JAMES A. WOODBURY. 3 Sheets--Sheet 1.

Improvement in Tempering Steel Railroad Rails.

No. 125,650. Patented April 9, 1872.

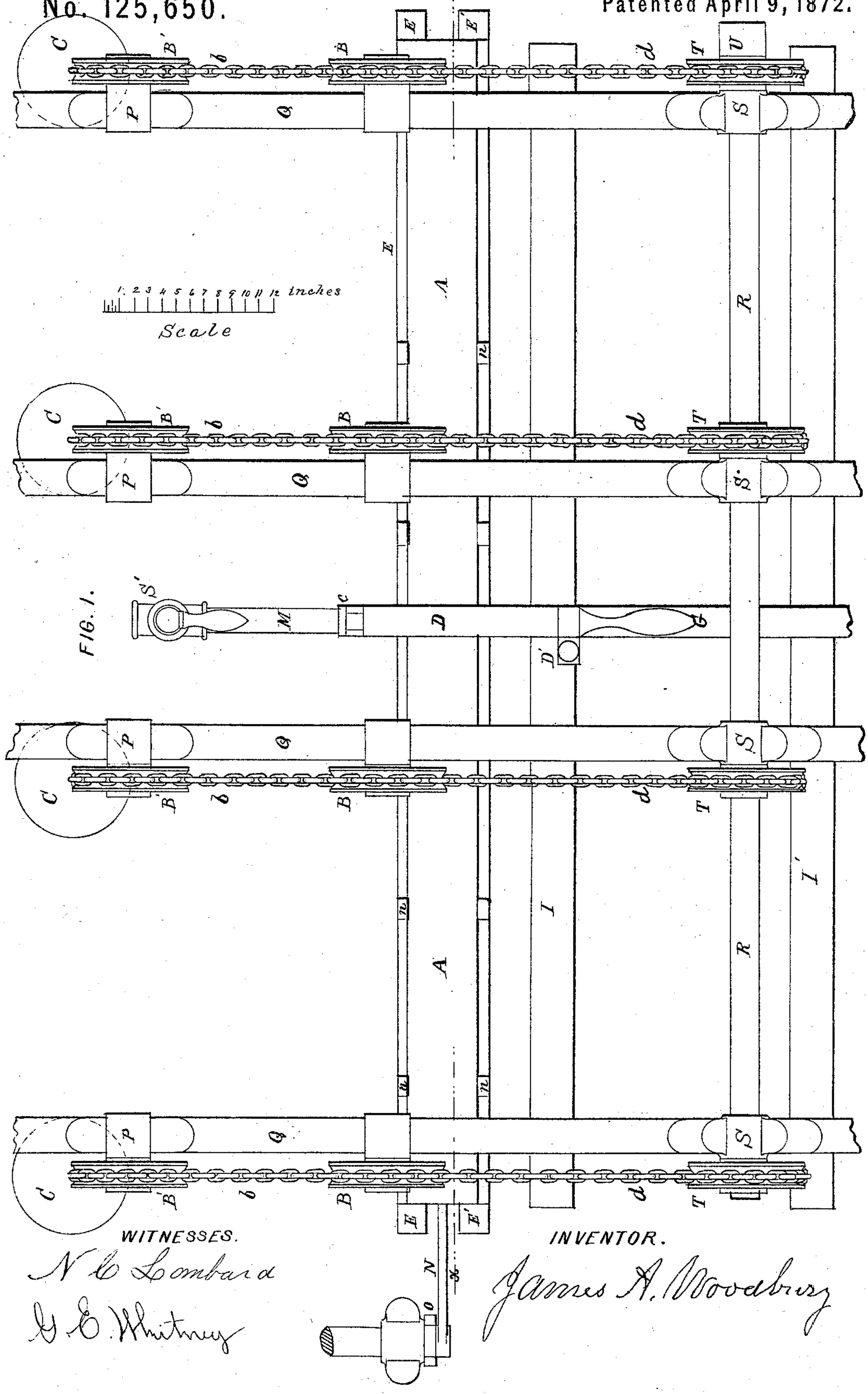

FIG. 1.

WITNESSES.

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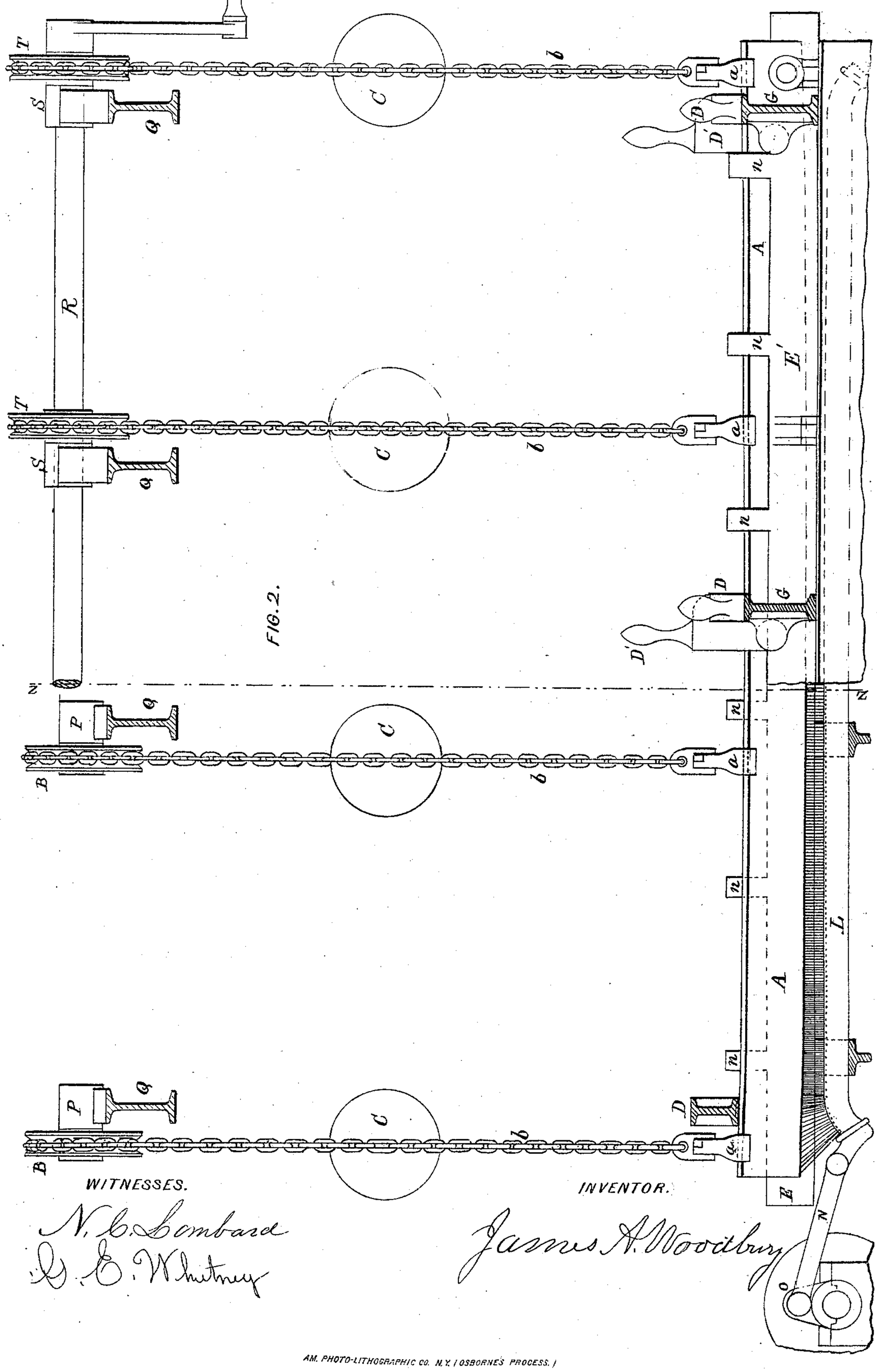

FIG. 2.

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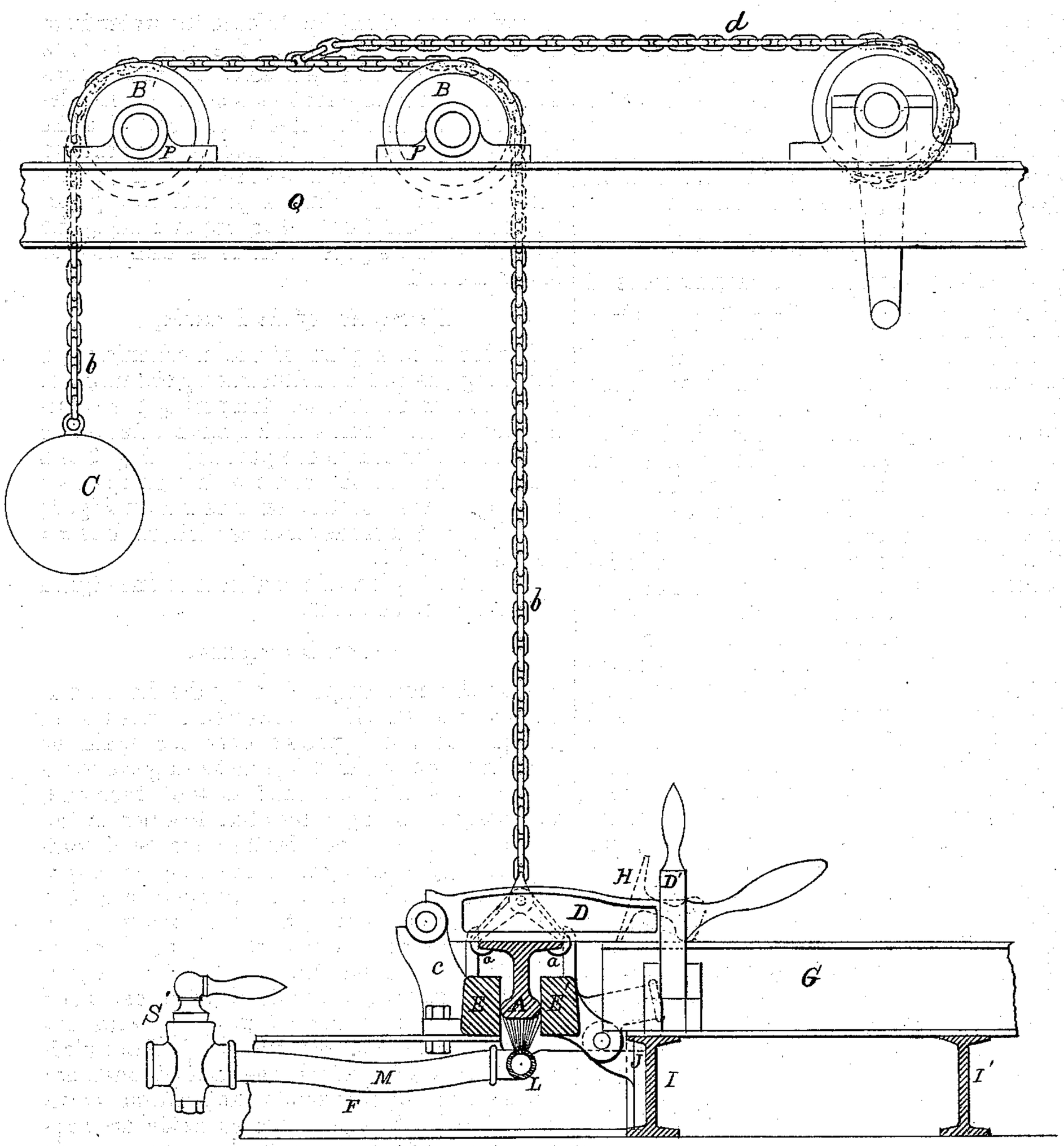

FIG. 3.

WITNESSES.

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UNITED STATES PATENT OFFICE.

JAMES A. WOODBURY, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN TEMPERING STEEL RAILROAD RAILS.

Specification forming part of Letters Patent No. 125,650, dated April 9, 1872.

To all whom it may concern:

Be it known that I, JAMES A. WOODBURY, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in the Manufacture of Railroad Rails, Wheels, and Tires, of which the following, taken in connection with the accompanying drawing, is a specification.

Nature and Objects of the Invention.

My invention relates to the manufacture of steel rails, wheels, and tires for railroads, and has for its object an increased durability of the article; and it consists in tempering the bearing surface or tread of the same, while the remaining and larger portion retains all the strength, toughness, and softness it had before the face was tempered. It also relates to a peculiar arrangement of mechanism for handling a heated rail, and applying a shower of water or other tempering or hardening material to that portion of the rail that it is desirable to have hardened, while the other portions of the rail are so protected that the water cannot have access to the same; and it consists, first, in suspending the rail by suitable hooks attached to chains, or an equivalent, passing over pulleys, and having counterpoise weights suspended from the other ends of said chains, several pairs of hooks, and the necessary chains to operate them being used, and the several counter-weights in the aggregate being somewhat heavier than the rail so that the rail will be held up against suitable stops provided for the purpose, said rail being suspended with the face or tread portion downward, and a short distance above and parallel to a pipe mounted in suitable bearings in such a manner that a reciprocating motion in the direction of its length may be imparted thereto for the purpose of evenly distributing the water which is discharged therefrom through a series of perforations along the upper side thereof, and cause it to completely cover the whole under surface or tread portion of the rail. It also consists in the combination with the above of a fixed gauge, against which one side of the rail rests, and a movable gauge on the opposite side of the rail, the movable gauge being so hung that its weight will keep it firmly against the rail, said gauges serving the purpose of a clamp to keep the rail straight sidewise, and of shields to keep the water from striking those portions of the rail that it is desirable to have remain soft. It further consists in the employment of a series of supplementary chains connected at one end with the chains before mentioned, and at the other to suitable drums or chain-wheels mounted on a common shaft, to which a partial rotary motion is imparted for the purpose of raising the counterpoise-weights when it is desirable to lower the rail.

Description of the Drawing.

Figure 1 is a plan of the mechanism for handling the rail, and illustrating the mode of operation or process for tempering the wearing surface of a rail which I have selected as that best adapted to the purpose. Fig. 2 is a side elevation of the same with a part shown in longitudinal section on line *x x* on Fig. 1; and Fig. 3 is a transverse section on line *z z* on Figs. 1 and 2.

The drawing is made to a scale of one-eighth of an inch to one inch.

General Description.

A is the rail suspended by the hooks *a a*, each pair of which is connected to one end of a chain, *b*, which passes over the chain or sprocket-wheels B and B′, and having the counterpoise-weight C attached to the other end, said weights being somewhat heavier in the aggregate than the rail, for the purpose of holding the rail A up against the stop or gauge-bars D. E is a stationary gauge-bar bolted firmly to the girders F, and provided with the ears *c*, to which the stop-bars D are hinged, so that they can be thrown back for the purpose of removing the rail after it has been tempered, and to supply its place with another hot rail from the furnace. G G are girders or skids upon which the heated rails are moved from the furnace to the position shown in dotted lines at H. These skids are supported on the girders I and I′. J J are stands bolted to the girder I, and to which the gauge-bar E′ is hinged in such a manner that its weight will hold it firmly against the rail. These gauge-bars also serve the purpose of shields to protect the upper portion of the rail from the action of the water by fitting closely to the edge of the tread portion of the rail,

as shown in Fig. 3. These gauge-bars E and E′ are provided with several prongs or fingers *n* projecting upward therefrom, which rest against the edges of the bed-flange of the rail to hold the rail in an upright position. The stop-bars D are securely locked in position, as shown by the hook-lever D′. L is a horizontal pipe arranged in suitable bearings in the girders F, having both ends closed up, and connected at its middle to an elastic pipe, M, through which it is supplied with water or other hardening liquid, all so arranged that said pipe may be moved in the direction of its length by means of the connecting-rod N and the crank O for the purpose of evenly distributing the water over the surface of the tread portion of the rail as it escapes through a series of small perforations in the upper side of said pipe. The pipe L is bent downward at its ends, and the perforations are so arranged as to cause the jets of water to diverge toward the ends of the rail to prevent the water from coming in contact with the perpendicular ends of the rail and hardening it to a greater depth than is desired. The chain-wheels B and B′ are mounted on studs set in the stands P, bolted to the upper side of the girders Q in such a manner that each chain *b* and its counter-weight may act independent of the others, as may be required by the greater contraction of the hardened side of the rail, and the consequent greater movement of the middle of the rail as compared with the ends. R is a shaft mounted in boxes S, secured to the girders Q, and carrying the chain-wheels T, to which one end of the chains *d* is attached, the other ends of which are shackled to the chains *b* in such a manner that a partial rotary motion applied to the shaft R by means of the crank U will cause all of the weights C to be lifted, and allow the rail A to drop into the position for applying the hardening material thereto.

The mode of operation which I have selected to illustrate my improvement I will now describe, first premising that I do not wish to confine myself to the precise mechanism here shown for carrying out my invention, as it is obvious that the mechanism may be variously modified without affecting the general principle. The rails having been first heated in a suitable furnace to the proper hardening temperature, they are brought in contact with pins to straighten them sidewise, and against other pins to curve the rail vertically sufficiently to compensate for the increased contraction of the hardened side of the rail, so that when the rail becomes cold it shall be straight. The rail is then slid along on the skids G G to the position shown in dotted lines at H, and the grapple-hooks *a a* are placed in position on the flange of the rail, and the weights C allowed to descend by a partial rotation of the shaft R, (which has previously been locked in a position to hold said weights up and slacken the chains *b*,) and cause the chains *b* to lift the rail A somewhat above the skids with the tread portion of rail downward, when the shaft R is again rotated in the direction to wind up the chains *d*, and, acting upon the chains *b*, raise the weights C, and allow the rail to descend to the position shown at A, when the hinged stop-bars D are brought down upon the rail and locked by the hook-lever D′, as shown. The shaft R is then released and partially rotated so as to allow the weights C to drop and lift the rail till its ends bear hard against the stop-bars D. The cock S′ is then opened to allow the water to fill the pipe L, and escape in a shower of small jets through the perforations in the upper side of said pipe, said jets striking the exposed tread portion of the rail, a reciprocating motion being imparted to said pipe at the same time for the purpose of insuring an even distribution of the hardening liquid over the surface that it is desirable to harden. As the end of the rail is subject to more wear than the other portions thereof, if desired, it may be hardened on the end face, and extending somewhat under the bed-flange to give it greater durability.

The rail is made of steel, homogeneous in its structure, of such a grade or quality that it will take a suitable temper for this purpose where the water is applied, and at the same time the lower or untempered portion of the rail shall be tough, strong, and of suitable quality to receive a heavy blow without breaking.

It is obvious that the tempering, as herein described, of the upper or tread portion of the rail will in nowise diminish its strength, from the fact that the lower portion of the rail which is first to break under the strain to which rails are subject is not affected by the hardening process. It is also obvious that the tempering process may extend around on each side of the tread portion of the rail far enough to resist the lateral wear which rails are usually subjected to from the flanges of the wheels in passing around curves.

The depth of the temper (or the hardened surface) can be increased or diminished by the force and length of time with which the water is applied. The whole rail, however, is not affected, but only the tread; this hardened portion merging into a soft steel foundation, so that there is no such abrupt change in the character of the metal as would cause the lamination of the wearing surface. The clamps may be arranged so that the exposed face of the rail shall be at one side or uppermost if desired. It will be apparent that the process described may be applied to the hardening of the faces of wheels and tires, as well as to the hardening of the treads of rails, circular instead of straight clamps or guards being employed, as described in a separate application for Letters Patent.

Claims.

1. On all steel rails having a hardened tread gradually merging into a soft steel foundation, as set forth.

2. The process of hardening or tempering

the wearing surface of a rail, wheel, or tire by covering or protecting the portions not to be hardened, and discharging a shower of water simultaneously upon every portion of the exposed surface, substantially as described.

3. The process of manufacturing rails with hard treads by discharging water, or its equivalent, on exposed parts of the rails while confined between clamps, which prevent twisting and define the parts to be acted on by the water, as described.

4. The gauge or shield bars E and E′, arranged and operating substantially as described.

5. The stop-bars D, in combination with the hooks *a*, chains *b*, and weights C, substantially as described.

6. The horizontal perforated pipe L, in combination with the gauge-bars E and E′, arranged and operating substantially as described.

Executed at Boston this 15th day of August, 1871.

JAMES A. WOODBURY.

Witnesses:
N. C. LOMBARD,
G. E. WHITNEY.