

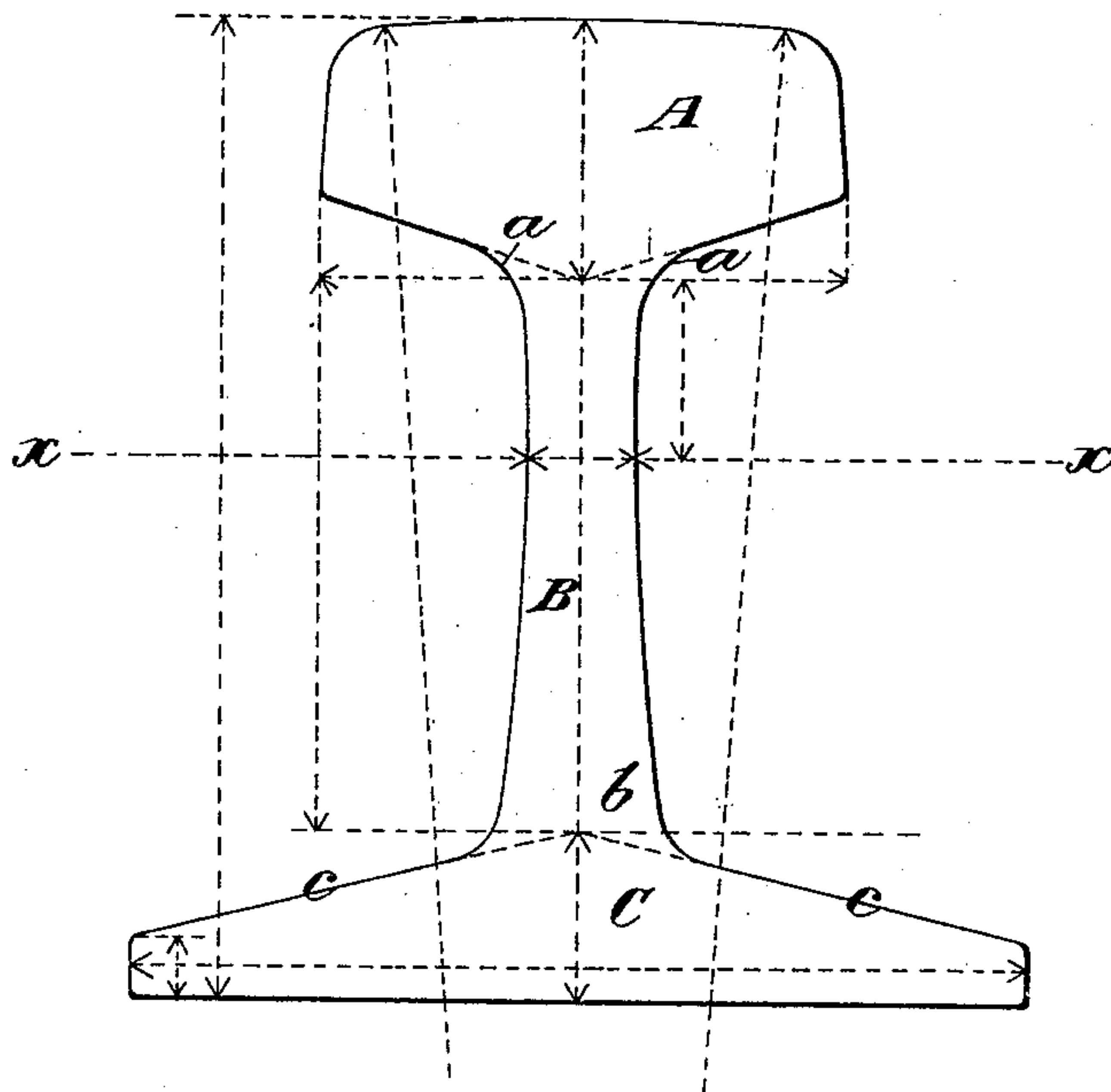
(No Model.)

P. H. DUDLEY  
RAILWAY RAIL.

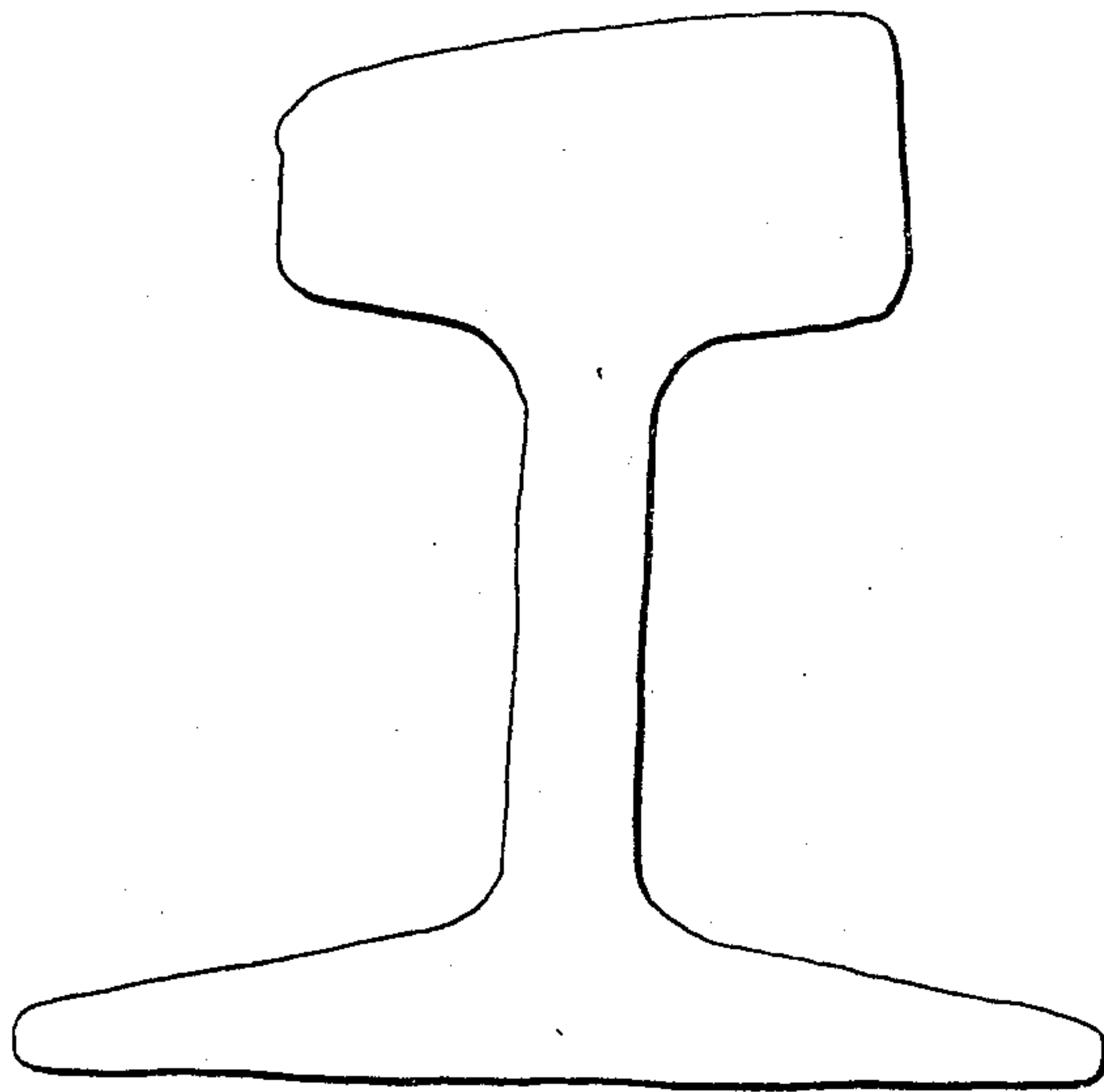
No. 486,633.

Patented Nov. 22, 1892.

*Fig. 1.*



*Fig. 2.*



*Witnesses:-*  
*D. H. Raymond*  
*O. Sundgren*

*Inventor:-*  
*Plimmon H. Dudley*  
*by attorneys*  
*Brown & Edwards*

# UNITED STATES PATENT OFFICE.

PLIMMON H. DUDLEY, OF NEW YORK, N. Y.

## RAILWAY-RAIL.

SPECIFICATION forming part of Letters Patent No. 486,633, dated November 22, 1892.

Application filed April 19, 1892. Serial No. 429,741. (No model.)

*To all whom it may concern:*

Be it known that I, PLIMMON H. DUDLEY, of New York, in the county and State of New York, have invented a new and useful Improvement in Railway-Rails, of which the following is a specification.

My invention relates to an improvement in railway-rails, having for its object the particular disposition of the metal composing the rail with a view of obtaining maximum strength and stiffness and long life with a minimum amount of metal.

It has been a commonly-accepted theory that the life and service of a rail will depend upon the depth of its head, the other dimensions remaining the same, and hence where the traffic became heavier the rails with deeper heavier heads were laid to provide for it. The result of this has been not only that rails have worn very rapidly, but heads which were not half-worn out have become permanently set or otherwise distorted, so as to render their removal necessary.

I have found by careful experiment that if the metal which has commonly been added to the depth of the head of the rail, with the object in view to lengthen its life and fit it for heavier traffic, be disposed in the form of broader and shallower heads having wider fillets between the under side of the head and the web, in widening the lower portion of the web, and in thickening the central portion of the base, at the same time making the edges thick, the stiffness of the rail will be very greatly increased, it will carry heavier loads without injury, and its life will be prolonged.

My present invention therefore consists in a railway-rail in which the head is comparatively broad and shallow, the fillets upon opposite sides of the web at the point where the web and head unite merge into the under side of the head at points well out toward the edges of the head and into the web at points well down from the under side of the head, the lower portion of the web being gradually widened as it approaches the base, and the base thick and having its upper face steeply inclined from its outer thick edges toward the web.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 represents a vertical cross-section of a rail embodying my invention, and Fig. 2 represents a vertical cross-section of a rail of ordinary form as it appeared when removed from the track.

A represents the head of the rail, B the web, and C the base.

The fillets which connect the opposite sides of the web with the under side of the head are represented by *a*, the widened portion of the web near the base by *b*, and the inclined portions of the base, which diverge rapidly from the bottom line, by *c*. The exterior faces of the web are curved in vertical transverse planes, the centers from which the curves are struck being located upon a transverse line above the middle point of the web.

In Fig. 1 the line on which the centers are taken for determining the curves of the opposite sides of the web is represented by *xx*, and the curves are swept by a radius about three times the height of the rail. To be exact, the height of the rail being four and one-eighth inches, the radius with which the sides of the web are determined is twelve inches.

The pitch I prefer for the under side of the head A before they merge into the fillets *a* for rails of fifty to sixty-five pounds per yard and under four and three-quarters inches high is equal to a depression of one inch for every three inches in extension, (though this may be modified to better suit the grade of metal used,) and for rails of seventy-five or more pounds per yard and over five inches high it is equal to a depression of one inch for every four inches of extension, and the pitch of the inclined faces *c* of the base is equal to a vertical rise of one inch in every four or five inches of extension. This feature, also, I modify to suit the metal employed. The width of the head is about one-half the height of the rail, or it may be somewhat more, and the depth of the head, measuring from the top to a point where the planes of its under side intersect, is equal to about one-half the width of the head. This makes a head having an eminently wide and shallow form, and, in connection with the heavy base and thickened web as it approaches the base, carries the neutral axis below the middle point in the height of the rail. The curve of the fillets *a* is not sharp, but very gradual,



carrying their vanishing points or the points where they merge into the under side of the head and into the opposite sides of the web well away from the angle, and thereby forming a firm support for the edges of the head to prevent it from yielding under heavy vertical or lateral pressure, so as to become displaced, relatively to the web and base. The web as it gradually widens toward the base and unites with the base by broad curves is prevented from assuming a set out of its proper relation to the base, and the base itself, being stiff and heavy, resists all strains both vertically and laterally and is not liable to become affected by oxidation sufficiently to materially weaken it.

The location of the line on which the centers are taken for determining the curves of the sides of the web above the center of the web and the consequent thickening of the lower portion of the web, in addition to lowering the neutral axis of the rail, better equalizes the strain of the metal between the base and head, checking the tendency to permanent set and checking the tendency of the web to bend near the base of the rail under heavy traffic; also, increases the moment of inertia of the section and becomes an important feature in the manufacture of the rail by more nearly equalizing the heat of the section between the base and the head, permitting colder rolling and lessening the amount of cold straightening required.

The effect of the rolling is by the above structure carried to such a depth that the head becomes substantially homogeneous in structure, the elastic limit of the metal, its hardness, and toughness being well within the control of the operator.

By examining the section Fig. 2 it will be observed that the web has taken a permanent set out of its true position relatively to the base, the head has rolled over, and the wear has consequently taken place more upon one edge of the head, so that the rail under unusual strain would be liable in its present condition to spread in the track or break. Its fillets are upon sharp curves, its web is

not thickened at the base, and the pitch of the base and under side of the head is not such as to afford the necessary strength. The head is comparatively deep, and the proportions are such as to render it impossible to set up such a condition of the metal as to prevent it from rapid wear.

In the form shown in Fig. 1, in which the metal in the head of the new rail is even less than that in the worn-out rail shown in Fig. 2, the head may be worn down to half its present thickness without disturbing the relative positions of the head, web, and base, thereby rendering its life long and its reliability at all times certain.

What I claim is—

1. A railway-rail the head of which is united with the web by fillets having a broad or open curve, the web being gradually thickened as it approaches the base, the gradual thickening of the web beginning at a point above the center of the web and the base increasing rapidly in thickness from its thick edges toward the web, substantially as set forth.

2. A railway-rail having the width of its head equal to about one-half the height of the rail, the depth of the head from the top to the intersection of the planes bounding the under sides of the head about one-half the width of the head, the head being joined to the web by fillets having a broad or open curve, and the neutral axis of the rail lying below the middle point of the height of the rail, substantially as set forth.

3. A railway-rail having the width of its head equal to one-half or more of the height of the rail, the depth of the head about one-half its width, and the curves of the opposite sides of its web taken in a vertical plane transverse to the rail, drawn from centers above the middle point of the web, whereby the web is thickened more at its lower portion than at its upper portion, exclusive of the fillets, substantially as set forth.

PLIMMON H. DUDLEY.

Witnesses:

FREDK. HAYNES,  
GEORGE BARRY.