No. 635,577. Patented Oct. 24, 1899.

E. W. McKENNA.

PROCESS OF AND MACHINE FOR RENEWING STEEL RAILS.

(Application filed Nov. 22, 1897.)

(No Model.) 3 Sheets—Sheet 1.

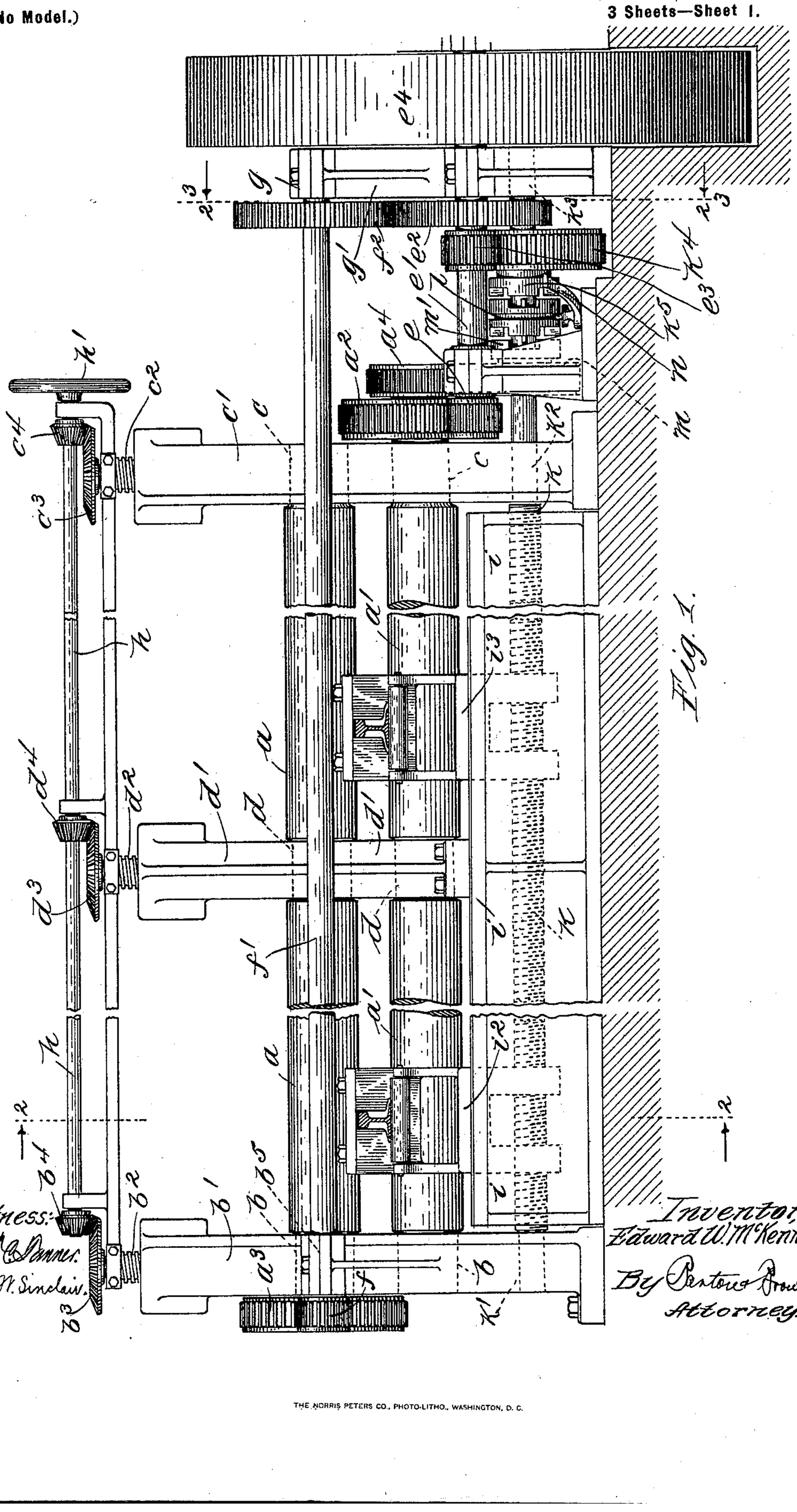

Fig. 1.

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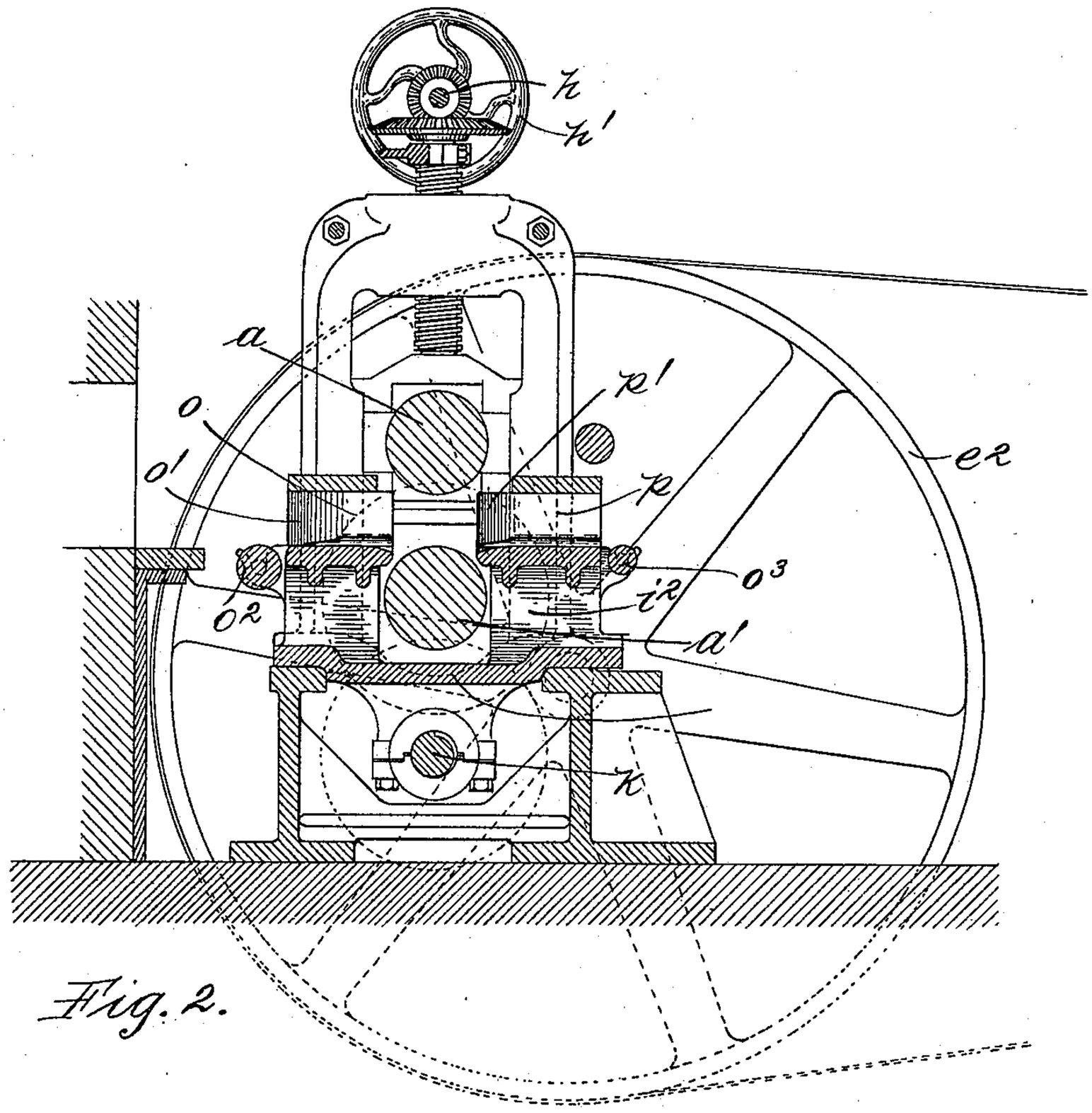

Fig. 2.

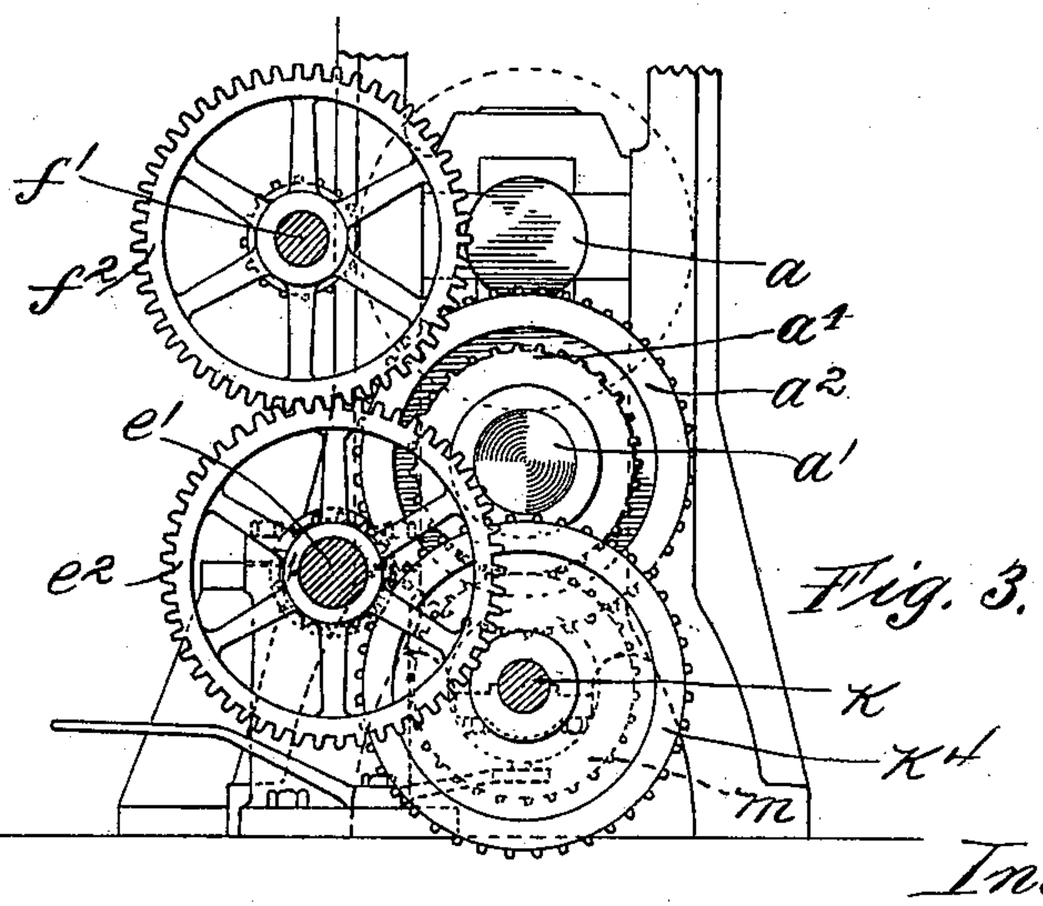

Fig. 3.

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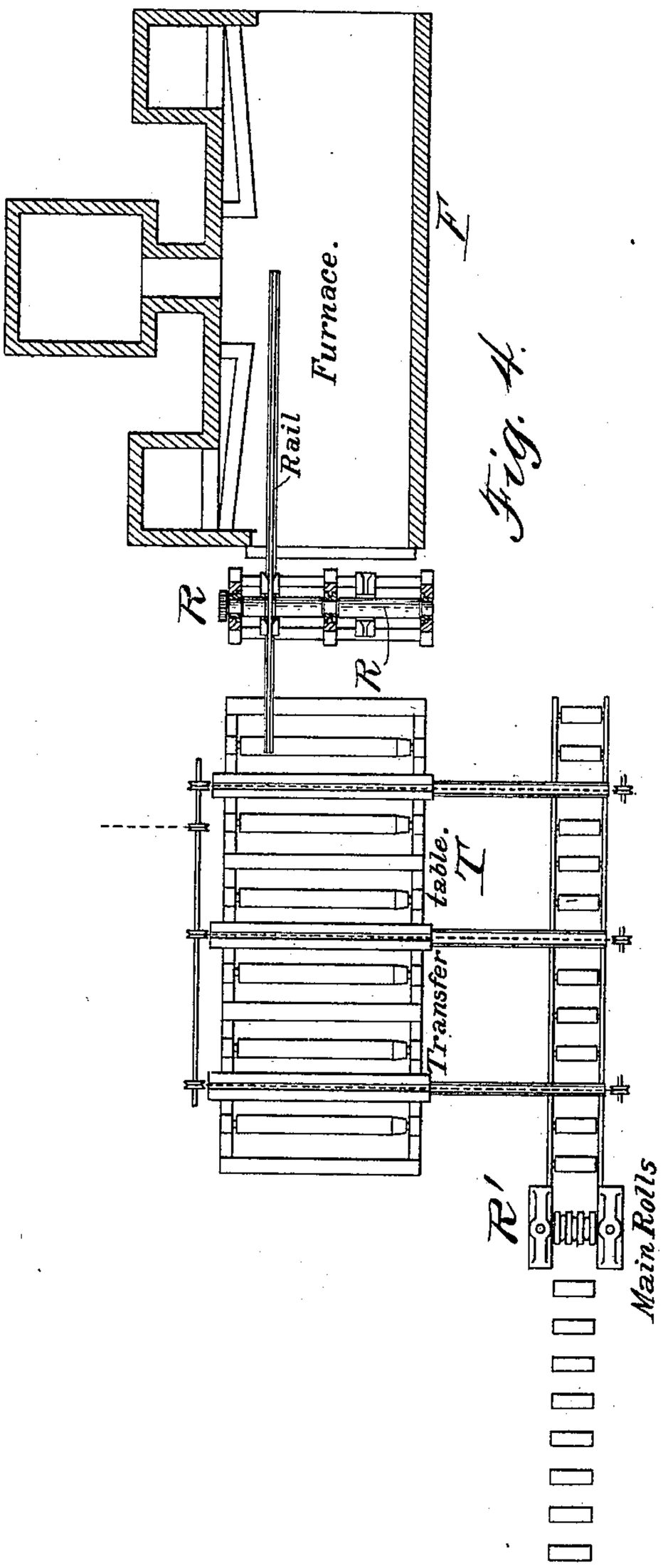

Fig. 4.

Fig. 5.

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PROCESS OF AND MACHINE FOR RENEWING STEEL RAILS.

SPECIFICATION forming part of Letters Patent No. 635,577, dated October 24, 1899.

Application filed November 22, 1897. Serial No. 659,485. (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 a certain new and useful Improvement in Processes of and Machines for Renewing Steel Rails, (Case No. 5,) 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 a process of and machine for renewing old steel rails for their original purpose; and its object is so to prepare the rail for the final shaping thereof that uniform fishing angles may be secured and that as little reduction as possible shall be made from the original weight of the rail which is to be renewed.

The work of renewing steel rails or adapting them for further use for their original purpose after they have become distorted in shape and otherwise impaired by service is carried on under varying conditions, which are at all times different from those which obtain in the manufacture of new rails. In the latter case the maker is working with blanks of a uniform shape and size and containing an absolutely exact quantity and distribution of metal, while worn rails even from the same track will vary in height from one sixty-fourth to one-half of an inch and will be otherwise distorted in shape even though the amount of metal remaining in the rails will be approximately uniform. Another difficulty is to retain the original fishing angles or, as is required in some cases, to renew rails of different shape, but of substantially equal weight, and reduce them to a standard shape with uniform fishing angles. The tendency here is in attempting to give the rail the required height to spread the inside of the head and of the flange farther apart than they were originally, destroying the fishing angles and leaving the rail permanently distorted in shape, so that the renewed rails do not fit the standard fish-plates as they should, and loose joints are formed when the rail is again put into service. It is well known in the art of rolling Bessemer steel that the blank to be passed through the rolls must be narrower than the horizontal width of the pass. The upper and nether pressure of the rolls then forces the steel out to the sides until the pass is filled, and any surplus metal is carried out in lengthening the blank. Since the old rails vary in height and shape, then, it is necessary that the higher rails should be broken down to the height of the lowest rail, so that the height of any rail before it is put through the roughing-pass will be not greater and preferably less than the horizontal width of such pass—that is, the maximum height of any rail before it goes through the roughing-pass must be only that of the rail which has been most reduced in height by service. The pass, moreover, must be of such dimensions that it will be entirely filled by the metal of the lightest rail in the lot which is to be renewed. Since any surplus metal resulting from the difference between the size of the pass in the roughing-rolls and the cross-section of the smallest rail is carried out in lengthening the rail, the ends whereof are sawed off and reduced to scrap, this pass should be made only a very little smaller than the cross-section of the smallest rail, my object being not to effect a large reduction of the cross-section of the rail, but the smallest reduction possible that will secure the result I seek—namely, to adapt the rail for further use for its original purpose. For these reasons, therefore, and to secure uniform fishing angles, as above pointed out, the rail must be reduced by pressure upon the top and bottom thereof to a height which is less than the width of the pass in the roughing-roll. The head will thus be crushed and the web buckled or upset, so that the head and flange are forced nearer together. Then as the rail is put through the roughing-pass on its side—that is, resting on the head and flange—the upper and nether pressure in the rolls will force the metal out into the head of the rail, giving the desired shape and fishing angles, and any surplus metal is carried out in elongating the rail. To sum up, then, my process consists in heating the rail, reducing it to a uniform height by pressure upon the top and bottom thereof, bringing the head and flange nearer together, and thereafter spreading the head and flange apart again, while rolling the rail

to the desired section for further use for its original purpose.

The mechanism which I prefer to employ in renewing old steel rails according to the process described above may be generally described as follows:

Immediately in front of the furnace is provided a breaking-down roll-train consisting of a pair of heavy driven rolls having opposing smooth surfaces for engaging the top and bottom of the rail as it leaves the furnace and adapted to exert pressure to bring the head and flange nearer together. The web of the rail is usually upset or slightly buckled as the rail is passed through these breaking-down rolls, and the scale which has formed in the furnace is broken, so that it may readily be removed by scrapers.

Main rolls having roughing and finishing passes are provided in position to receive the rail after it leaves the breaking-down rolls. Any of the well-known forms of transferring mechanism may be employed to carry the rail from one set of rolls to the other. The passes of the main rolls are shaped for spreading the head and flange apart again to give the required cross-section and fishing angles to the rail, thus completing the process which I have hereinbefore described.

The breaking-down rolls preferably are of an operative length substantially equal to the opening in the furnace and have smooth cylindrical surfaces without grooves or passes of any kind. A way preferably extends alongside the rolls parallel with the axes thereof, and a guide or guides may be arranged to travel to and fro along said way to receive a rail lying at any part of the opening in the furnace and direct the same between the rolls at that point, preventing lateral displacement of the rail while being broken down. Continuously-operating motor mechanism may be provided with reversing controller mechanism for causing and controlling the travel of said guides along the way.

The details of the construction and operation of the machine of my invention will be more easily understood upon an inspection of the accompanying drawings, in which—

Figure 1 is a front elevation of the rolling-machine embodying my invention. Fig. 2 is a sectional view on plane 2 2 of Fig. 1. Fig. 3 is a sectional view on plane 3 3 of Fig. 1. Fig. 4 is a diagram illustrating in plan a rolling-mill plant and arrangement of machinery of my invention for accomplishing the several steps of my improved renewing process. Fig. 5 is a detail view showing one of the passes of the main rolls.

Like letters of reference are used to designate like parts in all figures.

The rails to be renewed are heated in a furnace F, immediately in front of which is placed the breaking-down roll-train R, presently to be specifically described. The main rolls R′ are adapted to receive rails after they have been prepared therefor by the breaking-down roll-train R. A transfer-table T serves to convey the rails from one roll-train to the other. The passes of the main rolls may be shaped, as illustrated in Fig. 5, to give the desired cross-section to the rail.

The breaking-down roll-train consists, preferably, of a pair of heavy driven rolls $a\ a'$, whose operative length is substantially equal to the width of the furnace-opening, said rolls having smooth cylindrical surfaces without grooves or passes of any kind. The rolls $a\ a'$ are separated from one another, so that the rail may be passed between them and the opposing smooth surfaces of the rolls engage and exert pressure upon the top and bottom of the rail, bringing the head and flange nearer together, buckling or upsetting the web and breaking the scale which has formed on the rail in the furnace.

Each of the rolls $a\ a'$ is journaled in bearings $b\ c$, provided in the standards $b'\ c'$, respectively, and a third standard d' is preferably provided, having bearings d, adapted to support said rolls in the middle. The bearings $b\ d\ c$ of the roll a are preferably adjustable vertically in their respective standards, adjusting-screws $b^2\ d^2\ c^3$ being provided for this purpose. Miter-gears $b^3\ d^3\ c^3$ are provided upon the upper ends of said adjusting-screws $b^2\ d^2\ c^2$, respectively, which miter-gears mesh with miter-pinions $b^4\ d^4\ c^4$, respectively, mounted upon a common shaft h, which is provided upon its end with a hand-wheel h'. It will be seen that upon rotation of the hand-wheel h' the bearings b, d, and c of the upper roll a may be adjusted vertically, so that the rolls may accommodate rails of different heights.

The roll a' is provided upon its end with a gear-wheel a^2, which meshes with a pinion e, mounted upon a driving-shaft e', operated by any suitable mechanism. I have shown a wheel e^4 mounted upon the end of said shaft e', over which a driving-belt may be passed. The roller a is provided with a gear-wheel a^3, mounted upon its end, which gear-wheel meshes with a pinion f, mounted upon the end of a shaft f', one end of said shaft being journaled to rotate in a bearing b^5, provided in the standard b', the other end of said shaft f' being journaled to rotate in a bearing g, provided in a standard g'. (Shown at the right of the drawings in Fig. 1.) A gear-wheel f^2 is mounted to rotate with the shaft f' and meshes with a corresponding gear-wheel e^2 of equal size mounted upon the driving-shaft e'.

It will be seen that upon rotation of the driving-shaft the roll a' will be caused to rotate in an opposite direction through the agency of gear a^2 and pinion e, mounted upon the driving-shaft. Likewise the roll a will be simultaneously caused to rotate in a direction corresponding to the direction of rotation of said driving-shaft through the agency of gear-wheel a^3, pinion f, shaft f', gear-wheel f^2, and gear-wheel e^2, mounted upon the driving-shaft.

A way i is provided under the rolls $a\ a'$, and guide-carriers $i^2\ i^3$ are adapted to be

moved to and fro along said way, the guide-carrier i^2 traveling between the standard b' and the standard d', and guide-carrier i^3 likewise traveling on the way i between the standard d' and standard c'. The movement of said guide-carriers is preferably accomplished by means of a threaded shaft k, which is journaled to rotate in bearings k' k^2 k^3, provided in the standards b', c', and g', respectively. Threaded journals are provided upon said guide-carriers i^2 i^3, so that upon rotation of said shaft k the guide-carriers will thereby be caused to move simultaneously along the way i. A clutch l is splined to rotate with the unthreaded portion of said shaft k, but is movable longitudinally thereon. A gear-wheel k^4 is mounted to rotate loosely upon the shaft k and meshes with a pinion e^3 upon the driving-shaft e'. The gear-wheel k^4 is provided with a clutch-socket or extension k^5, so that when the clutch l is moved longitudinally upon the shaft k to engage with said clutch-socket k^5 the shaft k will be caused to rotate in a direction opposite to the direction of rotation of said driving-shaft. A gear-wheel a^4 is mounted upon the end of the roll a' and meshes with a corresponding gear-wheel m, mounted loosely upon the shaft k. The gear-wheel m is provided with a clutch-socket m', whereby upon the engagement of the clutch l with said clutch-socket m' the shaft k will be rotated in a direction corresponding to the direction of rotation of the driving-shaft e', rotation being imparted by means of pinion e upon the driving-shaft, gear-wheel a^2, meshing therewith, gear-wheel a^4, and gear-wheel m, whose extension is engaged by the clutch. A lever n is provided which is adapted to move the clutch l longitudinally upon the shaft k to cause said clutch to engage with either the clutch-socket k^5 of the gear-wheel k^4 or with the clutch-socket m' of the gear-wheel m, so that by manipulating this lever it is possible to start, stop, or change the direction of rotation of said shaft k, and thus to start, stop, or change the direction of movement of the guide-carriers i^2 i^3.

As shown in Fig. 2, the guide-carrier i^2 carries guides o p on each side of the roll-train, flaring mouths o' p' being formed by said guides to direct the rail at right angles between the rolls a a', said guides serving to prevent any lateral displacement of the rails while being rolled. The guide-carrier i^3 carries guides similar in all respects to those of the guide-carrier i^2. Rollers o^2 o^3 are provided in connection with the guides o p, respectively.

It will be seen that the machine of my invention is adapted to draw out and roll rails from any part of the furnace without the necessity of moving any rail an appreciable distance, since the operative length of the rolls being that of the width of the furnace it is only necessary to move one of the guide-carriers opposite that part of the furnace in which the desired rail may lie, when the end of the rail may be inserted in the flaring mouth of the guide mounted upon such guide-carrier, and the rolls will operate to withdraw the rail from the furnace.

Having thus described one form of my invention, I claim as new, and desire to secure by Letters Patent, together with all modifications therein which may be made by mere skill, the following:

1. The herein-described process of renewing steel rails for their original purpose, which consists in heating the rail, reducing it to a uniform height by pressure upon the top and bottom thereof, bringing the head and flange nearer together, and thereafter spreading the head and flange apart again, at the same time shaping the rail to the desired section, whereby uniform fishing angles may be secured, substantially as described.

2. The herein-described process of renewing steel rails for their original purpose, which consists in heating the rail, applying pressure to the top and bottom thereof to crush the head and buckle or upset the web, thereby to bring the head and flange nearer together, and thereafter rolling the rail to the desired section by spreading the head and flange apart again and forming the required fishing angles, substantially as described.

3. In a rolling-mill plant for renewing old steel rails, the combination with a furnace adapted to heat the rails, of a breaking-down roll-train through which the rail may be passed upon leaving the furnace, said roll-train having opposing surfaces adapted to engage the top and bottom of the rail and exert pressure thereon, whereby the head and flange are brought nearer together, and main rolls for operating upon the rail after it leaves said breaking-down rolls, said main rolls having passes shaped to spread the head and flange apart again and impart the desired cross-section to the rail, substantially as described.

4. In a rolling-mill plant, the combination with a furnace adapted to heat old steel rails, of a pair of breaking-down rolls located in front of said furnace and adapted to receive a rail therefrom, said rolls having smooth cylindrical surfaces between which the rail is passed and which are adapted to exert a pressure upon the top and bottom thereof, whereby the head and flange are brought nearer together, a guide for directing a rail between said rolls, and main rolls for operating upon the rail after it leaves said breaking-down rolls, said main rolls having passes shaped to the desired cross-section of the rail, whereby the head and flange are spread apart again and uniform fishing angles secured, substantially as set forth.

5. In a rail-rolling machine, the combination with a pair of rolls a a' between which the rail may be passed, journals b c at the ends of said rolls, supplemental journals d approximately in the middle of said rolls,

means for adjusting the distance between said rolls to accommodate rails of different height, a way *i*, guide-carriers i^2 i^3 adapted to travel along said way, guides carried by said guide-carriers, and means for causing movement of said guide-carriers along said way, substantially as described.

6. The combination with a furnace for heating rails, of a breaking-down roll-train placed before an opening therein, a guide for receiving a rail from said furnace and directing the same between said rolls, said guide having opposing vertical faces adapted to engage the sides of the head of the rail to sustain the latter against lateral displacement and in an upright position while being rolled, and means for moving said guide opposite different parts of the furnace-opening, substantially as described.

7. The combination with a furnace, of a rail-rolling machine placed in front of an opening therein, said machine having rolls of an operative length substantially equal to the width of the opening in the furnace, a guide adapted to receive a rail from any part of the opening in the furnace and direct the same between said rolls, and means for moving said guide opposite any point in said furnace, substantially as described.

8. In a rolling-mill plant for renewing old steel rails, the combination with a furnace for heating the rails, of a breaking-down roll-train located in front of an opening in said furnace, said roll-train having a pair of cylindrical rolls with smooth surfaces whose operative length is substantially equal to the width of said opening, a guide for receiving a heated rail from the furnace and directing the same between said rolls, a way along which said guide may travel, motor mechanism adapted to cause said guide to travel to and fro along said way, whereby a rail may be received from any part of said furnace-opening, means for controlling said motor mechanism, and main rolls for operating upon the rail after it leaves said breaking-down rolls, said main rolls having passes shaped to the desired cross-section of the rail, substantially as described.

9. The combination with a furnace for heating rails, of a breaking-down roll-train placed before an opening therein, said roll-train having cylindrical rolls forming opposing smooth surfaces, a guide having opposing vertical faces adapted to engage either side of the head of the rail, to direct the same between the rolls and sustain it against lateral displacement and in an upright position while being rolled, whereby the head and flange of the rail are brought nearer together, means for moving said guide opposite different parts of the furnace-opening, and main rolls for operating upon the rail after it leaves said breaking-down roll-train, said main rolls having passes for shaping the rail to the desired cross-section, substantially as described.

10. A machine for preparing rails for reshaping, which consists of a pair of rolls placed opposite an opening in a rail-heating furnace of a rolling-mill plant, said rolls having smooth surfaces adapted to engage the top and bottom of the rail, whereby the head and flange thereof are forced nearer together, a guide adapted to receive a rail from the furnace, said guide having opposing surfaces adapted to engage either side of the head of the rail, whereby the latter is maintained in an upright position and sustained against lateral displacement while being rolled, and means for moving said guide to and fro in the direction of the length of the rolls, in front of the furnace, to receive rails which may be lying at different parts of the furnace, substantially as set forth.

In witness whereof I hereunto subscribe my name this 18th day of November, A. D. 1897.

EDWARD W. McKENNA.

Witnesses:
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