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COOLING BED FOR METAL BEAMS AND RAILS.

No. 486,364. Patented Nov. 15, 1892.

Fig. 1.

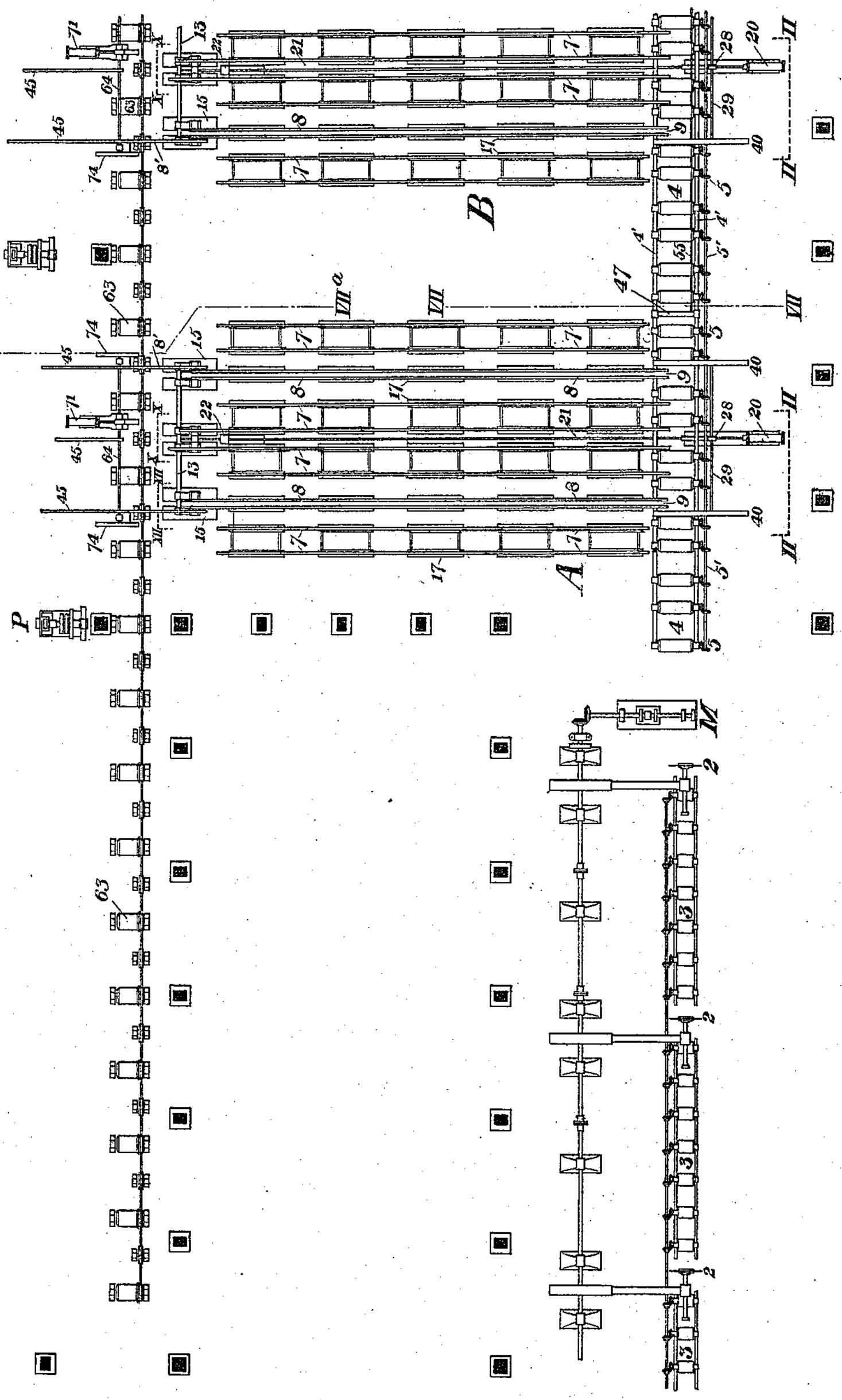

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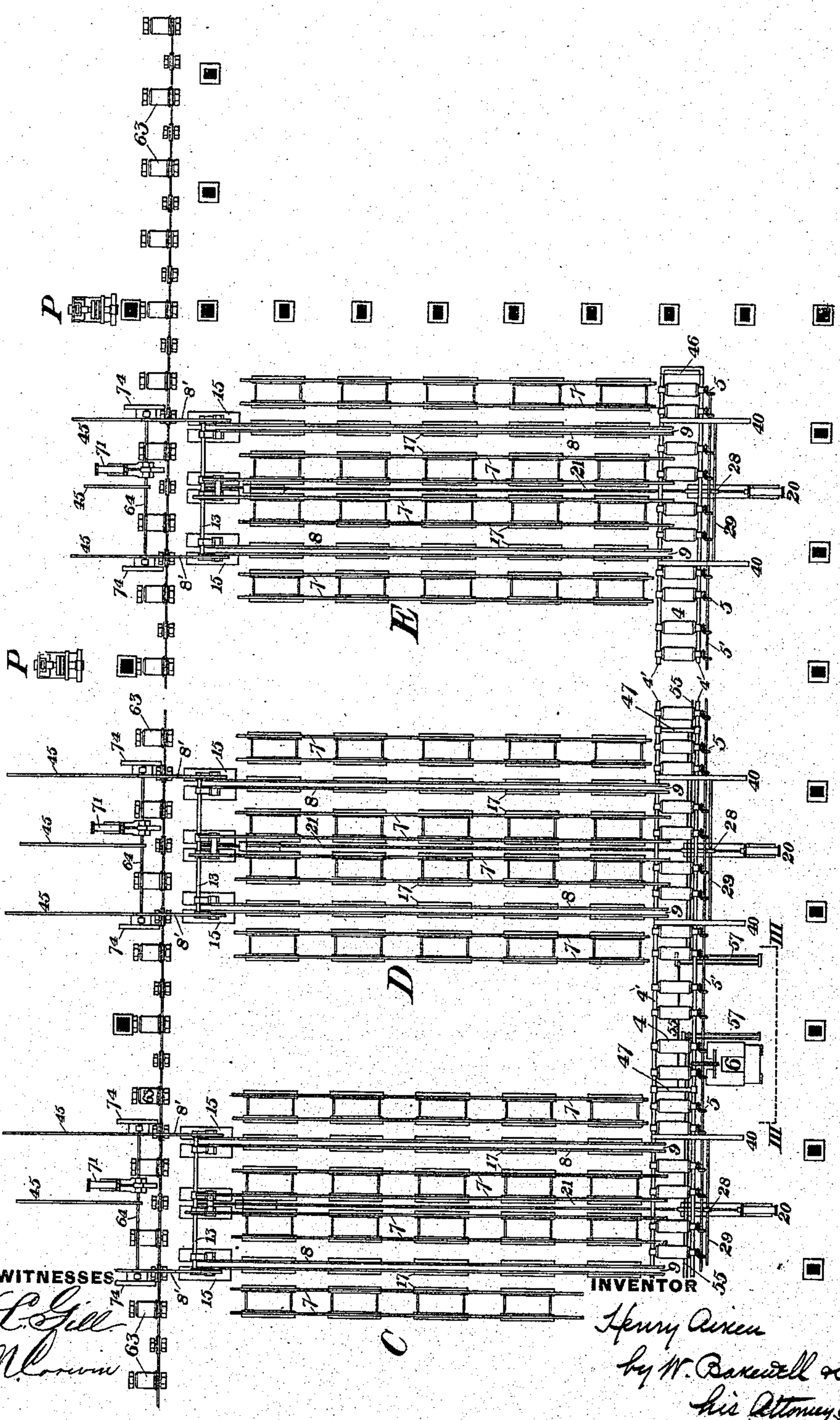
Fig. 1a



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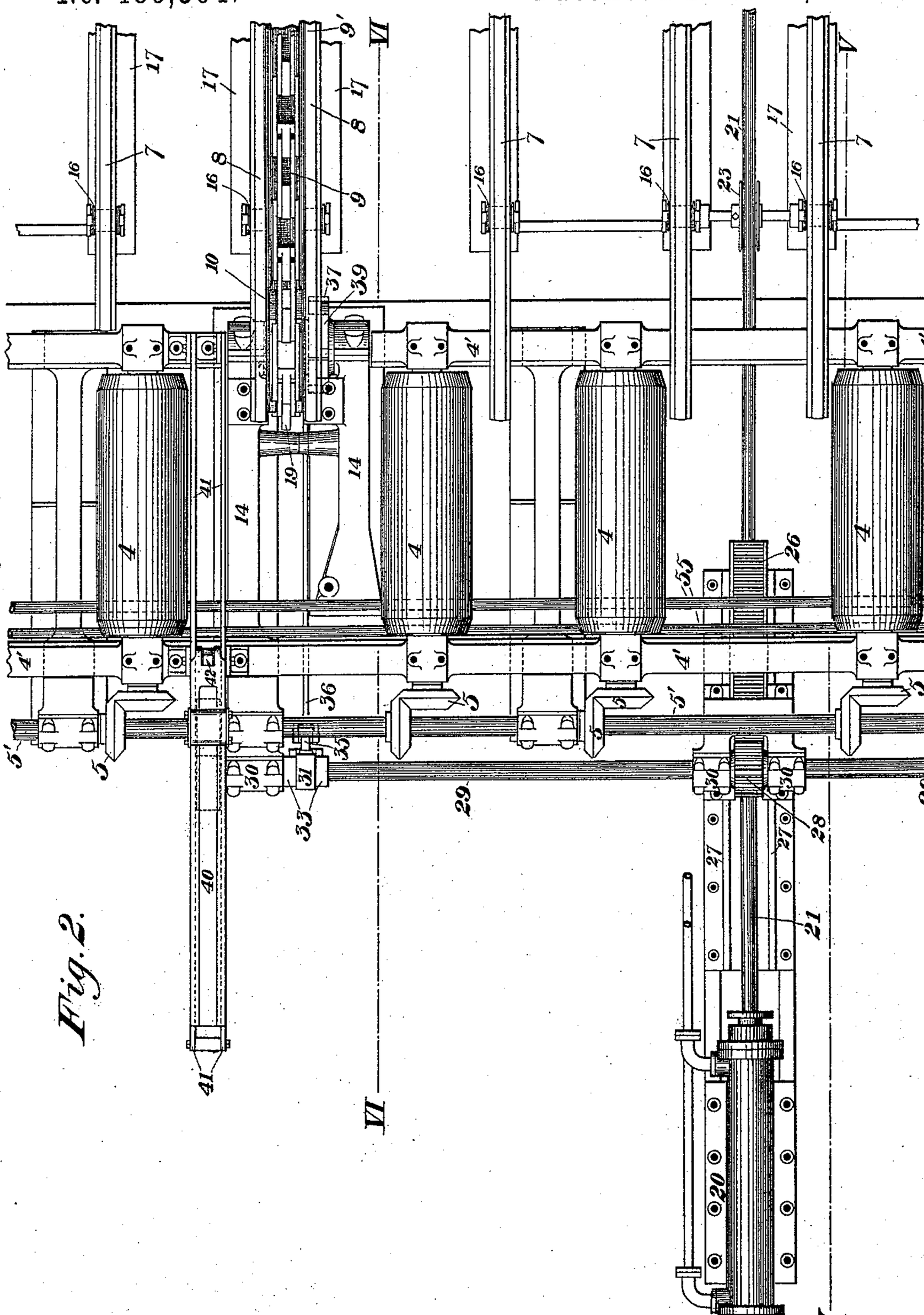

Fig. 2.

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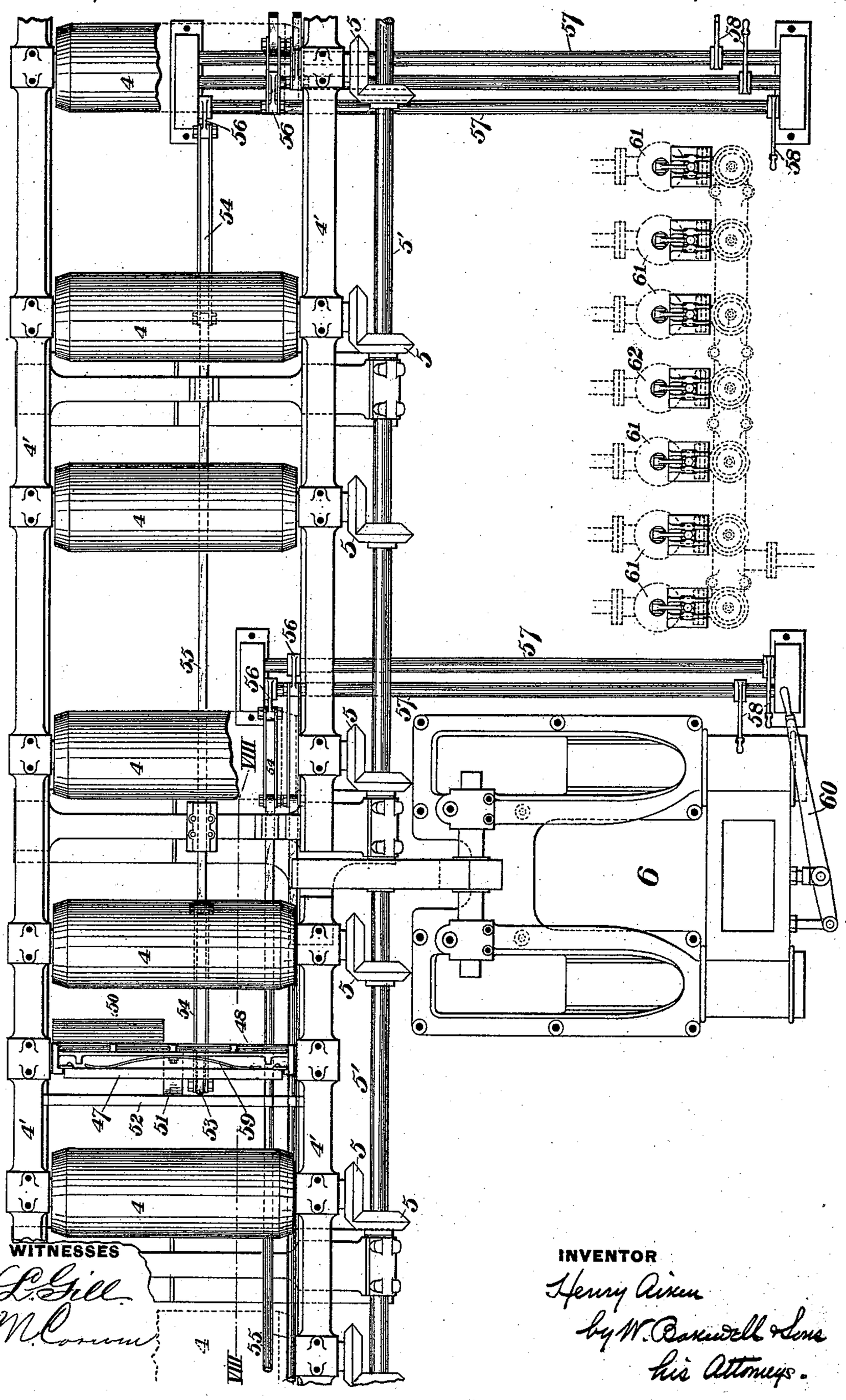
Fig. 3.



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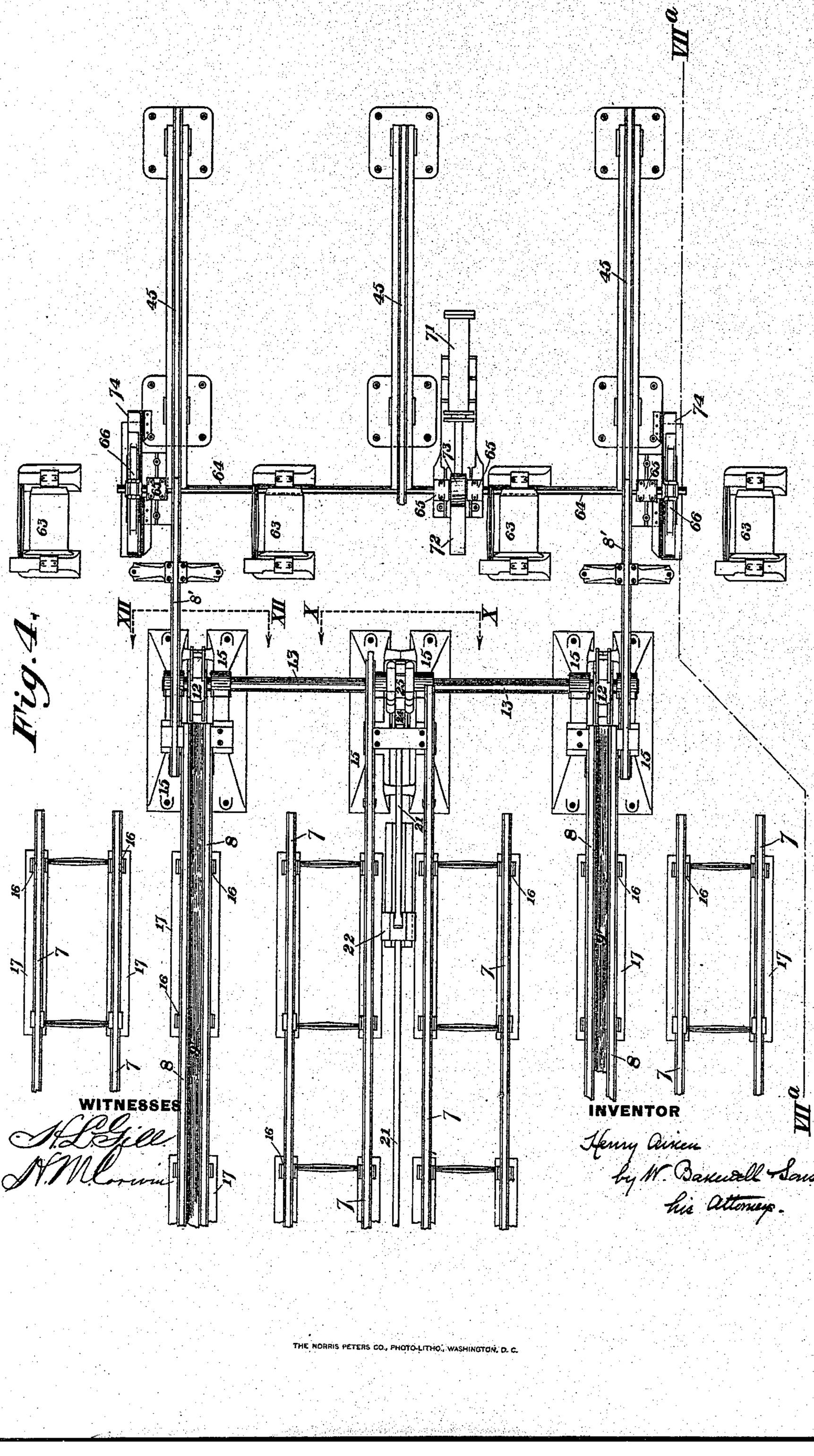

Fig. 4.

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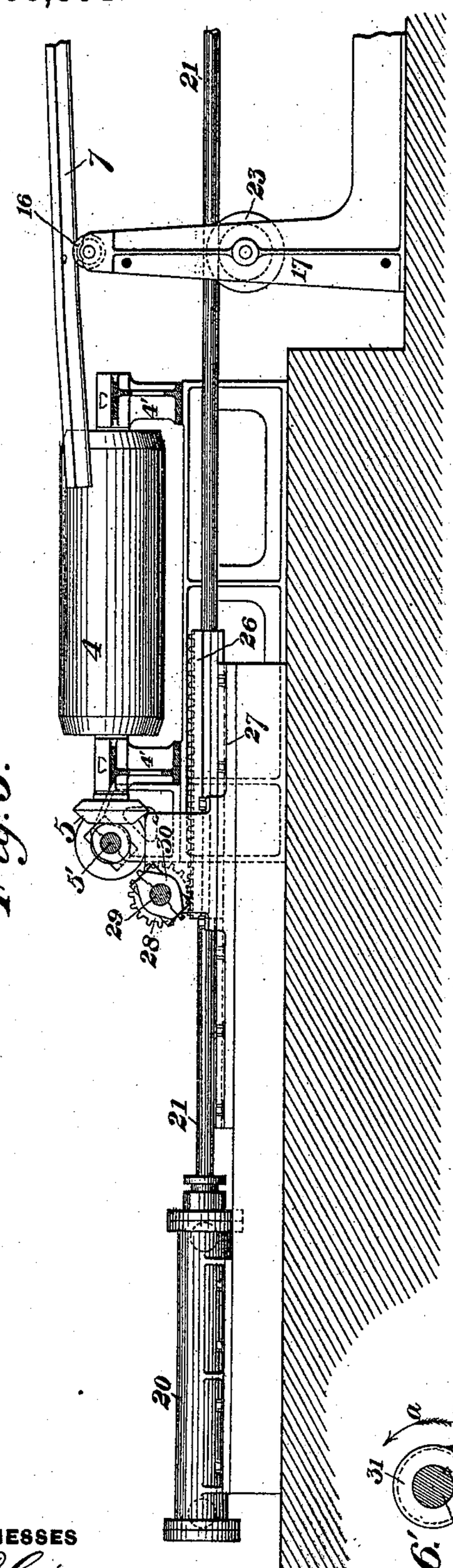

Fig. 5.

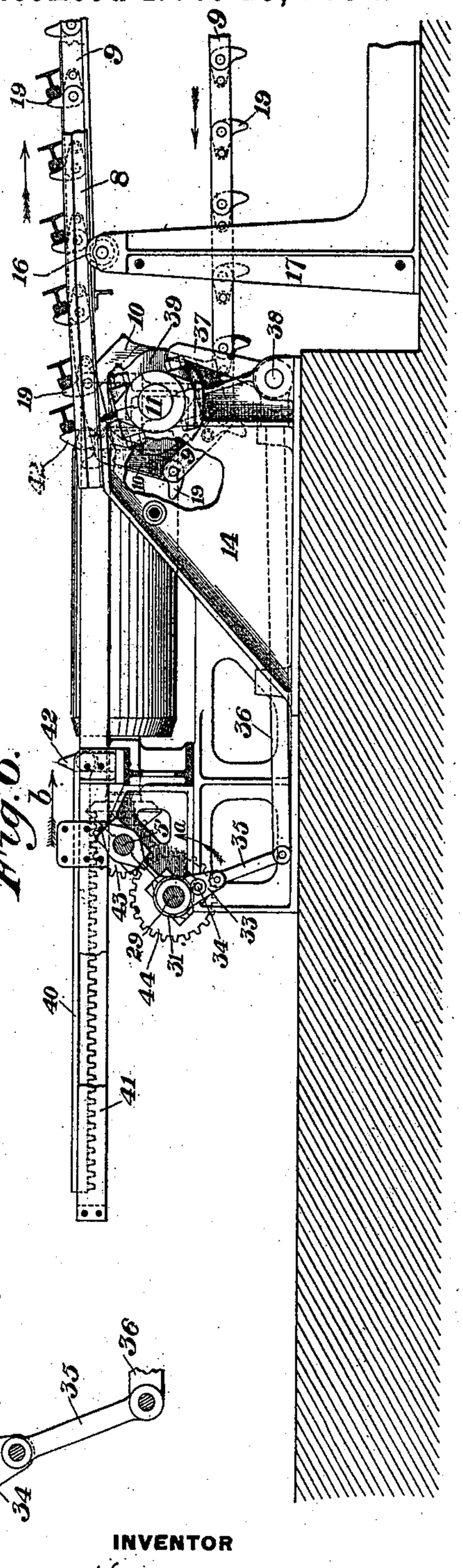

Fig. 6.

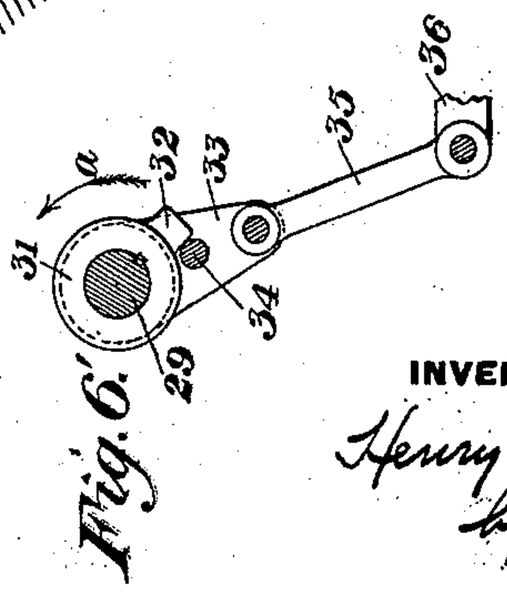

Fig. 6'.

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Fig. 7.

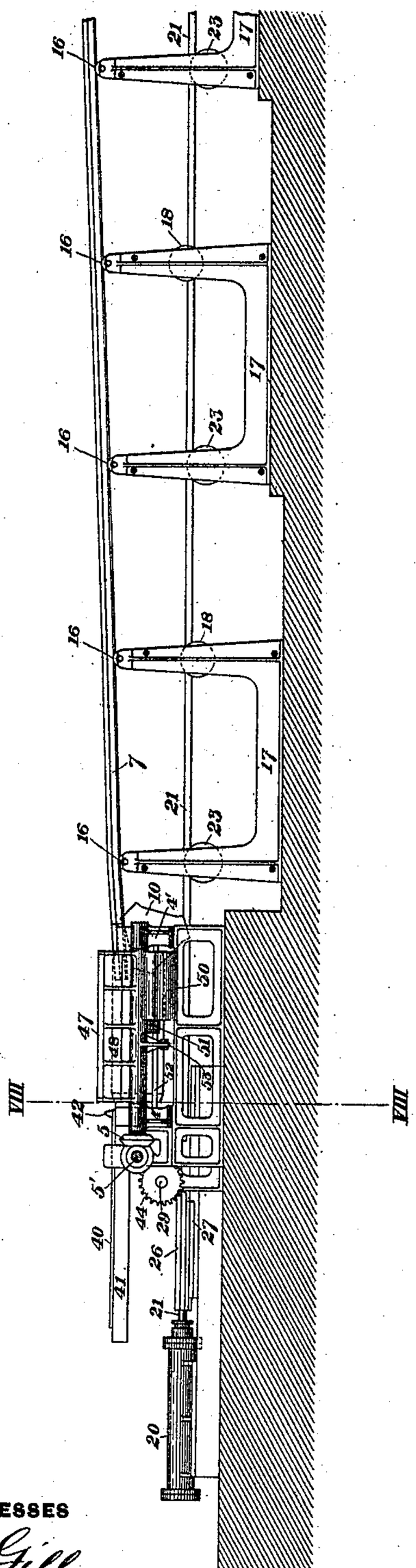
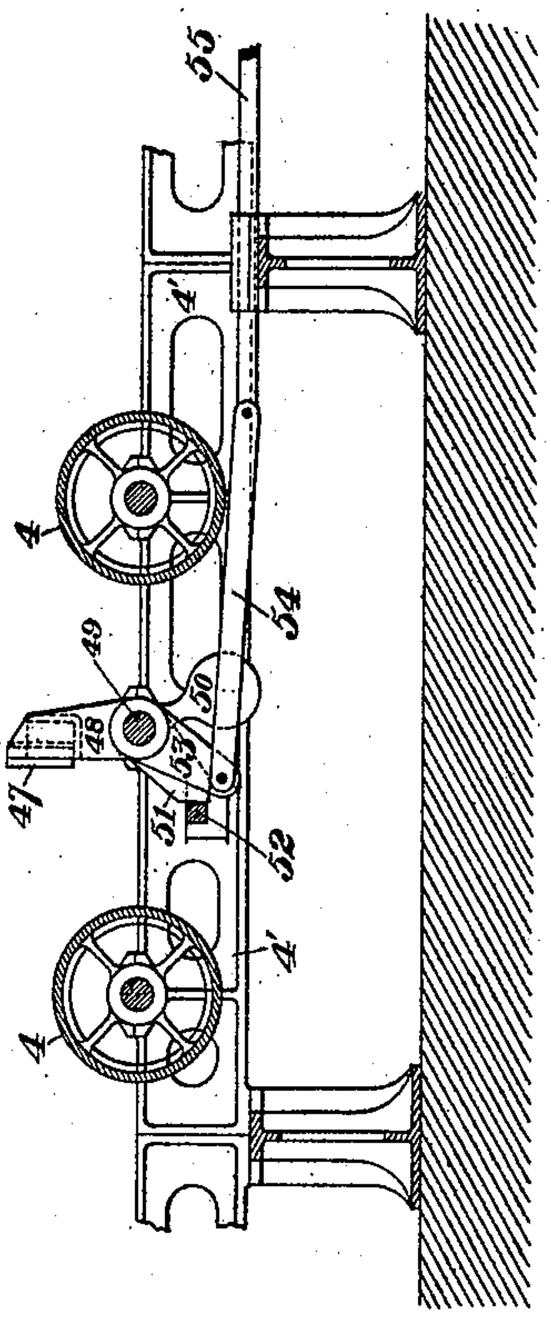


Fig. 8.



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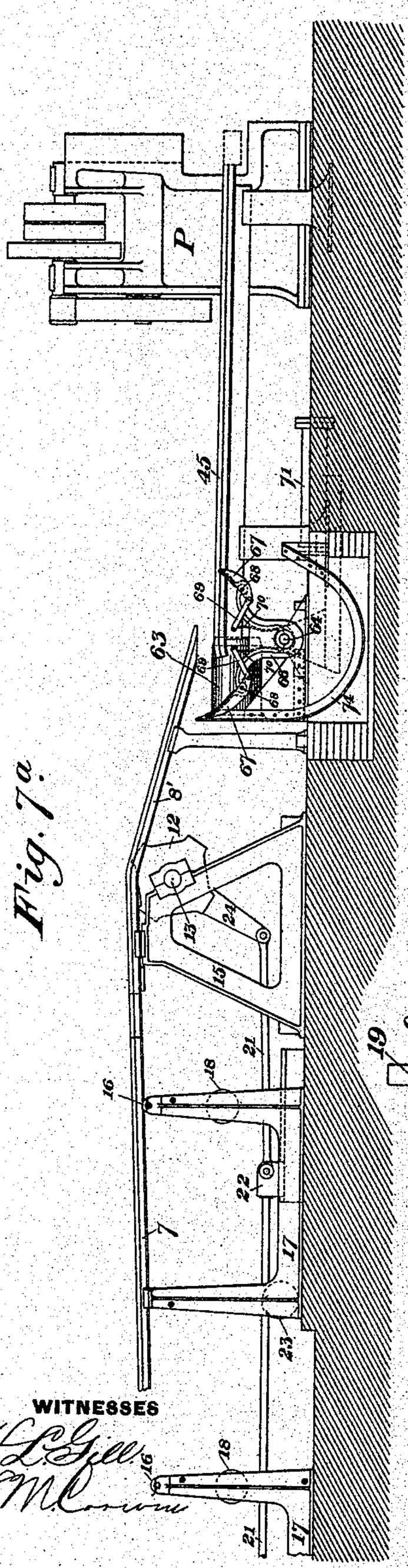

Fig. 7a.

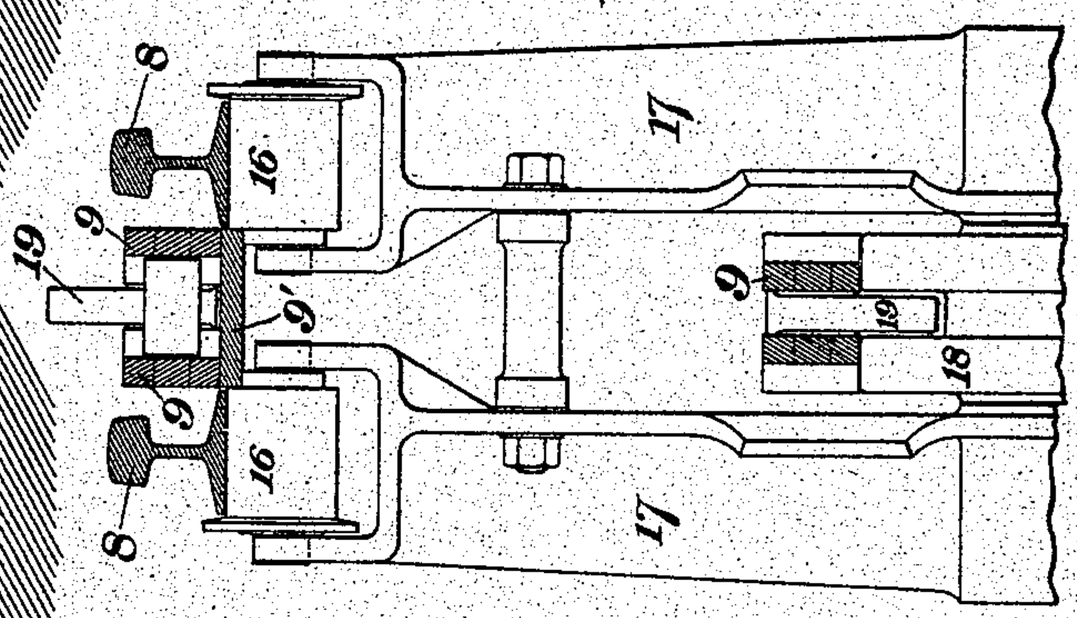

Fig. 9.

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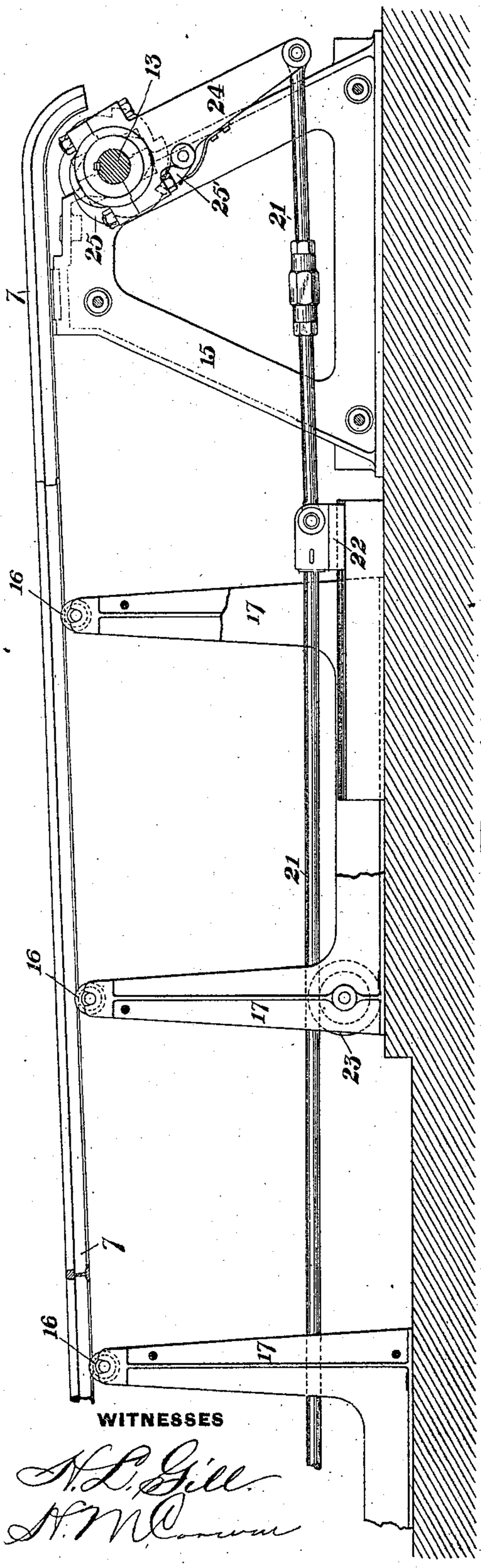

Fig. 11.

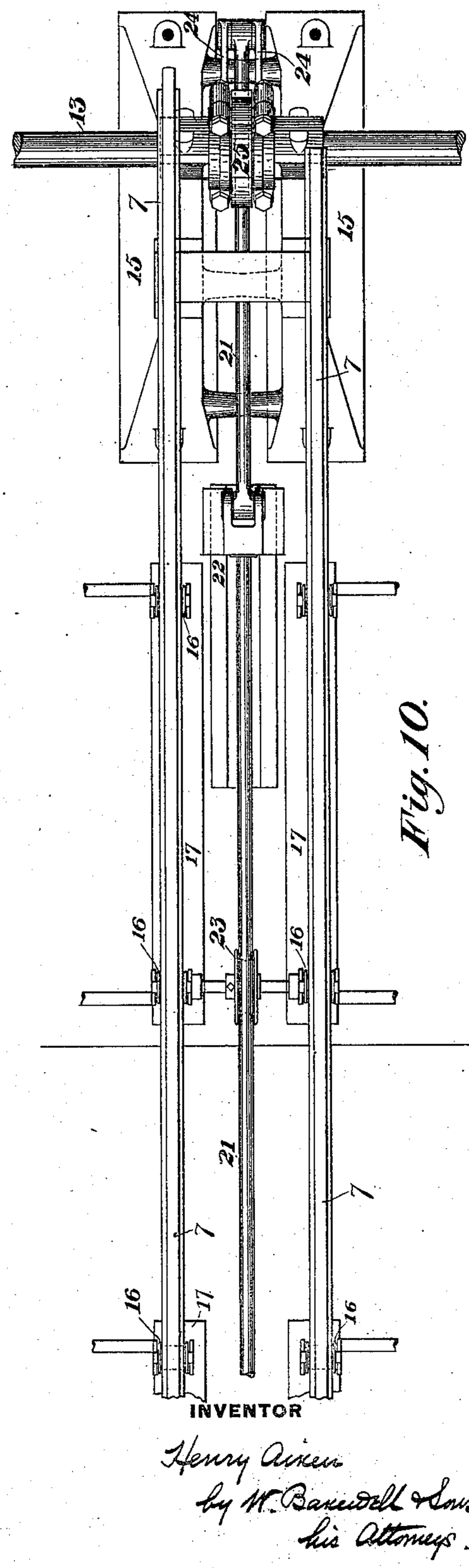

Fig. 10.

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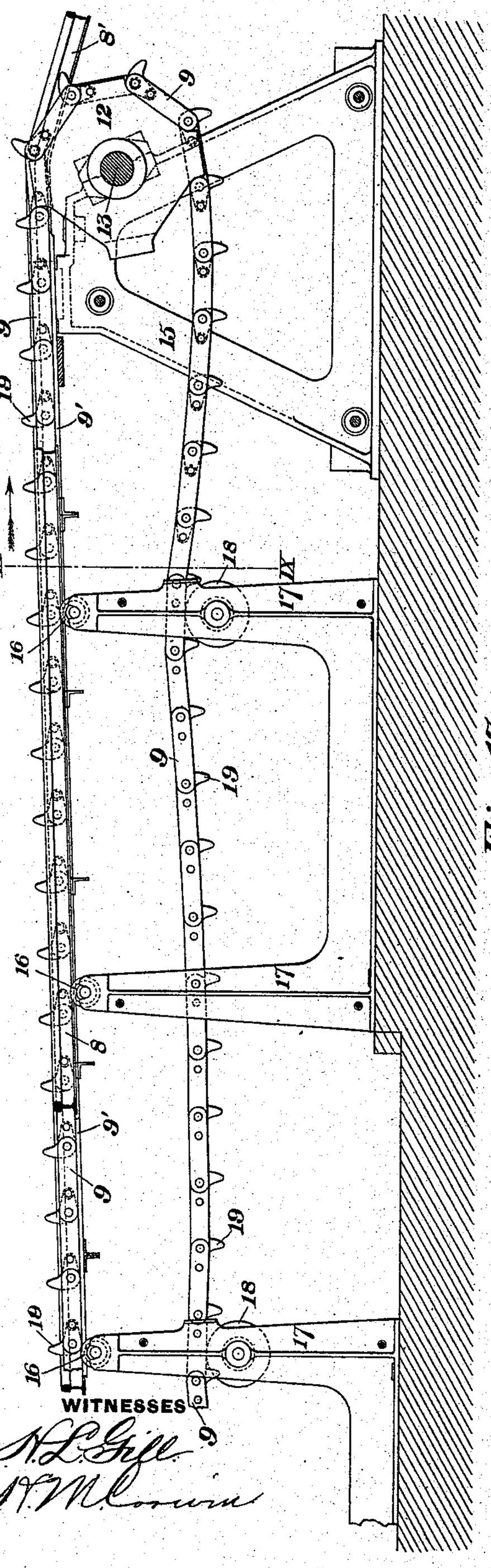

Fig. 13.

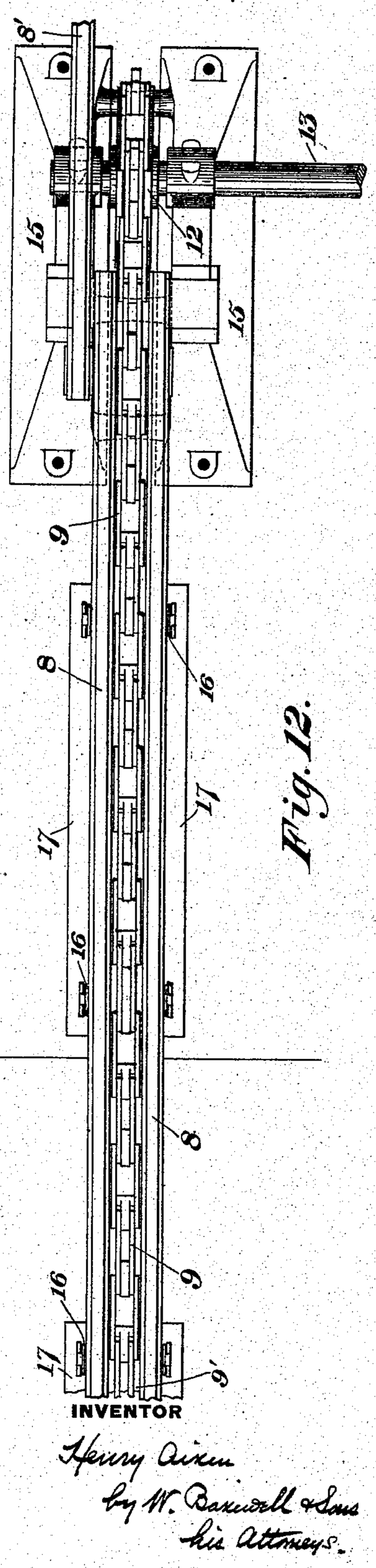

Fig. 12.

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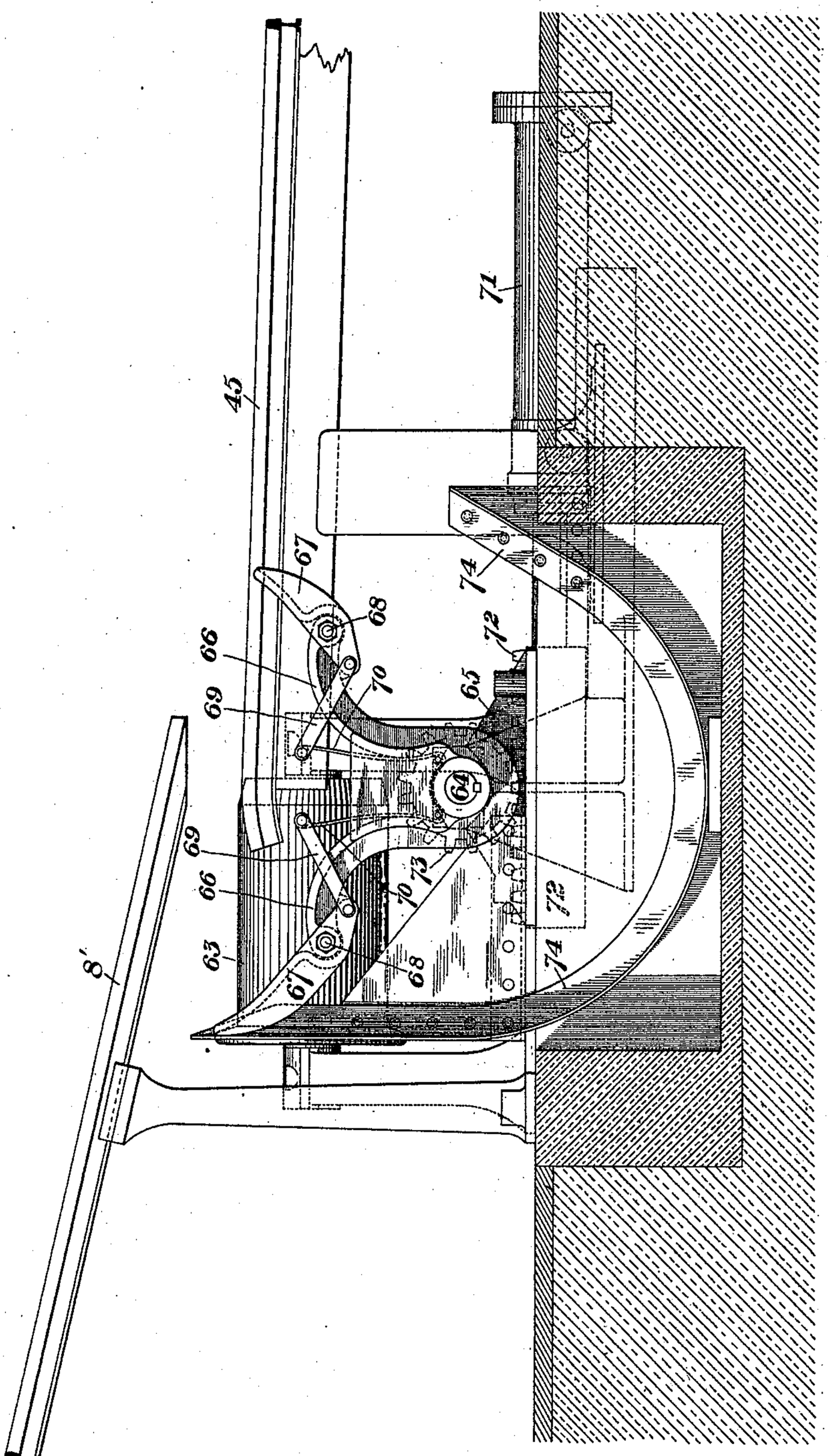
Fig. 14.



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UNITED STATES PATENT OFFICE.

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COOLING-BED FOR METAL BEAMS AND RAILS.

SPECIFICATION forming part of Letters Patent No. 486,364, dated November 15, 1892.

Application filed April 6, 1891. Serial No. 387,788. (No model.)

To all whom it may concern:

Be it known that I, HENRY AIKEN, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Cooling-Beds for Metal Beams and Rails, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of part of a rail-cooling plant embodying my invention. Fig. 1ª is a similar view of the remainder thereof. These views are shown separately because of the impracticability of illustrating them on the small scale which would be required if they were on a single sheet. Fig. 2 is an enlarged plan view of part of the apparatus opposite the dotted line II II in Fig. 1. Fig. 3 is an enlarged plan view of that part of the apparatus opposite the dotted line III III in Fig. 1ª. Fig. 4 is a plan view of the delivery end of one of the cooling-beds. Fig. 5 is an elevation shown as in section on the line V V of Fig. 2. Fig. 6 is a similar view shown as in section on the line VI VI of Fig. 2. Fig. 6ª is an enlarged detail view. Fig. 7 is a side elevation of the receiving end of one of the cooling-beds, shown as in section on the line VII VII of Fig. 1. Fig. 7ª is a similar view showing the other end of the bed, being as if in section on the line VIIª VIIª of Figs. 1 and 4. Fig. 8 is a vertical section on the line VIII VIII of Figs. 3 and 7, showing one of the movable stops. Fig. 9 is an enlarged vertical cross-section on the line IX IX of Fig. 13, showing the conveying-chains. Fig. 10 is a plan view of that part of the apparatus opposite the lines X X in Figs. 1 and 4. Fig. 11 is a side elevation of Fig. 10. (Shown partly in vertical section.) Fig. 12 is a plan view of that part of the apparatus opposite the line XII XII of Figs. 1 and 4. Fig. 13 is a side elevation of Fig. 12, partly in vertical section; and Fig. 14 is a side elevation of the transfer device employed at the end of the bed opposite to the receiving end.

My apparatus comprises saws by which the rail as delivered from the rolls is cut into sections and cooling-beds upon which the sections are then transferred and on which they are gradually cooled, being moved individually from one end to the other. At the end of the cooling-beds the rails are straightened by suitable straightening machines or presses.

Referring to Figs. 1 and 1ª, 2 2 represent the saws by which the rail is cut into lengths. The number of these saws depends upon the number of the cooling-beds, hereinafter described, there being preferably one more of the saws than of the beds. The long rail is delivered from the rolls upon the saw-table 3 and by action of the saws is cut into a number of pieces of equal length. In advance of the table 3 is a series or table of feed-rollers 4, supported in parallel order in a suitable frame 4′ and driven by gearing 5 and a shaft 5′ from an engine 6. The engine is shown in Fig. 3, and the feed-rollers and their driving-gearing are shown in Figs. 2 and 3. At equal intervals along the feed-table are tables A B C D E, extending at right angles to the feed-table and adapted to act as the cooling-beds for the rails.

I shall now describe the construction of one of the cooling-beds. The cooling-bed is made up of parallel rails 7 and pairs of parallel rails 8, set near to each other and adapted to act as guides for two endless chains 9. Only one of these chains is shown in Fig. 2, but a pair of them is indicated on each of the beds shown in Figs. 1 and 1ª. These rails, as shown in Figs 2, 5, and 6, extend up to the frame of the feed-rollers 4. At the end of the cooling-bed next the feed-rollers each chain 9 passes around a sprocket-wheel 10 on a shaft 11, and at the other end of the cooling-bed it passes around a sprocket-wheel 12 on a shaft 13. These sprocket-wheels and shafts are journaled on suitable supporting-stands 14 and 15. The under side of the upper branch of the chain passes over a plate 9′, set between the rails, which plate, together with the rails of the bed, are supported by rollers 16 on bracket 17, the function of which is to allow the plate and rails which are fastened at one end to move when expanding with the heat, Fig. 9. The lower branch of the chain passes over supporting-rollers 18. The chain is made up of links, as shown, and has outwardly-projecting spurs 19. In order to drive the chain I employ the following mechanism: 20 is a hydraulic cylinder situate at the table end of the cooling-bed and having a rod 21 projecting from its piston or plunger and extending

to the delivery end of the bed, it being supported by a slide 22 and at suitable intervals along its length by rollers 23, Figs. 5, 7, 7ª, 10, and 11. At the delivery end of the bed the rod 21 is pivotally connected to a double pawl-lever 24, which is loosely journaled on the shaft 13 and is provided with a pivoted spring-backed pawl 25′, engaging with the teeth of a ratchet-wheel 25, keyed to said shaft. The consequence of this construction is that as the rod 21 is moved backward and forward by the cylinder 20 it will swing the lever 24 and by the action of the pawl will move the ratchet-wheel through an arc equal to the space between two adjacent teeth. This rotation of the ratchet-wheel will turn the shaft 13 and the sprocket-wheels 12, and will therefore move the endless chains 9. The cylinder 20 is situate on the outer side of the feed-table, and, as shown in Figs. 2, 5, and 7, the rod 21 is provided with a rack 26, which moves in guides 27, and is in gear with a pinion 28 on a cross-shaft 29, journaled in suitable bearings 30. On the shaft 29 is keyed a collar 31, having a projecting dog 32, Figs. 6 and 6′, and adjacent thereto is a forked lever 33, journaled loosely on the shaft and having a cross-pin 34, adapted to be engaged by the dog 32 in the rotation of the collar. Said lever 33 is connected by a link 35 with the arm 36 of a bell-crank lever pivoted at 38, the end of the other arm 37 of which is adapted to engage and to act as a lock to a ratchet-toothed wheel 39, keyed to the sprocket-wheel shaft 11.

The operation of the parts of the apparatus above described is as follows: Suppose that the rod 21 and rack 26 are, as shown in Fig. 7, in their most retracted position and that the operator desires to move the endless chains to feed the rails along the bed. Motive fluid is admitted to the cylinder 20, so as to project the plunger and the rod 21. At the delivery end of the cooling-bed the effect of this is to swing the pawl-lever 24 outwardly and to cause the pawl 25′ to take a fresh bite on the next rear tooth of the ratchet-wheel. At the table end of the bed the effect of the forward motion of the rack 26 is by means of the pinion 28 to rotate the shaft 29 and the collar 31 in the direction of the arrow *a*, Fig. 6ª. During the first revolution of this collar the dog 32 moves idly; but at the end of such revolution it engages the pin 34 and turns the lever 33, thereby raising the arm 36 of the elbow-lever and releasing the arm 37 from the ratchet-wheel 39. The full extent of rotation of the shaft produced by the action of the rack and pinion is about one revolution and a quarter. The operator then by means of the controlling-valve reverses the action of the hydraulic cylinder, so as to retract the plunger and the rod 21. The effect of this at the delivery end of the cooling-bed is to swing the pawl-lever 24, Fig. 11, inwardly, thereby causing the pawl to turn the ratchet-wheel to the extent of one tooth and to turn the sprocket-wheels 12 and to move the chains in the direction of the arrows. At the other end of the cooling-bed the effect of the motion of the rack and pinion 26 28, Figs. 5 and 7, is to turn the shaft 29 and collar 31, Figs. 6 and 6ª in the direction opposite to that indicated by the arrow *a*. During the first revolution of the shaft the dog 32 moves idly; but when it reaches the end of the revolution it engages the pin 34, thereby moving the lever 33 downwardly, depressing the arm 36 of the elbow-lever and bringing the arm 37 into engagement with the wheel 39, thus locking the wheel and preventing the pawl at the other end of the bed from moving the chain farther than just the required distance. By this means I am enabled to stop the chain exactly at the position required, whereas without such locking device the expansion of the chain caused by the heat of the rails on the bed would disturb its action and prevent it from performing its functions properly. I derive an important advantage from actuating the chains by driving-sprockets situate at their delivery ends, because in this way the upper branches of the chains, being in a state of tension, are kept constantly taut, all their sagging being taken up by the lower branches, which perform no work. In this way the action of the chains is kept uniform with relation to each other.

I shall now describe the means which I employ for delivering the rails upon the cooling-bed from the feed-table. (See Figs. 2, 6, and 7.)

40 is a horizontal rack, which is supported in suitable guides 41 at about the level of the surface of the feed-rollers and at the outer side thereof, said guides extending across the frame of the feed-table, as shown in Figs. 2 and 6. There are two of these racks and guides for each of the cooling-beds. They are preferably situate adjacently to the lines of the sprocket-chains. Each rack has a pivoted dog or projection 42, which extends above the level of the feed-table 4. To actuate this rack, I employ a pinion 43, which may be journaled loosely on the driving-shaft 5′ of the feed-rollers and which is driven by a gear-wheel 44 on the shaft 29. In the forward motion of the rack 26 the rotation of the shaft 29 and gear-wheels 43 and 44 will move the racks 40 forward in the direction of the arrow *b*, Fig. 6, and the dogs 42, then engaging a rail-section lying before them on the rollers of the feed-table, will push it laterally upon the rails of the cooling-bed, as shown by the dotted dog 42 of Fig. 6. Then with the reverse motion of the rack 26 the rack 40 and dog 42 will be retracted, and the motion of the endless chains will cause the spurs 19 to engage the rail and to move it along one space on the cooling-bed. Thus at each operation of the cylinder 20 a rail is delivered to the cooling-bed and together with the preceding rails is moved laterally along the bed for a short distance. Each rail is separated from the rails next adjacent and does not touch them, as in

prior cooling-beds, where the rails are moved *en masse*. This is a very important feature of my apparatus and I believe is broadly new. Where the rails are in contact the proximity of a hot rail to a colder one is apt to cause it to warp, and thus to distort it or to impart to it internal strains, which permanently impair its efficiency. When the bed has become full of rails, each forward motion of the chains will deliver a rail down the inclined rails 8′ of the delivery end of the bed, Figs. 4 and 7ª, upon a frame 45, situate adjacently to the straightening-press.

When the rail is delivered upon the frame 45, it is cold and is in condition to be taken by the workman and straightened at the press.

I shall now describe the manner in which the sections of the rails are carried by the table 4 opposite to and stopped in position to be delivered upon the cooling-beds. At the end of the feed-table 4 is a permanent stop 46, and between rollers of the table opposite to the far side of each of the cooling-beds is a stop 47, Figs. 1, 1ª, 3, 7, and 8, adapted to be moved into and out of operative position. The construction of the stops 47 is shown in Figs. 3, 7, and 8. Each consists of a plate or bar 47, supported by a frame 48, fixed to a rotary shaft 49 and counterweighted by a weight 50.

51 is an arm projecting from the frame and adapted to engage a stop 52 when the frame is in an upright position, as shown in Fig. 8.

53 is a downwardly-projecting lever connected by links 54 and a rod 55 to a crank-arm 56 on a rotary shaft 57, having an operating-lever 58, by which it may be rotated. By motion of this lever the stop may be raised to the elevated position shown in Fig. 8, or may be turned so that it shall be lowered below the level of the feed-table. The stop-bar 47 is not rigidly attached to its frame, but is backed by a spring 59, which acts as a cushion when the end of the rail strikes the stop. Each of the stops 47 is provided with operating mechanism, as described above, and the several shafts 57 and levers 58 are preferably arranged in a group, as shown in Fig. 3, so as to be within easy control of one operator. At this same place are also arranged the valve-lever 60 of the engine 6 and the hydraulic valves necessary for operating the several motors.

When the rail is sawed into several sections, as described above, these sections, after passing through a cambering-machine M, are delivered to the feed-rollers 4. The first one is carried by the rollers until it reaches the permanent stop 46 at the end of the table, by which it is arrested opposite the cooling-bed E. The stop 47 at the far side of the next cooling-bed D is then raised so as to engage the end of the next rail-section and to stop it opposite said bed. The stop at the bed C is then raised, so as to stop the next rail-section at this bed, and thus the stops are elevated in succession, so as to arrest each of the rail-sections before one of the beds. The several transfer mechanisms may then be actuated simultaneously, so as to deliver the rails upon and move them along the beds, or they may be actuated separately, as may be more convenient. For controlling the several motors I employ the valves 61, (indicated in Fig. 3,) there being one valve for each motor, so that they may be operated separately. I also prefer to employ an extra valve 62, which is coupled with all the motors and is adapted to actuate them simultaneously.

As shown in Figs. 1 and 1ª, the straightening-presses P are near the ends of the respective cooling-beds, and the rails are delivered into convenient proximity to said presses. In case one or more of the beds should be out of repair or for any reason should not be used it may be desirable to use one or more of the other beds to do double duty in cooling rails for the press at the idle bed. For this purpose I employ supplemental conveying mechanism consisting, preferably, of a line of feed-rollers 63, extending transversely at the ends of the beds. After the rails have been delivered on the receiving-frames 45 they or a suitable number of them may be placed upon this line of rollers and conveyed to any of the presses. The rollers may be driven by suitable driving mechanism actuated from any convenient motor. In order to transfer the rails from the frames 45 upon the rollers 63 or upon the frames from the rollers, I may employ at each frame the mechanism shown in Figs. 4 and 14. At the end of each frame 45 is a shaft 64, journaled in bearings 65, and to said shaft are fixed upwardly-extending yokes 66, having on opposite sides of the shaft arms 67, pivoted to the yoke at the points 68 and connected by rods 69 with a spring 70, the tendency of which is to spread the arms 67, as shown in Fig. 7ª. For the purpose of rocking the shaft 64 I employ a hydraulic cylinder 71, whose piston-rod is connected with a rack 72 in gear with a pinion 73 on the shaft. When thus constructed, it is clear that if the piston-rod be projected or retracted it will rock the shaft 64 and will swing the yokes 66 in one direction or the other. When the yoke is swung to the right from the position shown in Fig. 7ª, the left-hand arm 67 will engage the rail which may be on the rollers 63 and will transfer it upon the frame 45. When the yoke is swung in the other direction, the right-hand arm 67 will similarly engage a rail on the frame 45 and transfer it to the rollers 63. Because of the fact that the arms are pivoted, as shown, they will move past any rails which they may meet on the reverse motions. The left-hand arm 67 is preferably made longer than the other, so that in its motion to the right it may engage any rail lying on the inclined rails 8′ and may move it upon the frame 45.

74 is a frame, which may be composed of angle-iron, the purpose of which is to confine

and limit the motion of the arms 67. The pivoting of these arms permits the yoke to move even after they have engaged the frame. There are preferably two of the yokes on the shaft 64, as shown in Fig. 4.

Some of the advantages of my improvement have been indicated in the foregoing specification. Others will suggest themselves to those skilled in the art.

The apparatus is very effective in its action and enables the rails to be handled rapidly and conveniently and with the least possible labor.

The continuous operation of the apparatus and the separating of the rails into groups on the cooling-beds make the work easy and rapid. The rails are delivered singly to the men at the straightening-presses in cold condition just as they are needed, and the men are not hampered by the simultaneous delivery of a mass of rails, as with prior apparatus.

The drawings represent the apparatus as it has been constructed for practical use and is, I think, in its most desirable form; but I do not wish to limit myself thereto, since modifications in form and construction and arrangement of the parts may be made by the skilled mechanic familiar with mill machinery and with the various devices used as equivalents to perform like functions.

It will be understood that my apparatus is adapted for use not only in a rail-mill, but also for cooling metal beams, &c.

I claim—

1. An apparatus for cooling metal rails, &c., comprising a bed constructed to cool the rails and a carrier arranged to move them along the bed, said carrier having series of projections, by which the rails are separated from each other while cooling, substantially as and for the purposes described.

2. An apparatus for cooling metal rails, &c., comprising a bed constructed to cool the rails, a carrier arranged to move them along the bed, said carrier having projections by which the rails are separated from each other while cooling, and driving mechanism constructed to actuate the carrying mechanism in successive steps of limited extent, substantially as and for the purposes described.

3. An apparatus for cooling rails, &c., comprising a bed provided with means for cooling the rails, endless conveying-chains arranged to move the metal along the bed, said chains having projecting separated spurs, and wheels upon which the chains are carried, substantially as and for the purposes described.

4. The combination, with a cooling-bed, of an endless conveying-chain provided with means for moving the metal, sprocket-wheels around which the chain passes, driving-gear acting on one sprocket-wheel, and a lock for the other sprocket-wheel, substantially as and for the purposes described.

5. The combination, with a cooling-bed, of an endless conveying-chain provided with means for moving the metal, sprocket-wheels around which the chain passes, driving-gear consisting of a pawl and ratchet acting on the sprocket-wheel at the delivery end and arranged to move the chain to a limited extent, and a lock for the other sprocket-wheel, substantially as and for the purposes described.

6. The combination, with a cooling-bed, of an endless conveying-chain provided with means for moving the metal, sprocket-wheels around which the chain passes, driving-gear acting on the sprocket-wheel at the delivery end and arranged to move the chain to a limited extent, a lock, and a motor connected both with the driving-gear and the lock, substantially as and for the purposes described.

7. The combination, with a cooling-bed, of an endless conveying-chain provided with means for moving the metal, sprocket-wheels around which the chain passes, a pawl and ratchet acting on the sprocket-wheel at the delivery end of the bed, a lock-wheel and detent at the other sprocket-wheel, and a motor situate at the receiving end of the bed and having a rod actuating said pawl and mechanically connected with the detent, said rod being arranged to actuate the pawl in its motion in one direction and to actuate the detent in its motion in the other direction, substantially as and for the purposes described.

8. The combination, with the bed, of the sprocket-wheel and a chain passing thereover, a stop-wheel upon the sprocket-wheel shaft, a detent arranged to engage the stop-wheel, a rotary shaft having a projection thereon, and a lever operated by said projection and connected to the detent, substantially as and for the purposes described.

9. The combination of the feed-table, the cooling-bed extending therefrom and having an endless conveying-chain provided with means for moving the metal, the transfer device for moving the rail from the feed-table to the cooling-bed, actuating mechanism for the chain, and a motor mechanically connected with the transfer device and with the chain-actuating mechanism and constructed to drive them alternately, substantially as and for the purposes described.

10. The combination of the feed-table, the cooling-bed extending therefrom and having an endless conveying-chain provided with means for moving the metal, the transfer device for moving the rail from the feed-table to the cooling-bed, actuating mechanism for the chain, a motor mechanically connected with the transfer device and with the chain-actuating mechanism and constructed to drive them alternately, and a lock for the chain, said lock being mechanically connected with the motor and adapted to be moved thereby into locking position at the end of the motion of the chain, substantially as and for the purposes described.

11. The combination of the feed-table and

conveying-chain provided with means for moving the metal, a rack-bar having a projection adapted to move across the table, driving-gear for the chain, and a hydraulic cylinder mechanically connected with said driving-gear and connected by gearing with said rack and constructed to operate said parts alternately on its forward and backward strokes, substantially as and for the purposes described.

12. The combination of the saws adapted to divide a rail into sections, a feed-table 4, leading from the saws, several series of beds constructed to cool the sections, extending transversely to the feed-table, conveying mechanism for the cooling-beds, having projections arranged to separate the rails, and straightening-presses at the ends of the cooling-beds, substantially as and for the purposes described.

13. The combination, with a feed-table, of a movable stop consisting of a pivotally-supported spring-backed bar and mechanism for raising said stop above the level of the table, substantially as and for the purposes described.

14. The combination of the cooling-bed, a frame adjacent thereto, upon which the rails are delivered therefrom, conveying mechanism having rollers 63, extending along the end of the bed, and transfer mechanism for shifting the rails from the frame to the conveying mechanism, or vice versa, substantially as and for the purposes described.

15. The combination of the cooling-bed, a frame adjacent thereto, upon which the rails are delivered therefrom, conveying mechanism extending along the end of the bed, and a rocking yoke between the conveying mechanism and the frame and having arms adapted to shift the rails from the frame to the conveying mechanism, or vice versa, substantially as and for the purposes described.

16. The combination, with the conveying mechanism and frame adjacent thereto, of the rocking yoke between the same, said yoke having pivoted arms, means for preventing movement of the arms in one direction, and means for rocking the yoke, substantially as and for the purposes described.

17. The combination, with the conveying mechanism, of the rocking yoke 66, having pivoted arms, means for preventing movement of the arms in one direction, mechanism for rocking the yoke, and a frame 74, containing the yoke, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 27th day of February, A. D. 1891.

HENRY AIKEN.

Witnesses:
W. B. CORWIN,
H. M. CORWIN.