No. 657,964. Patented Sept. 18, 1900.

J. S. SEAMAN.

MANUFACTURE OF RAILS.

(Application filed June 7, 1900.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

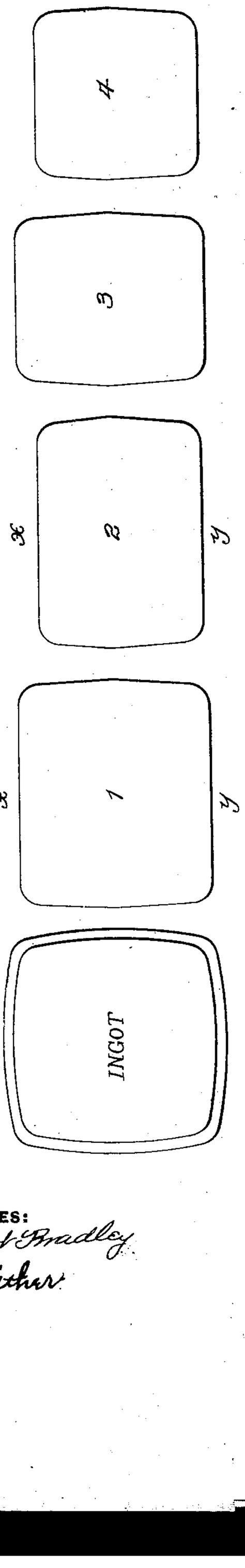


FIG. 2.

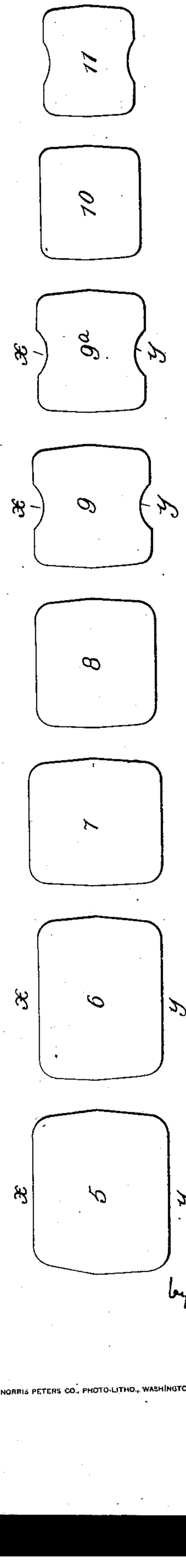
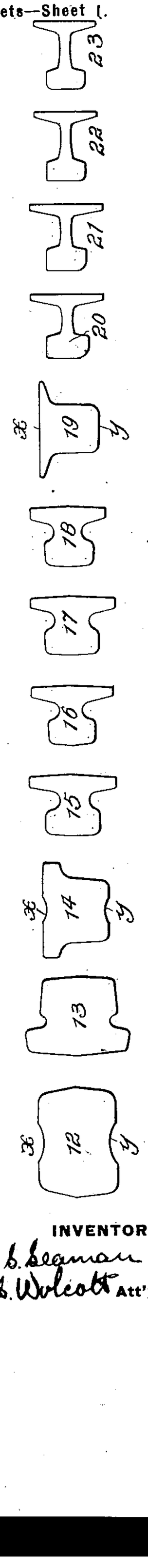


FIG. 3.



WITNESSES:
Herbert Bradley
F. E. Gaither

INVENTOR
Joseph S. Seaman
by Dennis S. Wolcott Att'y.

No. 657,964. Patented Sept. 18, 1900.

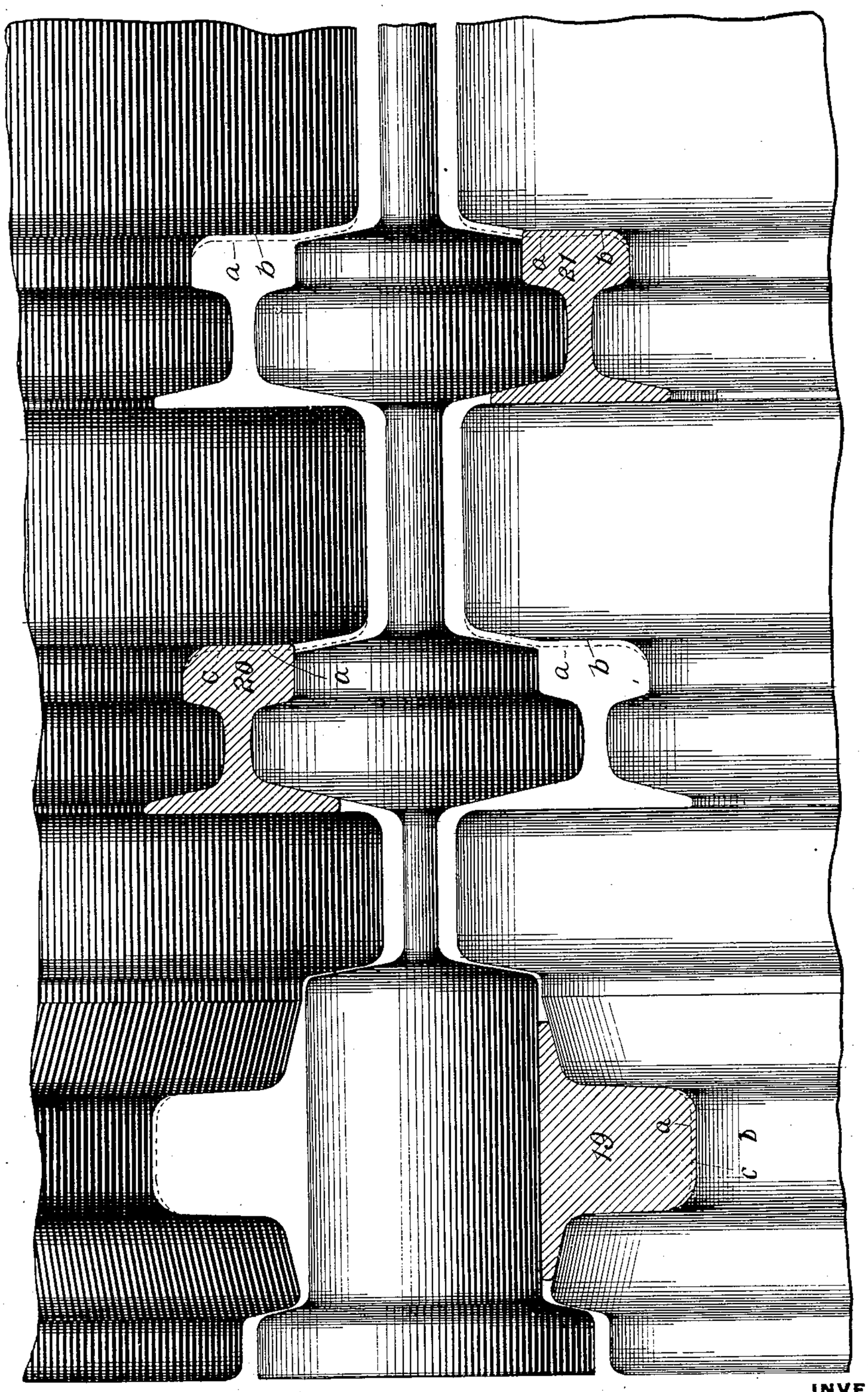
J. S. SEAMAN.

MANUFACTURE OF RAILS.

(Application filed June 7, 1900.)

(No Model.) 3 Sheets—Sheet 2.

FIG. 4.



WITNESSES:
Herbert Bradley.
F. E. Gaither

INVENTOR
Joseph S. Seaman
by Darwin S. Wolcott Att'y.

No. 657,964. Patented Sept. 18, 1900.

J. S. SEAMAN.

MANUFACTURE OF RAILS.

(Application filed June 7, 1900.)

(No Model.) 3 Sheets—Sheet 3.

FIG. 6.

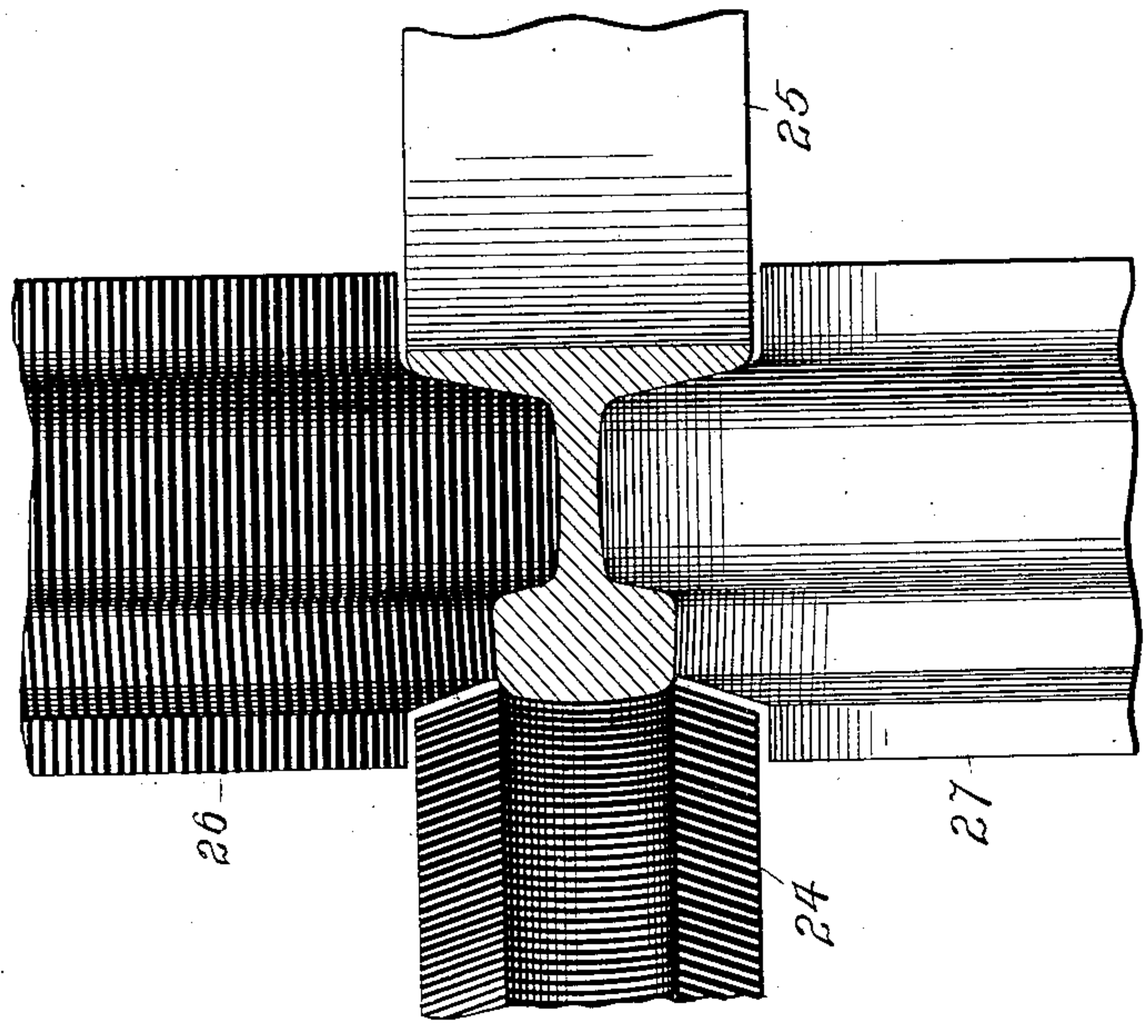
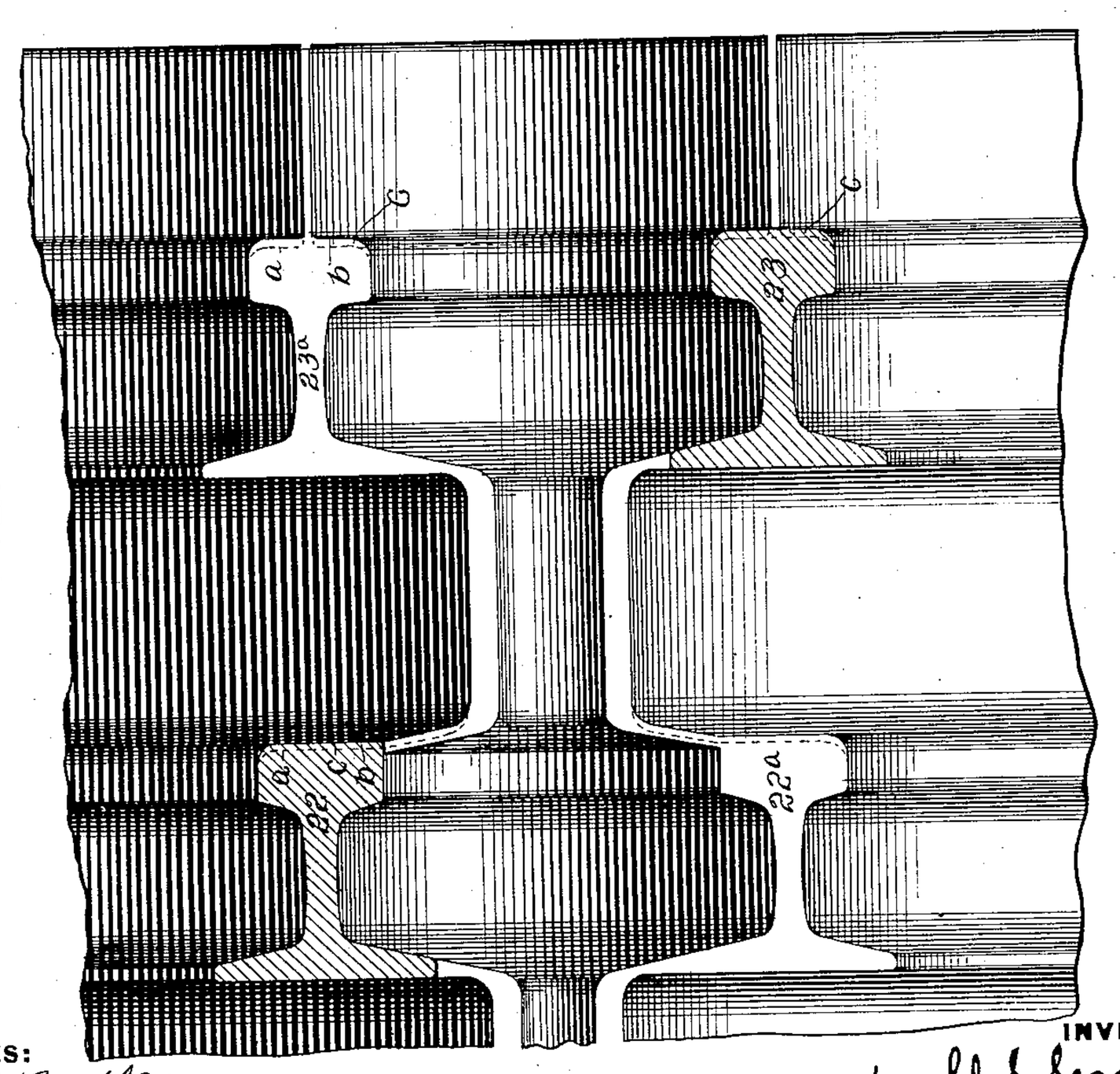


FIG. 5.



WITNESSES:
Herbert Bradley
F. E. Gaither

INVENTOR
Joseph S. Seaman
by Dannie S. Wolcott Att'y.

UNITED STATES PATENT OFFICE.

JOSEPH S. SEAMAN, OF PITTSBURG, PENNSYLVANIA.

MANUFACTURE OF RAILS.

SPECIFICATION forming part of Letters Patent No. 657,964, dated September 18, 1900.

Application filed June 7, 1900. Serial No. 19,394. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH S. SEAMAN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in the Manufacture of Rails, of which improvements the following is a specification.

The invention described herein relates to certain improvements in the manufacture of railroad-rails, and has for its object an improvement in the method of manipulation of the metal, whereby an increased working of the metal of the head portion of the rail is effected, such working being effected at such a time in the rolling operation as will produce an effect similar to that known in the metal-working art as "cold-rolling."

It is characteristic of the method now practiced in the production of rails that in the rolling operation that portion of the metal which is to enter into the head of the finished rail is subjected to an active rolling operation only in six passes of the twenty-four now usually employed in reducing an ingot to a finished rail. In all the other passes the active rolling operation is on the sides of the metal of the ingot, thereby effecting a lateral and longitudinal displacement of the metal, while the portions of the metal which go to form the foot or flange are subjected only to the restraining action of the side walls of the passes. It is also characteristic of the method now in use that the rolling is effected at as high a temperature as is possible in order to produce an increased tonnage. By reason of working the metal at high temperatures and also by reason of the non-working of the metal which goes to form the head of the rail such metal is, comparatively speaking, soft and spongy and incapable of withstanding the wear incident to the heavy engines and rolling-stock now employed. It has been attempted to overcome this objectionable feature by forming a comparatively-narrow rib along the surface of the head projecting beyond the plane of finish of the head and then forcing this rib down into the head, while preventing any material enlargement of the head. The result of this method is simply the formation of a comparatively-narrow band of condensed or hardened metal along the metal of the face of the head and without any working of other portions of the metal of the head. It has also been attempted to increase the durability of the head of the rail by forming during the finishing passes of an ordinary rail-mill the head higher and narrower than desired in the finished product and then by a subsequent rolling operation on the face or upper surface of such high head reducing the height and correspondingly increasing the horizontal dimensions of the head to those required in the finished product. By this method there will be no material hardening or condensing of the metal, nor will there be any working of such metal except along the comparatively-narrow portion of the head-blank as produced in the last passes of the finishing-rolls. By my improvement I provide for the working by the active operation of the rolling-surfaces of the rolls on the metal of the tread-face as well as of the sides of the head, and also for a hardening and compacting of the metal of all such portions of the head with which the wheels of the car will come in contact.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figures 1, 2, and 3 illustrate, diagrammatically, the several passes of the rolls now employed in reducing the ingot to a finished rail. Figs. 4 and 5 show the form or shape of the five finishing-passes as employed in the practice of my invention, and Fig. 6 shows the last or finishing pass in which the rail is brought to finished size and shape.

In the practice of my invention the ingot is reduced to or approximately to the finished rail by the same number of passes, said passes being formed in a two or three high mill of substantially the same shape and contour as those now employed, except for the passes in the finishing-rolls. It will be observed by reference to the diagrams shown in Figs. 1, 2, and 3 that the portions of the metal of the ingot which go to form the head and flange of the rail, such portions being indicated by the letters x and y, are not subjected except in passes 2, 3, 5, 6, 9 or 9^a, 12, 14, and 19 to an active rolling reduction. In all the other passes the rolls operate actively on the sides of the ingot or flange, effecting an elongation

of the ingot or blank, while the head and foot portions *x* and *y* are subjected to only a slight restraining or compressing action by the side walls of the several passes. While the shape or contour of the finishing-passes from 19 to 23 are similar to those now employed, I provide for a quantity of metal in the head portion of the blank or the portion thereof which goes to form the head in excess of that required to produce the head under the present practice, such excess of metal being distributed, preferably, in such manner that the "tread-surface," within which term is included the portions of the rail subjected to wear by the tread and flange of the car-wheel, is subjected in the final reducing pass to the greatest reduction. The shape and dimensions of the passes heretofore employed are shown in full and dotted lines in Figs. 4 and 5, and the shape and dimensions of the passes employed by me in the practice of my invention when the excess of metal is limited to the tread-surface are shown in full lines. The dotted line *a* indicates the line of finish of the head according to the present practice, and the full line *b* indicates the line of finish of the head in the practice of my invention. It will be observed that the increased body or portion *c* of metal provided for in the passes employed by me extends entirely across the head portion of the blank and slightly down onto the sides of such head. This additional body of metal in the head is preserved in all the finishing-passes now employed. In the last pass the rail is brought to approximately the finished size and shape, except as hereinbefore stated.

It is preferred after the rail has left the pass 23 to allow it to cool down to as low a temperature as is permissible for further reduction to finished size, so that in this final reduction the metal will be subjected to what is generally termed a "cold-rolling." This cold-rolling is effected in a universal mill, preferably one of the type or construction shown and described in Letters Patent No. 318,513, granted to me May 26, 1885. In such a mill the head and flange are subjected to an active rolling reduction by the vertical rolls 24 and 25, while the web and sides of the head and flange are subjected to the rolling action of the horizontal rolls 26 and 27. As all parts of the rail except the tread portion are of nearly finished size and shape the reduction effected by the horizontal rolls 26 and 27 and the vertical roll 25, which operate on the flanges, the web, and the under side of the head of the rail, will be comparatively slight; but the reduction effected by the vertical roll 24 will be sufficient to bring the vertical dimensions of the head to that desired in the finished rail. By thus actively rolling the tread-surface of the rail, even were no material reduction effected, a beneficial working of the metal would be produced; but by increasing the vertical dimensions of the head in the manner stated and rolling this additional body of metal into the head and at the same time preventing any increase of the horizontal dimensions of the head a great increase in working and reduction is effected and the metal is condensed and rendered more solid. By effecting this condensation of the metal while the rail is at comparatively-low temperature a hardening effect is produced, thereby rendering the head much more durable in service. It will be understood by those skilled in the art that the number of passes by which the ingot is reduced to the finished product may be varied—*i. e.*, decreased and increased; but in all cases provision should be made by suitably constructing some of the passes for a body of metal in the head of the rail in excess of that now required to form the head and the forcing of such additional body of metal into the head, while all surfaces of the latter are subjected to the action of rolling as distinguished from rubbing surfaces. In addition to this working and hardening of the metal of the head this last or final rolling can be employed for giving the desired camber to the rail. This greater reduction effected by the roll 24 in rolling in the portion of metal *c* will cause the rail to curve, such curvature being due to the greater elongation on the portion subjected to greatest reduction. In case the reduction of the head effected in the head-working pass in the universal mill should produce too great curvature or camber the passes in the finishing-rolls can be so proportioned that the flange portions will be a little thicker than desired in the finished product, thereby necessitating a material reduction of the flange portions in the universal mill. By suitably proportioning the reduction of the flange portions to be effected in the universal mill, such reduction of the flange proportionately neutralizing the curving effect incident to the reduction of the head, any desired curvature or camber of the rail can be produced.

While it is preferred that the additional body of metal *c* should be uniformly distributed over the tread-surface of the head of the rail, it may be arranged along the side or under portions of the head by enlarging the portions of the finishing-passes at the places where the body of metal *c* is to be added.

I claim herein as my invention—

1. As an improvement in the art of making rails, the method described herein which consists in providing during the rolling operation an additional body of metal uniformly distributed or substantially so over the entire tread-surface of the rail, and beyond the final plane of finish, and then as a final finishing operation forcing such additional body into the head by the action of a rolling-surface and without any material enlargement of the head, substantially as set forth.

2. As an improvement in the art of making rails the method described herein, which

consists in providing during the rolling operation a body of metal uniformly distributed over the head of the rail in addition to that required in the ordinary reduction of the rail and then as a final operation forcing such additional body of metal into the head without permitting any material enlargement thereof by the action of rolling-surfaces acting simultaneously on all parts of the surface of the head, substantially as set forth.

3. As an improvement in the art of making rails the method herein described, which consists in rolling an ingot to approximately the finished size and shape of rail desired, providing during such rolling operation a body of metal in the head of the rail in addition to that required in the ordinary reduction of the rail, allowing the partially-finished rail to cool and then as a final operation forcing such additional body of metal into the head without permitting of any material enlargement thereof by the action of rolling-surfaces acting simultaneously on all parts of the surface of the head, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOSEPH S. SEAMAN.

Witnesses:
DARWIN S. WOLCOTT,
H. M. CORWIN.