(No Model.)

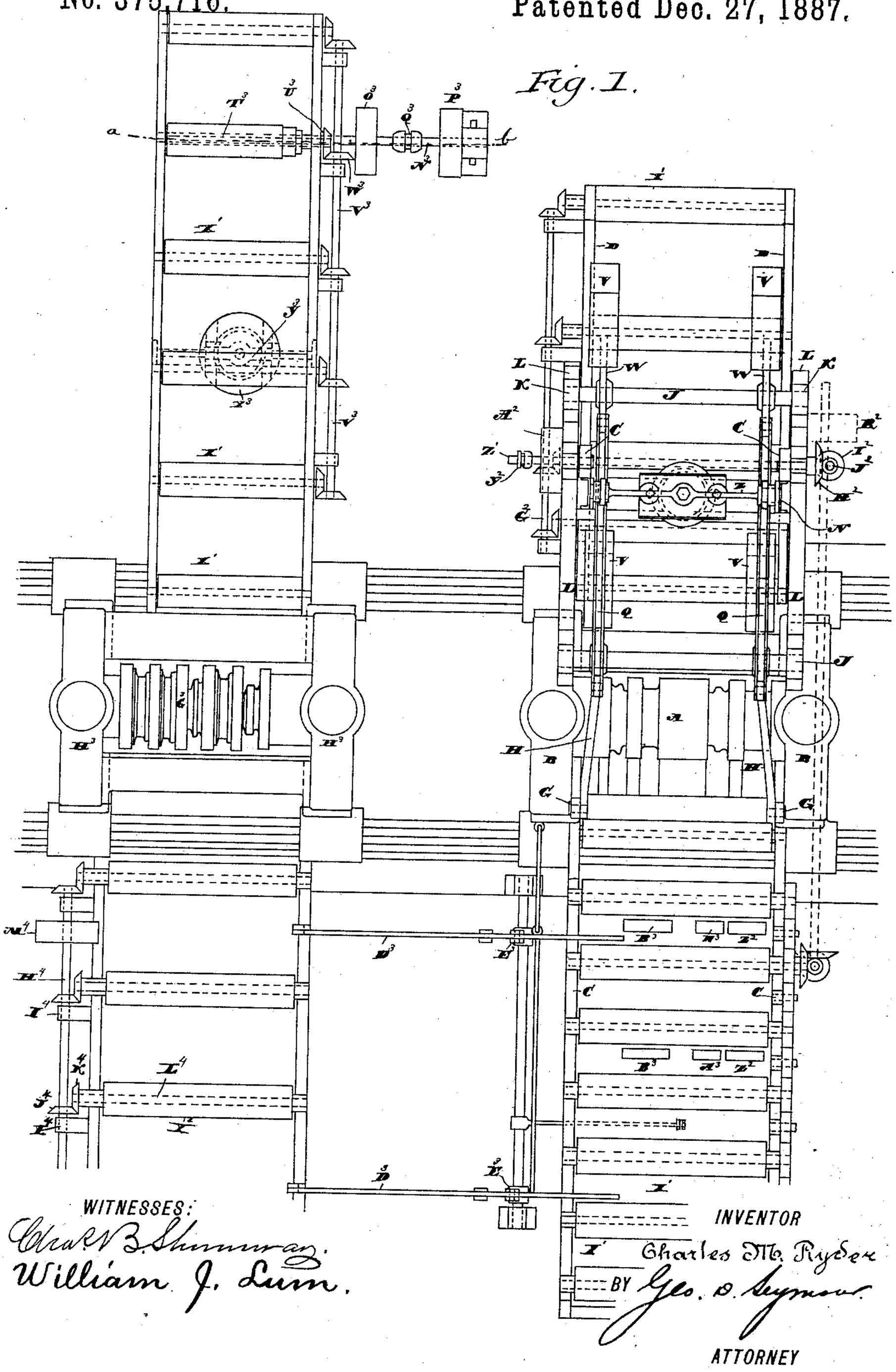
5 Sheets—Sheet 1.

C. M. RYDER.

FEEDING APPLIANCE FOR ROLLING MILLS.

No. 375,716. Patented Dec. 27, 1887.

Fig. 1.



(No Model.) 5 Sheets—Sheet 2.

C. M. RYDER.

FEEDING APPLIANCE FOR ROLLING MILLS.

No. 375,716. Patented Dec. 27, 1887.

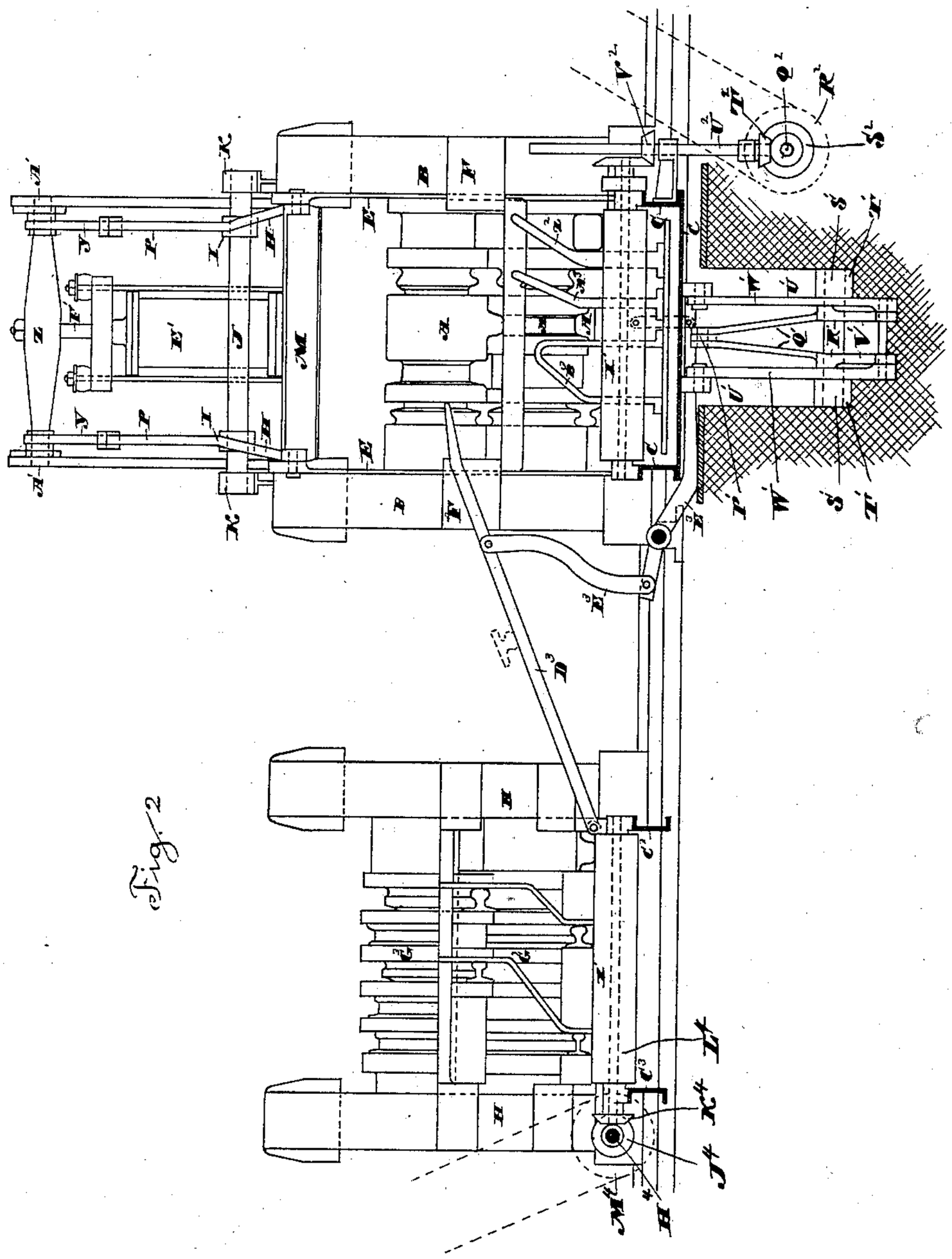


Fig. 2

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(No Model.)

5 Sheets—Sheet 3.

C. M. RYDER.

FEEDING APPLIANCE FOR ROLLING MILLS.

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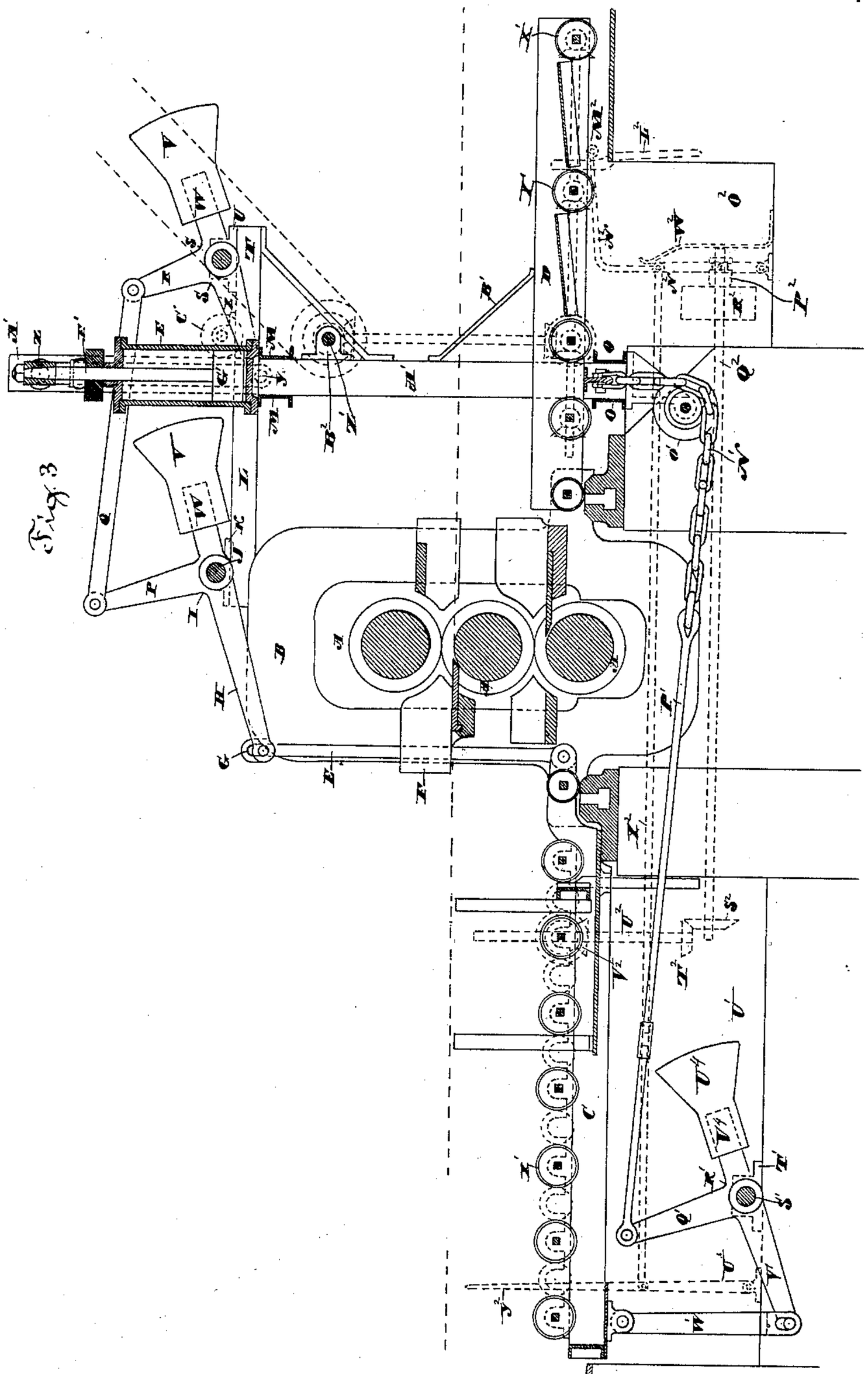

Fig. 3.

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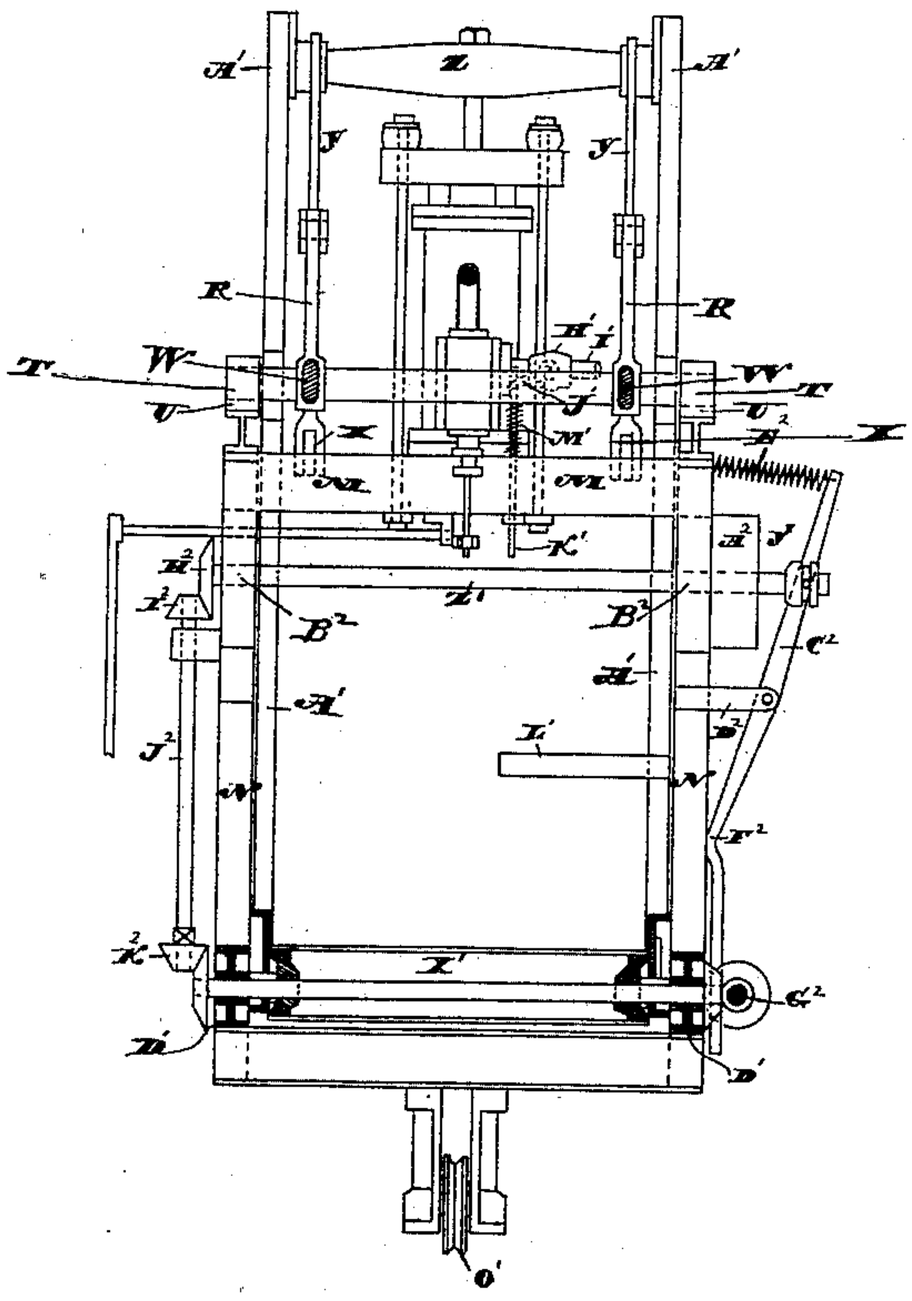
(No Model.) 5 Sheets—Sheet 4.

C. M. RYDER.

FEEDING APPLIANCE FOR ROLLING MILLS.

No. 375,716. Patented Dec. 27, 1887.

Fig. 4.



Witnesses:
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5 Sheets—Sheet 5.

C. M. RYDER.

FEEDING APPLIANCE FOR ROLLING MILLS.

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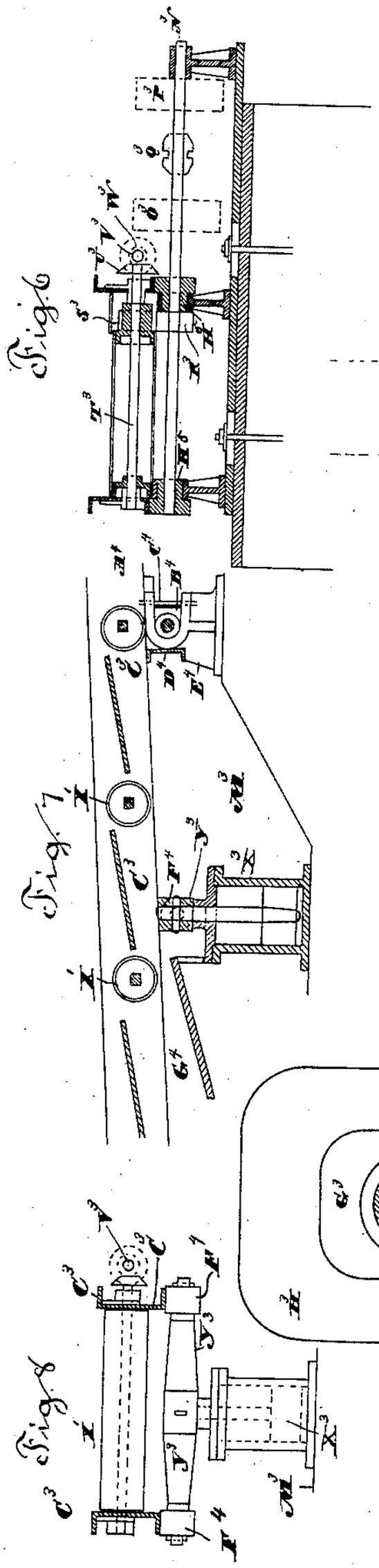

Fig. 6.

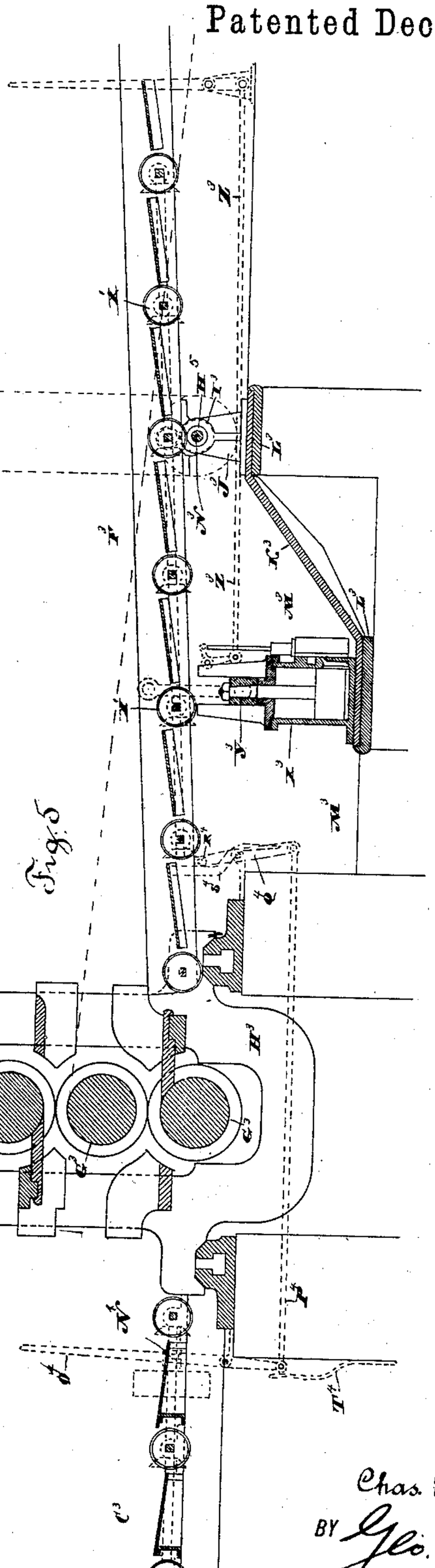

Fig. 5.

Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

CHARLES M. RYDER, OF GEORGETOWN; MASSACHUSETTS.

FEEDING APPLIANCE FOR ROLLING-MILLS.

SPECIFICATION forming part of Letters Patent No. 375,716, dated December 27, 1887.

Application filed June 2, 1887. Serial No. 240,056. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. RYDER, residing at Georgetown, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Feeding Appliances for Rolling-Mills; and I do declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to an improvement in rolling-mills, the object being to provide for them feeding appliances which shall effect an economy of time, labor, power, construction, and repair over the appliances now in use.

With these ends in view my invention consists in certain details of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of a rolling-mill provided with feeding appliances embodying my invention. Fig. 2 is a view thereof in front elevation, with the tables in section. Fig. 3 is a view in vertical longitudinal section through the roughing-rolls and their tables. Fig. 4 is a detached view, in rear elevation, of the coupling of such tables, with the rear table shown in section. Fig. 5 is a view in vertical longitudinal section through the finishing-rolls and their tables. Fig. 6 is a view in vertical transverse section on a line, *a b*, of Fig. 1, through the rear finishing-table and its working-bearings and showing the power-connections of its driven rollers. Fig. 7 is a detached view, in longitudinal section, showing additional features relating to the rocking bearings and power-connections of the rear finishing-table; and Fig. 8 is a view in rear elevation of such power-connections.

The roughing-rolls A A A and their housing B are of ordinary construction, as are also the front roughing-table, C, and the back roughing-table, D, in their general form and plan. A pair of vertical pitmen, E E, attached to the opposite edges of the inner end of the front table, C, and working in guides F F, secured to the housing B, are provided at their upper ends with elongated slots G G, through which they are connected with the arms H H of two bell-crank levers, I I, carried by a rock-shaft, J, working in bearings K K, mounted upon horizontal beams L L, supported by the upper part of the housing B and by cross-pieces M M, secured to uprights N N, connected at their lower ends with other similar cross-pieces, O O, the said cross pieces M M and O O and uprights N N forming a stationary frame located just to the rear of the roughing-rolls. The arms P P of the said bell-crank levers are respectively connected by links Q Q with the arms R R of two similar levers, S S, located at the opposite ends of a rock-shaft, T, working in bearings U U, secured to the opposite ends of the beams L L, aforesaid. Counter-weights V V, located upon the arms W W of the levers I I and S S, are employed to counterpoise the said front and back roughing-tables. The arms X X of the levers S S are connected, through links Y Y, with a cross-head, Z, secured to the upper ends of two uprights, A′ A′, rigidly secured at their lower ends to the inner end of the back table, D, the said head Z and the uprights A′ A′, forming a lifting-frame fixed with respect to the table D, but movable with respect to the stationary frame, before described. Braces B′ B′, connecting the said table and the uprights A′ A′, stiffen the said lifting-frame. The said uprights slide up and down on the uprights N N of the stationary frame and between the cross-pieces M M thereof.

Anti-friction rollers C′ C′, mounted upon the forward ends of the horizontal beams L L, are arranged to engage with the outer edge of the uprights A′ A′ of the lifting-frame. A pair of similar rollers, D′ D′, located at each edge of the lower end of the lifting-frame. travel upon the inner edges of the uprights N N of the stationary frame. These rollers distribute and equalize the strain imposed upon the lifting-frame by the back table, D, and reduce the power required for the operation of the same to the minimum.

A vertical steam-cylinder, E′, having suitable steam-connections, which are not shown, is mounted upon the upper cross-pieces, M M, of the stationary frame, in position for the connection of the outer end of its piston-rod F′ with the under face of the cross-head Z of the lifting-frame, whereby on the effective stroke of the piston G′ such rod pushes against such cross-head and lifts the lifting-frame, and hence the rear roughing-table. The move-

ment so imparted to the lifting-frame is transmitted to the bell-crank levers, and thence to the front roughing-table, which is thus simultaneously lifted with the rear table to the position indicated by the horizontal broken line in Fig. 3 of the drawings. On the downstroke of the piston the lifting-frame will follow the piston-rod back, permitting the tables to return to their first level. A valve, H′, located in the exhaust-pipe I′ of the said steam-cylinder, is provided with an arm, J′, connected with a vertically-movable tappet, K′, the lower end of which is engaged by a horizontal arm, L′, extending inward from one of the uprights of the lifting-frame. When the rear roughing-table is lifted, the said arm L′ engages with and lifts the tappet. Then, as the said table is lowered, the tappet follows the arm L′, being thereto actuated by a spring, M′, which gradually closes the valve with the effect of cushioning the descent of the tables, whereby through one table both are automatically cushioned.

A chain or cable, N′, attached to the lower face of the inner end of the back roughing-table, runs over a sheave, O′, secured to the lower cross-pieces, O O, of the stationary frame, the said cable passing between such cross-pieces. This chain or cable is attached to the adjacent end of a long horizontal rod or pitman, P, extending under the roughing-rolls and connected with the upper arms, Q′ Q′, of two bell-crank levers, R′ R′, carried by a rock-shaft, S′, mounted in bearings T′, attached to the floor of the pit U′. The arms V′ V′ of the said bell-crank levers are connected with vertical pitmen W′ W′, the upper ends of which are attached to the under face of the front table at the outer end thereof. Counter-weights U^4 U^4, mounted on the arms V^4 V^4 of the bell-crank levers R′ R′, also assist in counterpoising the tables.

It will thus be seen that power is transmitted from a cylinder located back of and above the roughing-rolls for operating the front and back roughing tables, the inner ends of which are united by a coupling extending over the rolls. The rollers X′ of the said front and back roughing-tables are driven toward the rolls when the tables are in their feeding positions, and are thereto automatically started and stopped by a clutch, Y′, located upon a driven shaft, Z′, carrying a loose pulley, A^2, to which power is communicated from any convenient source, such shaft being mounted in bearings B^2, secured to the uprights N N of the stationary frame. This clutch is positively operated by a lever, C^2, connected with it and pivoted to a horizontal arm, D^2, attached to the adjacent upright of the said frame, the lever being actuated to couple the shaft and pulley by a spring, E^2, connecting its upper end and the adjacent beam L, and to uncouple them by the projection of its lower end, which is bent, as at F^2, between the outer edge of the back roughing-table and the shaft G^2, driving the rollers X′ thereof. The opposite end of the said shaft Z′ is provided with a bevel-gear, H^2, meshing into a similar gear, I^2, located upon the upper end of an upright shaft, J^2, provided at its lower end with a sliding bevel-gear, K^2, operating gearing which drives the shaft G^2, and hence the rollers of the rear table. When the table is elevated, the said shaft G^2 is brought into line with the bend F^2 in the lever C^2, which is thus freed to be actuated by the spring E^2 in moving the clutch Y′ up to the loose pulley A^2, and coupling the same with the shaft Z′, and thereto actuating the same in driving the rollers. When the table is lowered, the shaft G^2 rides over the lower end of the lever C^2, and actuates it in uncoupling the loose pulley A^2 and the shaft Z′, whereby the rollers are stopped. A bent arm, L^2, having the functions of a cam and secured to and depending from the lower face of the said table engages with an anti-friction roller, M^2, mounted in the bent upper end of an upright lever, N^2, pivoted to the floor of the pit O^2, and connected with and positively operating a clutch, P^2, located upon a horizontal shaft, Q^2, extending under the roughing-rolls and carrying at a point under the back roughing-table a loose pulley, R^2, driven from any convenient source of power. The opposite end of such shaft is provided with a bevel-gear, S^2, meshing into a similar gear, T^2, located upon the lower end of an upright shaft, U^2, carrying a similar sliding gear, V^2, operating gearing which drives the rollers of the front roughing-table. A spring, W^2, engaging with the lever N^2, operates the same in engaging the clutch P^2 with the loose pulley R^2, and thus coupling the same with the shaft, when the rear table is lowered and the bent portion of the arm L^2 brought into line with the roller M^2, whereby an inward movement of the pivoted arm is permitted. When the rear table is lifted, the said bent arm pulls the pivoted lever outward against such spring, and so uncouples the loose pulley and shaft and stops the rotation of the rollers of the front roughing-table.

A long horizontal rod, X^2, extending under the roughing-rolls, is connected at its rear end with the lever N^2, and at its forward end with an upright hand-lever or manual, Y^2, pivoted to the floor of the pit U′ and extending above the front roughing-table. By pushing this manual toward the rolls the lever N^2 is operated in uncoupling the shaft Q^2 and loose pulley R^2, whereby the rollers X′ of the front table are stopped, but only as long as the pressure on the manual is sustained, for when it is relieved the spring W^2 operates to at once recouple the said shaft and pulley, provided, of course, that the tables are in their lowered positions. It will thus be seen that the rollers of the front and back roughing-tables are automatically started by the latter when they reach their respective feeding positions; that such rollers are automatically stopped by the action of the

back table, and that the rollers of the front table are under the control of a manual stop to arrest them, as occasion may demand.

Turners and shifters Z^2 Z^2, A^3 A^3, and B^3 B^3, extending upward between the rollers X′ of the front roughing-table, shift the bloom and turn it on its longitudinal axis, the bloom traveling from the outer to the inner edge of the table. From the inner edge of the front roughing-table the bloom is transferred to the adjacent edge of the front finishing table, C^3, on slides D^3 D^3, having lever-connections E^3 E^3 with the said front roughing-table, and operated thereby. The said turners and shifters and slides form, however, no part of this invention, and are only shown to complete the equipment of the mill. The said front finishing-table, C^3, and the back finishing-table, F^3, feed the partly-developed rail to the finishing-rolls G^3 G^3 G^3, which, with their housing H^3, are of ordinary construction.

The finishing-table C^3 is provided near its outer end with hollow trunnions H^5 H^5, working in bearings I^3, mounted in standards J^3, secured to a laterally-movable carriage, K^3, supported upon a suitable bed, L^3, located in the pit M^3 below the table. The said hollow trunnions receive a driven shaft, N^3, carrying loose pulleys O^3 and P^3, driven in opposite directions, a clutch, Q^3, located between such pulleys and operated by a manual, (not shown,) and a gear, R^3, meshing into a gear, S^3, mounted upon the shaft T^3 of one of the rollers X′ of the table, the said shaft T^3 carrying at one end a beveled gear, U^3, meshing with a similar gear, V^3, carried by a long driving-shaft, W^3, running parallel with and supported by the table and driving the other rollers thereof.

An upright cylinder, X^3, located upon the before-mentioned carriage K^3 at a lower level than the standards J^3, has its piston-rod connected by a cross-head, Y^3, with the table, which it raises and lowers, and is thereto provided with suitable controlling mechanism, Z^3, or the equivalents thereof.

By laterally moving the carriage upon its bed the table F^3, the standards J^3, and the cylinder X^3, with its connections, are all laterally moved with respect to the finishing-rolls, whereby the position of the table may be readily conformed to the rolls as they are changed, instead of moving the housing H^3 to conform the rolls in position to the table.

As shown in Fig. 7 of the drawings, the hollow trunnions H^5 H^5 have bearing in boxes A^4, open at their rear ends, so as to permit the trunnions to slide out of them, the trunnions being closed in by caps B^4, held in place by pins C^4, sufficiently strong to hold while the table is working normally, but readily sheering away to permit the trunnions to slide out of the boxes in endwise motion in case of accident. A beam, D^4, supported by the standard E^4 of the boxes A^4, is provided for the table to slide upon, as described.

As shown by Fig. 8 of the drawings, and in carrying out the principle of construction set forth in the preceding paragraph, the cross-head Y^3, aforesaid, is provided with anti-friction rollers F^4, upon which the table rests. A shield, G^4, located between the cylinder and the finishing-rolls, is designed to protect the former against injury by deflecting over it any rail which may gain an entrance under the forward end of the table.

Under the construction shown by these last two figures of the drawings the table will yield and move endwise in case of accident without any injury to its working parts, and may be readily restored to working position when the fault is removed.

A horizontal shaft, H^4, mounted in bearings I^4, offsetting from the outer edge of the front finishing-table, carries bevel-gears J^4, meshing into similar gears K^4, carried by the shafts L^4 of the rollers X′ of such table, the said rollers being driven toward the rolls when the table is feeding. The shaft H^4 also carries a loose pulley, M^4, driven from any convenient source of power, and a clutch, N^4, positively operated, to couple the said pulley and shaft by an upright pivoted lever, O^4, extending above and below the table, and connected at its lower end with a horizontal rod, P^4, extending under the finishing-rolls and attached to the lower end of an upright pivotal lever, Q^4, provided at its upper end with a roller, R^4, engaging with a bent arm, S^4, carried by and depending from the back finishing-table. A spring, T^4, engaging with the lower end of the lever O^4, operates the same in coupling the loose pulley M^4 and the shaft H^4 when the inner end of the back finishing-table is depressed, the bent arm S^4 operating to uncouple such parts and so stop the rollers of the front table when the said end of the back table is elevated, as shown by the inclined broken line in Fig. 5 of the drawings. The lever O^4 also has the function of a manual stop for stopping the rollers of the front table when the same is feeding. In this capacity the lever is pushed toward the finishing-rolls and against the spring, whereby it effects the uncoupling of the loose pulley and shaft, and held so long as it is desired to hold the rollers from rotation. When the lever is released, the spring T^4 at once couples the shaft and pulley again and the rotation of the rollers is resumed, provided of course that the back table is in its receiving position.

The driving-connections of the rollers X′ of the back finishing-table have already been described. The manual of such mechanism is operated to drive the rollers toward the rolls when the table is feeding and away from them when it is receiving.

It will thus be seen that the rollers of the front finishing-table are driven only when the same is feeding, that they are automatically started and stopped by the action of the back finishing-table, and that they may be stopped when rotating by a manual stop located adjacent to the front table.

By connecting the inner ends of the rough-

ing-tables by a coupling extending over the roughing-rolls, instead of under them, as has heretofore been done, the expense of constructing the mill is reduced fully one-half, and it is adapted to be attended and repaired during its operation, its parts being exposed to view and being readily accessible, whereas heretofore they have been located in a pit under the rolls and hence out of sight and difficult of access. Moreover, by locating the coupling over the rolls it is taken out of the way of the scales and waste which constantly drop from the metal being rolled and accumulate in large quantities under the rolls, whereas a coupling located under the rolls is impeded in its action by the described accumulations to that extent that the tables do not work properly and clear the metal, whereby the mill is often seriously damaged with great danger to the men operating it.

The inclusion of slotted pieces—such as the pitmen E E in the coupling—permits each table to be independently adjusted in its feeding position with respect to the roll-train with obvious advantage, the structure being so large that it is difficult to gage and assemble all the parts and secure the required precision of relative position.

The vertical arrangement of the cylinders makes the application of the power more direct and effective, simplifies the power-connections, and saves a great amount of power and wear.

The automatic cushioning of the front and back roughing-tables as they are lowered through a valve located in the exhaust of the operating-cylinder and operated by one of the tables is a feature commending itself for the simple mode it offers of securing the desired result, and has the advantage of being directly controlled by the tables cushioned.

The advantages of positively-operated clutches for starting the rollers over the friction-clutches heretofore employed are obvious, greater durability and reliability being secured.

The manual for stopping the feed rollers in the feeding positions of the tables may often be employed to advantage in an emergency. They provide against accident by making the bloom and the whole mill more completely under the control of the attendant. The provision for the endwise movement of the rear finishing-table also provides against the breakage of the mill while the arrangement for moving it laterally to the finishing-rolls enables it to be set readily to rollers of different size and configuration.

It is apparent that the various mechanisms shown herein for carrying out my invention may be modified or changed; and I would have it have it understood that I do not limit myself to the exact construction and combination of parts herein shown and described, but hold myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

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

1. A feeding appliance for rolling-mills, having a positive coupling mechanism extending over and above the rolls and connecting the inner ends of the table to each other, and including pitmen working in guides connected with the housing of the rolls, substantially as set forth.

2. A feeding appliance for rolling-mills, having a coupling mechanism, including bell-crank levers located above the tables and connected to each other over the rolls by a coupling-bar and to the inner ends of the tables by suitable connecting devices, and power-connections for such levers, substantially as set forth.

3. A feeding appliance for rolling-mills, having a coupling mechanism extending over and above the rolls, and including bell-crank levers connected to each other and to the inner ends of the tables and counter-weights for the tables carried by such coupling, substantially as set forth.

4. A feeding appliance for rolling mills, having a coupling mechanism extending over and above the rolls, and including bell-crank levers connected to each other over the rolls by a coupling-bar and to the inner ends of the tables by pitmen working in guides attached to the housing of the rolls, substantially as set forth.

5. A feeding appliance for rolling-mills, having a coupling mechanism extending over the rolls and connecting the inner ends of the tables to each other, and including a lifting-frame attached to one table and power-connections located above the tables for such frame, substantially as set forth.

6. A feeding appliance for rolling-mills, having a coupling mechanism extending over the rolls and connecting the inner ends of the tables to each other, and including a lifting-frame attached to the back table and a stationary frame located behind the rolls and co-operating with the said lifting-frame, and power-connections located above the rolls for such lifting frame, substantially as set forth.

7. A feeding appliance for rolling-mills, having a coupling mechanism extending over the rolls and connecting the inner ends of the tables to each other, and including a stationary frame located behind the rolls and a lifting-frame co-operating with such stationary frame, secured to the back table and composed of two uprights attached to such table and a yoke uniting the upper ends of such uprights, and power-connections located above the tables for such lifting-frame, substantially as set forth.

8. A feeding appliance for rolling-mills, having a coupling mechanism extending over the rolls and connecting the inner ends of the tables to each other, and including a stationary frame located behind the rolls, a lifting-frame attached to the back table and traveling

upon such stationary frame, and anti-friction rollers located on opposite sides of the lifting-frame for equalizing the strain upon it and reducing the friction of its operation, substantially as set forth.

9. A feeding appliance for rolling-mills, having a coupling mechanism extending over the rolls and connecting the inner ends of the tables to each other, and including a stationary frame located behind the rolls and a lifting-frame attached to the back table and co-operating with such stationary frame, and a vertical cylinder located above the tables and connected with such lifting-frame, substantially as set forth.

10. A feeding appliance for rolling-mills, having a coupling mechanism extending over the rolls and connecting the inner ends of the tables to each other, and including a stationary frame located behind the rolls and a lifting-frame attached to the back table and co-operating with the said stationary frame, and a cylinder supported by the stationary frame and located virtually within the lifting-frame, which it operates, substantially as set forth.

11. A feeding appliance for rolling-mills, having two tables, a cylinder for operating them, and a valve located in the exhaust of said cylinder and controlled by one of the tables for cushioning them when they are lowered, substantially as set forth.

12. A feeding appliance for rolling-mills, having two tables, a cylinder for operating them, a valve located in the exhaust of such cylinder, a spring-actuated vertically-movable tappet connected with such valve, and means for controlling the tappet and the closing of the valve by one of the tables, substantially as set forth.

13. A feeding appliance for rolling-mills, having a positive coupling mechanism located above the rolls and connecting the inner ends of the tables to each other, and including a stationary frame located behind the rolls and connected with the housing thereof and a lifting-frame attached to the back table and co-operating with the said stationary frame, and power-connections, including a cylinder located back of the rolls and above the back table and connected with the lifting-frame, substantially as set forth.

14. A feeding appliance for rolling-mills, having a coupling mechanism extending over the rolls and connecting the inner ends of the tables to each other, and including a stationary frame located back of the rolls and a lifting-frame attached to the back table, a coupling located under the rolls and connecting the tables to each other, and power-connections for the upper and lower couplings connected with the said lifting-frame, which travels upon the said stationary frame, substantially as set forth.

15. A feeding appliance for rolling-mills, having a coupling mechanism extending over the rolls and connecting the inner ends of the tables to each other, bell-crank levers located below the back table, a long horizontal pitman also connected with the levers and extending under the rolls, chain-and-sheave connection between such pitman and the inner end of the front table, and power-connections, including a cylinder located above the tables for operating them, substantially as set forth.

16. A feeding appliance for rolling-mills, including a vertically-operated table having driven feed-rollers and a clutch and lever automatically operated by the movement of the table to stop the said rollers when the table leaves its feeding position and to start them when it reaches such position, substantially as set forth.

17. A feeding appliance for rolling-mills, including two tables having driven feed-rollers and a clutch for each table, such clutches being connected and automatically operated by the movement of one table to stop the rollers of both tables when the same leave their feeding positions and to start them when the tables reach such positions, substantially as set forth.

18. A feeding appliance for rolling-mills, including two tables having driven feed-rollers, a clutch for each table to start and stop the rollers thereof, such clutches being connected and automatically controlled by the movement of one table to stop the rollers when the tables leave their feeding positions and to start them when they reach such positions, and a manual connected with the clutch of one table for stopping the rollers thereof when it is in its feeding position, substantially as set forth.

19. A feeding appliance for rolling-mills, including two tables having driven rollers, a clutch for each table for stopping and starting the rollers thereof, a pivotal lever connected with the clutch of one table and provided at its lower end with a cam through which it is actuated by such table as the same is raised and lowered, and a rocking lever actuated by such table and connected with and operating the clutch of the other table, whereby the rollers of both tables are automatically stopped and started by the raising and lowering of one of the tables, substantially as set forth.

20. A feeding appliance for rolling-mills, having a clutch for starting and stopping their driven rollers, a lever for operating such clutch, and a spring for operating the lever, which is also operated and controlled by one of the tables as the same is raised and lowered, substantially as set forth.

21. A feeding appliance for rolling mills, having a tipping finishing-table carrying driven rollers, hollow trunnions for the table to rock upon, and a driving-shaft having bearing in such trunnions and geared to the driven rollers, substantially as set forth.

22. A feeding appliance for rolling-mills, including a tipping finishing-table having a bearing upon which it rocks and a vertical cylin-

der located below the table and between the said bearing and the inner end of the table, substantially as set forth.

23. A feeding appliance for rolling-mills, including two finishing-tables, respectively located on opposite sides of a roll-train, one of such tables being laterally movable with respect to such train to conform it to changes in the rolls and housings, substantially as set forth.

24. A feeding appliance for rolling-mills, including a sliding table and supports and operating-connections therefor, the table being movable endwise away from the rolls over such supports and connections, substantially as set forth.

25. A feeding appliance for rolling-mills, including a sliding rocking table and supports and operating-connections therefor, the table being movable endwise away from the rolls over such supports and connections, substantially as set forth.

26. A feeding appliance for rolling-mills, having a rocking finishing-table mounted in bearings open at the rear, substantially as set forth.

27. A feeding appliance for rolling-mills, having a laterally-movable finishing-table and laterally-movable supports and operating connections, substantially as set forth.

28. A feeding appliance for rolling-mills, having a tipping finishing-table, bearings for such table to rock upon, a cylinder for rocking the table, and a laterally-movable carriage carrying the said bearings and cylinder and moved to laterally adjust the table to the rolls, substantially as set forth.

29. A feeding appliance for rolling-mills, having a rocking finishing-table mounted in bearings open at the rear and a beam for the table to slide upon in endwise displacement, substantially as set forth.

30. A feeding appliance for rolling-mills, having a rocking finishing-table mounted in bearings open at the rear, loose caps to close in the trunnions, and guards normally holding the caps in place but sheering away under abnormal endwise pressure outward, substantially as set forth.

31. A feeding appliance for rolling-mills, having a rocking finishing-table, a cross-head connected with the cylinder operating the table, and anti-friction rollers mounted in said head and supporting the table, substantially as set forth.

32. A feeding appliance for rolling-mills, having a rocking finishing-table, a cylinder located beneath the same for operating it, and a guard located between the cylinder and the rolls and extending to the top of the latter, substantially as set forth.

33. A feeding appliance for rolling-mills, having a stationary front and a rocking back table, the former carrying driven rollers, and means automatically controlled by the back table for driving the rollers of the front table when the same is feeding, substantially as set forth.

34. A feeding appliance for rolling-mills, having a stationary front and a rocking back table, the former carrying driven rollers automatically started and stopped under the control of the latter, and a manual for stopping the said rollers, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

CHARLES M. RYDER.

Witnesses:
GEO. D. SEYMOUR,
CHAS. B. SHUMWAY.