No. 835,414. PATENTED NOV. 6, 1906.

W. GOLDIE.

RAILROAD TRACK.

APPLICATION FILED NOV. 15, 1905.

2 SHEETS—SHEET 1.

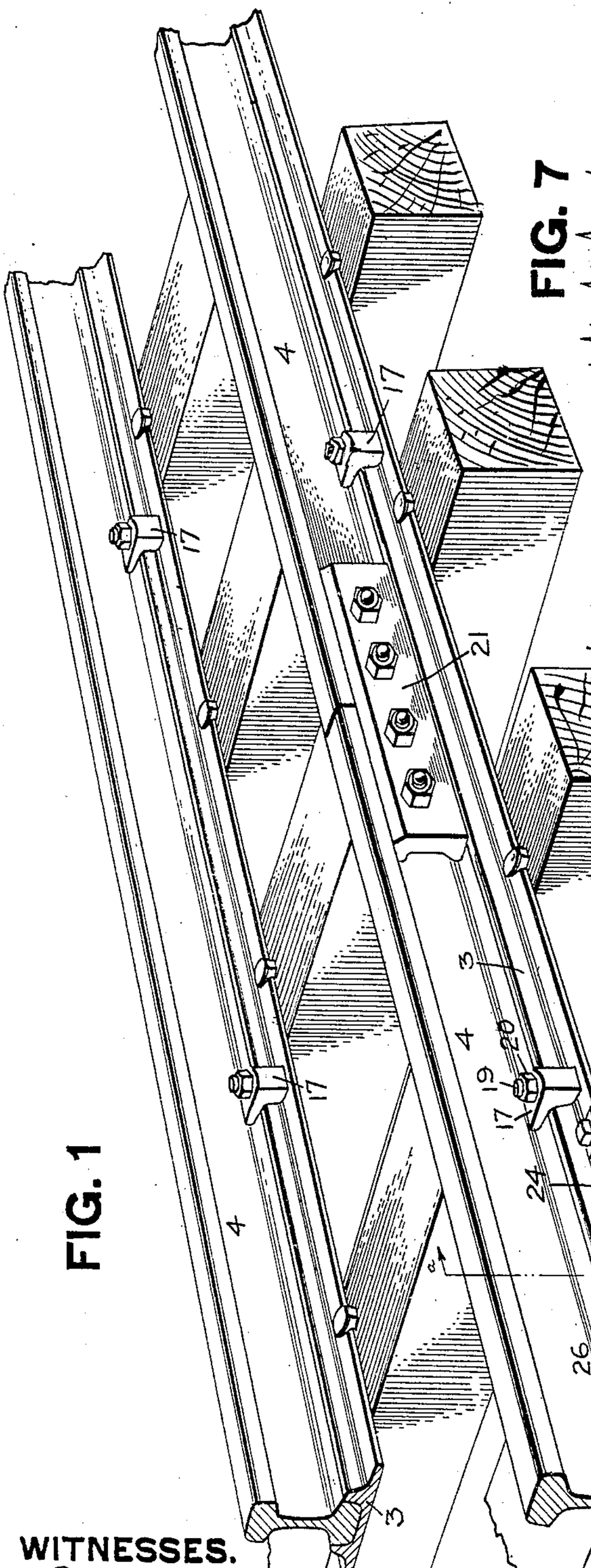


FIG. 1

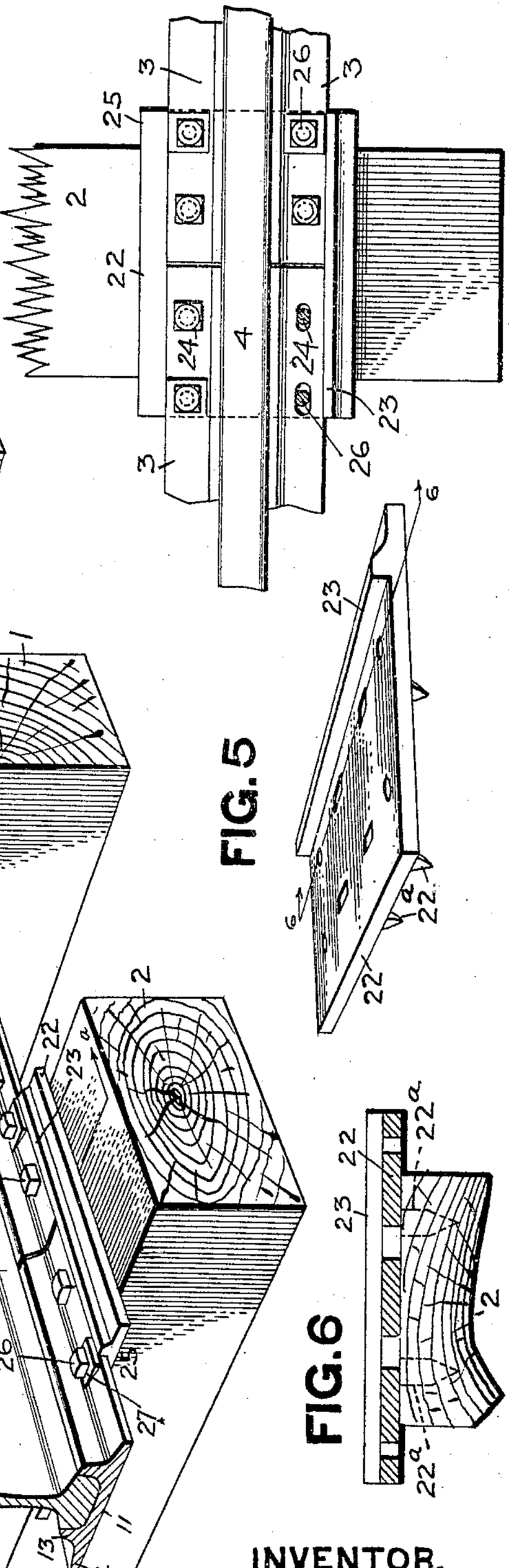


FIG. 7

FIG. 5




FIG. 6

WITNESSES.

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2 SHEETS—SHEET 2.

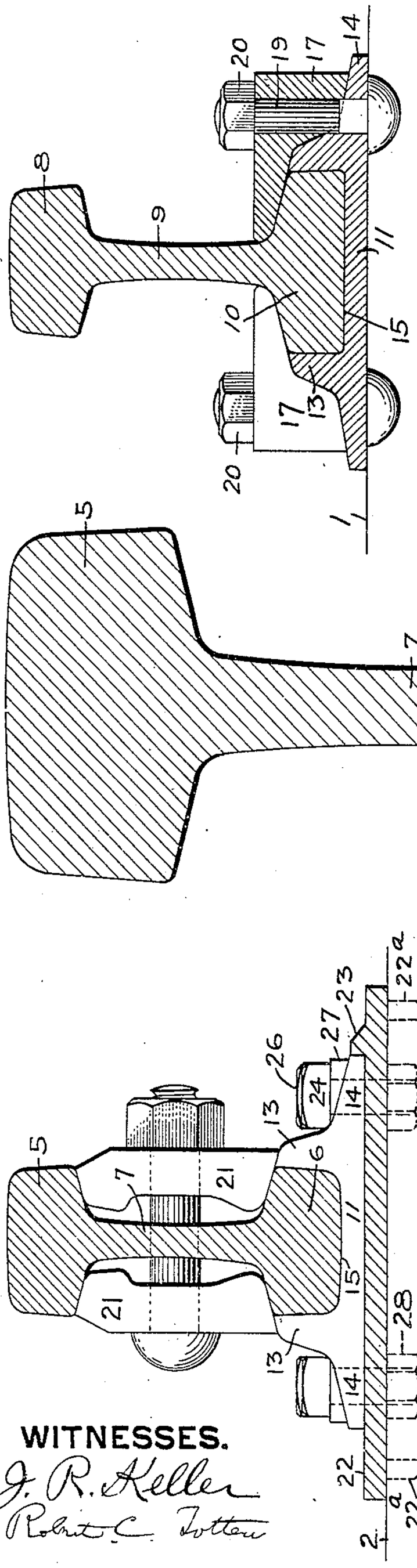


FIG. 3

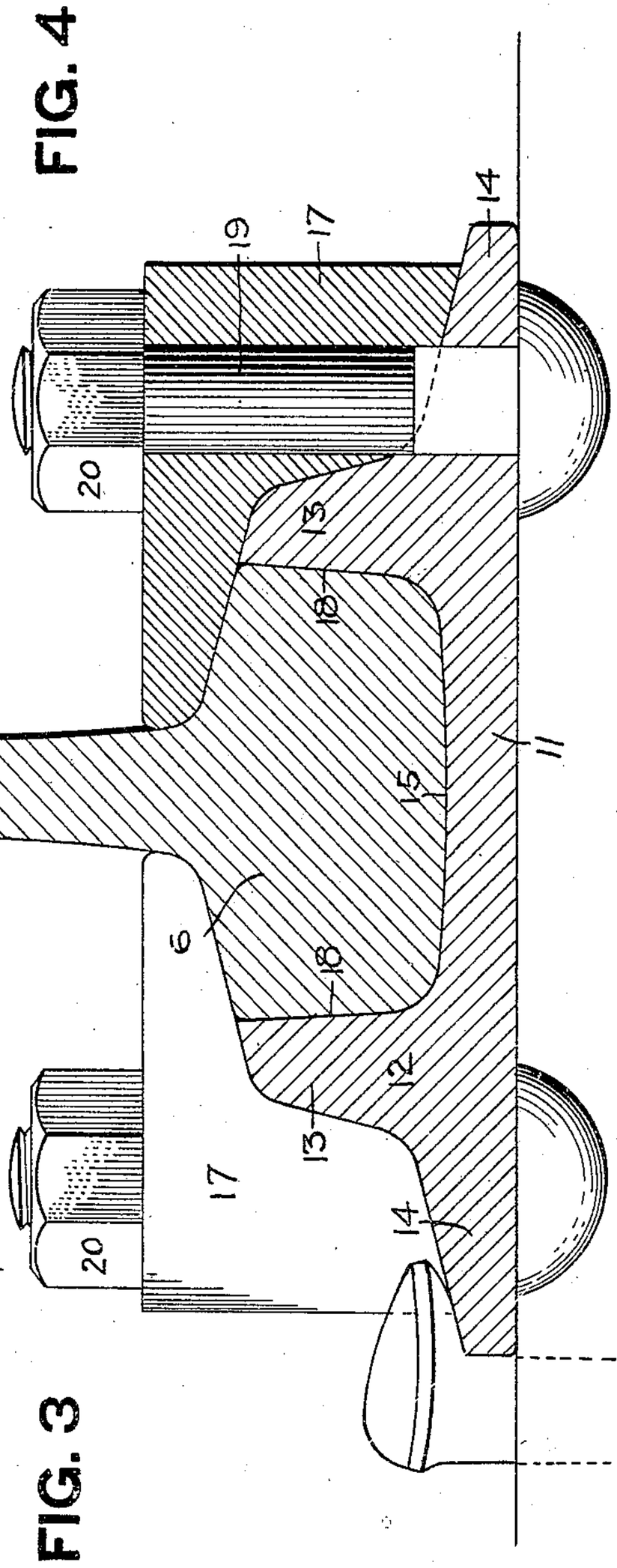


FIG. 4

FIG. 2

WITNESSES.

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# UNITED STATES PATENT OFFICE.

WILLIAM GOLDIE, OF WILKINSBURG, PENNSYLVANIA.

## RAILROAD-TRACK.

No. 835,414. Specification of Letters Patent. Patented Nov. 6, 1906.

Original application filed April 24, 1905, Serial No. 257,138. Divided and this application filed November 15, 1905. Serial No. 287,493.

*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 Railroad-Tracks; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to railroad-tracks, this application being in part a division of application for patent filed by me April 24, 1905, Serial No. 257,138. Its object is to provide a railroad-track of high wearing qualities and of sufficient stiffness to carry the loads to which such tracks are at present subjected through the increase of weight in locomotives and the cars and loads carried thereon.

As the weight and speed of trains have increased the railroads have endeavored to provide a track stiff enough and strong enough to sustain the same by the employment of rails of standard section, but increased in weight, height, and width of base-flanges to rest upon the ties; but practical difficulties have been met with on account of the greater bulk of metal in the rail-heads and the development of the wider base-flanges. In the first place, in forming the rails sufficient work was not applied to the rail-head to compact it to any great depth in rolling, as in the case of smaller rail-sections, and after rolling the great bulk of metal in the rail-head acted to anneal the same in cooling and to leave the head soft and liable to great wear under the heavier loads and higher speed of trains. It was also found that as the flanges forming the rail-base were rolled thin and wide they cooled much more rapidly than the rail-heads and in rails of such heavy section caused internal strain in the rail-body and increased the liability of the rails to camber or curve in cooling, which could only be removed by straightening under pressure when cold. Such straightening was liable to increase the internal strain and lead to cracking of the rail or cause the development of cracks in the rail-base, the main cause of broken rails. In the endeavor to provide rails of greater wearing properties the carbon and manganese have been increased to give greater hardness; but it has been found that this increased the internal strain in the rail-body and that the necessity of greater bending action to overcome the camber or curve of the rails in straightening the same, because of the greater elasticity of the harder rail, increases the liability to initial cracking of the base, which under the heavy loads would quickly extend throughout the rail-body. One of the most difficult problems presented to the railroad engineer has been to provide a stiff railroad-track amply sufficient to bear the load, free from liability to cracking, and one that can be easily laid and repaired.

The present invention is designed to meet these requirements.

It consists, generally stated, in the combination of an upper or main rail formed of a head, web, and base of relatively hard or high-carbon steel having high wearing qualities and a continuous underrunning rail-supporting base-bar formed of tough low-carbon steel and having in its upper face a seat corresponding to and adapted to receive and envelop the lower face and edge portions of the rail-base, thereby providing a track of great vertical strength and of high wearing qualities, in which the main rail can be rolled in such way as to be practically free from internal strain or cracking and is properly supported by a tougher stronger rail-supporting bar, which will support and hold the rail to place even in case of fracture of the rail under the strain.

It also consists in certain other improvements in the construction of the rail and the rail-supporting bar and the joints therefor, as will be hereinafter more fully set forth and claimed.

In the accompanying drawings, Figure 1 is a perspective view of a track embodying my invention. Fig. 2 is a cross-section of the rail and supporting-bar. Fig. 3 is a cross-section on the line *a a*, Fig. 1. Fig. 4 is a cross-section showing another form of rail and bar, and Figs. 5, 6, and 7 are detail views.

The invention is illustrated in connection with the use of wooden cross-ties, though of course it may be employed with any suitable character of cross-ties. It is shown in Fig. 1 with the cross-ties 1 of the ordinary size extending under the track-body, which track is formed of the continuously-running rail-supporting base-bars 3 and the main rails 4, seated therein, as hereinafter described, the

cross-ties 2, supporting the joints of the rail-supporting base-bars, being preferably made wide, as illustrated in said figure.

The rail 4 may be of any suitable form, though I prefer to employ a double-headed rail, as illustrated in Figs. 1 to 3, this double-headed rail having the heads 5 6 connected by the web 7. As shown in Figs. 1 to 3, this form of rail provides a thick narrow rail-base for seating in the rail-supporting bar hereinafter referred to and a base corresponding exactly to the rail-head, so that it is practically free from internal strain or cracking. Another form of rail well adapted for the use of my invention is illustrated in Fig. 4, in which the rail has the ordinary head 8 and web 9; but the rail-base 10 is also formed with a narrow thick body corresponding largely in shape to the rail-head, but having a flat lower face and upper vertical side edges, so that the rail-base is practically rectangular. This rail-base can be made either to contain practically the same amount of metal as the head or be somewhat increased in weight, as described in application for patent filed by me, Serial No. 257,137. In the rolling of either section illustrated as the head and base are of exactly or approximately the same shape and contain the same or approximately the same amount of metal little or no internal strain is developed in the rails in rolling and the rails are not liable to curve or camber in cooling, while as there are no thin edges liability to cracking of the base of the rail is practically overcome. As the rails are supported throughout their length by the rail-supporting bars, as hereinafter described, a greater load-carrying capacity can be obtained with a smaller section of rail head and base and a relatively harder steel of a high wearing quality can be employed, such as a high-carbon or carbon-and-manganese steel, and the rail-bodies may be more highly compacted in rolling, so that the main rail has very high wearing qualities, more than double that of the ordinary rail of the same strength now in use.

The rail-supporting base-bar 3 is preferably the form illustrated, being formed with a flat base 11 and with raised ribs 12, forming vertical web portions 13, which add greatly to the stiffness of the track structure, the base-bar extending out beyond the said web portions, so as to give the desired width of tread upon the ties. These tread-flanges 14 may be spiked or otherwise secured to the ties. Between the vertical webs 13 is formed the hollow seat 15, which corresponds in shape to the base of the main rail, which is to be seated therein, being made comparatively narrow and deep to give absolute support to the rail against lateral strain by firmly seating and supporting the narrow thick rail-base. Where a double-headed rail such as shown in Fig. 2 is employed, the side faces 18 of said seat are formed slightly tapering to receive the slightly-tapering head of the rail, while the base of the seat is concave and curved slightly, so as to give support to the entire surface of the rail-base. One advantage obtained from the use of such double-headed rail is that it is seated in the seat of the supporting-base bar by a wedge action, so that when forced to its seat, such as by the passing of the first load over the track, it is so firmly seated in the supporting base-bar that the main rail and the base-bar form, in effect, a single rail, giving the combined advantages of the support of the tough strong low-carbon steel base-bar with the high wearing qualities of the high-carbon or like hard main rail. Where a rail-section such as shown in Fig. 4 is employed, the seat 15 of the base-bar is of course made to conform thereto, and such section of rail obtains a very firm seating in the base-bar on account of the vertical side faces of the rail-base and the rail-seat in the base-bar. Both constructions of combined rail and base-bar are so united that under the ordinary vertical and side strains the rail cannot be displaced from its seat in the base-bar even though not bound therein by any suitable fastening device, and in case of fracture in the high-carbon or hard main rail it will be so supported in the base-bar that there is practically no liability to accident. The seat in the base-bar is of a depth sufficient to receive the entire base of the rail either the head or the double-headed rail, or the thick base portion of the form illustrated, though the base-bar does not extend above such rail-base.

Any suitable means for holding the rail-base in the seat of the base-bar may be employed, that illustrated in the drawings being clips or fastening devices 17, which are made to conform to the shape of the vertical webs 13 and the tread-flanges 14 of the base-bar, the clips being, as shown, of angular form, with a bolt-hole passing through the same and being held in place by bolts 19, having angular necks fitting in the angular holes punched in the base-bar, the heads of the bolts fitting against the lower face of the base-bar and the bolts being held in place by nuts 20, as shown. The main function of these fastening devices is to hold the main rail against rising under vertical strain where the load is bearing upon another portion of the rail—such, for example, as between ties adjacent to those where the clips are placed. The possible downward deflection of the rail-body at such adjacent points would be liable to lift the rail slightly out of its seat; but such clips hold it firmly therein, resisting such upward strain and so binding the rail and base-bar together that they act as practically a single metal structure. To this end these clips are located between the ties, the clips at one side being located out of line with those

on the other side and enabling the rail and base-bar as thus clamped together to resist the tendency to upward bending in the portion of the rail not carrying the load.

Any suitable spliced bar or joint between the main rails may be employed. I prefer to employ that shown in the drawings, in which the splice-bars 21 fit between the heads and bases of the rail-section, the upper edge of the splice-bar bearing against the under face of the rail-head, while the under face of the splice-bar extends over and bears upon the upper edge of the ribs or vertical webs 13 of the rail-supporting bar. By such construction the splice-bars give support to the rail at the joint not only through the bolting or clamping of the same together, but they transmit the load from the rail-head directly to the base-bar through their contact with the vertical webs of the base-bar on which they rest, the rail being supported at its joint not only by the base-bar extending under the joint and through the seating of the rail in the base-bar at that point, but through the splice-bars transferring the load from the rail-head directly to the upwardly-extending flanges of the base-bars, which flanges, as above stated, serve as trusses to increase the vertical stiffness of the base-bars.

To unite the sections of the base-bars, I prefer to employ the construction illustrated, the joint of the base-bars being located upon the wide cross-ties 2. For this purpose I employ the tie-plates 22, which rest upon the cross-ties and are preferably secured thereto by suitable claws 22ª, formed on the under face of such tie-plate and entering the tie. The tie-plate has formed on its upper face the rib 23, against which the outer edges of the base-bars rest, and to secure the base-bars to the tie-plates suitable spike-holes are formed in both the tread-flanges 14 of the base-bars and in the tie-plates, through which spikes or wood-screws 24 are driven into the ties. These spike-holes in both the base-bars and the tie-plates are formed oblong, so as to provide for expansion and contraction, while holding the base-bars against creeping action upon the ties. To still further unite the base-bars to the tie-blates, I prefer to extend each end to the tie-plate beyond the tie and under the base-bar, as at 25, and to unite the base-bars and ties by bolts 26 passing through both. These bolts are shown as resting on washers 27, the nuts 28 bearing against the under faces of the extensions 25 of the tie-plate.

The joints of the rails are preferably located within a few feet—say about three feet—of the joints of the base-bars, so that each rail is seated in the same base-bar except for about three feet of its length, which enters the adjoining base-bar. As so placed each rail is held from creeping action by the friction between the rail-base and base-bar, as the rail-base rests in the seat of the same base-bar for practically its entire length, and such rail and base-bar act practically as a single rail, there being practically no liability to creeping action in the rail upon the base-bar.

In the use of my invention the load of the passing train is carried by the combined main rail and base-bar, the weight of the train holding the rail within its seat in the base-bar and the deep seating of the rail-bases in the base-bars enabling the rails to resist lateral strain of the passing train upon the main rail, this being increased by the wedging of the rail-bases within the seat of the base-bars. The rail-base cannot be forced out of this seat except by the spreading and practical fracture of the base-bar in its seat, so that the base-bar gives positive support to the rail both vertically and laterally. As the rail-base is formed of tough low-carbon steel, it is enabled to resist great strain without breaking, and the rail can therefore be made of high-carbon or other similar steel of high wearing qualities, and while the rail has much greater strength than a standard rail-section of the same weight it has also more than double the wearing qualities on account of the high-carbon steel employed. Where a double-headed rail is employed, the life of the rail can also be correspondingly extended by the reversal of the rail when the head becomes worn. The wearing qualities of the combined rail are therefore much greater than that of the ordinary standard rail of the same weight and cost. As no wear is brought upon the base-bars when the main rails are worn out, by the employment of new main rails the track can be replaced at much lower cost than with the standard rail-sections, where the entire rail must be replaced. The combined rail through the main rail and its base-bar is much stiffer for the same weight than the ordinary rail-section, first, because the main rail itself, being formed of higher-carbon steel, is much stiffer than the rail of low-carbon steel as now required, while the base-bar supports the rail throughout its entire length and adds to its stiffness not only through the metal of the base-bar, but through the vertical webs thereof, forming the deep seat for the reception of the main rail. The increase strength is largely obtained because of the distribution of the metal in the combined structure, whereby a larger proportion of the metal is brought below the neutral axis of the structure, and thereby acts as a tension member. The main rails are also perfectly supported at their joints through the continuous under-running base-bars and through the transfer of the vertical strain from the splice-bars directly from the rails to the vertical web portions of the base-bars. The base-bars are also properly supported at their joints

through the tie-plates under the same and properly fastened thereto by spiking or bolting, as above described. The load of the passing train is thus sustained not only by the stiffer rail-section, but by the rail-supporting bar extending continuously under the rail and its vertical rib portions acting as braces or trusses to the rail throughout its length, and the distribution of the load throughout its length, and the distribution of the load throughout the length of the rails through such continuously-running base-bars, the load-carrying capacity of the track being thus largely increased. On account of the distribution of the load in this way over a large number of ties liability of the rocking of the ties under the load is also largely overcome and liability to disturbing the ballast practically prevented. As the rail-base is firmly seated in the seat of the base-bar throughout its length and is held therein by the rail-fastening devices, so that it cannot rise therefrom, the combined rail and base-bar give greater resistance to lateral or leverage strains and make the track much stiffer than where the rail is liable to be deflected between ties.

What I claim as my invention is—

1. The combination of an upper or main rail formed of a head, web and base and of relatively high carbon steel having high wearing qualities, and a continuously-underrunning, rail-supporting base-bar formed of tough, low-carbon steel and having in its upper face a seat corresponding to and adapted to receive and envelop the lower face and edge portions of the rail-base.

2. The combination of a main rail formed of a head and web, and a relatively narrow and thick rail-base and a continuous underrunning, rail-supporting base-bar, having a deep seat in its upper face corresponding in shape to and enveloping the lower face and edge portions of the rail-base, but not engaging the rail above the rail-base.

3. In a railroad-track, the combination of an upper or main rail formed of a head, web, a relatively narrow and thick base and of a continuous underrunning rail-supporting base-bar, having in its upper face a deep seat corresponding in shape to and adapted to receive and envelop the lower face and edge portions of the rail-base, but not engaging the rail above said rail-base, and fastening devices extending from the supporting base-bar over the upper face of the rail-base.

4. In a railroad-track, the combination of an upper or main rail formed of a head, web and base, and a continuous underrunning rail-supporting base-bar having in its upper face a seat having slightly-tapering side walls and corresponding in shape to and adapted to receive and envelop the lower face and edge portions of the rail-base which is wedged therein, but not engaging the rail above the rail-base.

5. The combination of a rail having a web portion and a head and base of the same size and shape, forming a double-headed rail, and a continuous underrunning rail-supporting base-bar, having in its upper face a seat corresponding in shape to such head portions and enveloping the lower face and edge portions thereof, but not engaging the rail above the rail-base.

6. The combination of an upper or main rail formed of a head, web and base, and a continuous underrunning, rail-supporting base-bar, having in its upper face a seat corresponding in shape to and adapted to receive and envelop the lower portion of the rail-base, said base-bar having vertical web portions forming said seat and serving to increase the stiffness of the structure.

7. The combination of an upper or main rail formed of a head, web and base, and a continuous underrunning rail-supporting base-bar, having in its upper face a seat corresponding in shape to and adapted to receive and envelop the lower portion of the rail-base, said base-bar having vertical web portions forming said seat and serving to increase the stiffness of the structure, and having horizontal extensions beyond said web portions to rest upon the tie.

8. The combination with an upper or main rail formed of head, web and base, and a continuous underrunning rail-supporting base-bar having in its upper face a seat corresponding to and adapted to receive and envelop the lower portion of the rail-base, and fastening devices extending over the rail-base to hold it within said seat, said base-bar having horizontal portions beyond the seat for the rail-base forming means for securing said fastening devices to the rail-base.

9. The combination with an upper or main rail formed of head, web and base, of a continuous underrunning rail-supporting base-bar, having in its upper face a seat corresponding to and adapted to receive and envelop the lower portion of the rail-base, and having vertical web portions outside of said seat, and joint plates uniting the main rail-sections, said joint plates fitting under the rail-head and resting on the upper edges of the vertical web portions of the base-bar.

10. The combination with cross-ties of tie-plates secured thereon, continuously-running, rail-supporting base-bars resting on said tie-plates, and having a seat in the upper face thereof, and a main rail seated in said base-bar, the base-bars and tie-plates having correspondingly-located holes for passage of screws or spikes to secure the base-bars upon the tie-plates.

11. The combination with cross-ties of continuous underrunning base-bars support-

ed thereon, and main rails seated in said base-bars, tie-plates secured to the ties and supporting the base-bars at the joints, said tie-plates having extensions beyond the ties, and the base-bars and tie-plates being united by bolts passing through the base-bar and tie-plate extensions.

12. The combination with the cross-ties, of upper or main rails formed of head, web and base, continuous underrunning base-bars having seats corresponding to and adapted to receive the rails, and fastening devices secured to the base-bars and extending over the upper faces of the rail-bases, said fastening devices being located between the ties.

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

WILLIAM GOLDIE.

Witnesses:
GEORGE H. RANKIN,
ROBERT C. TOTTEN.