

(No Model.)

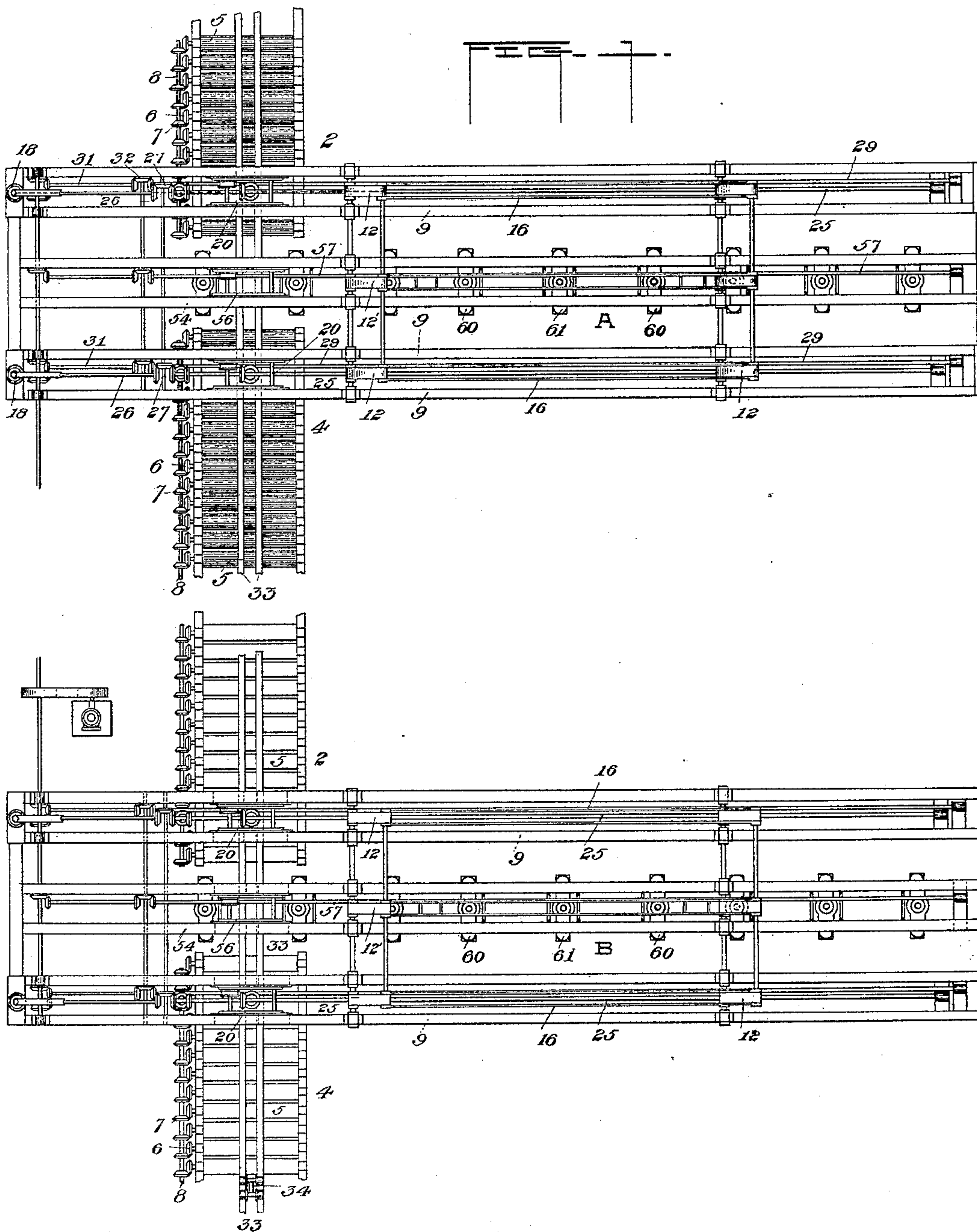
3 Sheets—Sheet 1.

J. MORGAN.

FEED TABLE FOR ROLLING MILLS.

No. 450,868.

Patented Apr. 21, 1891.



Witnesses  
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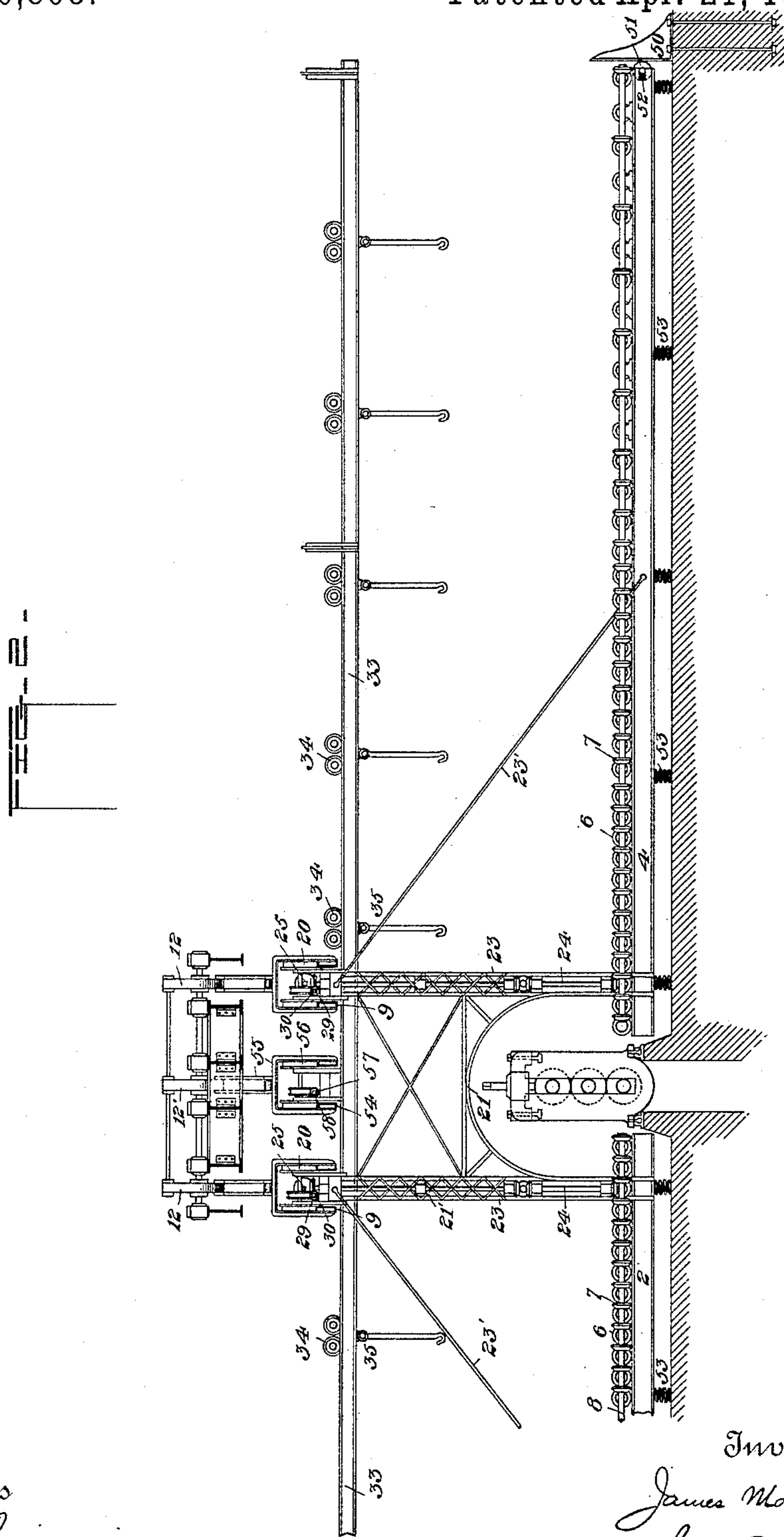
3 Sheets—Sheet 2.

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Patented Apr. 21, 1891.



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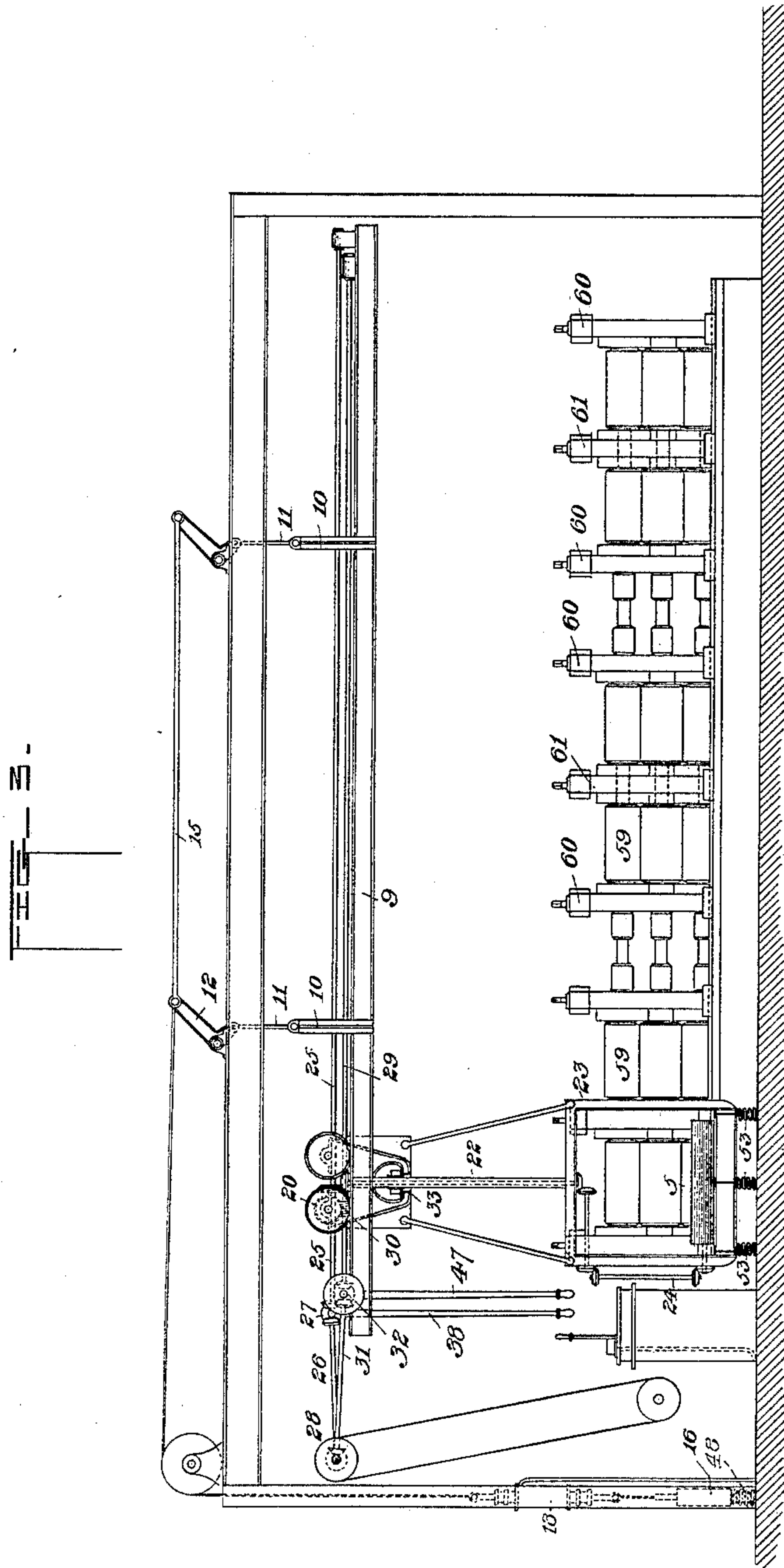
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# UNITED STATES PATENT OFFICE.

JAMES MORGAN, OF PITTSBURG, PENNSYLVANIA.

## FEED-TABLE OF ROLLING-MILLS.

SPECIFICATION forming part of Letters Patent No. 450,868, dated April 21, 1891.

Application filed August 21, 1890. Serial No. 362,629. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES MORGAN, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Mill Appliances, of which the following is a full, clear, and exact description.

My invention relates to an improvement in mill appliances, more particularly to an improvement on the feed-table shown and described in my patent, No. 403,204, granted on May 14, 1889. It is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of a rolling-mill plant provided with my improvements. Fig. 2 is a side elevation thereof, and Fig. 3 is an end elevation.

Like symbols of reference indicate like parts in each.

In Fig. 1 of the drawings I show two lines of rolls A B, set opposite to and parallel with each other, each having two feed-tables 2 4, one on each side of the line of rolls.

I shall first describe the construction and arrangement of the tables and the manner of their use with the line of rolls A, and shall then describe generally their conjoint use and the relation of the tables thereto. As described in my prior patent, each of the tables is composed of side frames made of flanged beams, between or on which are journaled the feed-rollers 5. These rollers have at their ends beveled gear-wheels 6, meshing with beveled pinions 7 on shafts 8, which shafts are driven by elevated power-connections from the supporting-carriages, as hereinafter described.

9 are the tracks on which the supporting-carriages are mounted. They are preferably upheld by elevated supports in the mill-building, as clearly shown in Figs. 2 and 3, and extend transversely to the line of the feed-tables. Each of the tracks which I show in the drawings consists of two parallel flanged beams, preferably I-beams, which are separated to permit the passage between them of the suspending mechanism of the feed-tables, and are connected at suitable intervals by yokes 10, consisting of strong frames, the ends of which underlie and support the tracks, while the middle or arched portions of the yokes are sufficiently elevated above the tracks to permit the passage of the trolleys or

carriages, and are connected by links 11 with the ends of bell-crank levers 12, by which they may be lifted.

The levers 12 are joined by connections 15 to each other and to one or more lifting-cylinders 18, which may be single-acting, so as to act only in lifting the tables, their motions in the opposite direction being effected by their gravity. To reduce the work of lifting the tables, I prefer to employ counter-weights 16, one of which may be attached to the plunger of the lifting-cylinder, and these counter-weights may be provided with springs 48 to cushion them on their descent.

On each of the tracks is a trolley or carriage 20, mounted on wheels directly above the front ends of the tables, and each carriage is connected by a strong upright trussed column 23 to a stirrup or hanger 22, which is affixed to the side beams of the table, as shown in Fig. 3. The columns 23 on opposite sides of the rolls are connected by bracing-struts 21' and an arch 21, which spans the roll-housings. The carriages or the tops of the columns are also connected with the tables at the middle or near the outer end by diagonal struts 23', which uphold the tables and enable them to be supported by columns from one end only, thus reducing the number of upholding appliances and simplifying the construction of the apparatus. In each of the columns 23 I journal a shaft 24, which is connected by counter-shafts and pinions with the shaft 8 of the feed-rollers, and at its upper end connected by gearing with a traveling miter-wheel on a squared shaft 25, journaled in the frame of the carriage.

The shaft 25 is driven by a shaft 26 and reversible gearing 27 from a driven pulley or wheel 28, which maintains operative driving-connection with said shaft in every position of the tracks. To move the carriages longitudinally on the tracks, I employ for each a second squared shaft 29, also journaled in bearings supported by the tracks and provided with a traveling worm 30 in gear with a worm-wheel on the axle of the carriage. This shaft may be driven by a shaft 31 and reversible gearing 32 from the pulley or wheel 28.

38 and 47 are levers by which the direction of rotary motion of shafts 25 and 29 may be reversed and the table caused to move later-



ally in either direction, and the feed-rollers to rotate either forward or backward.

The operation of my improved feed-tables is as follows: In order to move the tables laterally from one pass of the rolls to another, or from one set of rolls to another, the carriages 20 are caused to move on their tracks in the manner before described, and by such motion the feed-rollers will not be disconnected from gear with the driving mechanism on the carriages, which may be caused to operate in either direction, as already explained. If the feed-tables be used in connection with three-high rolls, they may be raised or lowered to shift the metal from one pass of the set of rolls to the next, either above or below, as the case may be, by action of the hydraulic motor 18, by means of which the tracks 9 and the supporting-carriages may be raised and lowered. The driving of the feed-rollers and the lateral motion of the feed-table are effected by means of the levers 38 and 47, and the hydraulic cylinder may be actuated or controlled by means of a valve situate in proximity to the said levers, so that the whole system may be under the control of a single person. As will be readily understood by those familiar with rolling-mill practice and the apparatus used therein, the parts or elements of my improvement may be modified in form and proportions to accomplish the same results in substantially the same way.

It sometimes happens that in using feed-tables the metal coming from the rolls engages with one of the feed-rollers, and the shock imparted thereby to the table is apt to break it loose from its holding or supporting devices. To prevent this I provide the tables at their ends with retaining stops or frames 50, strongly anchored to the mill-floor, and at the ends of the tables I journal wheels or rollers 51 in movable bearings, which are backed by springs 52. In the vertical motion of the tables the rollers travel against the faces of the stops 50, and if the table should receive a sudden shock from the cause above mentioned, the shock will be cushioned by the springs and the stops will resist the shock and hold the table in place. It is also desirable that the feed-tables be provided with cushioning devices, so as to prevent shocks when they are dropped to their lowest positions. This I effect by using springs 53, set under the tables, as shown in Fig. 2.

The parts of the apparatus as before described which are new and not shown in my prior patent are the direct supporting of the feed-tables at their front portions only, also the connection of the suspending columns of the two feed-tables by one arch spanning the rolls, and the manner of driving the feed-rollers and moving the tables, the springs and stops at the ends of the tables, and the springs under the tables.

In Fig. 2 I show other novel features of my invention.

In using the mill for rolling what are known

in the art as "billets" and "rounds" it is often necessary to dispense with the use of the feed-tables and to support the metal by tongs and hooks while it is passing through the rolls. In order to provide means for upholding such tongs and hooks, I secure to the carriages 20 tracks 33, each composed of parallel beams, which project horizontally transversely to the line of the rolls, and on these tracks I set trolleys 34, provided with links 35, from which the chains of the hooks may be hung. When it is desired to use these hooks, the carriages 20 may be moved on their tracks beyond the end of the line of rolls, and after lowering the tracks so as to deposit the feed-tables on the mill-floor the columns 23 and struts 23' may be unbolted from the carriages, (for this purpose I connect them with detachable bolts, &c.) so as to disconnect entirely the feed-tables from the carriages. The carriage-tracks may then be lifted and the carriage moved so as to bring the tracks 33 in proper position over and opposite to the roll-passes at which the metal is to be worked. When it is desired again to use the feed-tables, the carriage-tracks are raised, the carriages are moved into position directly above the columns 23, the carriages are then lowered, and the columns and struts secured thereto. I may also use the lifting mechanism of the tables as a power device or crane for lifting and moving the rolls from their housings. This I effect by using a third track 54, suspended by hangers 55 from bell-crank levers 12', which are journaled in line with the levers 12 and are connected with the latter so as to operate in unison with them. This track extends between and parallel with the tracks 9 and may be in all respects similarly constructed and arranged. On it I set a carriage 56, and to move the carriage I employ a driven shaft 57, extending parallel with the track and having a traveling worm in gear with a worm-wheel 58 on the carriage-axle. When it is desired to move any of the rolls from their housings, chains or other suitable appliances may be attached to the carriage, and having fastened such chains to the housing-cap it may be lifted by raising the track 54, and by running the carriage along the track the housing-cap may be removed to the end of the line of rolls and there deposited. In like manner the rolls may be removed from the housings and other rolls set in place therein. This appliance enables me to dispense with the use of a special crane and is therefore of great advantage in diminishing the cost of construction of the mill and in simplifying the nature of the appliances necessary to be used in connection with the rolls.

I shall now proceed to describe the construction, arrangement, and mode of use of the rolls themselves and the manner of conjoined use of the two sets of feed-tables.

The rolls shown in Fig. 3 are adapted to the rolling of flanged beams, such as I-beams.



Heretofore it has been customary for such purpose to employ rolls of considerable length, each set having several passes and having housings at the ends of each set and no intermediate housing. Between the housings the ends of the rolls have been connected by spindles and wabblers. The difficulty incident to the use of such rolls is that because of their great length they are very apt to break, and if it be attempted to shorten them by having only one pass for each roll the multiplication of housings and spindles unduly increases the size and cost of construction of the mill. In order to obviate these difficulties, I employ short rolls 59, each preferably formed with but a single groove, and I cast each roll integrally with the roll next in line with it. Two sets of rolls thus formed have housings 60 at each end and an intermediate housing 61, in which the conjoined necks of the rolls are journaled. Great strength and compactness of arrangement are thus afforded.

Referring now to Fig. 1, each line of rolls A B has a number of different passes. The line A constitutes the roughing-train and the line B the finishing-train of rolls. I first pass the metal to be rolled back and forth through the rolls of the set A in succession, moving the feed-tables laterally to shift the metal from one set of rolls to the next until the feed-tables come into the position shown in Fig. 1 opposite to the feed-tables of the line of rolls B. The length of the inner tables of these lines of rolls is such that the ends of the table shall meet or nearly meet. From the last pass of the line A the metal is delivered by the inner feed-table of said line to the inner feed-table of the line B, and by the feed-tables of this line it is caused to pass back and forth in succession through the rolls of the line B until it has been finished. As soon as the metal has been delivered from the last roll-pass of the line A the feed-tables of this line may be moved back to their original position and a new piece of metal started through the rolls, and as the two lines of rolls may be worked by different sets of men pieces may be in the act of passing through the rolls of the set A at the same time that another piece is being passed back and forth through the rolls of the set B.

I believe that I am the first to arrange two lines of rolls with feed-tables in connection with each other in the manner which I have described, and as such arrangement is of marked efficiency and is the means of saving time and labor in rolling metal beams, rails, &c., I intend to claim such arrangement, broadly, irrespective of the construction of the rolls or feed-tables.

I claim—

1. The combination, with a feed-table, of an elevated track and carriage by which it is supported, suspending mechanism consisting of a column extending from the carriage to the front end of the table, and a diagonal strut extending from the carriage to the table

at a hinder point, substantially as and for the purposes described.

2. The combination of rolls, feed-tables at the sides thereof, traveling carriages mounted on overhead supports, columns by which the tables are connected at the inner ends with the carriages, and an arch spanning the rolls and connecting the columns, substantially as and for the purposes described.

3. The combination of a feed-table, an overhead support, a carriage or carriages to which the table is detachably connected, and a projecting overhead track movable with the carriage and supporting-hooks, substantially as and for the purposes described.

4. The combination, with the rolls and feed-table, of a table-supporting carriage or carriages mounted on an overhead track, mechanism for lifting the track, and a carriage mounted on a track adapted to be lifted by said mechanism and having suspending devices for raising the rolls, &c., substantially as and for the purposes described.

5. The combination, with a rolling-mill feed-table and mechanism for lifting it, of an anchored stop at the end of the table, substantially as and for the purposes described.

6. The combination, with a rolling-mill feed-table and mechanism for lifting it, of an anchored stop at the end of the table, and springs at the end of the table adapted to engage the stop, substantially as and for the purposes described.

7. The combination, with a rolling-mill feed-table and overhead lifting and supporting mechanism, of springs at the under side of the table for cushioning it, substantially as and for the purposes described.

8. The combination of a rolling-mill feed-table, a supporting-carriage on an overhead track, and a driven shaft having a traveling gearing-connection with the carriage for moving it on the track, substantially as and for the purposes described.

9. The combination of a rolling-mill feed-table, a supporting-carriage on an overhead track, a driven shaft having a traveling gearing-connection with a shaft extending to the feed-rollers of the table for driving the same, substantially as and for the purposes described.

10. Two sets of rolls situate end to end and having three housings, two housings at the outer ends of the sets of rolls, and an intermediate housing, substantially as and for the purposes described.

11. In a rolling-mill plant, the combination of two parallel lines of rolls, each set having two feed-tables, one on each side thereof, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 5th day of July, A. D. 1890.

JAMES MORGAN.

Witnesses:

W. B. CORWIN,  
THOMAS W. BAKEWELL.