereafter concrete is cast on to the roadbed about the reinforcing elements and about the rail chairs, and is allowed to harden.

The railway track of the invention thus comprises rails laid in desired alignment with the underside of the rail bases seated on metallic rail chairs, the rail chairs in turn being secured to concrete reinforcing elements about which a slab of hardened concrete has been cast. The concrete is preferably cast to such a depth that its upper surface is at the level of the bottom surfaces of the rail bases, so that in the completed track the rails in the spaces between the rail chairs are supported directly by the concrete.

Advantageously a thin layer of resilient material is positioned directly under each rail base, between it and the surface of the rail chairs and concrete, to minimize vibratory stresses on the track structure and to deaden traffic noises.

The rail chair by which the rail is attached to the underlying reinforced concrete support is itself an element of our invention. It comprises a metallic chair plate having a slot formed in each of its end portions, and having anchor legs projecting downwardly for anchoring it to the concrete slab. The rails are secured to the rail chairs by means of hammerhead bolts having heads of such dimensions as to be capable of insertion through the slots of said plate, and, upon turning, of becoming interlocked therewith, and by rail clips adapted to engage

against the rail bases and to be clamped thereagainst by said bolts.

The foregoing and other features of our invention are described below with reference to the accompanying drawings, showing a preferred embodiment of the invention, in which—

Fig. 1 is a plan of a railway track according to the invention, showing it at various stages of construction;

Fig. 2 is a section taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a section taken substantially along the line 3—3 of Fig. 1;

Fig. 4 is a plan view on an enlarged scale of a rail attached to a rail chair assembly;

Fig. 5 is a section taken substantially along the line 5—5 of Fig. 4; and

Fig. 6 is a perspective showing the chair plate with parts broken away and with the bolt and clip about to be secured thereto.

The method of constructing a railway track in accordance with the invention is best shown in Figs. 1 to 3. When the roadbed **10** with required cuts and fills, culverts, bridges, tunnels, and drainage provisions has been completed and prepared for reception of the track structure by customary construction methods, the rails **11** are laid in place on rail supports **12**. The supports in the form shown in the drawings resemble conventional crossties except that they are preferably made of concrete. They are placed preferably at the greatest distance apart that the stiffness of the rails will permit, so that the rails will not sag to any significant extent between them. The rails are attached to the supports at the correct spoor gauge and are then adjusted true to line and grade for the permanent track position. Fastenings **13** by which the rails are attached to the supports **12** may be of the same design as the chair plate assemblies described below and may be embedded therein when the supports are made.

After the rails have been laid as described, rail chair assemblies **14** are attached to the rail bases **15** at suitable relatively closely spaced intervals between the supports **12**. A network of steel reinforcing elements **16** is attached to the rail chair assemblies, beneath the rails **11** and spanning the gauge space between them. Side forms **17** are set in place, and concrete **18** is cast about the reinforcing elements **16** to such a depth that its upper surface comes substantially to the level of the undersurfaces of the rail bases **15**. Small round holes **19** preferably are formed in the concrete to permit future adjustments of grade by pressure injection methods, as described in our aforementioned application Serial No. 457,406, as where settlements might occur in unstable ground formations. Also, drainage channels **20** extending under the rail bases **15** are formed in the concrete at suitable intervals, to permit rain and melting snow to drain from between the rails of the completed track. When the concrete has hardened, the side forms **17** may be removed. The supports **12**, however, are preferably left in place as a permanent part of the track structure.

In the completed track, the rails are securely attached to the concrete **18** by the chair assemblies **14**, and are well supported by the chair plates and by the concrete itself, for between the chair plates **14** the rails bear on the upper surface of the concrete.

The chair assemblies **14** by which the rails are attached to the supporting concrete are best shown in Figs. 4 to 6. Each of these assemblies comprises a strong metal chair plate **21**, formed with a rectangular slot **22** in each of its end portions. The chair plate **20** is substantially longer than the rail base **12** is wide, and the slots lie on either side of the rail base when the rail is properly seated on the chair plate. The length and width of the slots **22**

correspond to the dimensions of the heads 23 of hammerhead bolts 24: the width of the slots is only slightly greater than the width of the bolt heads 23 (the width of the head being substantially equal to the diameter of the bolt shank), and the length of the slot is a little greater than the length of the bolt head. Thus the head 23 of the bolt may be inserted through the slot 22, and then by turning the bolt through 90°, the bolt may be interlocked with the chair plate so that it cannot be withdrawn again through the slot. A housing 25 surrounds the slot 22 on the undersurface of the chair plate 21, so that when the concrete 18 is cast about the chair plate as described above, the space in which the head of the bolt 23 is received when inserted through the slot 22 does not become obstructed by the concrete.

Chair anchor legs 26 are securely attached to the chair plate 21, and extend downwardly therefrom. These legs advantageously are bent over at their lower end portions, as indicated at 27, to form hooks adapted to engage reinforcing elements 16 embedded in the concrete. These bent-over portions of the anchor legs may also serve to support the network of reinforcing elements 16 when the latter is mounted in place preparatory to pouring the concrete, as described above.

Rail clips 28 are provided to fasten the rails to the chair plates. Each of these clips is formed with a hole through which the bolt shank may extend, and with a lip 29 adapted to engage the rail base 15. When a nut 30 is screwed on the bolt 24, and is turned down against the upper surface of the rail clip 28, the latter clamps the rail securely against the chair plate.

A lug 31 extends downwardly from the undersurface of the rail clip 28, directly behind the hole through which the bolt extends. This lug is of a width about equal to the width of the slot 22, and it extends through the slot behind the bolt when the latter has been mounted in place. After the bolt has been interlocked with the chair plate in the manner described, and the rail clip 28 has been placed on the bolt with its lug 31 projecting through the slot 22, the lug prevents the bolt from being turned sufficiently to enable the bolt to disengage from the chair plate. Thereby accidental turning of the bolt in the slot to a position permitting it to be withdrawn from the chair plate is prevented.

Rail clips 28 of various sizes are provided to accommodate different sizes of rail bases, and to permit adjustment of the rails on the chair plates, as for adjusting spoor gauges in track curves.

Worn out or defective rails, bolts or clips can easily be removed and replaced. To do so, the nuts 30 are backed off, the rail clips are lifted from the bolts, and the bolts can then be turned to permit removal from the chair plates.

For the absorption of vibratory stresses on the concrete surface under the rails, and to reduce surface traffic noises, thin strips 32 of resilient and preferably sound deadening material are advantageously placed under the rails throughout their length and under the rail clips. Various materials, such as rubber, rubberized fabric, and various weather- and moisture-resistant fibrous materials, may be used for making the strips 32. It may be desired to employ such strips on main lines and other frequently used tracks, and to omit them from yard tracks, sidings and other tracks carrying only infrequently or very slow traffic. The insulating strips 32 may be set in place against the undersurface of the rail bases either before or after the concrete 18 is cast in place; but preferably, in order to insure the best possible bearing of the rails against the concrete, it is installed after the concrete has been poured and allowed to harden.

Conventional expansion joints may be provided as deemed necessary; and other conventional attachments and appurtenances may likewise be provided as required or deemed advisable.

The outstanding advantages of the new concrete railway track construction are as follows:

The reinforced concrete slab foundation supporting the rails for their entire length provides uniform distribution of all service loads, and it assures improved safety of railway operation while achieving technical and economical advantages which cannot be obtained by any other known method.

The concrete track structure is permanent, and is not affected by severe climatic conditions, fungus growth, termites or other destructive influences. No weeds can grow within the track area.

The concrete slab covers the whole area like a waterproof blanket. Storm water cannot enter freely below the slab, with the result that damage or inconveniences due to unstable ground conditions, where such conditions are caused by variable moisture content of the supporting ground and by frost, are eliminated. The greatest possible protection against vertical or horizontal misalignment of the rails is provided.

The uniform distribution of all dead and live loads over the entire track area provides for the greatest possible track stability by drastic reduction of maximum ground pressure. Applying the greatest possible traffic loads, with locomotive wheel loads of 15 tons on standard gauge track, produces a uniformly distributed ground pressure of less than 0.6 ton per square foot of directly affected area, which is about one third of the soil pressure under wooden ties.

The lighter uniform pressure of the service loads substantially prevents subsidence of the track structure, except in such cases as recently filled ground or unstable deep subgrade compressible soils. Where settlements occur, correction by well known soil stabilization or pressure grout jacking methods can conveniently be made at low cost.

The strong rail chairs deeply embedded in concrete and securely connected with the steel reinforcing elements of the slabs have no parts protruding over the surface that could be damaged during the construction period, and they become essentially integral parts of the concrete slab. The hammerhead bolts are securely held by the rail chairs and are safely locked in correct immovable position, and thus they provide for secure fastening of the rails in place by the rail clips. Track bolts and clips are, however, easily removable to permit replacement of worn or damaged rails.

Our new method of railway concrete track construction eliminates the use of wood ties with all their accessories of rail plates, spikes, anticreep devices and other fittings. Entirely eliminated also are stone or cinder ballast materials, and labor to place and maintain it. The continuous support of the rails on resilient insulation, and the uniform distribution of greatly decreased ground pressures from live and dead loads, permit the use of lighter weight rails than could otherwise be employed, and assure long rail life by elimination of bending and flexing stresses. Spreading of rails is substantially impossible. The great weight and stability of the permanent track structure eliminates rail creeping sections.

Economic advantages, as compared with customary wood tie railway track construction, accrue from combined savings of costs of track construction, maintenance and operation.

Reinforced concrete work of high quality can now be produced at moderate cost in almost every country and locality by experienced builders using highly developed concrete production equipment. Cement and concrete aggregates are available almost everywhere from local suppliers.

Costs of concrete railway track maintenance, one of the most expensive items of railroad service, amount to only a small fraction of the costs for maintenance of conventional wooden crosstie tracks.

Costs of railway operations are greatly influenced by

railway track conditions. The permanent stability of our concrete track structure provides for increased safety, greater speed and larger service capacity of the roadbed. On account of the improved track conditions, provided by our construction, excessive deterioration of locomotives and cars is avoided, with appreciable savings for rolling stock maintenance and repairs. The increased lifetime of its service also provides for reduced costs of amortization of the invested capital.

We claim:

1. A railway track comprising a rail-supporting slab of concrete having reinforcing elements embedded therein, rails laid on and supported by said slab, rail chairs comprising metallic plates embedded in said slab with their upper surfaces substantially flush with the upper surface of the slab, said rail chairs being disposed beneath the rails and at intervals along the length of each rail with the end portions of each chair plate projecting substantially beyond each side edge of the overlying rail base, each projecting end portion of each chair plate being provided with a housing forming an enclosure about the undersurface thereof and further having an aperture extending therethrough into said enclosure, said rail chairs being securely attached to the concrete reinforcing elements, and fastening means extending through said apertures and engaging the projecting end portions of the chair plates within said enclosures and securing said rails to said chair plates.

2. A rail chair assembly for use in railway track construction of the character described comprising a metal chair plate having a slot formed in each end portion thereof, a housing forming an enclosure about the undersurface of each end portion of the chair plate into which said slot opens, anchor legs projecting downwardly from said plate and adapted to be anchored in a concrete slab, hammerhead bolts having heads of such dimensions as to be capable of insertion through the slots of said plate and, upon turning, of becoming interlocked therewith, and rail clips adapted to be secured to said plate by said bolts.

3. A rail chair assembly of the character described comprising a metal chair plate having a slot formed in each end portion thereof, hammerhead bolts having heads of such dimensions as to be capable of insertion through the slots of said plate and, upon turning, of becoming interlocked therewith, and rail clips adapted to be secured to said plate by said bolts, each of said rail clips having a lug projecting from its undersurface in position to enter the slot in the chair plate alongside the bolt and substantially prevent turning of the bolt.

4. A rail chair assembly of the character described comprising a metal chair plate having a slot formed in each end portion thereof, hammerhead bolts having shank diameters and head widths only slightly less than the width of said slots and having heads of a length less than the length of said slots, whereby the head of one such bolt may be inserted through each slot in the chair plate and, upon turning through substantially 90°, may be interlocked with the chair plate, rail clips having bolt holes extending therethrough adapted to be placed on said bolts and secured thereby to said chair plates, lugs projecting from the underside of said rail clips in position to enter said slots alongside the bolts therein and prevent turning of said bolts sufficiently to become disengaged from the chair plates, and a housing on the underside of the chair plate about each slot therein and enclosing the space occupied by the bolt head and clip lug, whereby said chair plate may be embedded in concrete without interfering with ready installation at a later time of said bolts and rail clips.

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