E. R. Shepard,

Railway Rail.

No. 102,602. Patented May 3. 1870.

Fig. 1

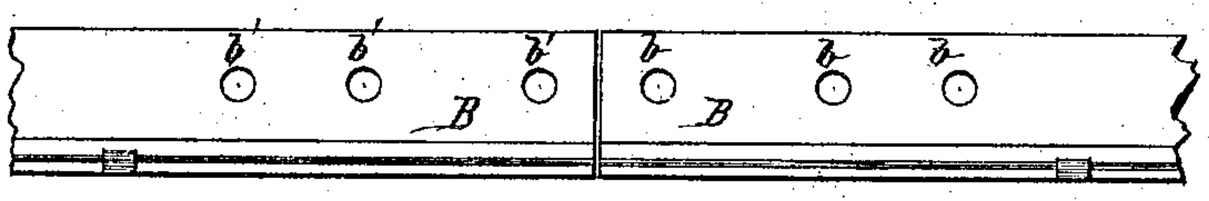


Fig. 2.

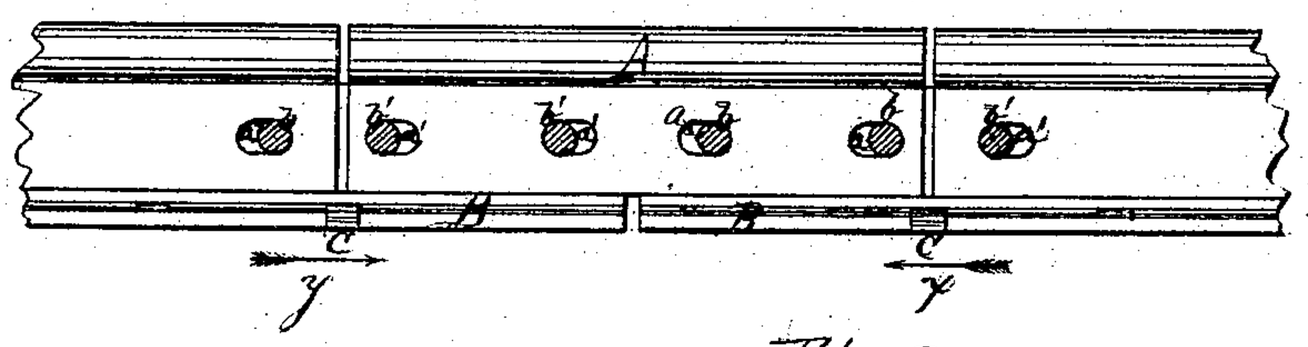


Fig. 3.

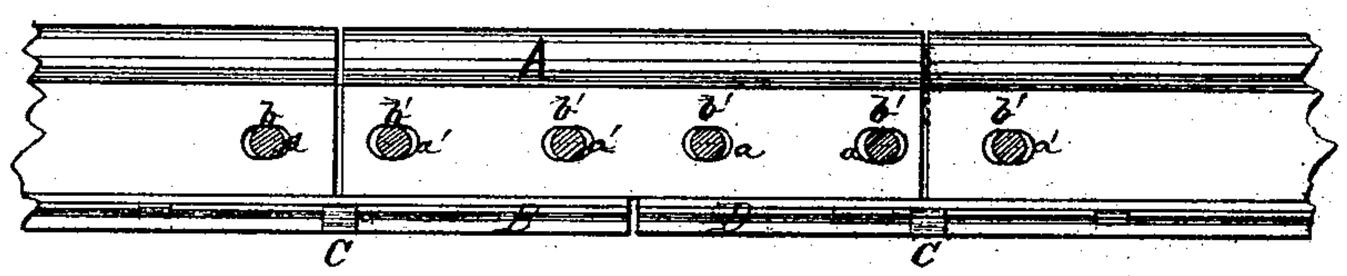


Fig. 4.

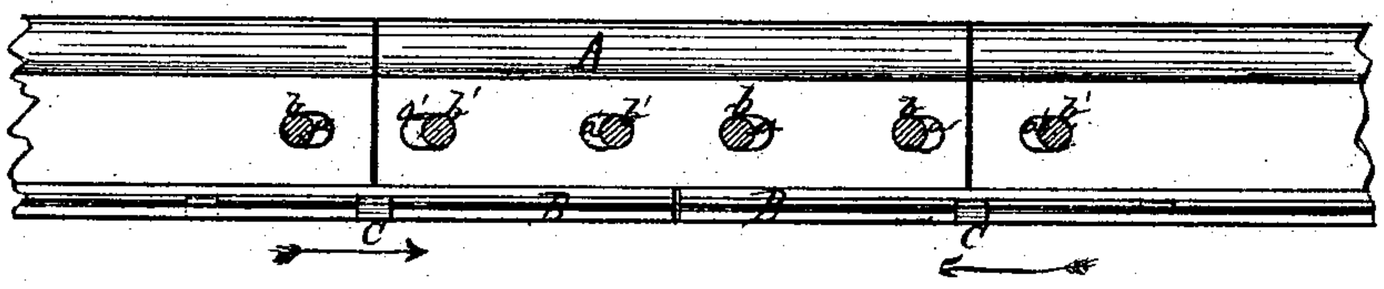


Fig. 5.

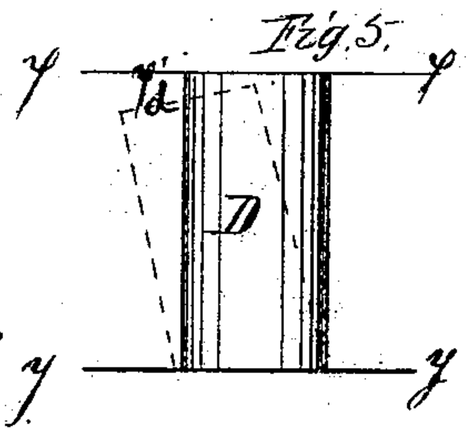


Fig. 6.

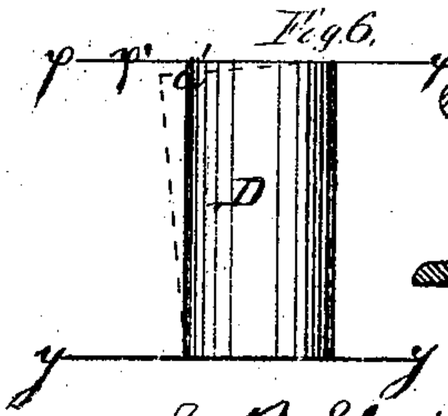
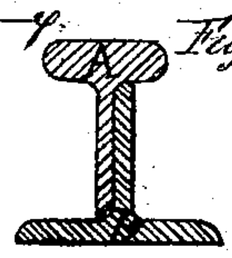


Fig. 7.



Witnesses
Alex. Mahon.
N. N. Doubleday

E. R. Shepard
by his attorney
A. W. Smith

UNITED STATES PATENT OFFICE.

EDWIN R. SHEPARD, OF SCRANTON, PENNSYLVANIA.

IMPROVED COMPOUND RAILWAY-RAIL.

Specification forming part of Letters Patent No. **102,602**, dated May 3, 1870.

To all whom it may concern:

Be it known that I, EDWIN R. SHEPARD, of Scranton, county of Luzerne, and State of Pennsylvania, have invented certain new and useful Improvements in Compound Rails, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is the base of the rail; Fig. 2, the rail at full contraction; Fig. 3, the rail at half expansion—say with the mercury at 30° or 40° Fahrenheit; Fig. 4, at full expansion, as in summer. Figs. 5 and 6 illustrate the effect upon the bolt-work or rivets produced by the shearing or sliding motion of the rail. Fig. 7 is a cross-section of the rail.

It is well known to all who are familiar with the history of the attempts heretofore made to use compound railroad-rails, that one of the chief obstacles in the way of their success has been the tendency to creep upon the ties, and another difficulty never before overcome has been the buckling of the rails caused by the expansion and contraction incident to the change in temperature of the atmosphere, which amounts frequently in certain localities to 60° or even 80° during twenty-four hours—enough to increase the length of a thirty-foot rail one-quarter or three-eighths of an inch. Call it but one-quarter of an inch, and it will be apparent that if both ends of the rail be rigidly held between the ends of two adjacent rails this middle one must, when expansion takes place, be deflected to such an extent as becomes quite a serious matter. There is also a shearing motion between the two parts, which, when one end of the rail is stationary and the expansion takes place wholly from that end, produces a heavy strain upon the bolt-work, and upon rivets more particularly, effecting their destruction very rapidly.

My invention has for its object the remedying of the above-named defects; and it consists in, first, a peculiar arrangement of the slots and perforations in the ribs or shanks of the rails for the insertion of the bolts or rivets; second, in making the base or lower portion of the rail shorter than the upper or head portion; third, in providing the base of the rail with notches at or near the center for the purpose of spiking the center of the base of the rail to the ties, thereby controlling the direction of the expansion and contraction and virtually compelling the base to expand from and contract toward its center.

The nature and scope of my invention will be better understood from the following description:

In the accompanying drawings, A represents the head of the rail, and B the base. Through the shank of the base are a series of perforations, *b b'*, just large enough to admit the bolt or rivet. These holes are at uniform distances from each other, this distance being governed by the number of bolts which it is desired to use in each rail; but care must be taken to have each pair of holes equidistant from the center of the rail—that is to say, the first hole *b* on one side of the center must be the same distance from the center as is the first hole *b'* on the other side of the center, these two being considered as a pair. This rule must be carried out throughout the entire length of the rail, and it will be evident that the length of the ends of the rails beyond the last pair of holes will vary because the length of the rails differ, and this difference will all be shown at the ends, as above stated.

In punching the slots *a* and *a'* in the shanks of head A the rule must be reversed. The punching must begin at one end and proceed halfway; then commence at the other end and proceed until it meets the other slots. The length of these slots should be about three-eighths of an inch greater than the diameter of the bolts or rivets, and the distance between the outer end of slot *a* or *a'* and the end of the rail should be one-eighth of an inch less than one-half of the distance between the two holes nearest the center of the base. Thus whatever difference exists in the length of head-pieces will be thrown into the center, making the two holes *a* and *a'* nearest the center a correspondingly longer or shorter distance apart. This, it will be observed, is exactly the reverse of the position of the holes in the base in which they are punched from the center toward each end. The necessity for this arrangement will be made apparent hereinafter. C are notches punched in the flange of the base at or near its center, of such size as to fit closely the spikes generally used for spiking the rails to the ties.

In laying the rails I first lay a number of the bases upon the ties with their ends a short

distance apart, then spike one of them firmly to a tie. I next place one of the heads upon the bases in such position that one end shall rest upon the center of each of two adjacent bases. In adjusting the parts accurately before bolting or riveting the following facts must be kept in mind: First, that the expansion which takes place in a rail of thirty feet in length from a change of temperature of 110° or 120°—that is, from 20° below zero in mid-winter to 90° or 100° above in summer—is from one-quarter to three-eighths of an inch; second, that from the fact that the base of the rail is spiked down in the center expansion can only take place from that point each way, as indicated by the arrows *x y* in Fig. 1; third, that expansion takes place in the head to the same extent as in the base, but in an opposite direction relative to the base—that is, supposing that the head be secured at its center, which I propose to do so far as is practicable. This will result in a movement of the head and base relative to each other of one-quarter of an inch at all points where the two may be in contact. I lay the head in such position that when the parts are at full expansion in the summer the bolts to be inserted in perforations *b* shall be brought into contact with the inner end of slot *a'*, as shown in Fig. 4. From the fact that nearly all rails are laid during the summer months the necessary allowance for additional expansion can be made with a good degree of certainty. After laying the head in proper position I bolt it securely to the base, and then move the next base to its place, observing the same rule with reference to the location of the bolt-holes and slots, keeping in mind the fact that the expansion in this second base takes place in a direction exactly opposite to that which has been provided for in the piece first laid, as indicated by arrow *y*, Fig. 4. After bolting this second base to the head I spike it firmly to the tie through notch C, and then proceed to lay another head in the same manner as the first.

From a careful examination of the effect of a change of temperature upon the rail it will be seen that as the temperature falls the bolts in bolt-holes *b* and *b'* will be drawn toward the center of the rail at C, while the slots *a a'* will be drawn toward each other, and the result will be that in winter the bolts will occupy positions in the slots *a a'* exactly the reverse of those occupied by them during the summer, as in Fig. 2. A fact to be noticed in this connection is that at either full expansion or full contraction the head is held firmly in place by the rivets or bolts and cannot be moved by the traction of the engine, and, in fact, the only time when it can be moved is at such time as the bolts shall be moving from one end of the slots to the other, and the point at which the greatest throw or movement is possible is when the bolts are just half-way, and even then it cannot amount to more than one-eighth or three-sixteenths of an inch, which is not enough to do any harm to either bolts or rivets, as I will endeavor to show. Under the old system of punching and bolting there was a necessity for leaving such play between the parts as would permit a movement of from three-eighths to one-half inch, which is double what I permit; but when we consider the effect upon the bolt-work, the injurious effects, instead of being reduced one-half by my arrangement, are almost, if not entirely, obviated, as will be seen from an examination of Figs. 5 and 6.

D represents a bolt of the usual length, and lying at right angles to the lines *x x* and *y y*, which represents the outer lines of the shanks of the rails. The dotted lines represent said bolt in the position into which it is thrown by the rails being crowded past each other, and it will be observed that the distance between the end of the bolt at *d* and the face of the rail at *x'*, and which must be provided for either by the elasticity of the parts or by pulling off the heads of the bolts or rivets; but when we reduce the throw of one end of the bolt one-half the virtual shortening of said bolt becomes almost unappreciable, as is shown at *d'*, Fig. 6.

The buckling of the rails is prevented by compelling each rail to expand and contract upon its own allotted space, instead of encroaching upon that belonging to its neighbor, thus avoiding all liability on the part of any rail to become jammed between two others, in which case, when a number of them are crowded tightly together, some of them will invariably buckle rather than push the adjacent ones as far as may be necessary to allow for its own increase in length.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The system herein described of punching the bolt or rivet holes in the base or lower portion of a compound rail.

2. The system herein described of punching slots in the tread or head portion of a compound railroad-rail.

3. Laying and spiking down compound railroad-rails in the manner and under the arrangement herein described and set forth.

EDWIN R. SHEPARD.

In presence of—

A. P. CHASE,

H. H. DOUBLEDAY.