

(No Model.)

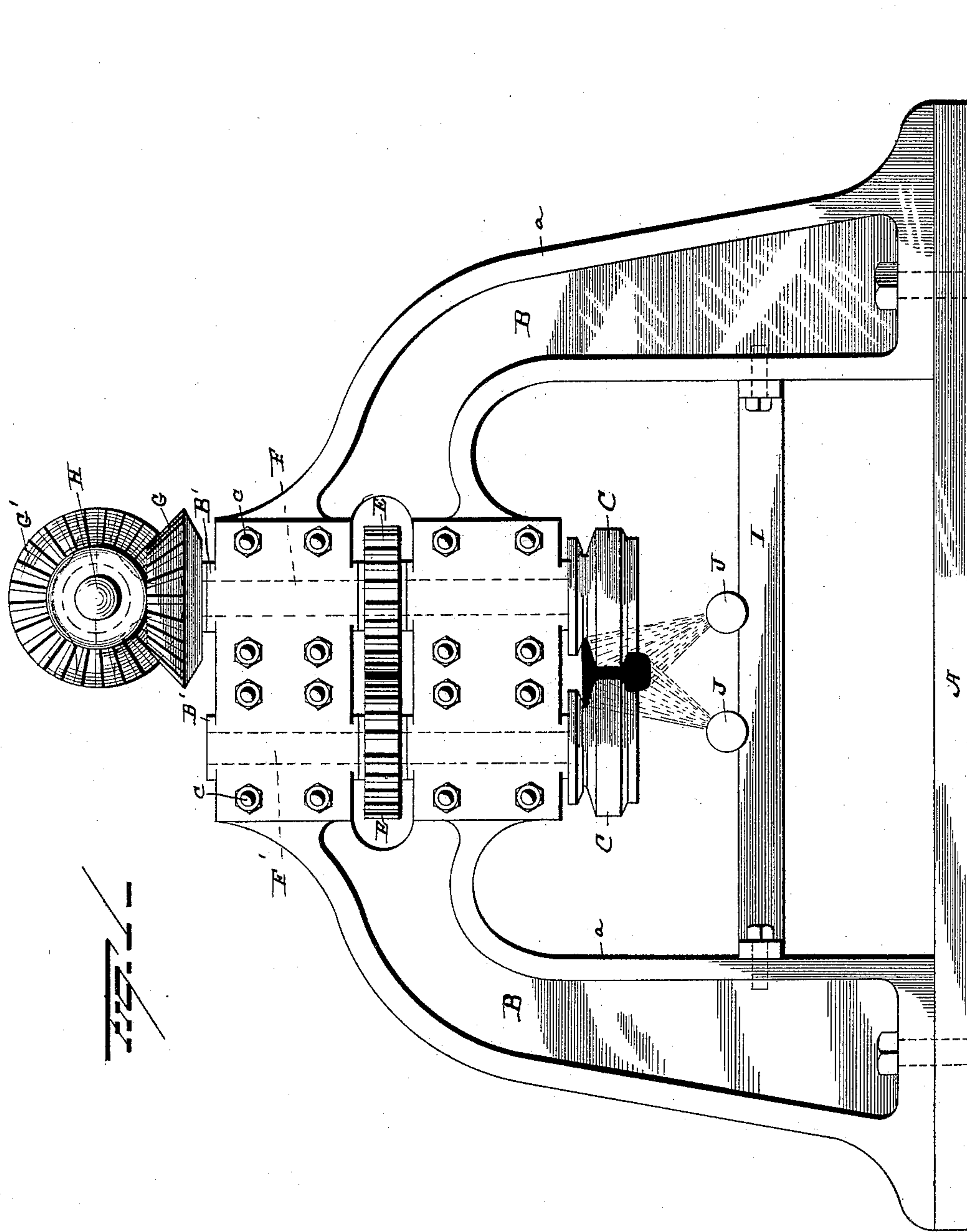
2 Sheets—Sheet 1.

J. COFFIN.

PROCESS OF TOUGHENING STEEL RAILS OR BARS.

No. 390,206.

Patented Oct. 2, 1888.



Witnesses
B. H. Nottingham
Geo. F. Downing

Inventor
John Coffin.
By his Attorney
H. A. Sugman.

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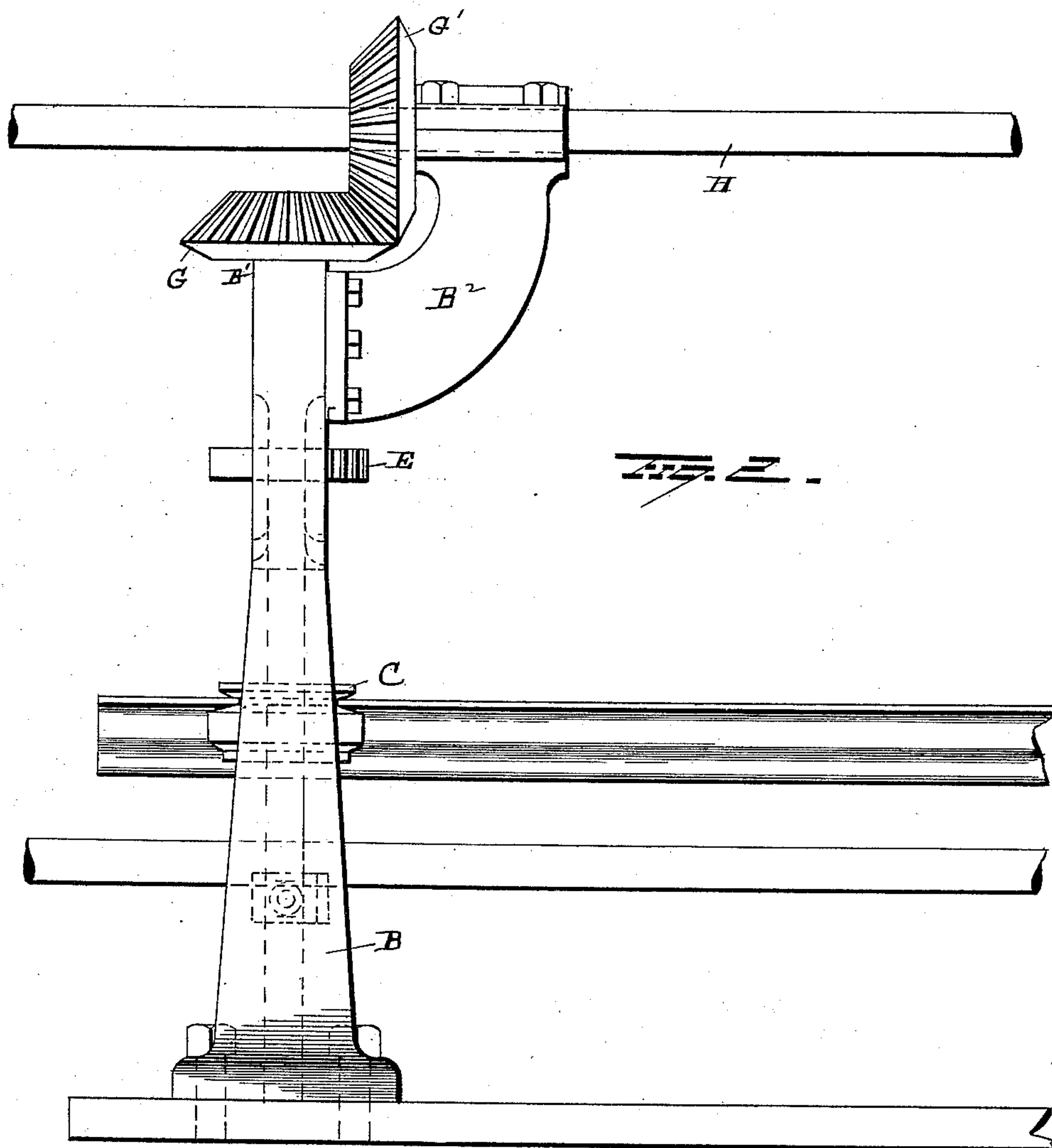
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Geo. F. Downing

Inventor

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By his Attorney

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UNITED STATES PATENT OFFICE.

JOHN COFFIN, OF JOHNSTOWN, PENNSYLVANIA, ASSIGNOR TO THE
CAMBRIA IRON COMPANY, OF SAME PLACE.

PROCESS OF TOUGHENING STEEL RAILS OR BARS.

SPECIFICATION forming part of Letters Patent No. 390,206, dated October 2, 1888.

Application filed October 18, 1887. Serial No. 252,718. (No model.)

To all whom it may concern:

Be it known that I, JOHN COFFIN, a resident of Johnstown, in the county of Cambria and State of Pennsylvania, have invented certain
5 new and useful Improvements in the Process of Toughening Steel Rails or Bars; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which
10 it appertains to make and use the same.

My invention relates to an improvement in a process and apparatus for toughening steel railroad-rails or other steel bars.

Patent No. 368,132, granted to me and dated
15 August 9, 1887, describes a process and apparatus for toughening steel rails. The process as set forth therein consists, essentially, in the transfer of a hot rail, after it has passed the finishing-rolls, to a point laterally opposite a
20 receiving-table, upon which the rail to be treated is shifted. The rail is then clamped at spaced intervals in firm contact with the table, and afterward inverted by proper mechanism, so as to suspend the rail head down-
25 ward above a bosh or water-tank and lower it therein. After the rail has been immersed, a series of jets of cold water are projected against the head or tread of the rail a proper length of time, when the table is reversed in position,
30 thus removing the clamped rail from the bosh.

It was indicated as an essential feature of the process shown and described in Patent No. 368,132 that the immersion and consequent partial cooling of the clamped rail should
35 continue long enough to reduce the temperature of the same to such a proper degree that the heat remaining therein after even diffusion throughout the mass will exhibit a low-red color if the rail is placed in the dark or pro-
40 tected from daylight.

The process of handling and partial cooling of steel rails just mentioned is designed to retain the structural arrangement of their mass by a rapid cooling of the heavier portion of
45 the rail when it leaves the finishing-rolls, the lowering of temperature being so graduated that a sufficient degree of heat will remain in the interior of the rail to evenly heat the entire rail to a low red in the dark. The de-
50 gree of heat retained in the rail, as just mentioned, has been proved by practical demon-

stration to be a proper temperature at which to arrest the cooling process and insure the retention of structural arrangement of the molecules given to the rails by the drawing
55 process, or successive passages of the rail between the roughing and finishing rolls. If rails are allowed to cool slowly a coarse, weak structure will result, and the compact strong arrangement of component atoms effected by
60 the rolling process of manufacture will be destroyed.

It has been found that it is not imperatively necessary that the rails be immersed in a bosh, or that the jets of water used to cool or par-
65 tially cool the rail should be projected on an immersed rail, if the rail is properly secured to prevent twisting or warping of the body while the spraying operation is in process.

The object of my present invention is to af-
70 ford a modified process whereby the operation of toughening steel rails or other steel bars may be accomplished in a manner equally as effective as by other processes and at less cost for apparatus constituting the plant.
75

My invention further consists in an improved process whereby the rails or bars to be treated will be automatically straightened as they are introduced into the apparatus, and also rigidly
80 held against torsional action when the rail is subjected to sprays of water while undergoing treatment to toughen it.

With these objects in view my invention consists in an improved process, which will be hereinafter described, and pointed out in
85 the claims.

In the drawings making a part of this specification, Figure 1 is an end elevation of the apparatus employed to spray water upon the body of the rail and hold it rigid while the
90 spraying operation is in progress. Fig. 2 is a side elevation of a sufficient portion of the mechanism to show the general construction of the same.

A represents the base of the machine, preferably made of metal and of sufficient length
95 to exceed the length of rails to be operated upon. The base-plate A should be placed upon and secured to a suitable foundation of timber or masonry, and its top surface should
100 be level, or nearly so.

Upon the base-plate A the upright hous-

ings B are mounted in pairs, these consisting of metal plates with stiffening-flanges *a a* formed integral upon the edges of the same. The lower ends of the housings B are enlarged to produce a broadened base for the same, and these bases are made sufficiently true on the surface that bears upon the base-plate A to render them stable, the pairs of housings being bolted in place upon said plate. A series of pairs of flat columns or housings B are arranged at spaced intervals upon the base-plate A, and as these are similar in construction the description of one pair will suffice for all.

The upper portions of the housings B (see Fig. 1) are curved toward each other, and the upper ends terminate in vertical shells or boxes B', said boxes being adapted to receive and support in proper relative position the shafts F F'. Suitable cap-plates are provided for the boxes B', which are held in place by the bolts *c*, so as to permit the shafts to rotate when actuated by means that will be presently described.

The shafts F F' are located parallel to each other and such a distance apart that proper space will be afforded between them for the twin gear-wheels E E, these wheels being located in apertures made through the boxes B', near their center of length, and secured upon the shafts F F', to have meshing contact with each other.

The upper ends of the shafts F are extended above the boxes B' to receive the bevel gear-wheels G, which are fitted upon them, and are secured in place so that the true lower ends of their hubs will bear upon the upper ends of the boxes B'.

A shaft, H, is supported a proper distance above the bevel-gears G by the curved bracket-arms B², which latter are secured in place upon the sides of the housings B at their upper ends. (See Fig. 2.) The shaft H extends the entire length of the apparatus, and is furnished at one end with a fast and loose pulley or a clutch-coupler, (not shown,) by which it is connected to a source of power and motion to permit the shaft to be rotated when necessary. Upon the shaft H a series of bevel gear-wheels, G', are fixed in proper relative location to mesh with the bevel-wheels G, and through them communicate motion, when required, to the shafts F F'. The lower ends of the shafts F F' are sufficiently projected below the boxes B' to receive the rollers C, these being secured to the shaft in any suitable manner.

The rollers C are turned upon their peripheral edges to conform in shape to the outline of the side of a finished rail, the diameters of each pair of metal rollers being such that the body of a rail may be introduced between the adjacent surfaces of these rollers and firmly supported laterally by the bearing-contact.

It will be noticed (see Fig. 1) that the configuration of surface of the rollers C is such as to give support to the portion of the head of the rail where it joins the web and that the tread or face of the rail is free or uncovered.

Below the lower ends of the rollers C C (see Fig. 1) two pipes, J J, are supported upon cross-bars I. These pipes should be as long as the rails operated upon, and they are connected at one end to a system of water-supply by which an adequate water-pressure in the pipes may be afforded, and ordinary valves or cocks (not shown in the drawings) are provided to control the flow of water into the supply-pipes and cut it off when desired.

The pipes J J are perforated throughout their length upon their upper side, the numerous small holes thus made in the pipes affording a series of spraying water-jets, which from the relative location of the pipes below a rail when it is gripped by the rollers C C will impinge forcibly upon the rail so held.

It is important for the proper operation of the apparatus that the several sets of housings B B shall be arranged at short-spaced intervals upon the base-plate A in a manner to insure the disposition of the series of mated rollers C C in the same horizontal plane, so that any deviation from straightness that may exist in a hot rail when it is being introduced endwise into place between the rollers will be corrected thereby, and slight vertical inclinations or lateral crooks will be removed automatically by the mere introduction of the rail between the rollers.

In operating the device just described it will be of advantage to place the apparatus in such a position with regard to the roll-train that when the rolled rail has received the last or finishing "pass" it will be projected upon the ordinary saw-table, where the action of the saws will remove the stub ends. The saw-table may be of the same height as the rollers C C and in a line therewith, so that a simple endwise movement of the rail will introduce its end between the rollers C C, it being understood that motion has been transmitted to them through the shaft H and bevel-gears G G'. When the rail has been properly introduced between the rollers C C, and thus straightened and held at numerous points throughout its length to prevent torsional action, the water-sprays are made to play upon the surface of the rail. When the temperature of the rail has been sufficiently lowered, motion is again given to the rollers C C and the rail removed endwise from the end of the machine opposite to where it entered. The degree of cooling will be determined by experience and should be arrested at a stage when sufficient heat will still remain in the interior to reheat by diffusion the entire body of the rail, so that an even low-red heat will be exhibited when daylight is excluded.

It will be apparent from the foregoing description that the process herein described embodies important changes in methods of manipulation, whereby the partial cooling of the rail under treatment is much more expeditiously effected and with less handling than in the process shown and described in patent of record, No. 368,132; and, further, that the

machinery employed is more simple and of cheaper construction, thus affording equal advantages in the matter of toughening the structural mass of steel rails or bars at a reduced cost for labor and machinery to effect the desired result.

I am aware that a process has been employed to harden steel railroad-rails by means of jets of water thrown upon their surface. I do not claim a process to harden steel rails or bars. My invention as herein shown and described is not intended for such a purpose, but consists in conducting the heat rapidly away from the rail while it is being held from twisting, the lowering of the temperature being effected in the open air, a sufficient degree of heat being allowed to remain in the body of the rail to reheat the entire mass evenly, so as to exhibit a low red heat in the dark, and insure by this means a retention of the structural molecular arrangement given to the rail by the rolling process, a toughened structural mass resulting from the manipulation or process herein described.

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

1. The process herein described of toughening steel railroad-rails or other steel bars, consisting in first passing the hot rail between

series of rollers for straightening same and for preventing it from warping, subjecting the rail while the latter is rigidly held in place by the rollers to a liquid-spray bath, and finally removing the rail while there is enough heat remaining in its body to reheat the whole mass evenly by diffusion to a low-red heat in the dark, substantially as set forth.

2. The process herein described of toughening steel railroad-rails or other steel bars, consisting in introducing the hot rail from the finishing-rolls into straightening and clamping apparatus; secondly, spraying jets of water upon the tread, web, and exposed faces of the base of the rail while the latter is rigidly held in place by the straightening and clamping apparatus until the temperature of the rail is measurably reduced, and finally removing the rail from the apparatus while sufficient heat remains in its mass, which when evenly diffused will show a low-red color in the dark, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN COFFIN.

Witnesses:

E. J. BURKHART,
C. M. BRENISER.