No. 752,913. PATENTED FEB. 23, 1904.

E. MILES.

PLATE HANDLING MACHINE.

APPLICATION FILED SEPT. 25, 1901.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

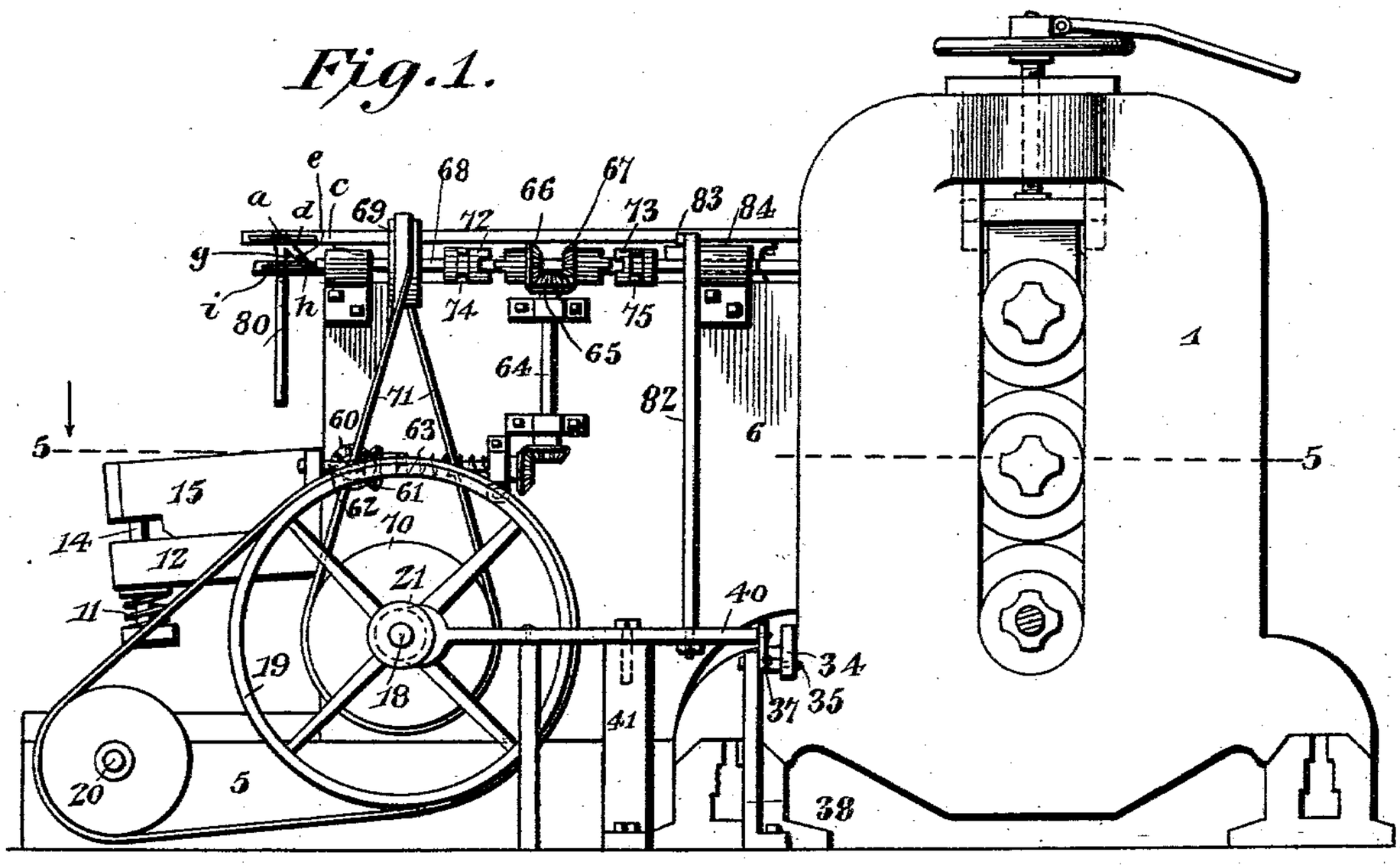
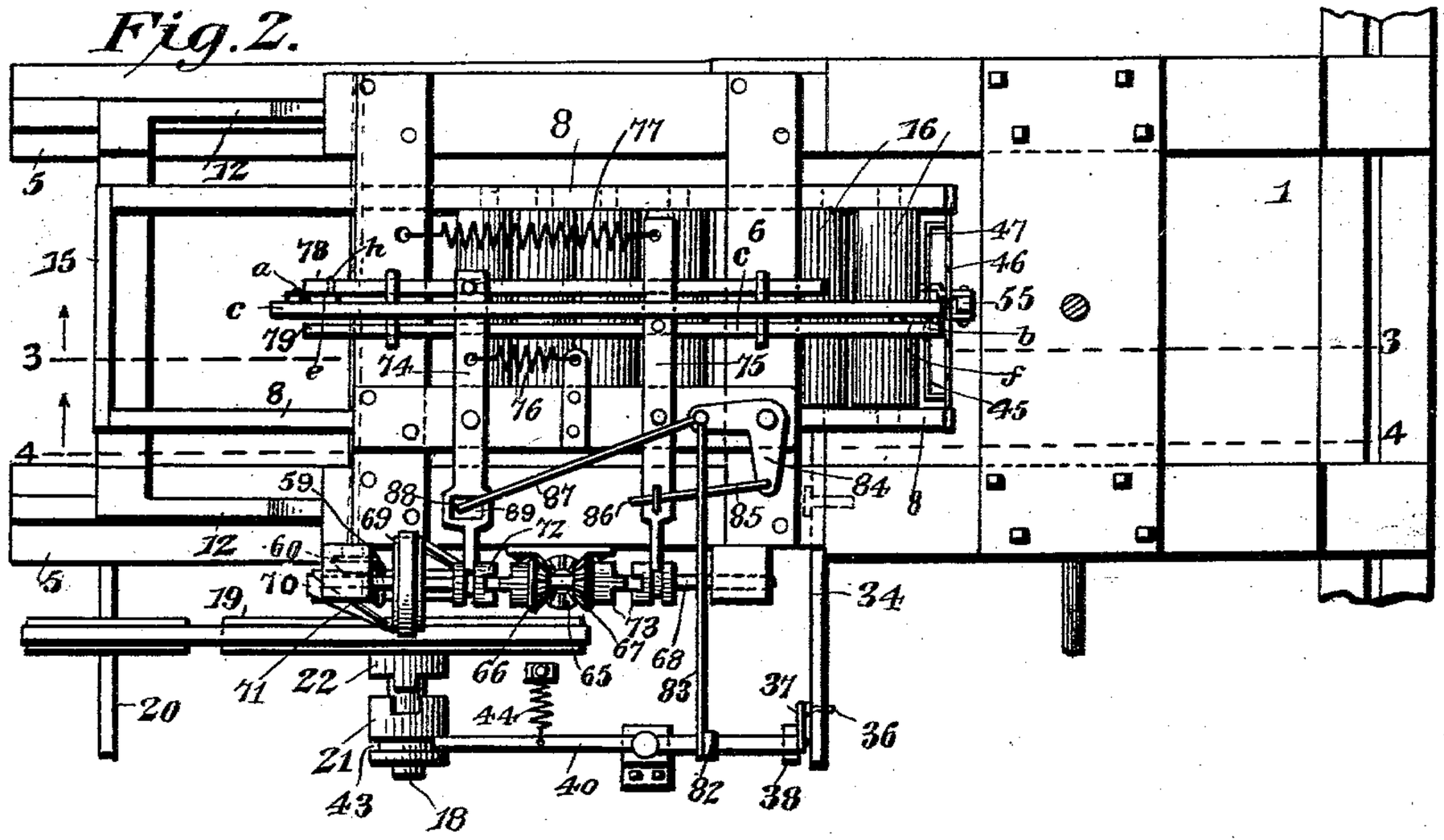


Fig. 2.



Witnesses
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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 4.

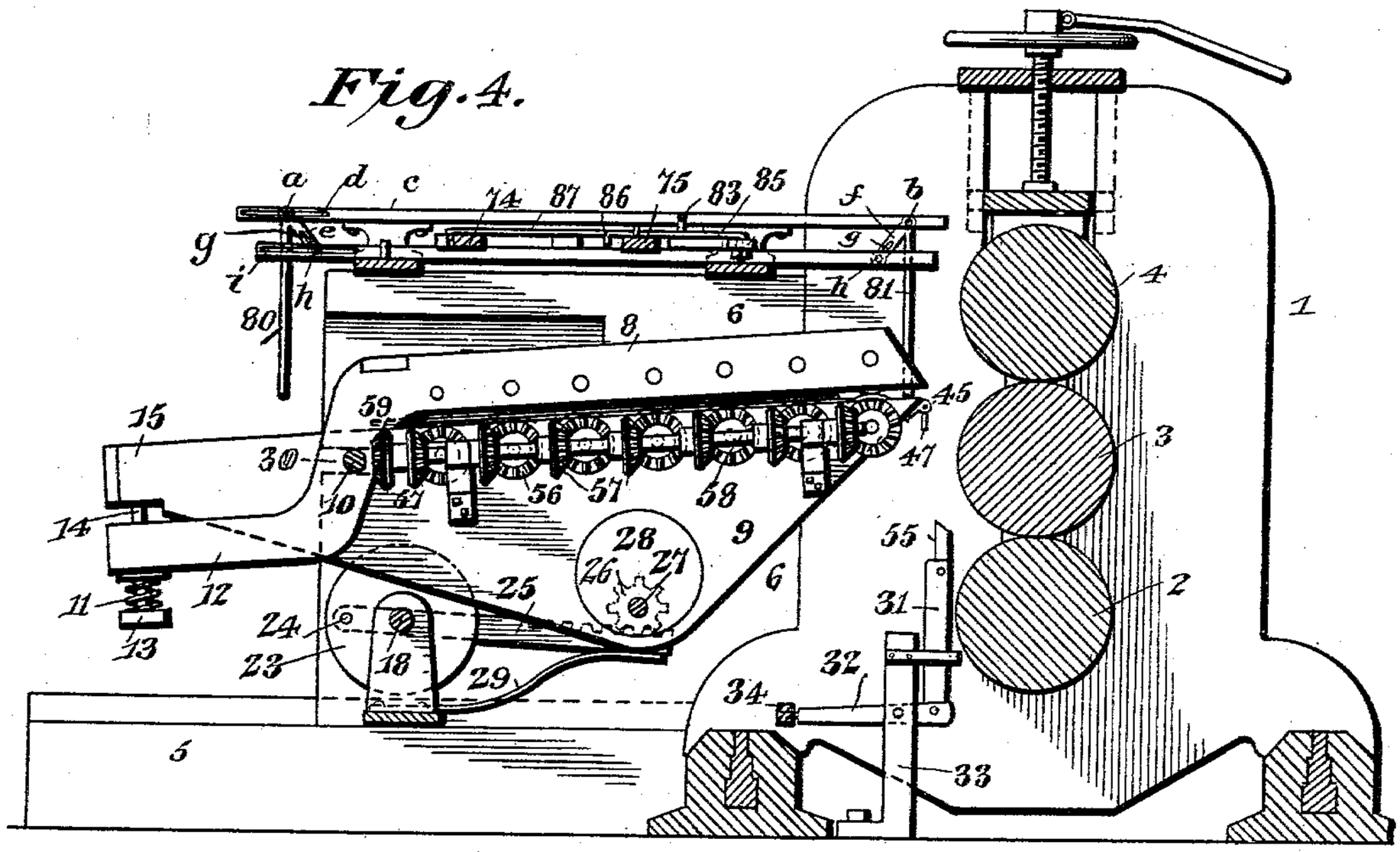
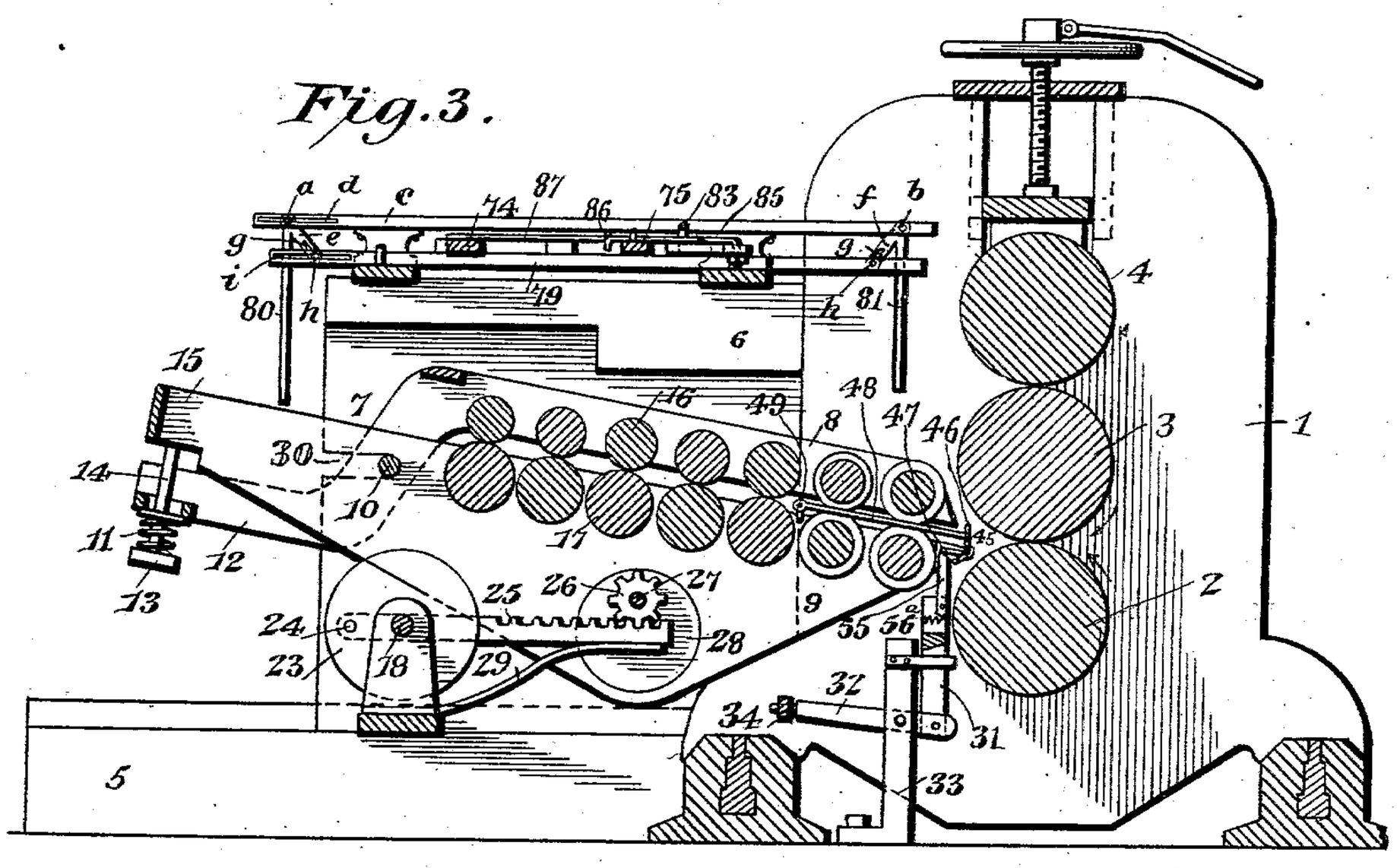


Fig. 3.



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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5.

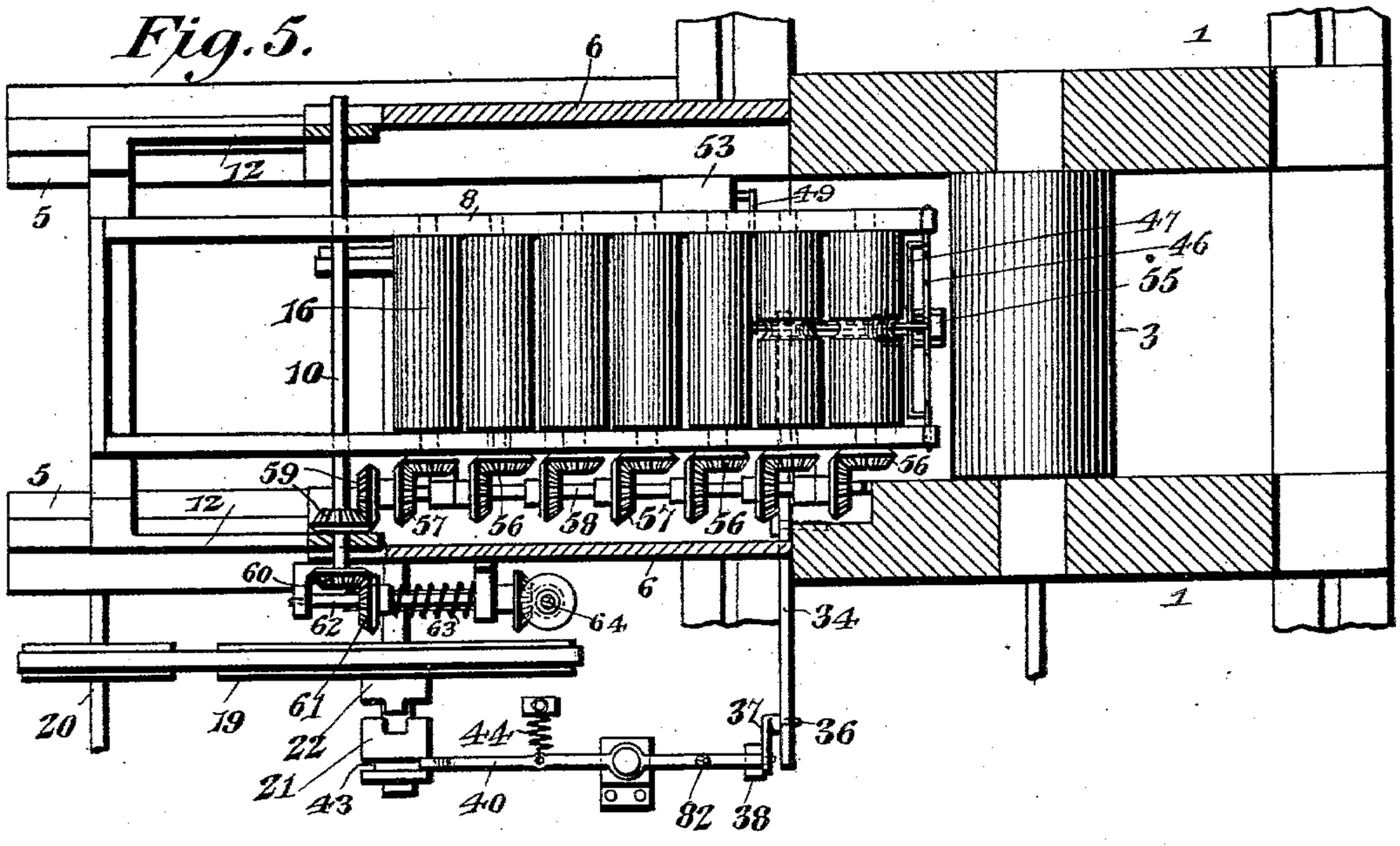


Fig. 7.

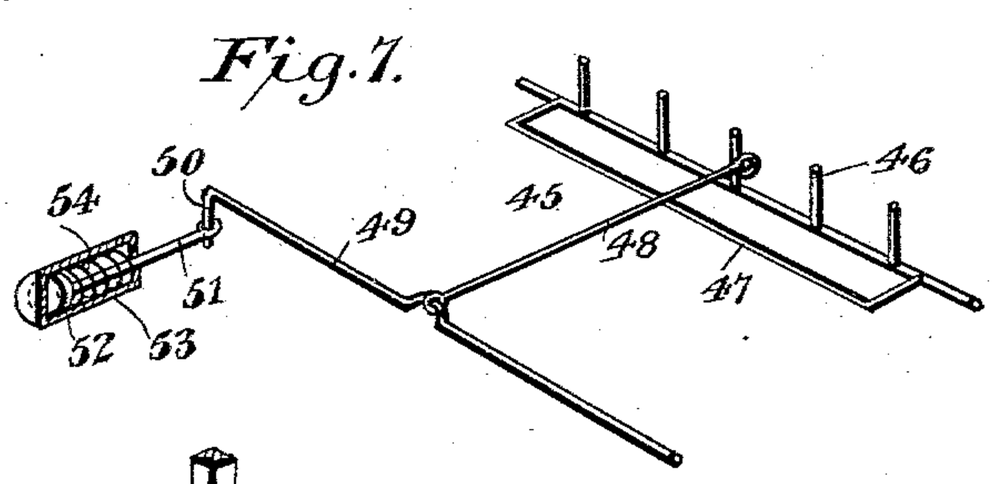
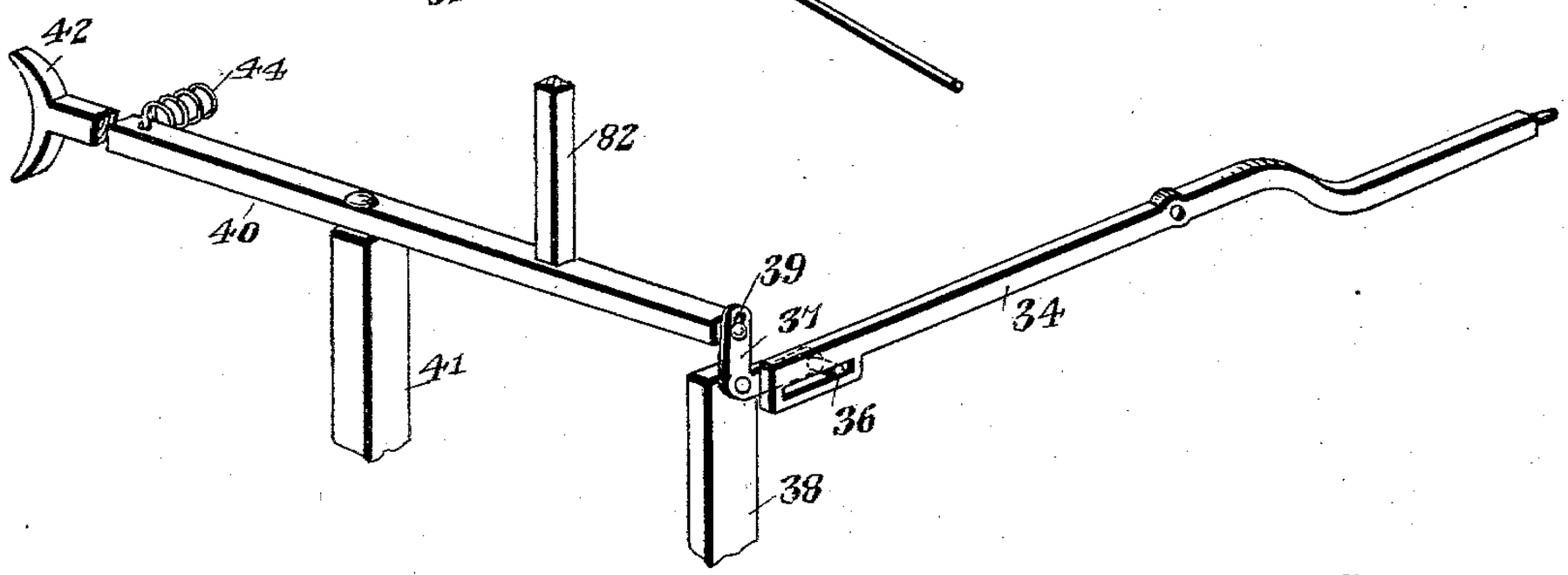


Fig. 6.



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No. 752,913. Patented February 23, 1904.

UNITED STATES PATENT OFFICE.

EDMUND MILES, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-HALF TO S. L. SELLECK, OF CLEVELAND, OHIO.

PLATE-HANDLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 752,913, dated February 23, 1904.

Application filed September 25, 1901. Serial No. 76,487. (No model.)

To all whom it may concern:

Be it known that I, EDMUND MILES, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Plate-Handling Machine, of which the following is a specification.

This invention relates to improvements in plate-handling machines for rolling-mills.

It is well understood in the art to which this invention appertains that the reduction of tin and other metal plates is accomplished by passing them successively between pressing-rolls. In mills employing a single pair of rolls the direction of rotation of the latter is continuously reversed as a plate is passed between them, forward and back. In other instances—as, for instance, in tin and sheet mills—the rolls of two-high stands are operated continuously in one direction and the sheet after having been rolled is passed back over the upper roll to another stand for further reduction or to a catcher who repasses it through the same mill. Frequently, however, the pressing-rolls are arranged in what are known as "three-high" stands—that is to say, three rolls are disposed one above the other. In this type of mills the rolls are continuously rotated in the proper directions and a plate is first fed between the two lower rolls and is then reversed and fed back through the two upper rolls. The manipulation of the plates by men standing at opposite sides of the rolls and known as "catchers" is exceedingly dangerous and arduous, beside being slow and expensive.

The present invention has for its object, therefore, to provide a plate-handling machine for receiving the plate from and feeding it back through the mill automatically, and while the invention is capable of application in connection with mills of the two-roll type it is especially designed as an auxiliary appliance for three-roll mills, and is therefore equipped with reversible receiving and delivering mechanism and also with automatically-operated mechanism for elevating the plate received from between the two bottom rolls to a sufficiently-elevated plane to permit the return of the plate through the two upper rolls of the mill.

A further object of the invention is to provide automatically-operated mechanism for discharging from the rear end of the plate-handling machine such plates or bars as may be too long to be properly handled by the device when operating to return the stock through the mill for further reduction or such as may have been rolled to a standard length.

To the accomplishment of these objects and others subordinate thereto, all as will hereinafter more fully appear, the invention consists in its preferred embodiment in those features of construction and arrangement which for the purpose of this application have been illustrated in the accompanying drawings and are embraced within the scope of the appended claims.

In said drawings, Figure 1 is a side elevation of my plate-handling apparatus complete and associated with a three-high stand of pressing-rolls. Fig. 2 is a top plan view of the subject-matter of Fig. 1, showing the parts in the position they assume during the reception of the plate by the tongs. Fig. 3 is a central longitudinal section on the line 3 3 of Fig. 2. Fig. 4 is a sectional view on the line 4 4 of Fig. 2, but showing the tongs in the elevated position. Fig. 5 is a horizontal section on the line 5 5 of Fig. 1. Fig. 6 is a detail perspective view illustrating the connection between the trigger and the lever of the machine-clutch. Fig. 7 is a detail perspective view of the pivoted trip and its intimately-connected parts.

Like characters of reference are employed to designate corresponding parts throughout the views.

1 indicates the usual housing of the three-high stand of rolls 2, 3, and 4, which are driven continuously by power applied in any suitable manner. Extending rearwardly from the housing 1 are disposed a pair of rails or guides 5, designed to slidably support the frame 6, arranged to sustain the plate-handling mechanism in operative proximity to the mill-rolls, but capable of bodily movement away from the rolls to facilitate the replacement or

repair thereof or of any part of the handling apparatus which may become deranged. The frame 6 consists, essentially, of side walls and transverse connecting members, as shown, and between said walls is located the handling apparatus proper. The primary element of the handling apparatus comprises what I shall term the "plate-receiving" member or the receiving and feeding tongs 7, comprehending upper and lower tongs members 8 and 9, having a common pivotal support upon the tongs-shaft 10 and urged together by any suitable means—as, for instance, a spring 11 bearing at one end against the under side of the rearwardly-extending tailpiece 12 of the tongs member 8 and at its opposite end against the head 13 of the stem 14 projecting from the opposed tailpiece 15 of the lower tongs member 9. The tailpieces of the members 8 and 9 are reversely disposed with respect to the relative positions of the members, so that while the jaw-like members are capable of separation they are constantly urged together by the spring 11 in a manner and for a purpose to be made more clearly apparent.

The tongs members are equipped with upper and lower series 16 and 17 of rollers carried by the upper and lower members 8 and 9 and suitably journaled in the sides thereof. The plate passed between the lower rolls 2 and 3 of the mill is received between the upper and lower series of rollers of the tongs, the members of which separate against the resistance of the spring 11 in a manner which will be apparent. The tongs are then swung upwardly to present its front end at the top of the middle roll, and the lower rollers 17 of the tongs are then positively rotated by mechanism to be described to return the plate between the upper rolls 3 and 4 of the mill.

Before describing the mechanism for operating the feed-rollers and for automatically controlling such operation I shall first describe the novel mechanism by means of which the tongs are bodily elevated and depressed and will then explain the manner in which the feed-rollers are driven in the proper direction and describe the mechanism for automatically controlling both the elevation and depression of the tongs and the rotation of the rollers. Adjacent to the rear end of the frame 6 and at a point below the tongs is suitably journaled the main shaft 18 of the machine. This shaft is designed to be driven by a belt-pulley 19, belted or otherwise geared to a power-shaft 20 and loosely mounted upon the shaft 18 for intermittent connection therewith through the medium of what may be termed the "machine-clutch" 21 splined upon the shaft 18 and arranged to be thrown into and out of engagement with the clutch-hub 22 of the pulley 19. (See Fig. 2.)

Upon one end of the shaft 18 is mounted a fixed crank-wheel 23, located in a plane between the opposite sides of the lower tongs member 9 and provided with a wrist-pin 24, connected to the rear extremity of a toothed rack-bar 25, meshing at its front end with a pinion 26, carried by an eccentric shaft 27, the eccentrics 28 of which are fitted in suitable circular openings in the depending sides of the lower tongs member 9.

The rack-bar 25 is held in engagement with the pinion 26 by suitable means—as, for instance, a spring 29—and is designed when reciprocated to rotate the eccentric shaft, and thus shift the position of the eccentrics 28 to elevate or depress the tongs, as the case may be. The throw of the eccentrics is so proportioned with respect to the dimensions of the mill-rolls that the tongs as a whole will have a curvilinear movement which will cause the front or receiving end thereof to substantially follow the periphery of the middle roll when the tongs are elevated to feed back a plate or are depressed to receive a plate from the mill. Obviously, therefore, the pivotal support of the tongs members must be capable of lateral movement, and, as clearly shown in Fig. 3 of the drawings, such movement is accommodated by horizontal slots 30, formed in the opposite sides of the frame 6 for the reception of the shaft 10.

The pulley 19, which is, in fact, the power-pulley of the machine, is designed to rotate constantly, and it will therefore appear that the elevation or depression of the tongs depends entirely upon the connection of said pulley with the shaft 18. As this connection is established by the machine-clutch 21, the automatic control of the machine is easily effected by means of a trigger 31 operatively related to the clutch 21 in a manner to retain the clutch in its disengaged position during the passage of a plate into the tongs and to throw the clutch into engagement when the trigger has been released by the passage of a plate from a position thereover. To this end the trigger 31 is disposed in an upstanding position immediately in front of the lower roll 2 and is pivotally supported at its lower end upon a short lever 32, fulcrumed intermediate of its ends upon a suitable support 33 and pivotally connected at its end opposite the trigger with a second and somewhat longer lever 34, fulcrumed intermediate of its ends upon the housing 1 and having a loose pivotal connection, as indicated at 36, with one end of a bell-crank lever 37, fulcrumed upon a post 38 and having a similar loose pivotal connection, as indicated at 39, with what may be termed the "main" clutch-lever 40, fulcrumed upon a post 41 and having a spanner end 42 engaging a groove 43 in the clutch 21.

A spring 44, connected to the lever 40 between its fulcrum and the clutch 21, exerts a constant tendency to move the clutch into engagement with the pulley 19; but this tendency is resisted by a plate passing to the machine from the mill, because at such time the trig-

ger will be held by the plate. Of course the depression of the trigger to move the clutch out of engagement with the pulley might be effected by the plate as the latter approaches the tongs. It is undesirable, however, to depend upon the plate for the depression of the trigger, because in this event the passage of the plate through the lower pass of the mill would have to be accurately timed to depress the trigger and thus stop the tongs at the instant the latter reach their lower position. I therefore provide at the front end of the lower tongs member 9 a trip device 45, substantially of bell-crank form and comprising the angularly-related arms 46 and 47, the former being normally vertical, or substantially so, and pivotally connected to a rod 48, extending rearwardly between the first two pairs of rollers, which are preferably grooved for its reception.

At its rear end the rod 48 is connected to a crank-shaft 49, journaled in the opposite sides of the tongs member 9 and having at one end an arm 50, pivotally connected to the stem 51 of a plunger 52, arranged for reciprocation within a spring-casing 53, mounted at one side of the member 9. The plunger 52 is normally urged by a spring 54 in a direction to maintain the arm 46 of the trip in a vertical position, which obviously disposes the arm 47 horizontally.

The arm 47, which may be of any desired form, is designed when the tongs are depressed to strike the upper end of the trigger 31 for the purpose of causing the depression of the latter and the disconnection of the shaft 18 from the power-pulley. In the normal position of the trip 45, however, its vertical arm 46 is disposed in the path of the plate fed to the tongs and will therefore be swung by said plate to a horizontal position, (see Fig. 4,) and this rearrangement of the trip will cause it to release the trigger, which, however, will be prevented from rising by the plate, as the latter will by this time have reached a position above the trigger. The trigger will then be retained in its depressed position by the plate alone, and when the rear end of the plate has passed from over said trigger the latter will be automatically elevated under the impulse of the spring 44, the clutch 21 will be thrown into engagement, and the tongs will be elevated in the manner described.

The disengagement of the pivoted trip 45 from the upper end of the trigger is facilitated by a pivoted contact-piece 55, normally retained in its proper position by a stout spring 56^a.

In order to communicate motion to the lower series 17 of feed-rollers for the purpose of feeding the plate back through the rolls of the mill or of discharging it from the rear end of the handling apparatus, as will be more fully explained, each of said rollers is provided upon one of its trunnions with a small beveled gear-wheel 56, meshing with similar beveled gears 57, mounted on a counter-shaft 58, disposed lengthwise of the member 9 and carried in suitable bearings upon one side wall thereof. The counter-shaft 58 is geared by means of beveled gears 59 with the shaft 10, provided upon its outer extremity with beveled gears 60, meshing with a gear 61, slidably mounted upon a short horizontal counter-shaft 62 (see Fig. 5) and constantly urged into engagement with the gear 60 by a spring 63. The gear 61 is splined upon the shaft 62; but its longitudinal movement thereon is designed to accommodate that lateral movement of the shaft 10 which, as heretofore explained, is necessary to accommodate the peculiar curvilinear movement of the tongs. The shaft 62 is in turn geared to a vertical counter-shaft 64, provided at its upper end with a beveled gear-wheel 65, meshing with two loose gears 66 and 67, upon what may be termed the "roller-driving shaft" 68, journaled in suitable bearings at the top of one side of the frame 6 and geared, as by pulleys 69 and 70 and a belt 71, with the power-pulley 19, to one side of which the pulley 70 is preferably fixed.

The loose gears 66 and 67 are oppositely disposed, and by connecting one or the other of them with the driving-shaft 68 it is evident that the tongs-rollers may be rotated in one direction or the other as it is desired to feed the plate back through the mill or to discharge it from the rear end of the handling apparatus. To provide for this intermittent engagement of these gears, as desired, a pair of what may be termed "roller-clutches" 72 and 73 are splined upon the shaft 68 and arranged for engagement with the clutch-hubs of the gears, and while said clutches are both normally out of engagement with the gears they are designed to be thrown automatically into engagement therewith by the plate.

The roller-clutches 72 and 73 are operated by clutch-levers 74 and 75, fulcrumed upon the top of the frame 6 and normally urged in the proper direction to keep the clutches out of engagement by springs 76 and 77, and for the automatic operation of these levers each is pivotally connected to a slide-bar 78 or 79 projecting beyond the opposite ends of the frame and provided with depending trip-arms 80 and 81, the arm 80, located at the rear end of the machine, being laterally adjustable, as shown, so that it may be struck and operated by plates of predetermined lengths. The specific construction of these trip-arms and the mounting thereof may be varied within wide limits; but they preferably constitute the long arms of reversely-disposed bell-crank levers having fulcrum-bolts *a* and *b* passing through a supporting-

bar *c*, located between the bars 78 and 79 and in a somewhat higher plane, as best seen in Fig. 4, the lateral adjustment of the fulcrum-bolt *a* at the rear end of the machine being accommodated by a longitudinal slot *d* in the bar *c*. The short arms *e* and *f* of these bell-crank levers are provided with slots *g*, as shown, for the accommodation of the bolts *h*, which connect these short arms with the slide-bars, the bar 78 being formed with a longitudinal slot *i* to accommodate the lateral adjustment of the rear bolt *h*.

Under certain conditions—that is to say, when the tongs have been elevated—it is designed to simultaneously throw the machine-clutch 21 out of and the roller-clutch 73 into engagement in order to stop the elevation of the tongs and to rotate the feed-rollers in a direction to discharge the plate back through the rolls. It is for this reason that the trip-arm 81 is provided, as it will be seen that the forward and upward movement of the tongs will present the rear end of the plate carried thereby to the arm 81, thus moving the latter laterally and effecting the swinging of the clutch-lever 75 and the engagement of the clutch 73. It follows from what has been said that this movement must also effect the disengagement of the machine-clutch 21, and I therefore provide the clutch-lever 40 with an upstanding arm 82, to the upper end of which is pivotally connected a link 83, having its opposite end connected to one arm of the bell-crank lever 84, fulcrumed upon the top of the frame 6 and having its opposite arm connected to one end of a draw-wire 85, having a hook end 86 arranged to engage the lever 75 at the side thereof opposite the bell-crank lever. It will now be seen that the swinging of the lever 75 by the striking of the plate against the trip-arm 81 will effect the engagement of the clutch 73 with the gear-wheel 67 and will exert a pull upon the draw-wire 85, serving to rock the bell-crank lever 84, which, by reason of its connection with the lever 40, will simultaneously withdraw the machine-clutch 21 from engagement with the power-pulley. Thus the upward movement of the tongs may be stopped and the feed-rollers will be simultaneously started and positively driven to feed the plate back between the upper rolls of the mill. When the discharge of the plate from the member is complete, said plate will have passed beyond the trip-arm 81, releasing the lever and permitting the spring 77 to restore the lever 75 to its normal position. This will effect the disengagement of the clutch 73 to stop the rollers and will reëngage the machine-clutch 21 with the pulley 19 to connect the operating mechanism of the machine with the plate-receiving member. This operation of the arm 81, controlled by the plate, will therefore simultaneously stop the rollers and start the member on its return movement, which movement will be terminated, as we have already seen, by the automatic depression of the trigger 31.

We have now seen in what manner the complete reception of the plate by the plate-receiving member or tongs automatically effects the elevation of the plate to the upper mill pass, how the plate when it reaches its elevated position automatically effects the stopping of the tongs in proper position and simultaneously starts the feed-rollers to effect the discharge of the plate or the return thereof to the mill, how the discharge of the plate from the member effects automatically the simultaneous stopping of the rollers and the starting of the member on its return movement, and how the member is automatically stopped when it reaches its completely depressed position. This structure is complete in itself and comprehends one embodiment of my invention. I prefer, however, to effect the automatic discharge of certain plates at the rear of the tongs, as it sometimes happens that further reduction of the plate is not desired, or that the plate is of such length as to make its return impracticable. It is for this reason that I provide the trip-arm 80. By adjusting this arm to the desired position it will be seen that a plate of any predetermined length being fed into the tongs will strike the trip-arm, effect the swinging of the lever 74, and will throw in the clutch 72. This will cause the feed-rollers of the tongs to be rotated in the reverse direction for the purpose of expelling the plate at the rear of the apparatus. We have seen, however, that the passing of the plate from over the trigger ordinarily effects the elevation of the tongs. Obviously this is not desirable while the plate is being fed out of the rear end of the machine, and means must therefore be provided for preventing this automatic actuation of the trigger during the rearward discharge of the plate. A simple embodiment of such means comprehends what may be termed a "locking-rod" 87, pivotally connected to the bell-crank lever 84 at or adjacent to the connection therewith of the link 83, the opposite end of the locking-rod 87 being provided with a hook extremity 88, received within a transverse slot 89 in the lever 74, this loose connection between the lever and the locking-rod serving to permit the actuation of the bell-crank lever in the manner heretofore described without effecting similar movement of the lever 74. It will be observed, however, that when the lever 74 is swung to throw the clutch 72 into engagement with the adjacent gear 66 the end of the slot 89 will be presented to the hook end of the locking-bar 87, and the bell-crank lever will thus be locked against movement while the plate is passing from the rear end of the tongs. In this manner the machine-clutch 21 will be

locked in its disengaged position, and the passing of the plate from over the trigger will not effect the elevation of the tongs.

Briefly, the operation of the device is as follows: Assuming the parts to be in the position indicated in Fig. 3 of the drawings, a plate is fed between the rolls 2 and 3 and into the tongs or plate-receiving member. As the front edge of the plate comes into contact with the pivoted trip 45 the latter is swung out of engagement with the upper end of the trigger, and the latter swings up against under side of the plate. When the plate has been entirely received within the tongs, the passing of its rear end from over the trigger will permit the elevation of the latter under the impulse of the spring 44, (see Fig. 2,) and the clutch 21 will be thrown into engagement with the power-pulley. The rotation of the power-pulley 19 will now cause the rotation of the main shaft 18 and of the crank-wheel 23, the reciprocation of the rack 25, and the rotation of the eccentric shaft 27. The shifting of the positions of the eccentrics 28, due to the rotation of the shaft 27, will cause the tongs to be swung upwardly until the end of the plate carried thereby is brought into contact with the trip-arm 81. Said arm will then be moved toward the rolls and having reached the limit of its movement will permit the plate to pass between the upper rolls 3 and 4, since the movement of the trip-arm will have thrown the clutch 73 into engagement with the gears 67 to start the feed-rollers and will also have effected the simultaneous disengagement of the machine-clutch 21 to stop the tongs. When the plate has passed entirely beyond the trip-arm 81, the spring 77 will restore the lever 75 to its normal position, which will effect the disengagement of the clutch 73 to stop the rollers and the reëngagement of the machine-clutch 21 to start the tongs on their downward movement, as the rack 25 will now be reciprocated in the opposite direction. When the tongs have reached the depressed position, the pivoted trip 45 will depress the trigger 31 to disengage the machine-clutch 21, and the tongs will thus be stopped in position to receive the next succeeding plate from between the lower rolls 2 and 3. Assuming now that this next plate is of standard or excessive length, its front end will strike the trip-arm 80 before the release of the trigger 31 is effected and the clutch 72 will be thrown into gear to effect the rotation of the feed-rollers in the direction of the dotted arrow in Fig. 3. The locking-bar 87 will now be in a position to lock the machine-clutch 21 against movement, so that the plate may be discharged entirely from the rear end of the apparatus without effecting the bodily movement of the tongs.

In order that the generic terms employed in the claims may be clearly understood by reference to that form of the invention which for the purpose of this disclosure is illustrated in the accompanying drawings, attention is called to the fact that the machine and roller clutches 21, 72, and 73 and their connections constitute stopping, starting, and reversing mechanisms for both the plate-receiving member and the rollers, since by throwing these clutches in or out at the proper time the plate-receiving member is started upward, stopped at the upper pass of the mill, and reversed or started downward, and since the rollers are started to feed the plate from one end of the member, stopped after the delivery of the plate, or reversed to feed the plate from the opposite end of the mill it should also be noted that the stopping, starting, and reversing means are automatic, since they are brought into play without manual assistance and complete their cycle of operations at the proper times to the attainment of a definite end without necessitating the aid of an attendant. The machine will also be seen to comprehend automatic means in the shape of the trigger and trips and the associated springs for operating the stopping, starting, and reversing mechanisms, and since these several trips and the trigger are either positively operated by the plate being handled or are prevented by the plate from operating until a predetermined instant the machine will be seen to comprehend plate-controlled means for operating the stopping, starting, and reversing mechanisms of the member and rollers and therefore plate-controlled means for controlling the operation of both the member and rollers. The trip 81 constitutes plate-operated means for stopping the member and starting the rollers opposite the upper pass of the mill and also constitutes plate-operated means for stopping the rollers and starting the member. I wish also to make it perfectly clear that in referring to the upper and lower passes of a mill I do not use the term "pass" in the restricted sense of a passage between two rolls, but in the broad sense of a space, whether it be between a pair of mill-rolls or above the uppermost roll of the stand, since it is clear that the machine while particularly useful in connection with three-high mills is of great use as a catcher for receiving a plate from between the rolls of a two-high stand and for passing the plate back over the upper roll in a manner well understood in the art.

It is thought that from the foregoing the construction and operation of the apparatus will be understood; but while the present embodiment of the invention is believed at this time to be preferable I desire to reserve the right to effect such changes, modifications, and variations of the illustrated structure as may be suggested by experience and experiment, provided only that such variations are properly embraced within the scope of the protection prayed.

What I claim is—

1. In a plate-handling machine, the combi-

nation with a movable plate-receiving member, of means for moving said member to effect the transfer of the plate carried thereby, and a trigger controlling the operation of said means, said trigger being disposed to be held in one position by a plate passing to the member and released by said plate when the latter has been entirely received by said member.

2. In a plate-handling machine, the combination with a vertically-movable plate-receiving member and operating mechanism therefor, of a trigger controlling the movement of the member and disposed in position to be controlled by the plate passing to the member, and a trip device likewise controlling the operation of the member and disposed to be tripped by the plate during the elevation thereof.

3. In a plate-handling machine, the combination with a plate-receiving member and mechanism for operating said member to effect the transfer of the plate and the return of the member to its initial position, of a trigger controlling the operation of the receiving member and disposed for actuation by the plate passing to the member, and a trip device located at a point above the trigger and disposed for actuation by the plate to stop said member in position to deliver the plate.

4. The combination with the mill-rolls, rotatable continuously in the same direction, of a movable plate-receiving member arranged to receive a plate from one pass of the rolls, means for moving said member to another pass to deliver the plate, a series of feed-rollers carried by the plate-receiving member, means for rotating the rollers in one direction when the member is in the receiving position, means independent of the rolls for automatically stopping the rollers, and means for automatically starting the rollers in the reverse direction when the member reaches the delivering position.

5. In a continuously-operating rolling-mill, the combination with the rolls and a plate-receiving member provided with a series of feed-rollers and operating means therefor, of automatically-operated means for starting, stopping and reversing said rollers, independently of the rolls.

6. In a plate-handling machine, the combination with a vertically-movable plate-receiving member and a series of feed-rollers carried thereby, of roller-operating mechanism, means for automatically controlling the movement of the member, and automatically-operated means for stopping and starting the rollers in both the elevated and depressed positions of the plate-receiving members.

7. In a plate-handling machine, the combination with the vertically-movable plate-receiving member, a series of feed-rollers carried thereby, and roller-operating mechanism, of a trip device controlling the operation of both the member and the rollers.

8. In a plate-handling machine, the combination with a plate-receiving member, a series of feed-rollers, and roller-operating mechanism, of trip devices arranged to control the operation of the feed-rollers in opposite directions, said trip devices being disposed adjacent to the opposite ends of the receiving member for automatic actuation.

9. In a plate-handling machine, the combination with a vertically-movable plate-receiving member, a series of feed-rollers carried thereby, mechanism for operating the member, and mechanism for operating the feed-rollers, of a trigger controlling the operation of the member and located in position to be actuated by a plate passing to the member, a trip device disposed for automatic actuation when the member has reached its elevated position, and means operated by said trip device for stopping the member and for starting the rollers to discharge the plate.

10. In a plate-handling machine, the combination with a vertically-movable plate-receiving member, a series of feed-rollers carried thereby, operating mechanism for the member, and roller-operating mechanism, of a trigger controlling the operation of the member and disposed to be held in its depressed position by a plate passing to the member, a trip device controlling the operation of both the member and feed-rollers and disposed for actuation by a plate when the latter is raised to its elevated position, a second trip device disposed adjacent to the rear end of the member for actuation by the plate, and means operated by the second trip device for reversing the rollers to effect the discharge of the plate from the rear end of the member.

11. In a plate-handling apparatus, the combination with a vertically-movable plate-receiving member, of an eccentric connected to said member to move the same in a curvilinear path, and means for operating the eccentric.

12. In a plate-handling machine, the combination with a plate-receiving member having a laterally-movable pivotal support, of an eccentric connected to said member to move the same in a curvilinear path, and means for operating the eccentric.

13. In a plate-handling machine, the combination with a plate-receiving member, of an eccentric connected thereto to effect the vertical movement of the member in a curvilinear path, a toothed-pinion connected to the eccentric to operate the same, a rack engaging the pinion, and means for reciprocating the rack.

14. In a plate-handling machine, the combination with the frame, a vertically-movable plate-receiving member mounted therein, and feed-rollers carried by the member, of a trip device carried by the frame and disposed for actuation by the plate supported by the member, and mechanism connected with the trip device for controlling the operation of the member and feed-rollers respectively.

15. In a plate-handling machine, the combi-

nation with the frame, a vertically-movable plate-receiving member mounted therein, and feed-rollers carried by the member, of a main shaft journaled in the frame, mechanism operated by said shaft for moving the member, a power-pulley loosely mounted on the shaft, a clutch on the shaft to connect the power-pulley thereto, and a trigger disposed in advance of the plate-receiving member and operatively related to the clutch to operate the same.

16. In a plate-handling machine, the combination with the frame, a vertically-movable plate-receiving member mounted therein, feed-rollers carried by said member, member-operating mechanism and roller-operating mechanism, of a machine-clutch controlling the connection of the member-operating mechanism with the member, a trigger controlled by the plate passing to the member and operatively related to the machine-clutch, roller-clutches, controlling the connection between the roller-operating mechanism and the rollers, and designed to effect the rotation of the rollers in opposite directions, and trip mechanism operatively related to the clutches and disposed for actuation by the plate supported by the plate-receiving member.

17. In a plate-handling machine, the combination with a support, of the plate-receiving tongs comprising a pair of pivoted members between which the plate is received, and means for moving the tongs vertically.

18. In a plate-handling machine, the combination with a support, of the plate-receiving tongs comprising a pair of pivoted members, each provided with a series of feed-rollers between which the plate is received, and means for yieldingly urging the members toward each other to grip a plate.

19. In a plate-handling machine, the combination with a vertically-movable plate-receiving member, and feed-rollers, of means for imparting vertical movement to said member, and means for automatically stopping the member and starting the feed-rollers to deliver the plate when the member reaches its elevated position.

20. In a plate-handling machine, the combination with a vertically-movable plate-receiving member, and feed-rollers, of means for imparting vertical movement to said member, and means operated by the movement of the member for stopping the member and starting the feed-rollers.

21. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers, and operating means for the member and rollers, of means for automatically stopping the rollers and starting the member.

22. In a plate-handling machine, the combination with a movable plate-receiving member, and feed-rollers, of operating means for the member and rollers, and means engaged by the plate to stop the member and start the rollers.

23. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers, and operating means, of means disposed for automatic actuation to stop the rollers and start the plate-receiving member upon the complete delivery of the plate from said member.

24. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers, and operating mechanism, of means for effecting the automatic movement of the member in one direction, means for automatically stopping the member and starting the feed-rollers to deliver the plate, and means for stopping the rollers and starting the member after such delivery has been effected.

25. In a plate-handling machine, the combination with a movable plate-receiving member provided with a series of feed-rollers, of means for moving the member, and automatic means for stopping, starting and reversing the rollers.

26. In a plate-handling machine, the combination with a movable plate-receiving member provided with a series of feed-rollers, of means for stopping, starting and reversing the member, and automatic means for stopping, starting and reversing the rollers.

27. In a plate-handling machine, the combination with a movable plate-receiving member, and a series of rollers carried thereby, of operating mechanism for the member, roller-operating mechanism, and a trigger controlling the operation of the member, said trigger being disposed to be held in one position by a plate passing to the member, and operative to start the member when released by the plate.

28. In a rolling-mill, the combination with the rolls, and the plate-receiving member provided with a series of feed-rollers, of means for rotating said rollers, and means independent of the rolls for automatically reversing the rollers.

29. In a rolling-mill, the combination with the rolls, and the movable plate-receiving member provided with a series of feed-rollers, of means for rotating the rollers, and means for automatically stopping and starting the rollers at each limit of movement of the member.

30. In a rolling-mill, the combination with the rolls, and the plate-receiving member provided with a series of feed-rollers, of means independent of the rolls for rotating the rollers, and automatically-operated means for stopping and reversing the rollers.

31. In a plate-handling machine for rolling-mills, the combination with a movable plate-receiving member disposed to receive the plate from the rolls, of operating mechanism for

said member controlled by the plate, and means likewise controlled by the plate for automatically stopping the member to permit the delivery of the plate.

32. In a plate-handling machine, the combination with a movable plate-receiving member, and mechanism for moving said member to effect the transfer of the plate, of means controlled by the plate for automatically starting, stopping and reversing the member to effect the transfer of the plate, the stoppage of the member to deliver the plate and the return of the member to its initial position.

33. In a continuously-operating rolling-mill, the combination with the rolls, and the movable plate-receiving member provided with a series of feed-rollers, of means for rotating said rollers, and trip devices disposed for automatic actuation in different positions of the member to control the operation of the rollers independently of the rolls, whereby said rolls may operate continuously without reference to the operation of the rollers.

34. In a continuously-operating rolling-mill, the combination with the rolls, and the plate-receiving member provided with a series of feed-rollers and operating means therefor, of means for starting, stopping and reversing said rollers independently of the rolls, and trip devices disposed to effect the automatic actuation of the starting, stopping and reversing means.

35. In a plate-handling machine, the combination with a movable plate-receiving member, and a series of feed-rollers carried thereby, of roller-operating mechanism, means for automatically controlling the movement of the member, and means controlled by the plate for controlling the operation of the rollers.

36. In a plate-handling machine, the combination with a movable plate-receiving member, a series of feed-rollers carried thereby, and roller-operating mechanism, of a trip device disposed for control by the plate and controlling the operation of both the member and the rollers.

37. In a plate-handling machine, the combination with a movable plate-receiving member, a series of feed-rollers, and roller-operating mechanism, of trip devices arranged to control the operation of the feed-rollers in opposite directions, said trip devices being disposed for control by the plate.

38. In a plate-handling machine, the combination with a movable plate-receiving member, and feed-rollers, of means for imparting movement to the member, and a trip device arranged to automatically stop the member and start the feed-rollers.

39. In a plate-handling machine, the combination with a movable plate-receiving member, and feed-rollers, of means for imparting movement to said member, and automatic means for simultaneously stopping the member and starting the feed-rollers.

40. In a plate-handling machine, the combination with a movable plate-receiving member, and feed-rollers, of a trip device arranged to automatically stop the rollers and start the member.

41. In a plate-handling machine, the combination with a movable plate-receiving member, and feed-rollers, of automatically-operated means for simultaneously stopping the rollers and starting the member.

42. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers, and operating means, of means controlled by the plate and disposed for automatic actuation to stop the rollers and start the plate-receiving member, upon the complete delivery of the plate from said member.

43. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers, and operating means, of a trip device disposed for actuation by the plate and arranged to simultaneously stop the rollers and start the plate-receiving member, upon the complete delivery of the plate from said member.

44. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers, and operating mechanism, of means for automatically starting the member in one direction, means for simultaneously stopping the member and starting the feed-rollers to deliver the plate, and means for simultaneously stopping the rollers and starting the member after such delivery has been effected.

45. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers, and operating mechanism, of means for starting the member in one direction, a trip device for simultaneously stopping the member and starting the feed-rollers to deliver the plate, and means operated by said trip device for stopping the rollers and starting the member after such delivery has been effected.

46. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers, and operating mechanism, of means for starting the member in one direction, a trip device disposed for control by the plate and arranged to stop the member and start the feed-rollers to deliver the plate and to stop the rollers and start the member after such delivery has been effected.

47. In a plate-handling machine, the combination with a plate-receiving member provided with a series of feed-rollers, of means for moving the member vertically, and plate-controlled means for stopping, starting and reversing the rollers.

48. In a plate-handling machine, the combination with a plate-receiving member provided with a series of feed-rollers, of plate-controlled means for starting, stopping and reversing the member and for stopping, starting and reversing the rollers.

49. In a rolling-mill, the combination with the rolls, and the plate-receiving member provided with a series of feed-rollers, of means for rotating the rollers, and plate-controlled means for stopping and starting the same.

50. In a rolling-mill, the combination with the rolls, and the plate-receiving member provided with feed-rollers, of means for rotating the rollers, and plate-controlled means for stopping and reversing the rollers.

51. In a plate-handling machine, the combination with a movable plate-receiving member, and operating means therefor, of a trip device disposed to be tripped by the plate to stop the plate-receiving member in proper position.

52. In a plate-handling machine, the combination with a movable plate-receiving member, and operating means therefor, of a trip device operatively related to said means and disposed to be tripped by the plate during the elevation thereof.

53. In a plate-handling machine, the combination with a movable plate-receiving member, and operating means, of a trigger controlling the operation of said member, means for automatically moving the trigger to start the member, a trip, and means for automatically moving the trip to stop the plate-receiving member in proper position to deliver the plate and to subsequently start the member.

54. In a plate-handling machine, the combination with a movable plate-receiving member, and a series of feed-rollers carried thereby, of operating means for the member and rollers, means for starting the member, a trip device, and means operated by said trip device for simultaneously stopping the member and starting the rollers to discharge the plate.

55. In a plate-handling machine, the combination with a movable plate-receiving member having a series of feed-rollers, and operating means for the member and rollers, of plate-controlled means for stopping the rollers and starting the member.

56. In a plate-handling machine, the combination with a movable plate-receiving member, of operating means therefor, and plate-controlled means for stopping the member.

57. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers carried thereby, and operating mechanism for the member and rollers, of plate-operated means for stopping the rollers.

58. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers carried thereby, and operating mechanism for the member and rollers, of plate-operated means for starting the rollers.

59. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers carried thereby, and operating mechanism for the member and rollers, of plate-operated means for stopping and starting the rollers.

60. In a plate-handling machine, the combination with a movable plate-receiving member, feed-rollers carried thereby, and operating mechanism for the member and rollers, of plate-controlled means controlling the operation of both the member and the rollers thereof.

61. In a plate-handling machine, the combination with a movable plate-receiving member, a feed-roller carried thereby, and operating mechanism for the member and roller, of plate-operated controlling mechanism common to the member and roller and arranged to simultaneously start one and stop the other of said elements.

62. In a plate-handling machine for rolling-mills, the combination with a plate-receiving member provided with feed-rollers, and means for operating the member and rollers, of means for automatically starting the member when the plate has been received thereby from a mill-pass, means for stopping the member and starting the rollers when the member reaches another pass of the mill, and means for automatically stopping the rollers and starting the member when the plate has been delivered.

63. In a plate-handling machine for rolling-mills, the combination with a plate-receiving member provided with feed-rollers, and means for operating the member and rollers, of means for automatically starting the member when the plate has been received thereby from a mill-pass, means for stopping the member and starting the rollers when the member reaches another pass of the mill, and plate-controlled means for stopping the rollers and starting the member when the plate has been delivered.

64. In a plate-handling machine, the combination with a movable plate-receiving member, a series of feed-rollers carried thereby, and operating mechanism for the member and rollers, of a trigger controlling the operation of the member and located in position to be actuated by a plate passing to the member, a trip device disposed for automatic actuation when the member has reached another position, and means operated by said trip device for stopping the rollers and starting the member.

65. In a plate-handling machine, the combination with a movable plate-receiving member, a series of feed-rollers carried thereby, and operating mechanism for the member and rollers, of a trigger controlling the operation

of the member and located in position to be actuated by a plate passing to the member, a device disposed for automatic actuation when the member has reached another position, and means operated by said device for stopping the member and for starting the rollers to discharge the plate.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

EDMUND MILES.

Witnesses:
H. C. KERSTINE,
JAS. H. KERSTINE.