

No. 608,378.

Patented Aug. 2, 1898.

E. W. McKENNA.
MACHINE FOR RENEWING OLD STEEL RAILS.

(Application filed Oct. 12, 1893.)

(No Model.)

2 Sheets—Sheet 1.

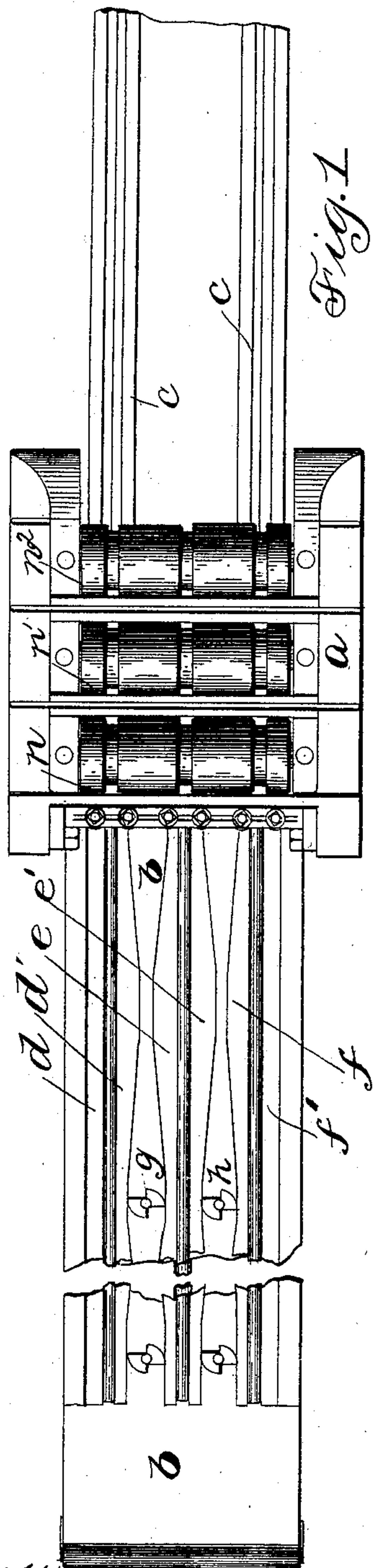


Fig. 1

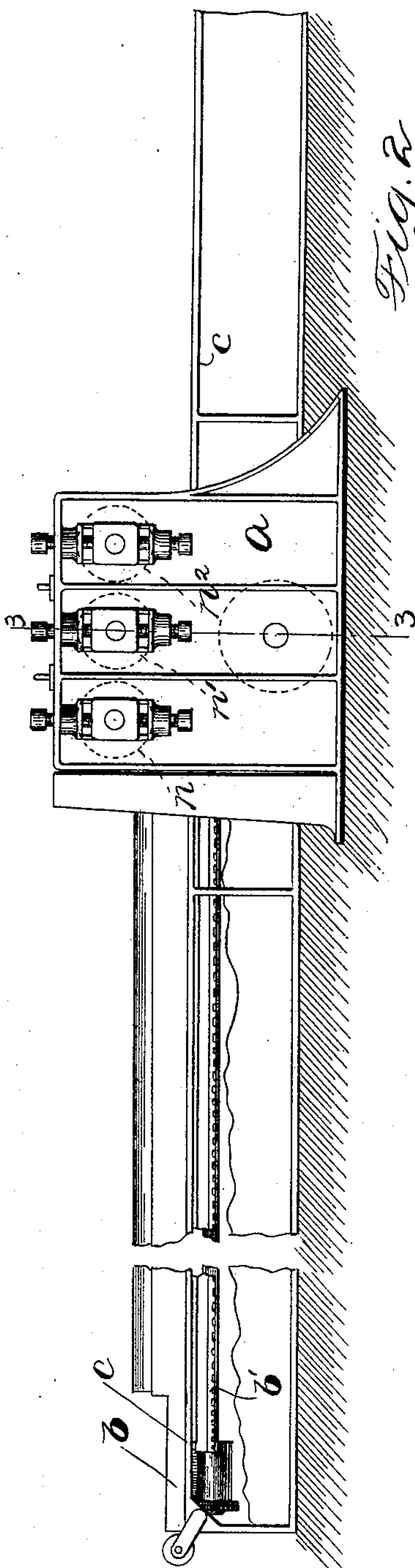


Fig. 2

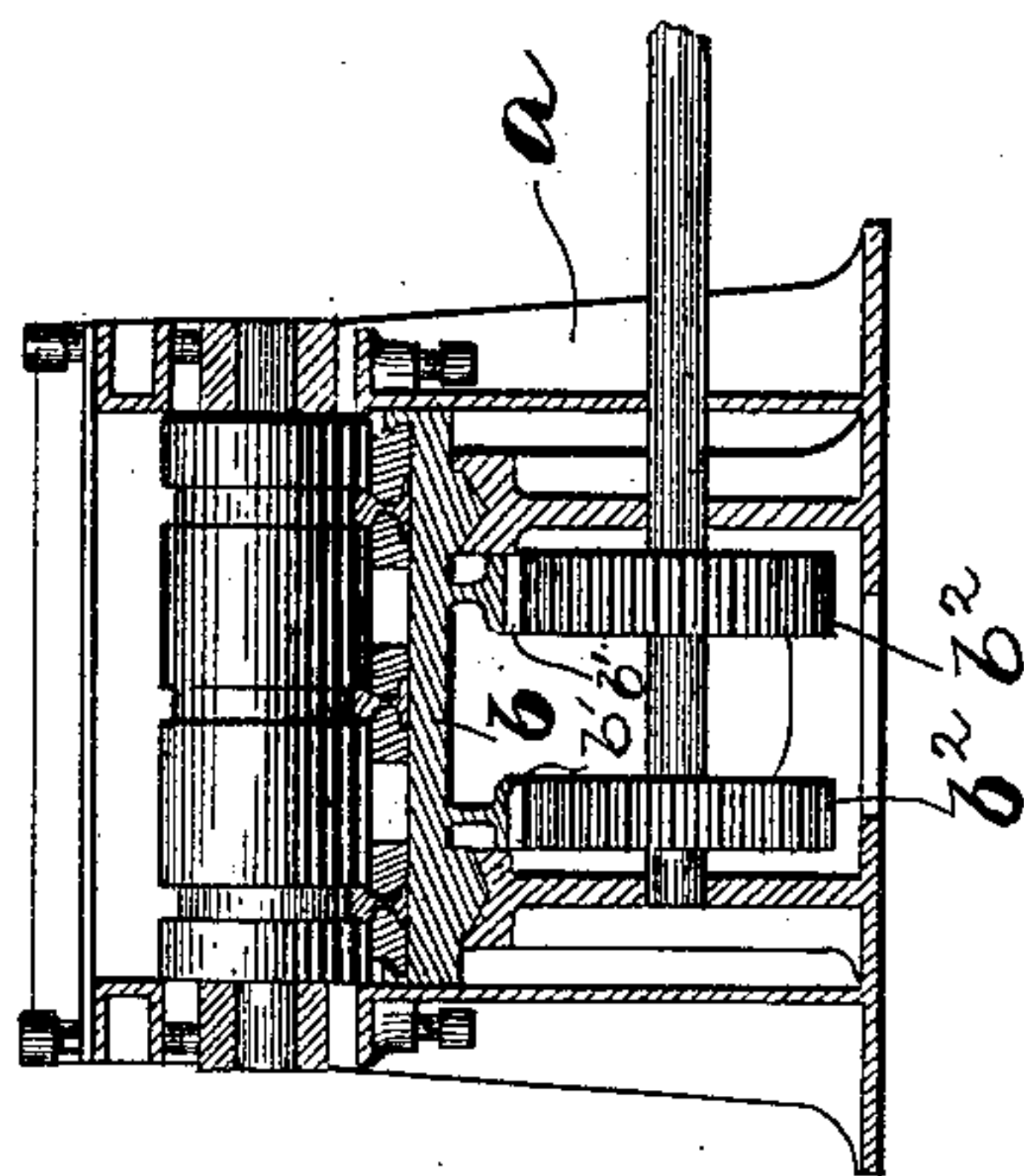


Fig. 3

Witnesses:

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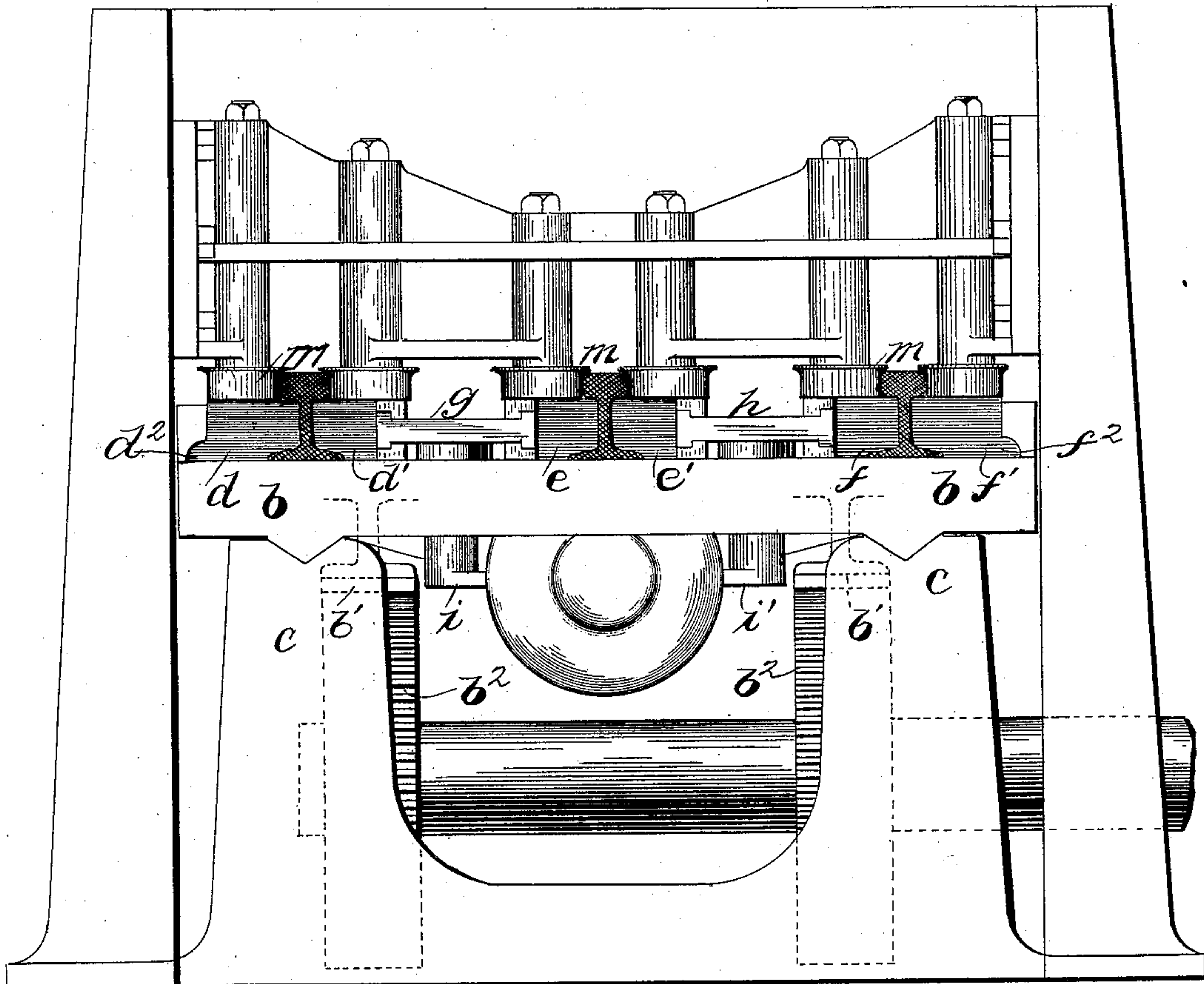


Fig. 4

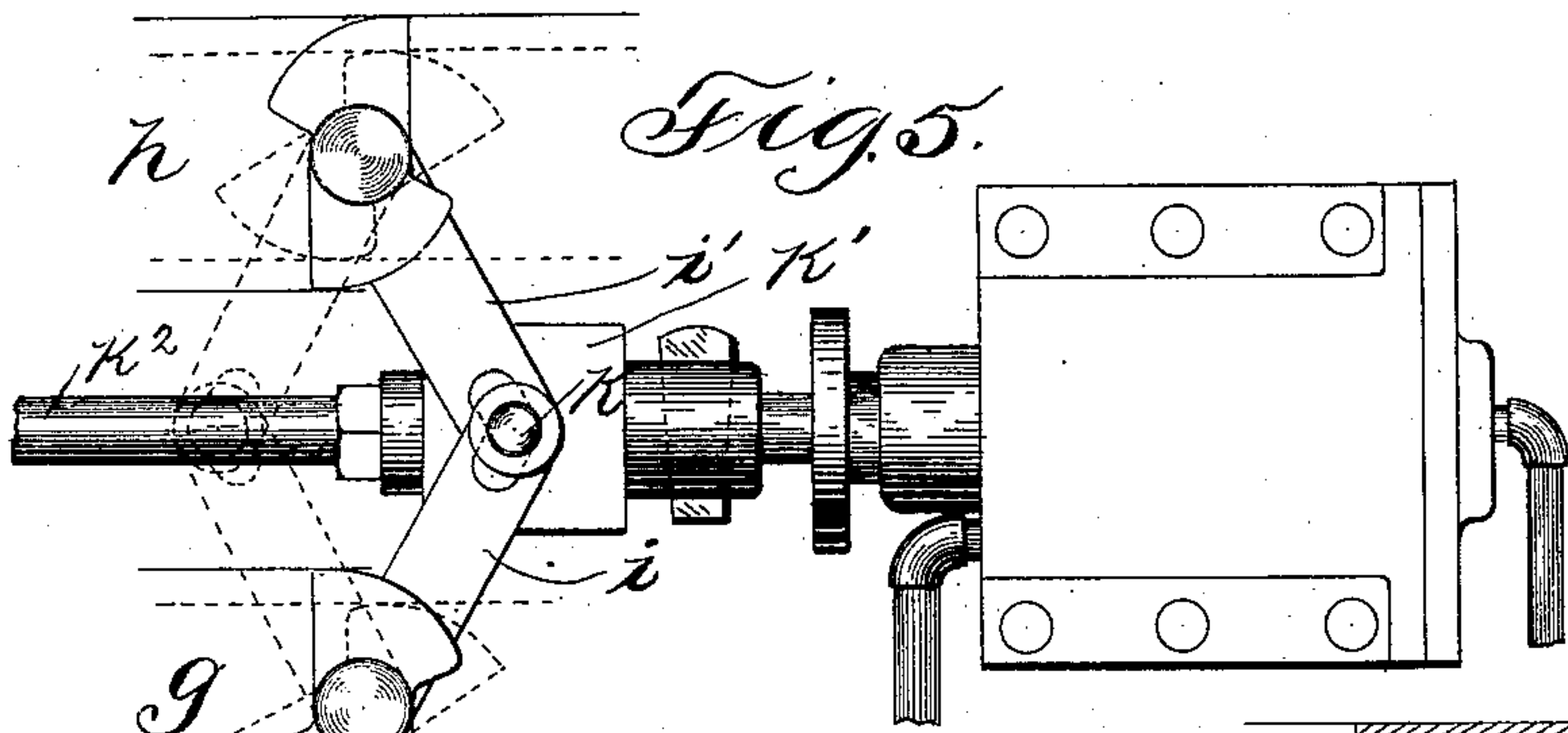


Fig. 5.

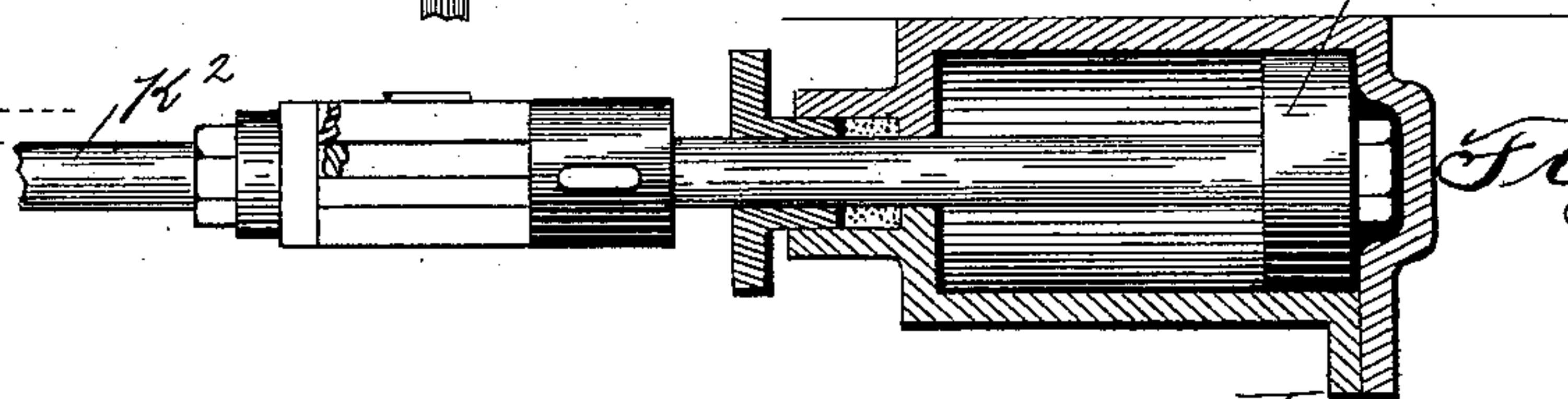


Fig. 6

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UNITED STATES PATENT OFFICE.

EDWARD W. McKENNA, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO THE
McKENNA STEEL WORKING COMPANY, OF SAME PLACE.

MACHINE FOR RENEWING OLD STEEL RAILS.

SPECIFICATION forming part of Letters Patent No. 608,378, dated August 2, 1898.

Application filed October 12, 1893. Serial No. 487,975. (No model.)

To all whom it may concern:

Be it known that I, EDWARD W. McKENNA, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Methods of and Machines for Renewing Old Steel Rails, (Case No. 2,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to an improved machine for renewing old steel rails.

In United States Letters Patent No. 522,228, issued to myself July 3, 1894, I have described a method of renewing old steel rails, which consists in reducing the cross-section of the rail to make up for metal lost by wear or other cause, but without limiting the reduction to any particular portion of the cross-section, the invention being in this particular generic, while the present application is for an invention specific, in that it relates to the reduction of the cross-section of the head only.

As is well known, rails after they have been in use for some time become worn, especially at the ends, due to the impact of the wheels in passing from one rail to another. It is the policy of some railroads to saw off the ends of such rails when they have become worn to an inconsiderable extent, replacing the shortened rails in the track and subjecting them to further use. Such a practice is objectionable, since it necessitates the use of rails of less than the standard length in connection with standard-length rails and increases the cost of the track in requiring more rail-joints and, further, increases the jar upon the train. Furthermore, the ends removed are only available as scrap, while if such material can be restored to its original use it has practically three times the scrap value. Again, after a rail has been used for some time the tread becomes very uneven, due to a "shouldering" of the metal thereof out of place. A depression is caused in the tread, perhaps due to the resting at a point thereon of a concentrated load, and as the wheels pass over the depression the impact causes a flowage of the metal until the depression becomes so serious that the jar upon the train, with the conse-

quent injury to running-gear and fragile merchandise, necessitates the removal of the rail. When the metal of the tread of the rail has been thus shouldered out of place to such an extent as to require its removal, the rail heretofore has been unfit for further use in its former capacity and has only found utility as architectural iron or, when rerolled to rails of smaller cross-section, as tramway-rails. Again, pieces of metal are sometimes chipped from the end or side of the head of the rail, due to some accidental occurrence, thereby rendering its further use impracticable, while rails in special locations are subject to uneven wear, as instanced by the outer rail on a curve, in which the side of the head portion becomes in time worn away to such an extent as to require its removal.

My invention contemplates the renewing of old steel rails when rendered useless or inefficient as such in any of the ways above mentioned or in any other manner; and it consists in passing the rails through rolls, whereby the web and flange are maintained practically intact, while the displaced metal in the head is restored to its place and a symmetrical head of the desired pattern is produced, the cross-section of the head being generally reduced approximately in proportion to the amount of metal lost by wear or other cause, but to a greater extent, if necessary, to bring the head to the desired shape.

Oftentimes the tread of a rail becomes so uneven by shouldering of the metal out of place as to require its removal before the ends or other portions of the rail become appreciably worn away, and, in fact, in most cases the depression caused at the ends of the rails is in the nature of a shouldering or flowage of the metal, so that by my process the rail may be renewed by passing it through rolls without necessarily materially reducing the cross-section, the process then being in the nature of a straightening of the old rail.

The machine for accomplishing the above process consists in its preferred form of a traveling carriage provided with jaws adapted to grasp the web and flange of the rail which has previously been heated to the desired degree—i. e., to a temperature at which the carbon will not be materially affected—

the carriage being then impelled forward, whereby the head of the rail is passed successively through rolls that properly reduce and form the same.

5 Although I prefer to use a machine embodying the above-mentioned general features, the process of renewing may be practiced, though less advantageously, by the ordinary rolls, in which the friction of the rolls
10 upon the rail furnishes the draft that impels the rail through the rolls. When thus practiced, there may of course be a slight reduction in the web and flange portions of the rail, due to the grasp of the rolls, but it would or could
15 be a reduction of no material extent, and therefore I desire that the expression "practically intact," employed in the claims appended hereto in reference to the maintaining of the original dimensions of the web and flange sections, shall be construed in this broad sense.
20 My invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a plan view of the machine of
25 my invention, a portion thereof being shown as broken away. Fig. 2 is an elevational view thereof. Fig. 3 is a sectional view on line 3-3, Fig. 2. Fig. 4 is an end view of the machine. Fig. 5 is a plan view of the cams
30 that actuate the jaws for clamping the rails and of the mechanism that actuates the cams. Fig. 6 is an elevational view, partly in section, of a portion of the mechanism shown in Fig. 5.

35 Like letters refer to like parts throughout the several figures.

The machine comprises a standard or housing *a*, supporting the rolls, and a traveling carriage *b*, traveling in V-shaped ways provided
40 in the frame or bed *c* of the machine. The traveling carriage supports upon its upper surface the jaws for clamping the rails. In the drawings a machine having capacity for handling three rails at a time is illustrated;
45 but any desired number of rails may be handled at a time, determined by the desired capacity of the machine. Upon the under surface of the carriage are provided racks *b'* *b'*, which engage with gear-wheels *b²* *b²*, driven
50 first in one direction and then in the other to effect the reciprocal travel of the carriage in a well-known manner.

The jaws *d* *d'* *e* *e'* *f* *f'*, between which the rails are clamped, extend throughout the
55 length of the carriage, which is preferably sufficient to accommodate thirty-foot rails, the standard length. The outer jaws *d* and *f'* of the outer pairs are made stationary, while all of the others are made transversely
60 movable, said stationary jaws being provided with lips *d²* and *f²*, that engage with corresponding channels in the carriage for securely maintaining said jaws in position. The transverse movement of the remaining jaws is ef-
65 fected by the cams *g* and *h*, which are adapted to rotate about vertical axes, each cam comprising a pair of leaves arranged on either

side of the axis of rotation, the peripheries of the leaves being arcs of circles eccentric to the axis of rotation or other curves possess-
70 ing a varying radius of curvature. These cams are located between the adjacent jaws of adjacent pairs, and when they are so turned that the edges of the jaws engage with those
75 portions of the cams nearest the axis of rotation the jaws are opened and the rails may be inserted or withdrawn, while if the cams be so turned that the edges of the jaws engage with portions of the cams more distant from
80 the center the jaws of the respective pairs are caused to approach and clamp the rails. I preferably employ five such pairs of cams located at distances along the jaws, and in
85 order to prevent bending of the jaws at points between the locations of the cams the portions of the jaws intermediate between the cams are made of an increased transverse dimension.

The journals upon which the cams rotate extend downward through the bed of the carriage *b* and are provided with arms *i* *i'*, rigidly
90 secured thereto or formed integral therewith. The slotted ends of said arms engage with a pin *k*, provided upon the reciprocating cross-head *k'*. When the cross-head is in the position shown in full in Fig. 5, the cams are so
95 rotated that the jaws are caused to engage with the portions of the cams of greatest radius of curvature, and in consequence the jaws are pressed apart. When the arms *i* *i'*
100 have been moved by the travel of the cross-head to the left to the position indicated in dotted lines, the cams are rotated until the engaging surfaces of the cams become those
105 of lesser radius of curvature and the edges of the engaged jaws may be brought toward one another. The piston-rod *k²*, upon which are mounted the several cross-heads that control the movements of the cams, is secured to
110 a piston *k³*, that may be actuated by water, steam, or in any preferred manner, the driving fluid being conveyed to the cylinder through flexible pipes or by a sleeve-pipe; but
115 an expedient whereby fluid may be conveyed to a moving cylinder being old and forming no part of my present invention in its individual capacity I have omitted it from the drawings for clearness.

In the operation of the cams it is necessary that the force causing the approach of the
120 jaws to clamp the rail be checked when the rails have been securely clamped, as otherwise, the whole of the rail being heated, the tendency would be to compress the web and flange and distort the shape of the rail. This
125 checking may be accomplished by providing means for cutting off the motive fluid when the piston has traveled a definite distance by counterbalancing the pressure on the piston
130 by a gradually-increasing force or in any preferred manner; but as this forms no part of my present invention in its individual capacity I have not deemed it necessary to illustrate this feature.

The jaws are so shaped upon their faces that they conform to the shape of the flange and web portion of the rail, while the upper surfaces of the jaws are proportioned to conform to the proper shape of the under surface of the head of the rail, so that when the rail is clamped between the jaws such portion of the head as may have been pressed below the proper height by wear will be raised.

The first set of rolls $m\ m$ through which the heads of the rails pass are journaled to rotate about vertical axes and act upon the sides of the heads. The rolls of the respective pairs are located at such a distance apart that the width of the head after passing therethrough will be the same or less than the width of the head at the completion of the process of renewing. The heads of the rails after having passed through these rolls pass successively through peripheral channels provided in horizontally-journaled rolls $n\ n'\ n^2$. The width of each channel I preferably make equal to the desired width of the head of the completed rail, while the depths of the channels vary, the depth of each being somewhat greater than the depth of that of the succeeding roll. The head of the rail having been rendered greater in height than the desired height of the completed rail in passing through the first set of rolls, the first roll n serves to slightly reduce the height of the head of the rail, pressing the metal to the side, thus increasing the width of the head. The next roll serves to still further decrease the height and increase the width of the head, while the last roll, which is completely filled by the metal of the head in its passage, imparts to the head the proper height and width and the proper shape. The rolls are journaled so that the rotation is imparted thereto by the friction of the rails in passing therethrough.

Although preferable, it is of course not essential that the width of the channels in all of the rolls before the last be equal in width to the desired width of the completed rail, and the several widths may be so arranged relatively to the decrease in the height that the head will completely fill each channel as it passes therethrough.

In the above-described machine the jaws are rendered movable while the rolls are fixed; but to reverse this construction and make the jaws stationary and the rolls movable I consider as within the scope of my invention.

While I prefer to use a machine as above described in renewing the rail—that is, a machine in which the head is first decreased in width to a dimension less than that of the completed rail, the finishing process consisting in bringing the head to the desired shape by force applied to the top of the head and in the direction of the line of work—my method may be practiced by the use of horizontal rolls alone or in any other manner in which the metal of the head may be redistributed

and brought to the proper shape. I have found that a more durable rail is produced by completing the rolling process by force applied in the direction of the line of work, since the metal is thus rendered more compact in the tread of the rail and its life prolonged, the metal in the tread of the rail being at the same time compressed for some distance from the surface, and a compact structure with a tough outerskin strongly resistant to wear will be formed. In application Serial No. 487,875 I have claimed, broadly, the process of rolling the head of a rail by first imparting thereto a less width and a greater height than the desired dimensions of the head of the completed rail and then bringing the head to the desired shape by pressure imparted thereto in the direction of the line of work, and I desire, therefore, to limit the present case so far as it pertains to this feature to the particular adaptation of this process to the renewing of old rails by operating upon the head thereof.

The rolls of the machine being adjusted to turn out a renewed rail of a particular shape and section and the old rails being worn away in different degrees, it is evident that in some rails the cross-section of the head will be reduced almost in exact proportion to the amount of metal lost, while in other cases the cross-section will be reduced more than in proportion to the amount of metal lost, in which latter case a small portion of metal will be removed entirely from the head. It is with these facts in mind that in the claims appended hereto the expression “reducing the cross-section of the head of the rail to make up for the material lost by wear or other cause and to bring the head to the desired shape” has been used, which is to be construed as meaning that the cross-section is reduced in exact proportion to the material lost when such reduction will bring the head to the desired shape or more than in exact proportion when such extra reduction is necessary to bring the head to the desired shape. When the rail is defective from shouldering of the metal out of place, only the head may be rerolled without a marked reduction of the cross-section, and I consider such an operation as this to come within the purview of the expression referred to.

Should the head of a rail be worn away to such an extent that not sufficient metal is left in the head to furnish material for a renewed head, I flow a portion of the metal of the web into the head by a “transferred” process; but as this forms the subject-matter of an application, Serial No. 487,976, filed concurrently herewith I will not describe this method further.

In my application, Serial No. 487,875, heretofore referred to I have claimed, broadly, the general features of the machine herein particularly described, and in this application I have drawn the claims to such features of the machine as particularly adapt it to first reduce the width of the head and then com-

plete the process by rolling in the direction of the line of work.

It will be observed that the machine above described, by the insertion of proper jaws and rolls, may be used for renewing rails of various standard shapes.

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

10 1. In a machine for rolling rails, the combination with means for maintaining practically intact the web and flange portions of the rail, of means for reducing the width of the rail-head without constraining the flow of
15 metal toward the top of the head, and means for decreasing the height of said head and for limiting the transverse flow of the metal of the head, substantially as described.

20 2. The combination in a machine for rolling rails, with means for maintaining practically intact the web and flange portions of the rail, of means for constraining said rail from warping or bending approximately throughout the entire length thereof, means for re-
25 ducing the width of the rail-head without retarding the flow of metal toward the top of the head, and means for decreasing the height of said head and for limiting the transverse flow of the metal of the head, substantially
30 as described.

3. In a machine for renewing rails, the combination with means for maintaining practically intact the web and flange portions of the rail, of rolls disposed to bear upon the
35 sides of the rail-head and adapted to reduce the width thereof without constraining the flow of metal toward the top of the head, and a roll or rolls bearing upon the top of the head adapted to reduce the height of said
40 head and constrain the lateral flow of the metal thereof, substantially as described.

4. In a machine for renewing old steel rails, the combination with rolls adapted to act successively upon the sides and the top of the
45 head of the rail, of a traveling carriage provided with jaws adapted to grasp the web

and flange of the rail and maintain the same intact, substantially as described.

5. In a machine for renewing old steel rails, the combination with a traveling carriage 50 provided with jaws adapted to grasp the rail, of vertically-journaled rolls adapted to act upon the sides of the head of the rail, and horizontally-journaled rolls adapted to act upon the top of the head of the rail, substan- 55 tially as described.

6. In a machine for renewing old steel rails, the combination of a traveling carriage provided with jaws adapted to grasp the rail, of rolls adapted to act upon the sides of the head 60 of the rail, and a series of horizontally-journaled rolls provided with peripheral channels, said channels being of successively-diminishing depth, substantially as described.

7. In a machine for renewing old steel rails, 65 the combination with means for advancing the rail, of rolls adapted to act upon the sides of the head of the rail, the peripheries of said rolls being at a distance apart less than the desired width of the completed rail, a series 70 of rolls adapted to successively act upon and diminish the height of the head of the rail, and means for limiting the transverse flow of the metal of the head, substantially as described. 75

8. In a machine for renewing old steel rails, the combination with the traveling carriage 80 provided with jaws $d d'$, $e e'$, $f f'$, adapted to clamp the rails, of the series of cams $g h$ adapted to cause the approach of the members of the respective pairs of jaws to clamp the rails, the rolls $m m$ adapted to act upon the sides of the heads of the rails, and the rolls $n n' n''$ adapted to complete the process of renewal, 85 substantially as described.

In witness whereof I hereunto subscribe my name this 11th day of October, A. D. 1893.

EDWARD W. MCKENNA.

Witnesses:

JNO. I. SABIN,
N. L. COLLAMER.