(No Model.) 6 Sheets—Sheet 1.

D. H. LENTZ.

ROLLING MILL HOOKING MACHINE.

No. 307,473. Patented Nov. 4, 1884.

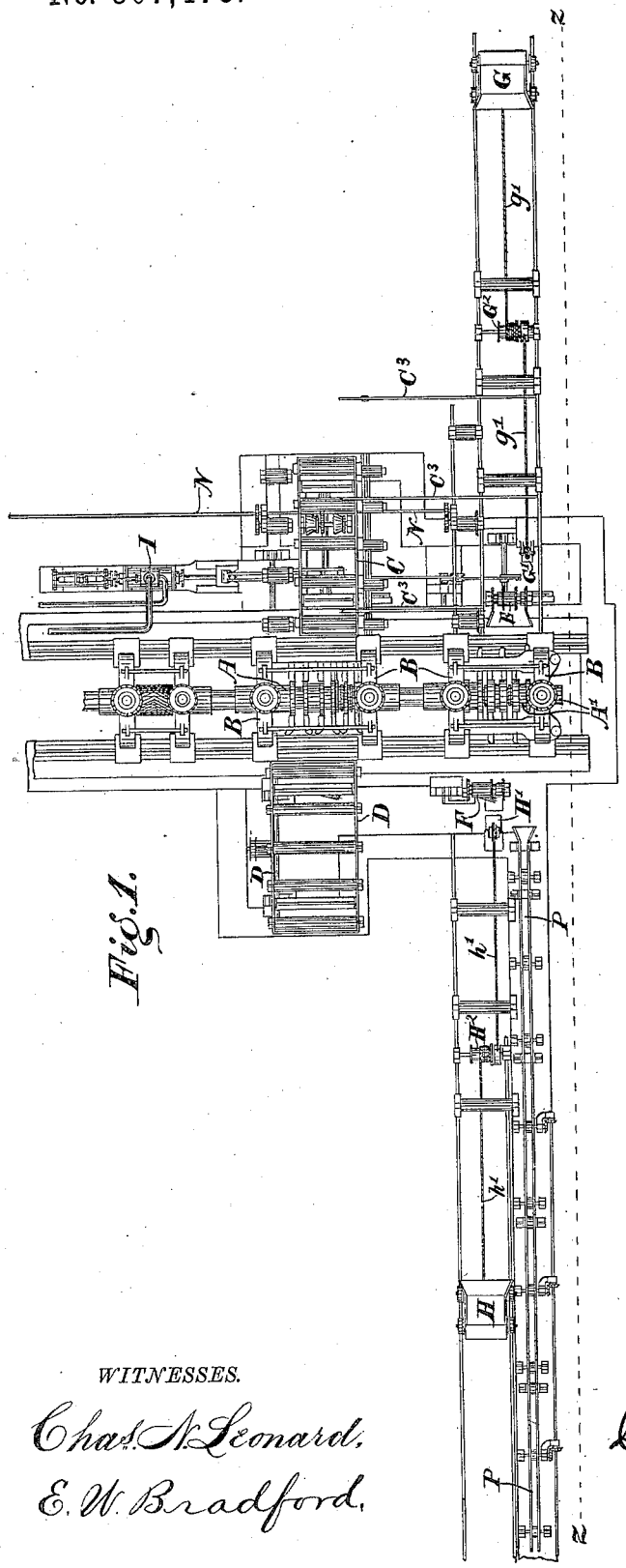

Fig. 1.

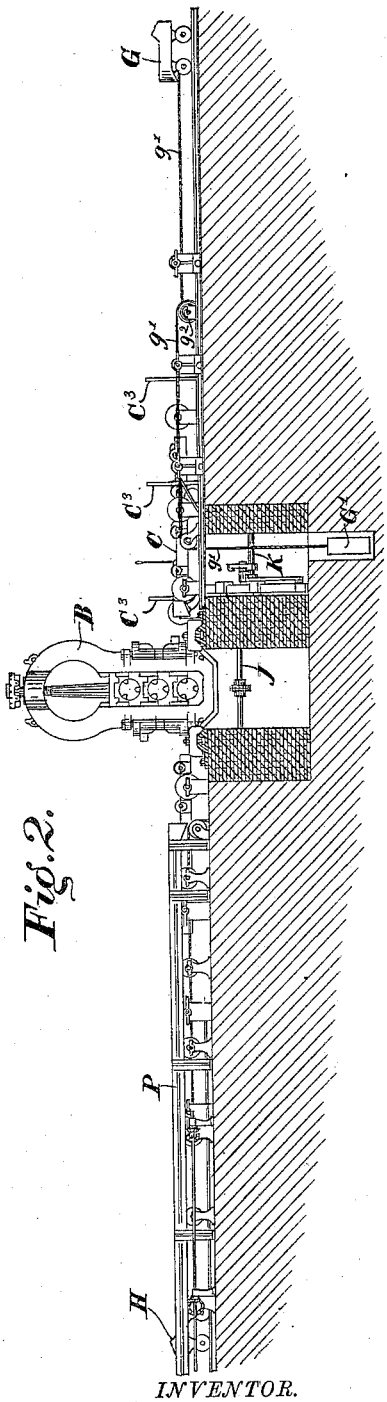

Fig. 2.

WITNESSES.

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C. Bradford.

ATTORNEY.

(No Model.) 6 Sheets—Sheet 2.

D. H. LENTZ.

ROLLING MILL HOOKING MACHINE.

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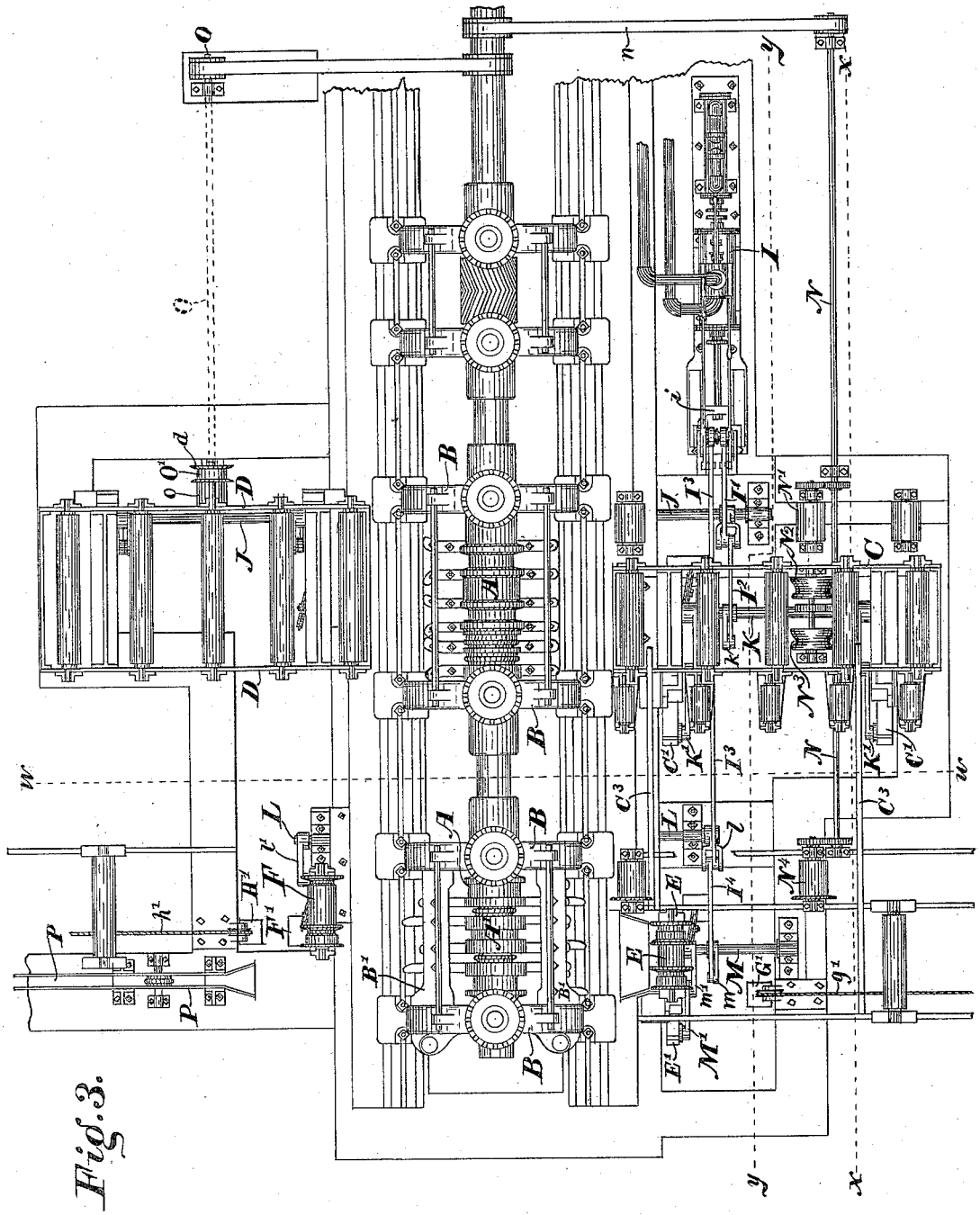

Fig. 3.

WITNESSES.

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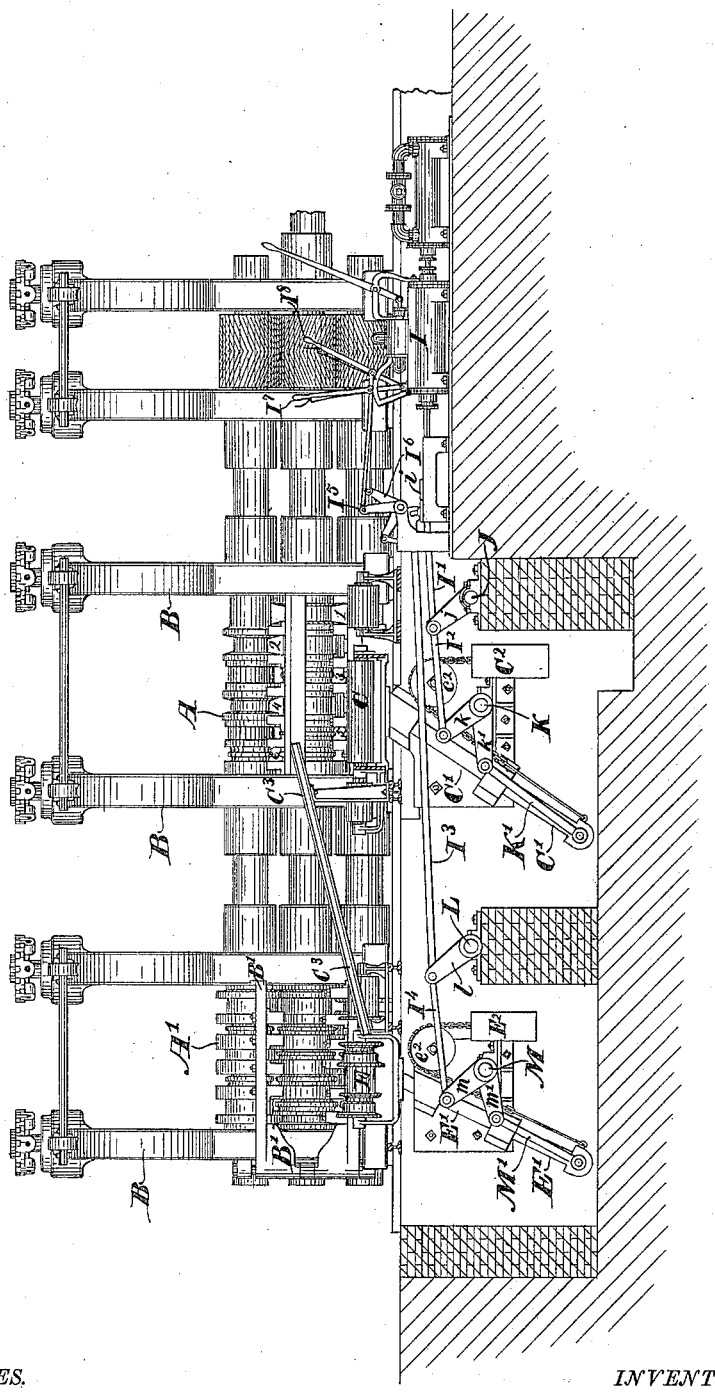
(No Model.) 6 Sheets—Sheet 3.

D. H. LENTZ.

ROLLING MILL HOOKING MACHINE.

No. 307,473. Patented Nov. 4, 1884.

Fig. 4.



WITNESSES.

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(No Model.) 6 Sheets—Sheet 4.

D. H. LENTZ.

ROLLING MILL HOOKING MACHINE.

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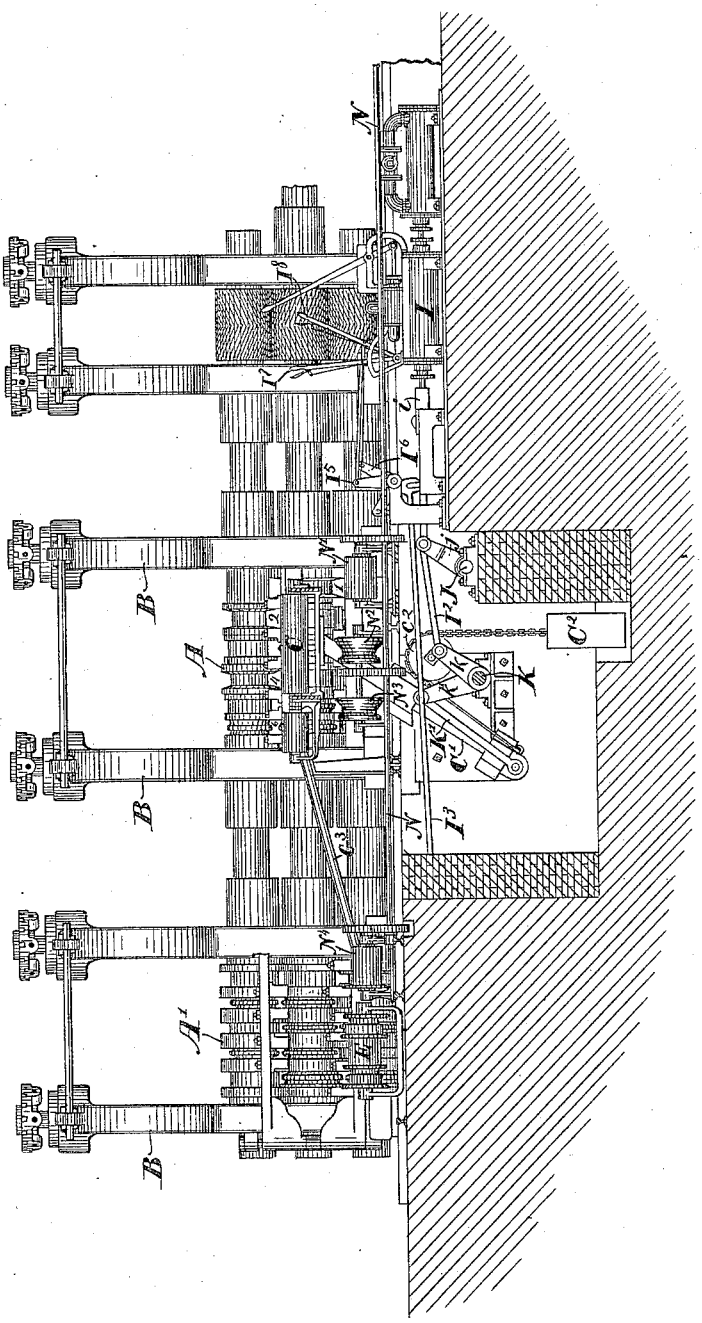
Fig. 5.



WITNESSES.

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(No Model.) 6 Sheets—Sheet 5.

D. H. LENTZ.

ROLLING MILL HOOKING MACHINE.

No. 307,473. Patented Nov. 4, 1884.

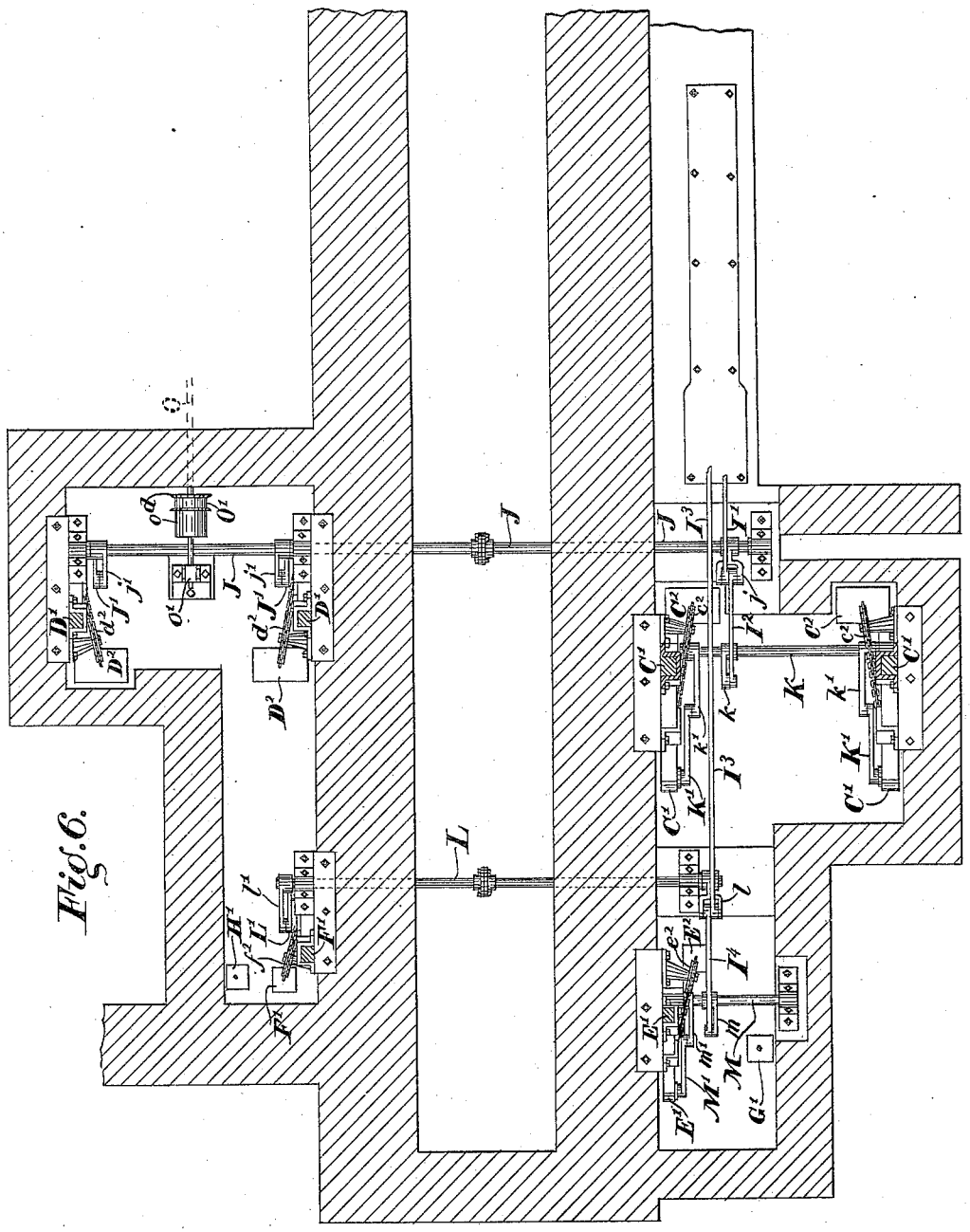

Fig. 6.

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D. H. LENTZ.

ROLLING MILL HOOKING MACHINE.

No. 307,473. Patented Nov. 4, 1884.

Fig. 7.

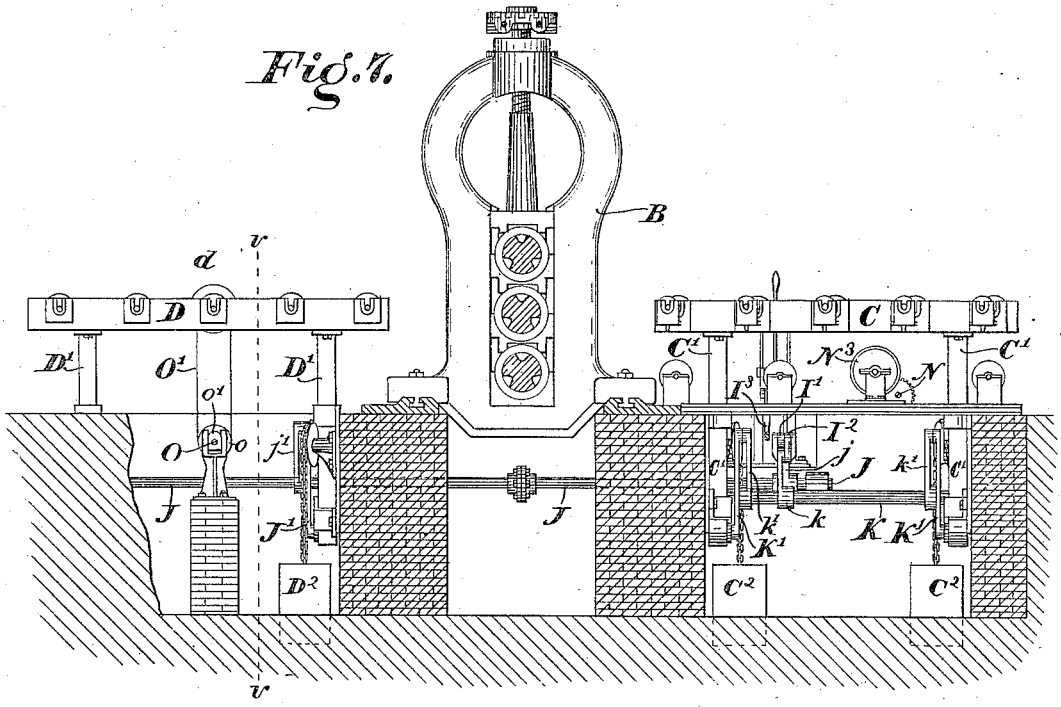


Fig. 8.

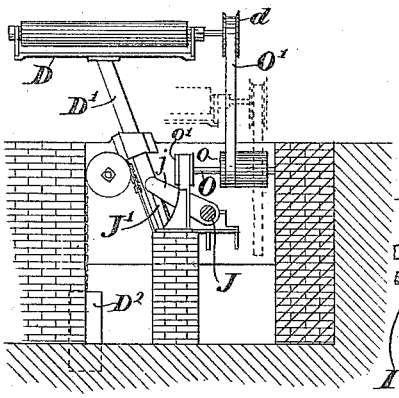


Fig. 9.

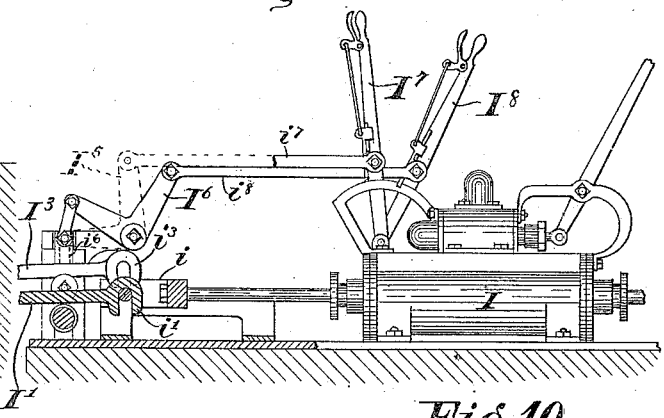


Fig. 11.

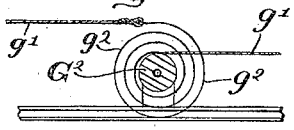
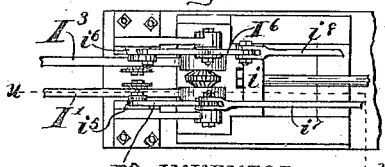


Fig. 10.



WITNESSES.

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UNITED STATES PATENT OFFICE.

DAVID H. LENTZ, OF INDIANAPOLIS, INDIANA, ASSIGNOR OF ONE-THIRD TO JOHN THOMAS, OF SAME PLACE.

ROLLING-MILL HOOKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 307,473, dated November 4, 1884.

Application filed May 28, 1883. (No model.)

To all whom it may concern:

Be it known that I, DAVID H. LENTZ, of the city of Indianapolis, county of Marion, and State of Indiana, have invented certain new and useful Improvements in Rolling-Mill Hooking-Machines, of which the following is a specification.

The principal object of my present invention is to provide a machine to be used in connection with rolls for rolling iron or steel, which shall do a large part of the labor which is known as "hooking"—that is, the raising and lowering of the partly-rolled rails or bars as the same are passed back and forth through the rolls—and I have therefore denominated it a "hooking-machine." This object is accomplished by providing tables adapted to receive said partly-rolled rails as they are delivered from one pass of the rolls on either side, and carry them, by raising or lowering, to the proper position for the next pass.

Said invention consists in suitably-constructed tables, suitable mechanism for raising and lowering the same diagonally, and certain appliances used in connection therewith in handling the partly-rolled rails, as will be hereinafter more specifically described and claimed.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters of reference indicate similar parts, Figure 1 is a top or plan view of a mill embodying my invention; Fig. 2, a side elevation, partly in section, of the same, taken on the dotted line *z z* in Fig. 1; Fig. 3, a view similar to a portion of Fig. 1, but on an enlarged scale; Fig. 4, a sectional view thereof, looking upwardly from the position indicated by dotted line *y y* in Fig. 3; Fig. 5, a view similar to Fig. 4, but looking from the dotted line *x x* in Fig. 3, and showing one of the lifting-tables in raised position; Fig. 6, a plan view of the machinery in the pits below the tables, the connection between such machinery and said tables being shown in section, and also the foundations of the mill; Fig. 7, a transverse vertical sectional view looking to the right from the dotted lines *w w* in Fig. 3, the tables being in the position shown by Fig. 5; Fig. 8, a sectional view looking to the left from the dotted line *v v* in Fig. 7; Fig. 9, a side elevation, on an enlarged scale, of the engine for operating the tables separately from the rolls, and showing the cross-head in section on the dotted line *u u;* Fig. 10, a detail plan view of the cross-head of the engine and the rods connected therewith, also on an enlarged scale; and Fig. 11, a detail view of the spool and coiled spring which are inserted between the two portions of the ropes connecting the carrier-cars and their weights.

In said drawings, the portions marked A represent the roughing-rolls; A′, the finishing-rolls; B, the housing therefor; C D E F, the rising and falling roller-carrying tables; G H, traveling cars for carrying the outer ends of the rails when they are nearly rolled; I, an engine for operating the mechanism which raises and lowers the roller-carrying tables C D E F; J K L M, the several shafts of said mechanism; N, a shaft for driving various drive-rolls which operate to urge the partly-rolled rails toward the rolls; O, a shaft which serves at times through a belt to drive one of the rollers in the table D, and P the way which carries the rails from the rolls to the sawing-machine.

The rolls A A′ and housings B are or may be of any usual or approved form, the construction of these parts not being involved in my present invention. The guides B′, attached to the housings, are, however, of a novel construction, and are reserved as the subject-matter for a future application for Letters Patent.

The tables C D E F are constructed of metal in the form of a frame-work, in a simple and strong manner. They are each adapted to be elevated or depressed, and are severally preferably provided with rollers, which serve the usual purposes of anti-friction rollers in moving the partly-rolled rails toward or from the rolls. When depressed, the tops of these tables are about level with the tops of the lower rolls, and when elevated they occupy a similar-relative position to the middle rolls, as is illustrated best by a comparison of Figs. 4 and 5 of the drawings. Stems C′ D′ E′ F′ are respectively secured to the frame-work of said tables, and pass down into and are adapted to slide through bearings or slides attached to the walls of the pits below them. (See particularly Figs. 4 and 6.) Said stems have en-

larged lower ends which come in contact with the under sides of their respective lower bearings when the tables are elevated to the extreme height to which it is desired that they should go, (see Fig. 5,) and serve to limit the upward movement of said tables. Said tables are severally mounted upon and are elevated and lowered by these stems, said stems being operated by the mechanism which will be presently described.

In order that the tables shall move steadily as they are raised and lowered, counterbalancing-weights C^2 D^2 E^2 F^2 are provided, which are connected to the lower ends of the stems by means of chains which pass over pulleys or sheaves c^2 d^2 e^2 f^2. Slides C^3 are provided, by which the partly-rolled rails, after being delivered from the last pass of the rolls A, are aided in being transferred from the table C to rollers in front of the first pass of the rolls A'. These slides are inclined, (see Figs. 4 and 5,) and thus the labor of moving said rails is much decreased, their own gravity being nearly or quite sufficient to cause them to move down said slides.

The cars G H are placed upon tracks which extend out in line from the tables E F, respectively, and are adapted to support the ends of the rails as they approach completion, after they reach too great a length to be successfully wholly supported by the tables. They are adapted to be pushed back by said rails as they issue from the rolls, and to be drawn forward by weights G' H'. Said weights are connected to said cars by ropes g' h', as shown. It is impracticable, owing to the force with which the rails come in contact with said cars, to have an unyielding connection between them, as, if such a connection were employed, it would be broken by such contact. I therefore divide the ropes g' h' and connect the ends to intermediate spools, G^2 H^2. Upon these spools are coiled springs g^2 h^2, to which one end of the ropes are connected. Thus, when the rails strike the cars, said cars are pushed back a short distance before the weights are perceptibly raised, said springs permitting several revolutions of said spools before said weights are forced into a motion equal to that of the cars, and thus relieving the strain which would result from the sudden jerking of the weights upward, which would occur were the connection between the cars and weights unyielding.

The engine I is adapted to raise and lower the several tables C D E F, and its cross-head i is connected to the shafts which operate said tables by the main rods I' I^3 and the supplemental rods I^2 I^4, which are severally connected to the arms j k l m on the shafts J K L M, respectively. The cross-head i and bars I' I^3 are formed to be detachably connected, the said bars having hook-like ends i' i^3, and the said cross-head having a suitable bar with which said hooked ends will engage. Said ends of these bars I' I^3 are supported in vertical slides i^5 i^6, (preferably provided with anti-friction rollers, as shown,) which are hung on bell-crank levers I^5 I^6, and which are operated by hand-levers I^7 I^8 through connecting-rods i^7 i^8, as shown. As will be readily seen, either of these bars can thus be disengaged at will, thus allowing either of the two sets of tables to be operated separately from the other, or both bars can be allowed to remain engaged, and all the tables thus operated at once. There are some peculiar features about this engine I outside of its connections which have been described; but as said engine is reserved as the subject-matter of another application for Letters Patent, it will not be further illustrated or described herein.

The several shafts J K L M run along under the tables transversely of the rolls, and are connected to the stems D' C' F' E', upon which the tables rest, through the medium of arms j', k', l', and m' and the connecting-rods J' K' L' M'. By this means, where said shafts are rocked by the pull of the engine I upon the rods I' I^2 I^3 I^4, said arms and connecting-rods will operate to pull up said stems, and thus elevate the tables to which they are attached. It will be understood, of course, that when the rod I^3 is disengaged from the cross-head of the engine, and the rod I' engaged, the shafts L M and tables E F will not be affected, but only the shafts J K and tables C D, and vice versa.

The shaft N may be driven from any convenient shaft about the mill. It is shown as being driven from the main shaft, which drives the rolls through a belt, n. (See Fig. 3.) Said shaft has spur-gear or other suitable connections with the drive-rolls N' N^2 N^3 N^4, and said rolls are thus kept continually in motion. The roll N' receives the bloom and carries it forward to the first pass of the roughing-rolls. When the partly-rolled rail has been returned to the table C and said table is lowered, the rolls N^2 and N^3 project above the tops of the rollers in said table, and successively come in contact with the partly-rolled rails and carry them forward to the corresponding passes of the roughing-rolls A. The roll N^4 receives the partly-rolled rails as they are shifted from a position in front of the roughing-rolls to one in front of the finishing-rolls, and carries them forward to the first pass of said finishing-rolls, much as the roll N' carries the blooms forward to the first pass of the roughing-rolls. The cars G H answer the purposes of the drive-rolls of similar appliances in the further passing of the rail through the finishing-rolls. These several rolls and cars relieve the operatives of a great portion of the hard labor of moving the blooms and partly-rolled rails during the process of rolling.

The shaft O is similar to the shaft N, but drives one of the rollers of the table D, instead of a separate drive-roll. It is not desired that said roller should be in motion except when

the table is in raised position, and as said table rises and falls on an incline, the following means of connecting the roller to said shaft have been adopted: A drum, *o*, is placed upon the shaft O, and a pulley, *d*, upon the extended end of the shaft of said roller. A belt, O′, which is just long enough so that it will become tight when the table is fully raised, is then placed upon said pulley and drum. When the table is raised, the belt becomes tight, as shown by the full lines in Fig. 8. When it is lowered, it drops down past the drum, as shown by the dotted lines in the same figure.

To insure a perfectly-tight belt when the table is raised, the end of the shaft O is mounted in a vertically-sliding box, *o′*, and the belt is made so short that it will lift said shaft slightly when drawn up by the table. The belt, being loose at all times when the table is not fully raised, is capable of moving from one end of the drum to the other as said table rises and falls, without being thrown from the pulley *d*.

The way P is not properly a part of the present invention, being simply for the purpose of carrying off the finished rails, and will not, therefore, be further described herein.

The operation of my said invention may be recapitulated as follows: The bloom is first brought from the furnaces and thrown onto the set of rollers of which the drive-roll N′ forms a part. These rollers carry the bloom forward into the pass of the roughing-rolls numbered 1, (see Fig. 4,) which run it through in the ordinary manner and deliver it onto the table D. The engine I is then operated through the rods I′ I^2 (the rods I^3 I^4 being preferably disengaged therefrom) to rock the shafts J K, and through the intermediate mechanism and slides raise the tables C D, the latter with the bloom (or now partly-rolled rail) upon it. When the table reaches its full height, the belt O′ becomes tightened and drives the roller to which it is attached so as to return said partly-rolled rail toward the rolls. As said table raises on an incline which is just sufficient to bring the partly-rolled rail in front of the pass numbered 2, said rail is then carried through said pass and delivered onto the table C. The engine is then reversed and the tables C and D lowered. As said table C also moves on an incline just sufficient to bring the rail to the pass 3, and as said table drops sufficiently to allow the weight of the rail to rest on the drive-roll N^2, which is directly in front of said pass, said rail is driven by said roll toward and into said pass, and after being run through is again delivered onto the table D. Said table D is again raised, and, as before, operates to move the rail toward the rolls and into the pass 4. After being delivered onto the table C, said rail is carried through the pass 5 by the aid of the drive-roll N^3, and then, in like manner as through the passes 2 and 4, through the pass 6. Then before the table C is again lowered the rail is thrown off onto the slides C^3, down which it runs onto the set of rollers of which the drive-roll N^4 forms a part, and is by said set of rollers carried toward the first pass of the finishing-rolls. The rods I′ I^2, which operate the tables C D, are meanwhile disconnected from the engine I, and the rods I^3 I^4, which operate the tables E F, are connected instead. Said tables E F are then operated in connection with the rolls as the rails pass back and forth, much in the same manner as the tables C D have been described as operating, except that the cars G H serve instead of the several drive-rolls, to force the rail toward the rolls.

As the stems of the tables C E and those of the tables D F are set at opposite inclinations, it will be readily seen, as the first-named tables always lower the partly-rolled rails and the second named always raise them, that all the tables carry said rails uniformly in one direction laterally—*i. e.*, from the first to the last pass successively in regular order.

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

1. The combination, with the train of rolls of a rolling-mill, of tables upon which the partly-rolled rails are handled, inclined sliding stems upon which said tables are rigidly mounted, and slides rigidly secured to the foundation or frame-work of the mill in which said stems are mounted, said tables being thus adapted to be moved in a diagonal line past the face of the rolls, substantially as set forth.

2. The combination, with the train of rolls of a rolling-mill, of tables upon which the partly-rolled rails are handled, diagonally-inclined stems upon which said tables are mounted, bearings or slides rigidly secured to the foundation or frame-work of the mill in which said stems are mounted, and means for moving the stems in said slides, said tables being thus adapted as they are raised and lowered to carry the metal from one pass to another pass located diagonally thereto in the upper or lower set of rolls.

3. The combination, in a rolling-mill, of the train of rolls, lifting-tables, inclined sliding stems therefor, counterbalancing-weights for the tables, and mechanism whereby the tables are raised and lowered, substantially as shown and specified.

4. The combination, in a rolling-mill, of the train of rolls, lifting-tables, inclined stems for said tables, arranged diagonally to the face of the rolls, and mechanism for operating the same, whereby said tables as they are raised and lowered carry the metal from one pass to another pass located diagonally thereto in the upper or lower set of rolls.

5. The combination, in a rolling-mill, of the series of lifting-tables, an engine for operating the same, connections running from each table or set of tables to said engine, and means, substantially as described, whereby each of said connections may be separately discon-

nected from said engine, and said tables thus operated independently or conjointly.

6. The combination, in a rolling-mill, of the train of rolls, a series of lifting-tables, an engine for operating the same, and intermediate mechanism consisting of the cross-head of the engine and connecting-bars I' I³, the latter of which are separately detachable from said cross-head, substantially as set forth.

7. The combination, in a rolling-mill, of a series of lifting-tables, an engine for operating the same, connecting-rods and connections running from the stems on which said tables are mounted to the engine, and means for separately disconnecting said rods from said engine, whereby said tables may be operated separately or conjointly, substantially as set forth.

8. The combination, in a rolling-mill, of the train of rolls, the lifting-tables operating as specified, a shaft, N, and a series of drive-rolls driven by said shaft and independent of said tables, substantially as shown and specified.

9. The combination, in a rolling-mill, of the carrier-cars, weights attached to said carrier-cars, and intermediate springs, whereby the car in starting is permitted an initial speed greater than that of the weight, substantially as set forth.

10. The combination, in a rolling-mill, of the train of rolls, the several tables, the inclined stems, the rigid inclined slides therefor, the rock-shafts, the arms thereon, the several connecting-rods, and the engine for operating the same, substantially as described, and for the purposes specified.

11. The combination, in a rolling-mill, of the train of rolls, the several tables, the means for operating the same, the drive-roll shafts, the several drive-rolls, the carrier-cars, and means for operating the same, substantially as set forth.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 17th day of May, A. D. 1883.

DAVID H. LENTZ. [L. S.]

In presence of—
C. BRADFORD,
E. W. BRADFORD.