No. 676,128. Patented June 11, 1901.

W. GOLDIE.

METHOD OF SURFACING RAILROAD TRACKS.

(Application filed July 25, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

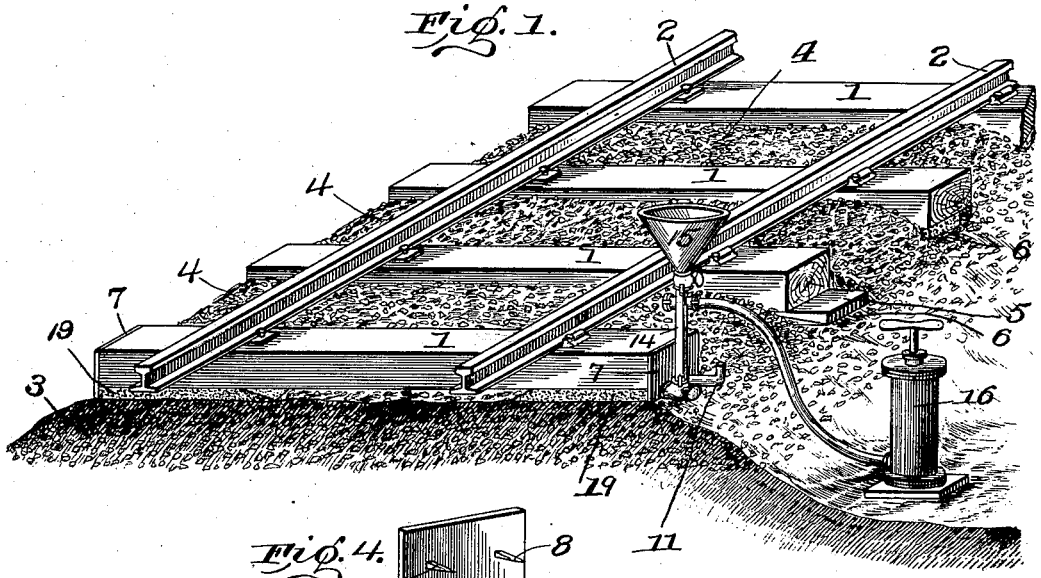

Fig. 4.

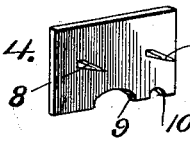

Fig. 2.

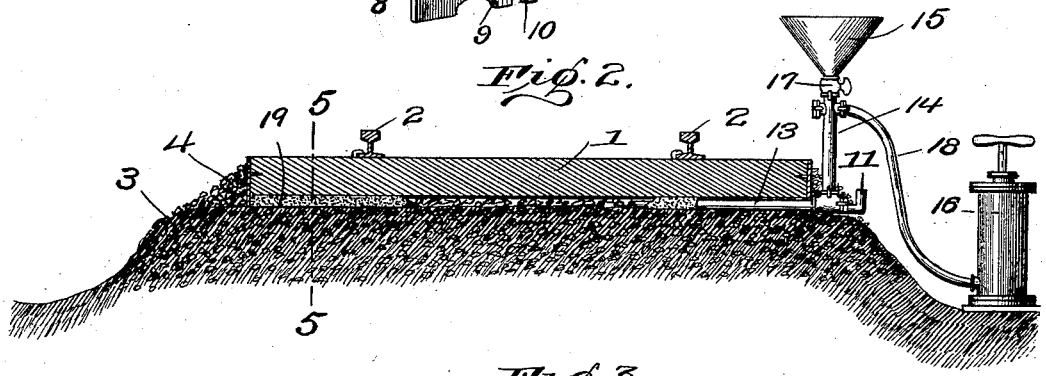

Fig. 3.

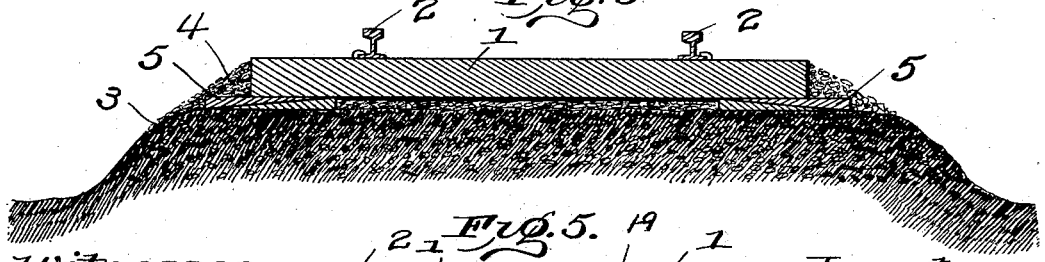

Fig. 5.

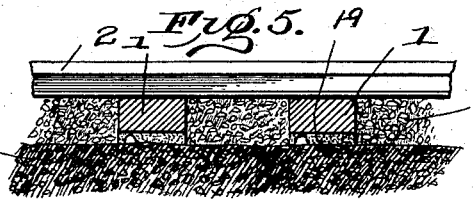

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Fig. 6.

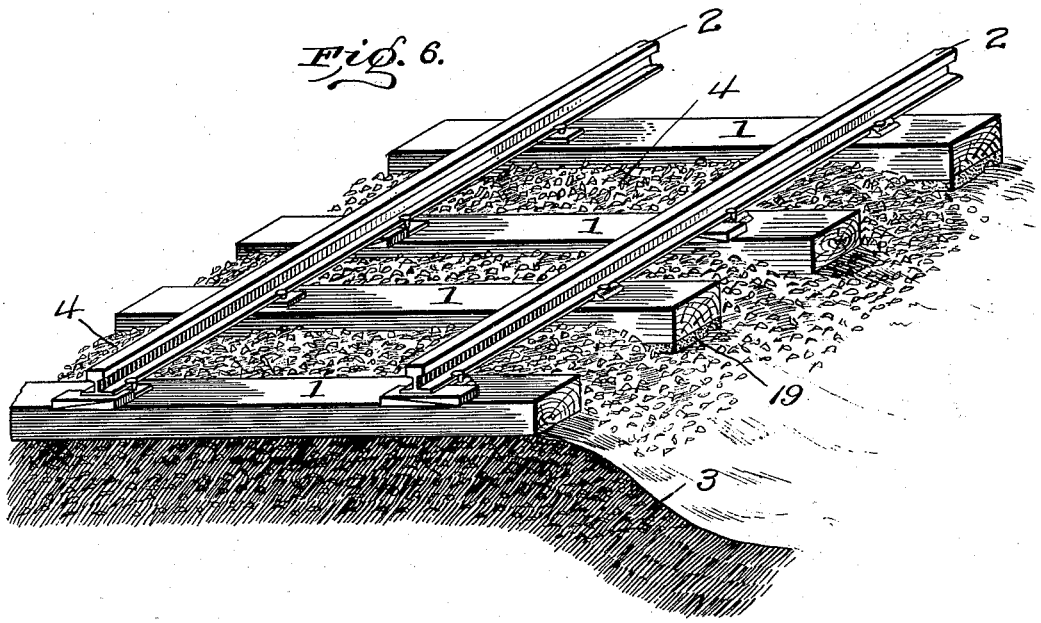
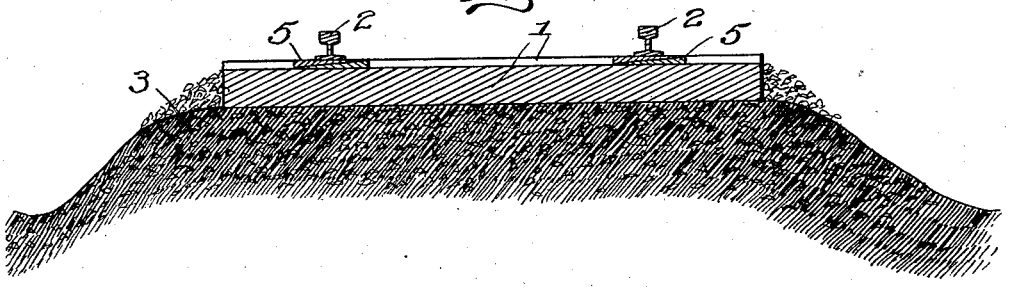


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM GOLDIE, OF WILKINSBURG, PENNSYLVANIA.

METHOD OF SURFACING RAILROAD-TRACKS.

SPECIFICATION forming part of Letters Patent No. 676,128, dated June 11, 1901.

Application filed July 25, 1900. Serial No. 24,744. (No specimens.)

To all whom it may concern:

Be it known that I, WILLIAM GOLDIE, a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Methods of Surfacing Railroad-Tracks; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the surfacing of railroad-tracks, its object being to provide means for bringing the tracks to and holding the same at proper surface without the necessity of tamping, which is the main or only means now employed on the ordinary steam-railroad for such purpose.

In the laying of railroad-tracks where gravel ballast is employed the custom has been to lay a body of gravel and then place the ties upon the same and spike the rails to the ties and then bring the track to surface by shoveling and tamping the gravel under the ties and between them, the gravel being packed or tamped most solidly under the ends of the ties, which it is more important to support. If the track is more solidly ballasted in the center, the strain coming on the ends of the ties has a tendency to force out the ballast, leaving such end portions insufficiently supported and often leading to the cracking or breaking of the ties. The same custom is followed where broken stone is used for ballast, the main difference between the two tracks being that with the gravel a broader support contacting with more points of the tie is obtained, though the drainage is liable to be imperfect and the small particles of sand and dirt are forced out by the passing train, making travel disagreeable, while with the broken-stone ballast the tie is liable to be supported on a few of the solid stones packed or tamped under it, and though the drainage is more perfect it is only practicable to use hard-wood ties, because the weight of the passing trains will cause the stone to wear into the ties, it often occurring even with hard-wood ties that the stone will wear into the tie-body an inch or more. In either case as the train passes over the track the great weight of the locomotives and cars will gradually pack down the road-bed, solidifying the ballast under the ties and forming a solid bed or support for each tie; but as the ballast under some ties is packed more solidly than under others the weight of the passing train is sufficient to press down the imperfectly-supported ties, or the frost will affect the solidity of the ballast, so that the track soon becomes uneven. One of the principal expenses in the maintenance of way is to surface the track, this requiring constant work and being a very serious expense on all roads. The ordinary way of surfacing a track consists in raising it slightly by means of jacks and then packing the ballast under the ties by means of shovels and tamping-picks, this always requiring the removal of the ballast between the ties in order to reach under the ties for tamping. This surfacing of the track is objectionable because it is liable to disturb the solid bed formed by the weight of the train, as above referred to, and after the surfacing has been accomplished the track necessarily rests on a fresh portion either of gravel or stone, which is liable again to pack and sink down under the weight of the train, so that repeated surfacing of the track is necessary to maintain it in good condition. While improvements have been made in the weights of rails and rail connections, these have been found insufficient to withstand the very heavy strains incident to increased weight in the rolling-stock and increased speed of the trains, and some means of obtaining a permanent surfacing of the track by which the solid bed under the ties formed by the weight of the passing train will not be disturbed and a more perfect support for the track requiring little or no resurfacing secured has been considered desirable, but has not yet been obtained. By the present invention this object is obtained in connection with regular railroad-tracks.

It consists, broadly stated, in injecting cement under the ties and upon the ballast bed, giving them support, and thereby forming interposed cement supporting-beds for the ties, the invention including certain other improvements, such as compacting the ballast under the ties, for example, by the weight of the passing trains, so as to obtain a practically solid ballast bed for the ties, and then raising the ties and injecting the cement under the same; placing dam-plates at the ends of the ties to confine the cement; before in-

jecting the cement, if necessary, tamping on each side of the ties to compact the ballast and confine the flow of the cement before it is injected, and in case of tracks in use mechanically supporting the rails at different points, such as at each alternate tie, after the track has been surfaced to enable the track to sustain a passing train, and injecting the cement under the other ties, and when such interposed cement bodies or beds are set to support the track injecting cement under the ties where the track was first mechanically supported, as well as in other improvements hereinafter particularly set forth and claimed.

To enable others skilled in the art to practice my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a perspective view of a track, illustrating the invention. Fig. 2 is a side view of the apparatus and a sectional view of the track, showing the mechanism for applying the cement. Fig. 3 is a cross-section of the track, illustrating the means of supporting the ties. Fig. 4 is a perspective view of the dam-plate used for closing the ends of the space under the ties. Fig. 5 is a longitudinal section on the line 5 5, Fig. 2; and Figs. 6 and 7 illustrate a modification of the invention.

In carrying out the invention I may employ any suitable plastic material which is quick-setting—such as Portland cement or other cement of like character, asphaltum, or like materials—the purpose being to provide solid interposed beds between the ties and the ballast beds on which the ties have been seated which will conform substantially to both the ballast bed and the lower surface of the tie. The term "cement" as used in the specification and claims is therefore to be understood as broad enough to include any such materials. This cement is to be injected either mechanically or under fluid-pressure or otherwise under the ties when in plastic or other condition, so that it can be made to set quickly to form a solid bed, any means of injecting the same being included within the invention.

By "injecting" the cement under the tie I mean forcing the same under the tie by means of a constant or uniform pressure, such as by compressed air or steam or even mechanical means which will cause a stream of cement to flow under the tie without disturbing the underlying compacted bed of ballast and without the necessity of tamping the cement under the tie, which latter is to be avoided, since it disturbs the said solid bed of ballast previously formed under the tie, and the term "injecting" in the specification and claims is used in this sense and is not intended to cover the forcing of the cement under the tie by tamping, pounding, or similar ways.

For the practice of my invention I may employ any suitable apparatus, the drawings showing very simple apparatus suitable for the purpose and which forms the subject-matter of another application of even date, Serial No. 24,745.

The invention is illustrated in connection with an ordinary single track, and the idea is to form cement bodies or beds at the ends of the ties, leaving the center part to be supported simply upon the ballast, so as to prevent center binding, as above referred to. The ties 1 are of course the ordinary wooden ties, though the invention may be employed with metal ties, if considered desirable. The rails 2 are generally located from fifteen to eighteen (15 to 18) inches from the ends of the ties, and the purpose of the invention is to form a cement support under the rails or at least under the ends of the ties, so as to give support to the parts directly under the rails. The ties rest upon the regular ballast, such as 3, the ballast being filled in between the tracks, as at 4, this interfilling of ballast extending up toward or to the tops of the ties.

Where the invention is used in connection with surfacing track previously laid, (and as its principal use will be in connection with the same, I will describe it more particularly therewith,) I employ any suitable mechanical support for the rails at different points, such as the shims 5, fitting under some of the ties, as shown in Figs. 1 and 3, or like shims 5 between the rails and ties, as shown in Figs. 6 and 7, the shims shown being simply two tapering pieces of wood, one being inserted under the tie and the other being driven under it, so that a sufficiently strong support is provided for the ties to sustain the track while the cement beds are being formed under the other ties. In the practice of the invention in resurfacing such track by means of the ordinary lifting-jacks the track is raised and brought to the desired surface, according to the requirements of the engineers, depending, of course, upon whether the track is curved or straight, as well known to road-masters. The shims 5 are then inserted under any suitable number of ties or between any suitable number of rails and ties to give the temporary support to the track, and the interposed cement beds are formed above the solid ballast beds and under the other ties. For that purpose it is necessary to have some means for injecting the same under the ties, and that illustrated in the drawings is considered suitable for the purpose, though it is to be understood that any means for carrying out the broad idea is included within the invention. It will be evident that the ballast bodies 4 between the ties form side walls to confine the space under each tie, and thereby confine the flow of the cement, and if this is not sufficiently solid the operator may either before or after the raising of the track tamp the same slightly, so as to confine it, and after the raising of the track the operator may tamp the sides of the ties between the rails—that is, the center portion—so as to force the ballast to great extent under the

ties to confine the flow of cement. This is not, however, considered necessary. The workmen then clear out the ballast, which may extend around the ends of the ties, as at 6, in order to provide space for the dam-plates 7, each of which fits against the end of the tie-body and forms a dam to prevent the cement from flowing backwardly from under the tie. This dam-plate is shown in perspective in Fig. 4, being simply a metal plate corresponding in width to the tie-body and being of sufficient height to extend up along the end of the tie and hold thereto, the dam-plate having spikes or prongs 8, which take into the tie and hold it in place. The dam-plate is also preferably formed with openings or recesses 9 10 close to or in its lower edge, one opening, 9, for the insertion of the injector-pipe by which the cement is injected under the tie and the other opening, 10, for the insertion of the drainage mold-bar 11, which, as shown in the drawings, is a long bar inserted under the tie for a greater distance than the cement bed to be formed, so as to insure a regular drainage-canal 12 for the flow of the water collected under the mid-portion of the bed, and thereby prevent rotting action on account of confined moisture.

The apparatus for injecting the cement illustrated in the drawings consists of an injector-pipe 13, extending under the tie, a feeding-pipe 14, communicating therewith, a mixing funnel or basin 15, communicating with the injector-pipe, and an air force-pump 16, arranged to generate the air-pressure for injecting in the cement. The funnel 15 is provided with a valve 17 at its base, and the hose 18, leading from the force-pump 16, communicates with the feed-pipe 14 just below said valve, the funnel forming a basin for the mixture of the cement and gravel, sand, or small broken stones which may be used with it, if desired, the intention being to form a plastic body of cement or grout sufficiently fluid to flow from the basin into the feed-pipe 14. After the feed-pipe has been filled the valve 17 is closed, and by means of the force-pump the body of cement in the feed-tube is forced therefrom into the injector-pipe 13, which may extend any desired distance under the tie. The cement is thus injected between the tie and the solid ballast bed 3, spreading out under the same and being confined on the outer sides by the ballast bodies 4 between the ties, and as it is the expectation that the cement shall be simply plastic instead of fluid it will flow but little farther than the point to which it is injected, but will settle in such space, filling the irregular spaces of the ballast and flowing up against the tie itself and conforming to the same, so forming a solid interposed bed between the tie and the ballast bed, as at 19, which gives support to the tie for its full width and conforms, substantially, to the under face of the tie and to the top face of the ballast. To inject in the cement, the injector-pipe may be swung around, if necessary, and may be drawn back farther and farther, so that the full space under the tie is filled with the cement and a broad solid bed for the support of the end of the tie provided. To accomplish this, it will of course be necessary to fill the feeding-tube 14 several times, and as soon as the body of cement therein has been forced by the air-pump under the tie the valve 17 may be opened, the feeding-tube again filled, and the operation repeated. I prefer for the purpose to employ the cement while in a plastic state, but in some cases it may be considered more desirable to apply the same when dry either mechanically or by injecting, depending either upon the moisture contained in the ballast or water fed under the tie for the moistening and setting of the cement. The cement can be supplied in this way under each end of the tie while the track is mechanically supported, as above stated, until properly surfaced, and the track is permitted to rest in that condition until the cement is fully set and ready to support the tie, when the drainage-molding bars 11 may be withdrawn, the dam-plates 8 removed, and the operation then repeated with the ties where the rails have been mechanically supported, such as upon the shims 5 or other supports, such as the alternate ties above referred to, and while the cement beds are being formed under these ties the previously formed and set cement beds will give the necessary support for the track and any train passing over it.

Where new tracks are being formed, after the rails have been regularly laid a train should be passed over the track, so as to compact the ballast as far as possible by the weight of the train, as is the regular custom, and if the track is not then in service the track may be surfaced in the way above described, being supported on jacks or in other ways at the proper height, and the cement beds may be formed under all the ties at one time and the track be supported upon the jacks until all the cement beds are set and ready to receive the load. Under other circumstances the invention may be employed as found necessary, such variations in its use as would naturally occur being of course included within the scope of the invention.

In the use of the invention the regular solid compacted beds for the ties formed by the weight of the passing trains are not in any way disturbed; but instead of that a solid support conforming to any irregularities in such ballast bed and conforming to the under face of the portion of the tie supported is provided, this cement bed being of the full width of the tie and giving a broad solid support thereto conforming to the irregularities of the tie-body, so that a solid and perfect support therefor is obtained. The cement supporting-beds so formed also unite to some extent with the ballast below and extending up the sides of the ties and bind the whole to-

gether into a solid supporting-block for the tie. It is also evident that the difficulties heretofore experienced on account of the ballast holding the moisture in contact with the tie-bodies will be largely overcome, as the cement in conforming to the shape of the tie-body will prevent entrance of such moisture to an appreciable extent, and therefore prevent rotting, while the center portion of the tie, being but loosely ballasted and freely drained, will not be liable to rotting action. The main difficulties with the use of gravel ballast are also overcome, the ordinary gravel-ballasted track being liable through the yielding of the ballast to force out the sand when a train passes over the same and in rising again when relieved of the load to suck in the air, such action by the pumping in and pumping out of the air working out practically all the small particles of sand or dirt in the form of dust, rendering travel exceedingly disagreeable and gradually carrying off and loosening the ballast and making resurfacing necessary. It is evident that the cement beds formed in accordance with my invention will entirely prevent such action, as the loose bodies of sand will, as stated above, be united or bound to the cement supporting-bed, which binds the whole together and prevents this difficulty. The difficulty of the wearing of the stone ballast into the ties will also be overcome, as the cement will flow around the stone ballast, forming a solid bed, conforming to the shape of the tie and supporting it as above referred to, and giving support for the full width of the tie instead of on a few hard points of the stone ballast, as in the present track. As the solid beds formed by the weight of the passing trains are not disturbed in the surfacing of the track, but the interposed supporting-beds simply rest thereon, and such beds are strong and solid, it is evident that after the track is once surfaced in this way there will be little or no settling, the only possible settling being in the ballast in places where it has not been sufficiently packed, and in such cases a fresh layer of cement may be interposed, if necessary, which can easily be done by forming the cement more fluid, so that it will flow into the small space between the tie and cement bed previously formed. On account of the much more solid supports so given to the ties the strength of the track to resist strain is of course very largely increased, and it is believed that by the invention a track will be made sufficiently strong to sustain the weight of the heavy rolling-stock now in use or heavier rolling-stock and to sustain much higher speeds of trains than now employed. The use of the invention will effect a large saving in the cost of maintenance of road, considering the fact that when once applied to a solidly-packed track resurfacing will seldom be necessary.

What I claim, and desire to secure by Letters Patent, is—

1. The method of surfacing railroad-tracks, consisting in injecting cement under the ties to form supporting-beds therefor.

2. The method of surfacing railroad-tracks, consisting in raising the ties and injecting cement under the same to form supporting-beds therefor.

3. The method of forming railroad-tracks, consisting in compacting the ballast under the ties and then raising the ties and injecting cement under the same to form supporting-beds therefor.

4. The method of forming railroad-tracks, consisting in seating the ties in the ballast by the weight of the passing train, and then injecting cement under the ties.

5. The method of surfacing railroad-tracks, consisting in tamping on each side of the ties, and injecting cement under the ties to form supporting-beds therefor.

6. The method of surfacing railroad-tracks, consisting in placing dam-plates at the ends of the ties and injecting cement under the ties to form supporting-beds therefor.

7. The method of surfacing railroad-tracks, consisting in placing dam-plates at the ends of the ties, tamping on the sides of the ties, and injecting cement under the same.

8. The method of surfacing railroad-tracks, consisting in raising the track to surface the same, mechanically supporting the rails at some of the ties, and injecting cement under the other ties to form supporting-beds thereof, and subsequently injecting cement under the ties where the rails were first mechanically supported.

9. The method of surfacing railroad-tracks, consisting in inserting an injector under the tie, injecting cement through the same under the tie and then partially withdrawing the injector and injecting a further portion of cement.

10. The method of surfacing railroad-tracks consisting in inserting a molding-bar under the tie, and then injecting cement under the tie and around the bar, and removing the bar to form a drainage-canal.

In testimony whereof I, the said WILLIAM GOLDIE, have hereunto set my hand.

WILLIAM GOLDIE.

Witnesses:
F. W. WINTER,
ROBERT C. TOTTEN.