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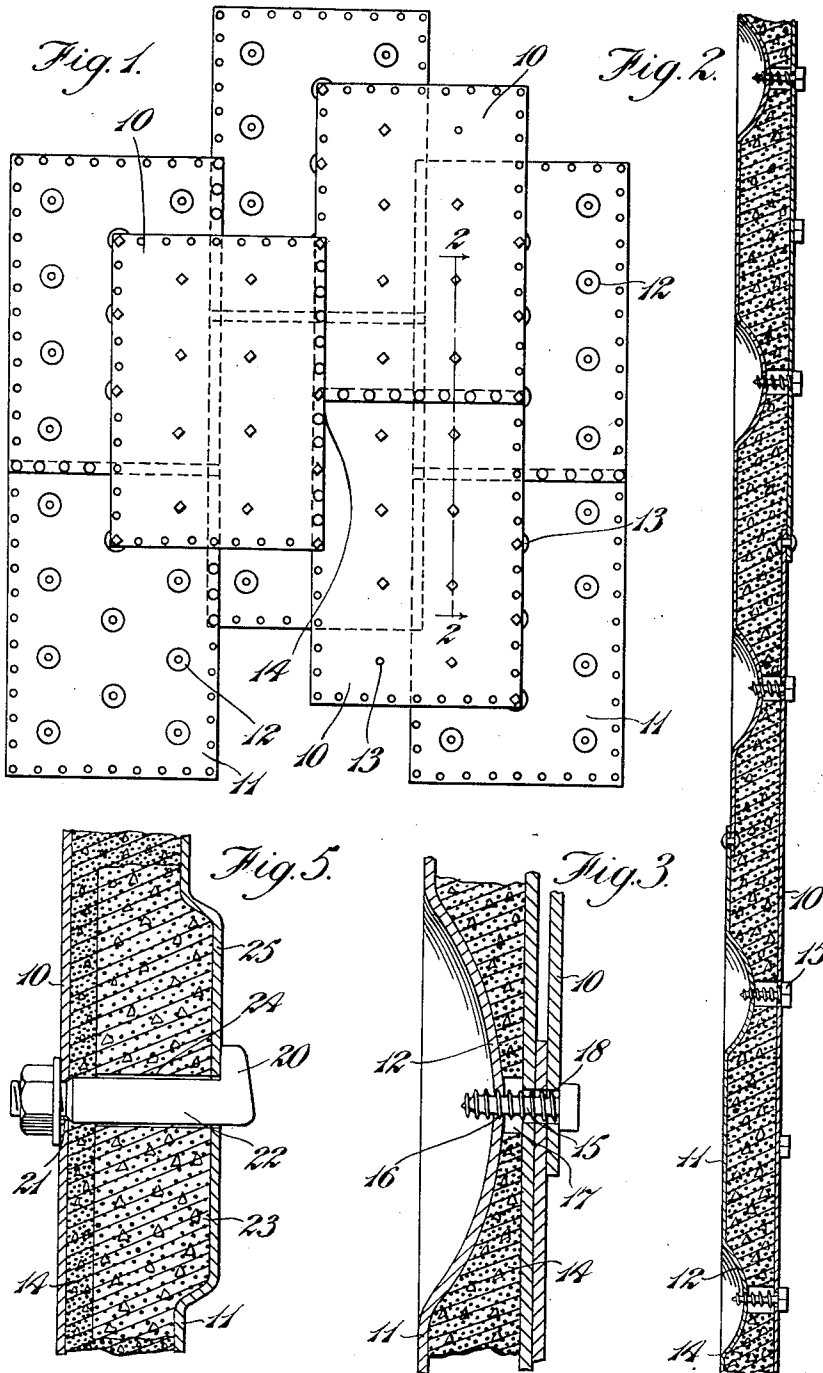
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1,921,822

MANUFACTURE OF ROADS, YARDS, AERODROMES, AND LIKE SURFACES AND MEANS THEREFOR

Filed Sept. 14, 1931

2 Sheets-Sheet 1



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Fig. 4.

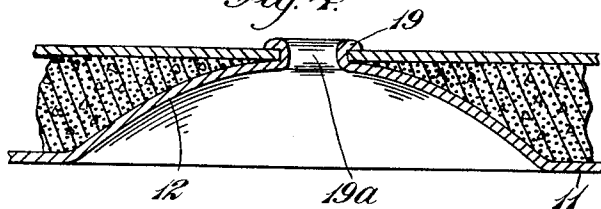


Fig. 6.

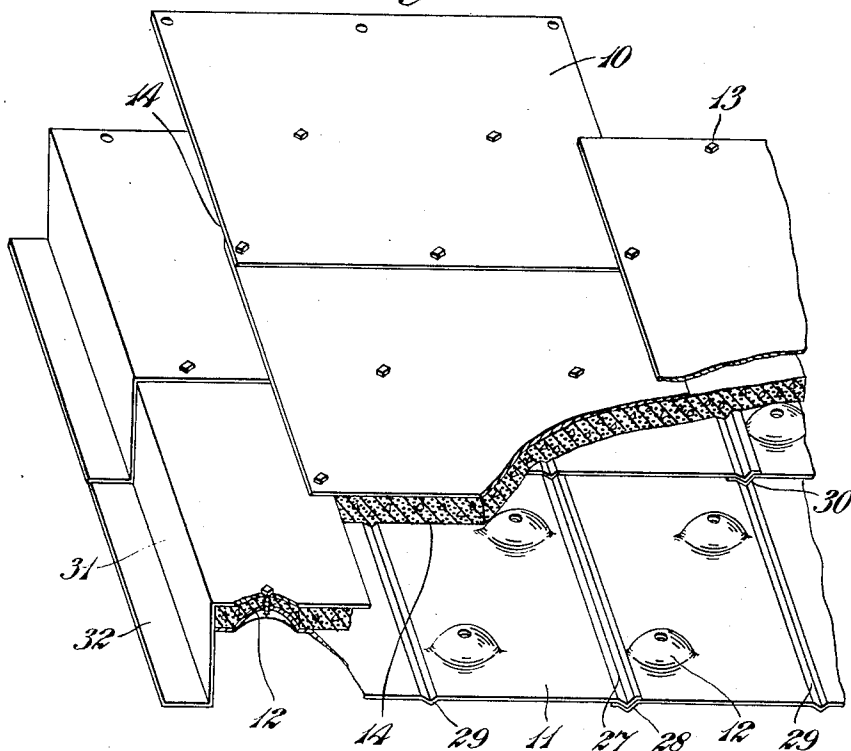
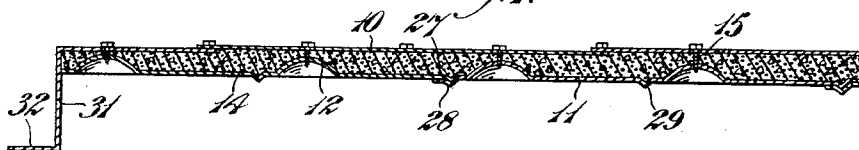


Fig. 7.



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UNITED STATES PATENT OFFICE

1,921,822

MANUFACTURE OF ROADS, YARDS, AERODROMES, AND LIKE SURFACES AND MEANS THEREFOR

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Application September 14, 1931, Serial No.
562,721, and in Great Britain September 19,
1930

9 Claims. (Cl. 94-4)

This invention relates to an improved manufacture of roads, yards, aerodromes and like surfaces and means therefor. It has as its object the provision of a stronger construction of road and the like which is better suited to modern traffic conditions, and which can be produced more rapidly being less subject to weather interruption and requiring less skilled labour in carrying it out than previously proposed methods of construction.

The invention is characterized primarily by a novel foundation structure consisting of duplex metal plating with the component plates spaced apart and cementitious substance, sand, or other suitable non-metallic material filled in and sandwiched between them.

In preparing the site where it is proposed to lay a foundation of this kind, it is desirable in the first place to excavate the surface material and to consolidate the subsoil by rolling. A layer of sand, ground clinker or other suitable material in a fine state of division is then placed on the consolidated subsoil to form a bed for the duplex metal foundation structure. The metal plates are then laid, the lower layer of plating preferably being put down first, the sandwiched cementitious material or the like being next applied and the top layer of plating subsequently added and secured by suitable means conveniently on the lines set forth in the sequel. The invention is not restricted to this method of assembling the foundation, as it might for instance under certain circumstances be desirable to interconnect the plates and to fill in the sandwiched material away from the site or otherwise to modify the procedure outlined above. The duplex plate foundation is designed to be used for supporting a top layer of any suitable road surfacing material such as a bituminous macadam, stone setts, rubber or the like.

The individual plates in the respective layers of the duplex foundation are preferably of steel and of a size as large as is convenient for transport and manipulation, say six feet by four feet. Adjoining plates may be independent but they are preferably connected together by means of welding, by bolting, by riveting, by means of pegs, through the agency of interlocking grooves or ribs in the plates or by other suitable means. The upper layer and lower layer of plates may be positively separated independently of the sandwiched material by such means as distance sleeves around connecting bolts, by shouldered bolts and rivets, by means of bosses or ribs pressed inwardly in the plates of one or both

layers or by means of precast blocks of concrete or other suitable material distributed at suitable intervals between the layers. The plates of either the top layer, the bottom layer or both, may be impressed with ribs or channels at intervals, and at right angles to one another or otherwise disposed to stiffen the plates or to resist relative movement in any direction between the plates and the material sandwiched by them.

The sandwich filling between the plates is preferably of a cementitious nature and may either be floated in to fill the space between the top and bottom layers or may be precast to such a shape as will fit around the distance pieces which separate the two layers, the interstices being subsequently filled by means of liquid cement.

For the purpose of drawing down the top layer towards the bottom, use may be made of quick thread screws, interengaging tongues and apertures, hook bolts or other quickly operated means of engagement.

In the accompanying drawings, certain preferred arrangements of the duplex plating in accordance with the invention are illustrated together with details of various methods of connecting the plates together.

In these drawings:

Figure 1 is a plan view of a number of assembled plates three being shown in the upper layer and six in the lower layer for convenience in illustration.

Figure 2 is a section on an enlarged scale along the line 2-2 of Figure 1.

Figure 3 shows the use of a quick thread bolt as a means of keying the layers together.

Figure 4 shows a second method of interconnecting the layers.

Figure 5 shows another method of keying the layers together making use of a hook-bolt passing through a pre-cast concrete spacing block.

Figure 6 is an isometric view in part broken away of an assembly of plates having integral grooves or ribs for interconnecting adjacent plates of the lower layer, and

Figure 7 is a section across the assembly shown in Figure 6.

In the method of assembly shown in Figures 1 and 2 the individual plates 10 of the upper layer and those 11 of the lower layer, are staggered in every possible sense so that the junctions between the plates in the two layers do not lie directly over one another. Adjacent plates in the lower layer are secured together along their edges by rivets, bolts or by some form of welding. Dis-

tributed over the surface of these plates are upstanding bosses 12 designed to space apart the top layer of plates to the necessary extent and also to carry or take the fastening means by which the layers are held together. For this purpose the plates 10 of the top layer are drilled at intervals with holes 13 designed to co-operate with the bosses 12 account being taken of the relative lateral displacement of the plates in each layer. In the arrangement illustrated some of the fastening bolts or the like pass through holes around the edges of the upper plates, intervening holes along these edges being used merely for purposes of interconnecting adjacent plates as in the lower layer. Figure 3 illustrates the disposition of the plates at a point such as that indicated by the reference 14 in Figure 1 where two plates overlap along the edge of a third, immediately above one of the upstanding bosses 12 in a lower plate. In the sectional view illustrated in Figure 3, a cementitious concrete filling 14 is sandwiched between the layers so as to bind the whole assembly into an integral structure which is capable of spreading transmitted shocks over a wide area of subsoil, and consequently of forming a satisfactory unyielding foundation structure for receiving a surfacing of any desired nature.

Figures 3 and 4 show preferred methods of interconnecting the layers of plates. That illustrated in Figure 3 consists in using a screw 15 having a large quick thread running right up to the head thereof. Holes are provided in both plates one or both being punched or pressed to give a partial thread for engagement by the screw. In the illustrated construction the hole 16 in the bottom plate is situated on the top of the boss 12 and the metal surrounding this hole is punched or otherwise raised slightly at one side and slightly depressed at the diametrically opposite side to give the hole an approximate partial thread with which the screw will engage. In some cases where the thickness of the metal of which the plates are composed is approximately equal to the distance between adjacent threads on the screw, it may be left to the act of inserting and tightening the latter to distort the edges of the hole in the required manner to give the effect of the partial thread. In assembling the parts for interconnection by the method illustrated in Figure 3 it is preferable to provide a removable wooden or like sleeve between the layers and around the holes so that the holes are not liable to become choked when the concrete is filled in. The sleeve may either be left in place or removed to leave a small void 17 as shown. The hole or holes 13 in the upper plate or plates may conveniently be unthreaded and drilled to give a clearance around the screw as shown. This permits of the easy insertion and tightening of screws inserted from the top of the duplex plating. The method of using the quick thread screws may also be applied to the connection of laterally adjoining plates in a layer in place of the rivets or bolts, the use of which has already been described for the purpose.

Figure 4 illustrates an alternative method of connecting the layers together, in which projecting tongues of one plate are passed through an aperture in the other plate over the margins of which the tongues are spread, by hammering them down or in like manner to form the securing means. This method is particularly suitable for use with the upstanding spacing bosses 12 in the lower plate. The crown of each box is split and punched to throw up a number of

integral tongues, and the plates of the top layer are punched with holes so disposed as to engage with these tongues. The top layer having been dropped bodily on to the bottom layer until the upstanding tongues project through the holes in the top layer, the tongues can be spread over the margins of the holes as indicated by reference 19 so as to rivet the plates firmly together. When assembling the plates removable means such as sleeves around the upstanding tongues may be used to keep the latter free from the concrete which is filled onto the bottom layer prior to dropping the top layer into position.

The tongues may be separately formed if desired: as by means of short ferrules with split upper ends, screwed or riveted into apertures in the bosses of the lower plate.

In order to ensure that the continuity of the metal plates connected in this way shall be preserved the holes 19a formed by the tongue and aperture connections preferably filled up either with plugs of wood or the like with cement or in other suitable manner.

The method of interconnecting the layers shown in Figure 5 makes use of a hook bolt 20 having an L head as shown or if desired a T head. Such a bolt may be dropped through a slot in the bottom layer and engaged therewith by turning through a right angle. Such bolts may pass through distance sleeves or pre-cast blocks and through holes 21 punched to receive them in the top layer. Conveniently the hook bolt 20 is formed with a square shank 22. After engagement with the bottom plate in the manner already explained and turning through a right angle, the bolt is locked in this position against further rotation by slipping over it the precast concrete block 23. The latter has a bore 24 corresponding in section with that of the bolt shank and rests in a shallow depression 25 of oval, rectangular or other non-circular plan so that its rotation and consequently rotation of the bolt is prevented. In order to seat the bottom layer of plates more satisfactorily it may be desirable to substitute the depression 25 by a correspondingly shaped elevated boss, in which case the bottom of the concrete block is formed with a shallow recess to accommodate this boss. In addition the top plate may be formed with a depression resting within a recess in the top face of the block. The upper end of the bolt 20 may be provided with nut and washer as shown or with a cotter pin. The portion 26 of the bolt passing through the upper layer is preferably tapered to eliminate any decrease between the bolts and the holes 21.

Figures 6 and 7 show a slightly modified form of duplex plating in which the plates of the bottom layer are pressed with integral ribs or grooves by means of which adjacent plates are locked together without the use of a positive connecting means. Either end of each of the component plates 11 of the bottom layer, is formed with a continuous rib or groove 27 and 28 along it. In the middle of the plate parallel with these ribs or grooves a similar groove 29 is provided. The rib or groove 27 at one end of the plate is preferably made shallower than that 28 at the other end to the extent of the thickness of the plate. When the plates are laid the deeper groove 28 on one end of a plate receives the shallower groove 27 on the adjacent end of the next plate, the two nesting together as shown at 30 whilst the main bodies of the two plates lie in the same plane.

The object of the similarly formed centre groove 29 in a plate is to enable the plates to overlap each other slightly in the lateral direction when they are disposed in staggered relation. In this relation the channelled end of one plate will be opposite the middle of the laterally adjacent plate and the shallow end groove on the overlapping portion of this plate will be accommodated in the centrally disposed groove of the next laterally adjacent plate so that all the plates may lie approximately in the same plane. As a further improvement each of the grooves may be pressed progressively deeper towards one edge of the plate so as to facilitate still further the overlying of the edges of one row of plates over those of the laterally adjacent row. The grooves or ribs across each plate add stiffness to the plate and when a number of plates are laid the interlocking depressed or ribbed ends and these middle ribs or grooves form a number of continuous series of grooves or ribs across the whole structure of the foundation, increasing stability, and providing a keying effect with the surface material laid on the upper plate and also with the filling foundation material placed between the two layers of duplex plating.

Where it is desired to form a lateral connection between adjacent plates, the latter in addition to the grooves at their ends may have similar grooves along the side edges preferably terminating short of the ends of the plate. In this way adjacent lines of plates may be interconnected to form a continuous structure.

The ribs or grooves in the plates are preferably curved in cross-section, but they may be shallow V-shape or any other open section which will provide a quickly engaged interlocking connection.

Attachment means between the layers is provided and may conveniently take any of the forms already described with reference to Figures 3, 4, or 5.

The side edges of plates which are intended to be used at the side of a road, or like surface, may if desired be pressed with an integral downward flange on one or both of the component members of the duplex plate. If each member is flanged there will be an upward flange on the bottom member and a downward flange overlaying it and enclosing it on the upper member.

These integral flange portions may be utilized for preventing any tendency of the cementitious material between the plates to spread laterally.

If a flange on the upper plate only is provided, or if a downward flange on each member is formed, the flange will go below the plates, foundation and will serve to retain laterally the ash or other road bed below the foundation plates.

Suitable edge flanges are indicated by reference 31. In the structure illustrated, the top plates adjacent the side of the road are twice bent, first downwardly well below the duplex foundation and then horizontally and outwardly to form a flange 32. This arrangement prevents the sandwiched material from being squeezed out laterally from between the layers and it also holds together the consolidated subsoil. The horizontal flange 32 forms a satisfactory bedding for a curbing stone. Seated in this way the curbing is not liable to displacement due to settling or spreading of the road foundation. In order to facilitate subsequent dismantling of part of the road surface without disturbing the downwardly directed edge flange 31 the latter may be formed

of angle section independently of the layers of plates and attached thereto.

The component plates constructed in any of the ways described above may be impressed at intervals with strengthening ribs or channels. For instance the upstanding bosses 12 may form meeting places for ribs of height equal with or lesser than the bosses. Alternatively the bosses may be entirely replaced by ribs which can be used to carry the interconnecting means between the layers. Such a rib system may conveniently be of diamond configuration. Ribs or channels provided in this manner serve not only to stiffen the plates but also to resist relative movement between the plates and the material sandwiched by them. In order still further to bond the plates with the sandwiched cementitious material the inwardly directed faces of the former may be provided at intervals with upstanding projections. These may be readily formed by spot welding or similarly attaching short lengths of angle-section to the plates in the desired positions.

I claim:

1. A road and like foundation structure embodying therein top and bottom spaced layers, each comprising metal plates arranged with the edges of the plates in one layer offset with respect to the edges of the plates of the other layer and a non-metallic filling material disposed between said layers.

2. A road or like foundation structure embodying therein, top and bottom spaced layers, each comprising a plurality of metal plates having side and end edges, the plates of each layer being connected together at their sides and ends, and arranged with the connected together sides and ends of the plates in one layer offset from the like sides and ends of the plates in the other layer and a non-metallic filling material disposed between the plates of the respective layers.

3. A road and like foundation structure embodying therein top and bottom spaced layers, each comprising metal plates arranged with the edges of the plates in one layer offset with respect to the edges of the plates of the other layer and a cementitious mass arranged between the several plates of both layers and binding them all together.

4. A road and like foundation structure embodying therein top and bottom spaced layers, each comprising metal plates arranged with the edges of the plates in one layer offset with respect to the edges of the plates of the other layer, means connecting the plates in one layer to those in the other layer and a cementitious filling material arranged between the several plates of each layer and connecting them all together.

5. A road or like foundation structure embodying therein top and bottom spaced layers, each comprising metal plates connected together at their sides and ends in overlapping relation, with the connected together sides and ends of the plates in one layer offset with respect to the connected together sides and ends of the plates in the other layer and a filler of cementitious material arranged between the several plates of both layers and binding them together.

6. A road or like foundation structure embodying therein top and bottom spaced layers, each comprising metal plates arranged in overlapping relation at their sides and ends, the overlapping edges of the sides and ends of the plates in one layer being offset with respect to the overlapping edges of the sides and ends of the plates in the other layer, means connecting the overlapped

edges of the plates in one layer with portions of the plates of the other layer within their sides and ends and a layer of cementitious material disposed between the several plates of both layers and binding them together.

7. A road or like foundation structure embodying therein top and bottom spaced layers, each layer comprising metal plates arranged with their side and end margins in overlapping relation, the overlapped margins of the plates in one layer being offset with respect to the overlapped margins of the plates in the other layer, portions within the overlapped margins of the plates in said other layers being formed to extend toward the plates of said first mentioned layer, means connecting the overlapped margins of the plates in said first mentioned layer to said portions of said plates in said other layer and a cementitious filler material between said layers and adhered to the plates of both layers and connecting them together.

8. In a foundation structure of the kind described, spaced top and bottom layers, each comprising metal plates, the metal plates in one layer being arranged with their side and end margins in overlapping relation, the overlapped margins of

the plates in one layer being offset with respect to the overlapped margins of the plates in the other layer, portions within the margins of the plates of one layer being depressed toward the plates in another layer and means for connecting the plates of both layers together at points coincident with said depressed portions before mentioned.

9. The method of making a foundation structure of the kind described which consists in arranging as a layer upon a previously prepared base, a plurality of metal plates with the side and end margins thereof in overlapping relation, then arranging as a second layer spaced from the first one, another plurality of metal plates with their sides and end margins in overlapping relation but offset with respect to the like margins of the plates in the first mentioned layer, connecting the plates of both layers together at desired points and subsequently to thus making the first mentioned layer, applying a cementitious material thereto which upon hardening connects the plates of both layers together.

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