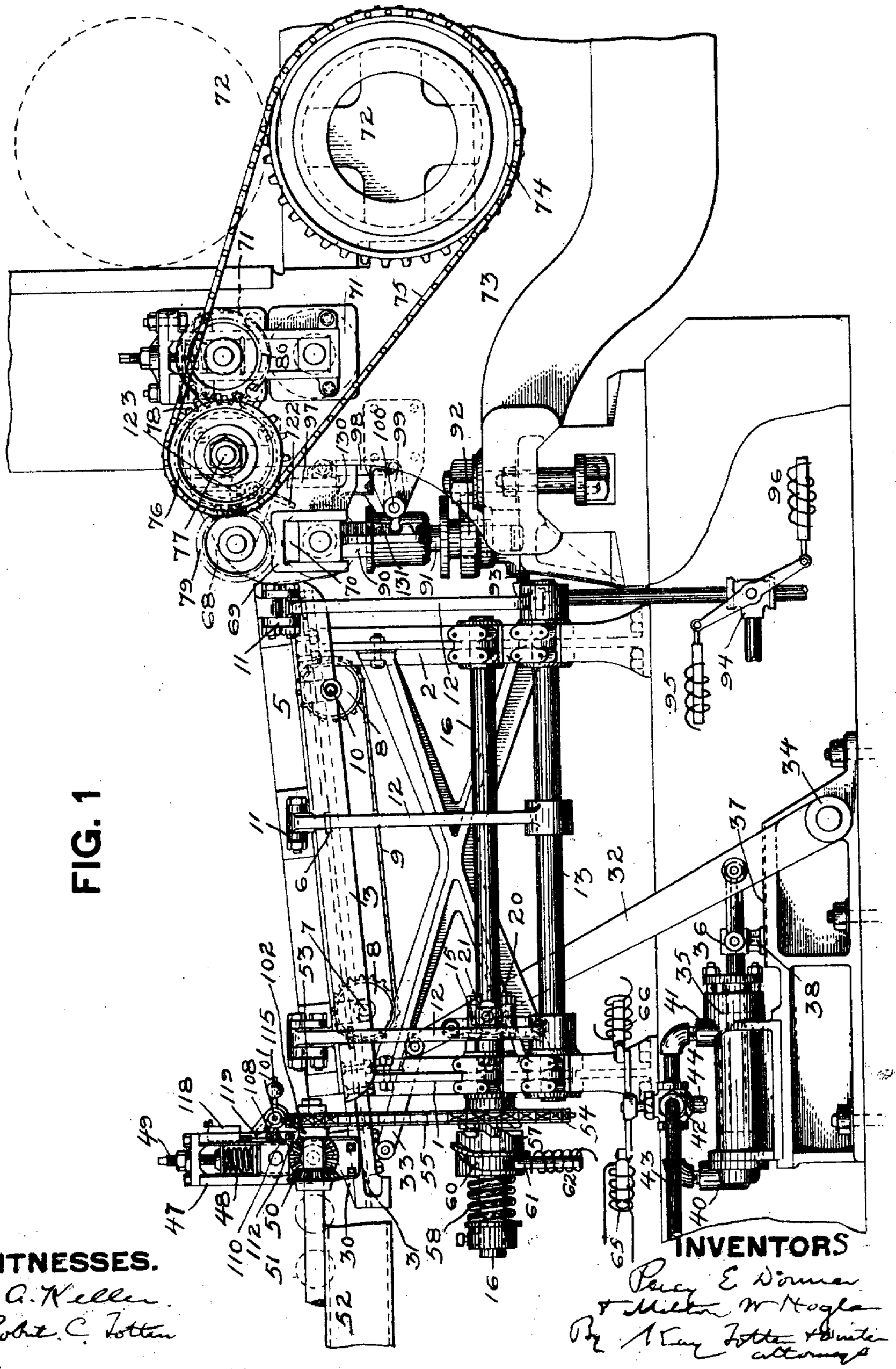
No. 897,526. PATENTED SEPT. 1, 1908.

P. E. DONNER & M. W. HOGLE.

MATCHING MECHANISM.

APPLICATION FILED FEB. 2, 1907. 6 SHEETS—SHEET 1.

FIG. 1



WITNESSES.

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6 SHEETS—SHEET 2.

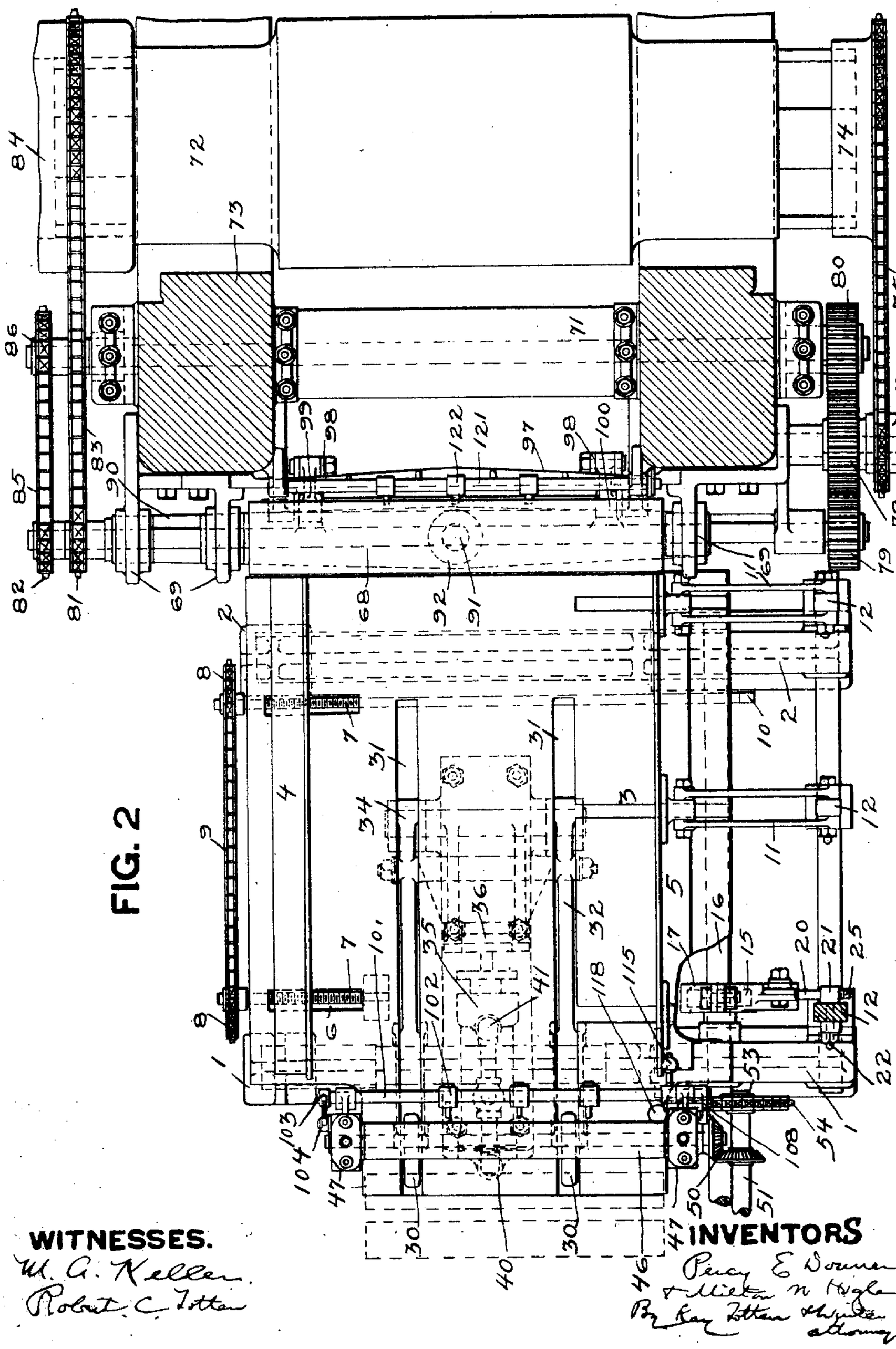

FIG. 2

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6 SHEETS—SHEET 3.

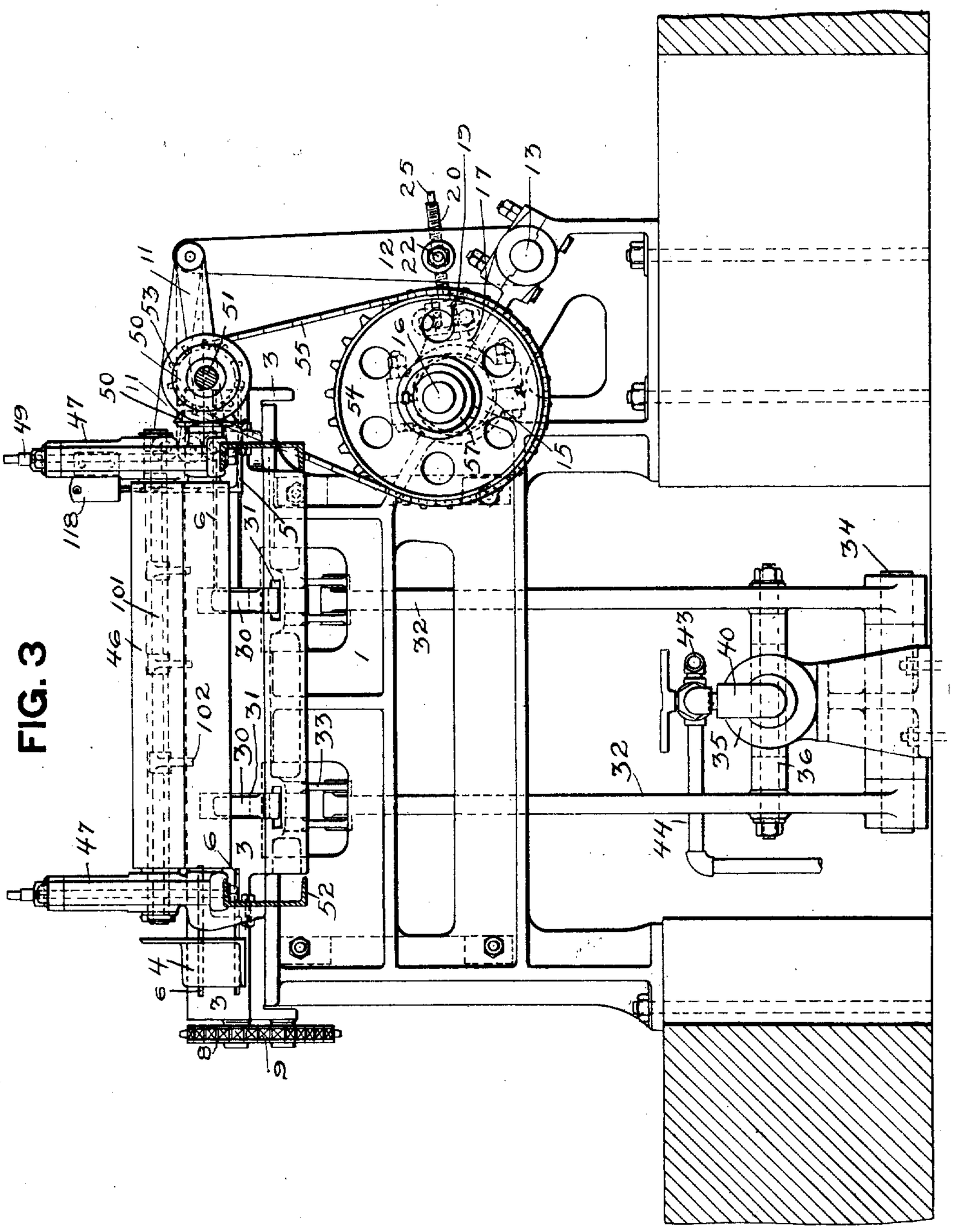

FIG. 3

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6 SHEETS—SHEET 4.

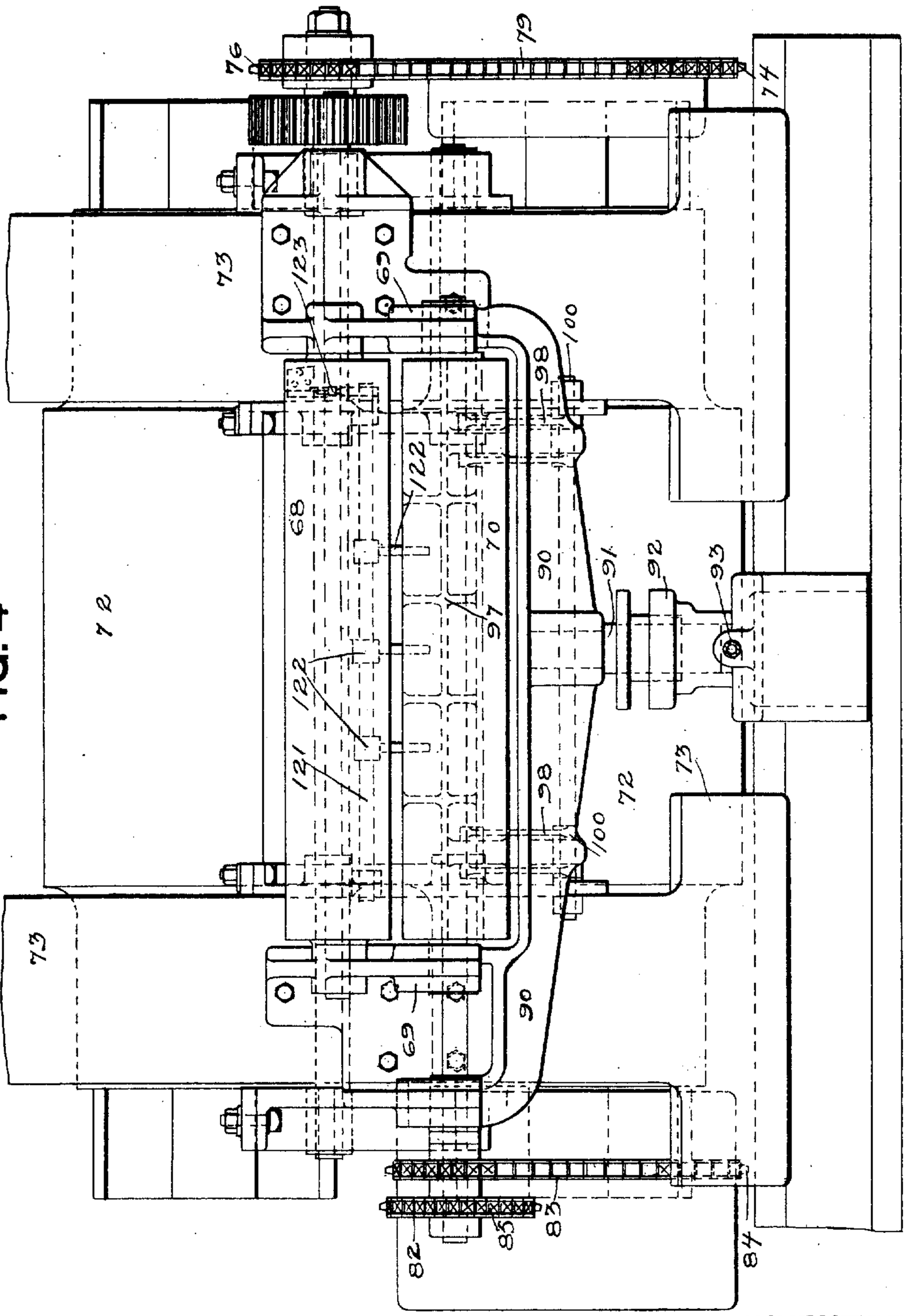

FIG. 4

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6 SHEETS—SHEET 6.

FIG.6

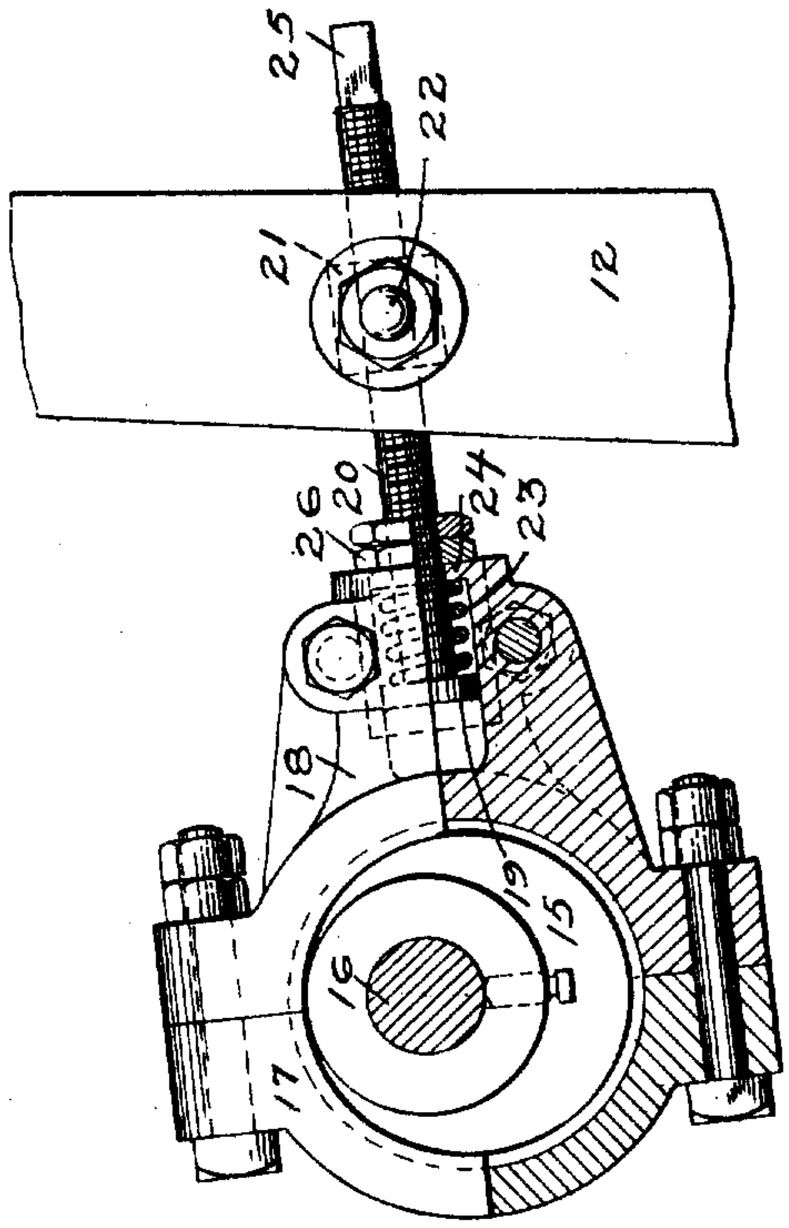
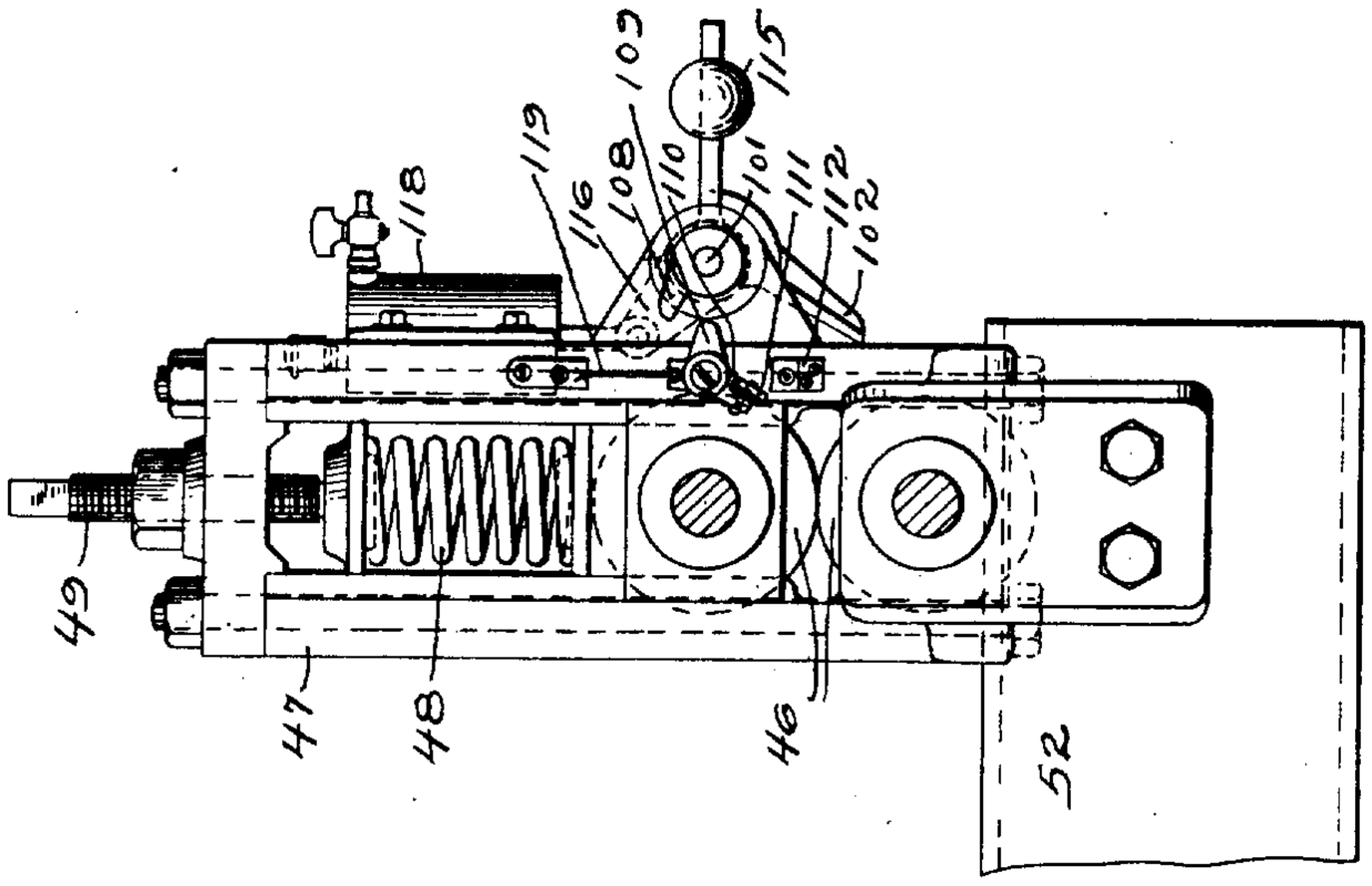


FIG.5



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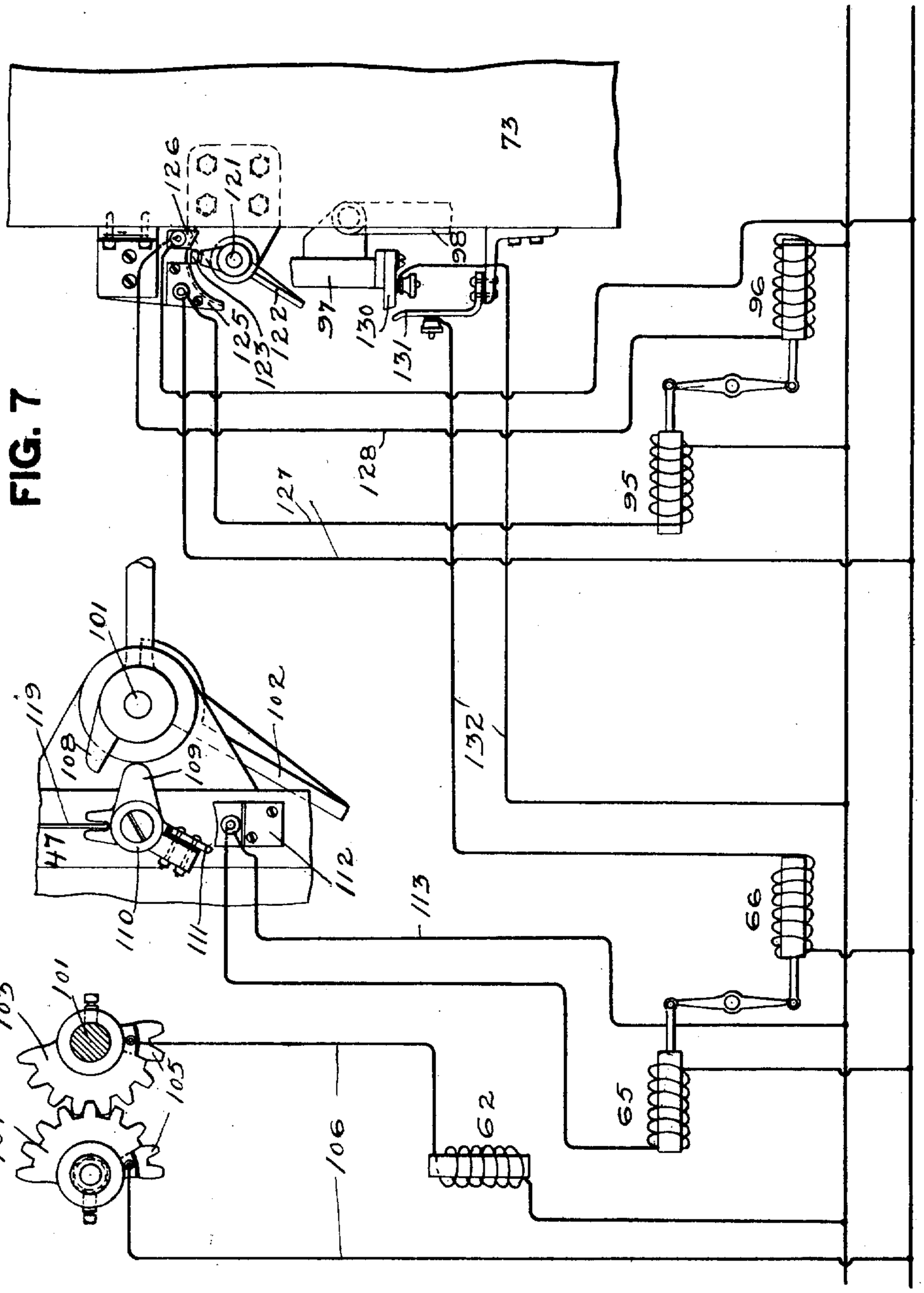
APPLICATION FILED FEB. 2, 1907.

6 SHEETS—SHEET 6.

FIG. 7



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UNITED STATES PATENT OFFICE.

PERCY E. DONNER AND MILTON W. HOGLE, OF PITTSBURG, PENNSYLVANIA; SAID HOGLE ASSIGNOR TO SAID DONNER.

MATCHING MECHANISM.

No. 897,526. Specification of Letters Patent. Patented Sept. 1, 1908.

Application filed February 2, 1907. Serial No. 355,503.

To all whom it may concern:

Be it known that we, PERCY E. DONNER and MILTON W. HOGLE, residents of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Matching Mechanism; and we do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to matching mechanism for matching metal sheets and plates, and more especially to matching mechanism to be used in connection with continuous or tandem mills for reducing metal to sheet form.

The objects of the invention are to provide matching mechanism which is substantially horizontal, thus enabling the two mills between which the same is placed to be on the same level; to provide mechanism which operates automatically for both side and end matching; to provide mechanism which performs the end matching at the rear ends of the plates; and in short, mechanism which operates entirely automatically to feed the plates into the matcher, match the same both at the side and ends and feed the same out of the matcher.

In the accompanying drawings Figure 1 is a side elevation of our matching mechanism, the electro magnets being shown diagrammatically; Fig. 2 is a plan view of the same, the housings for the second reducing rolls being in horizontal section; Fig. 3 is a front elevation of the matching mechanism; Fig. 4 is a rear elevation of the same; Fig. 5 is an elevation on an enlarged scale showing the housing for the feeding-in rolls with connected appurtenances; Fig. 6 is an enlarged sectional detail of the mechanism for actuating the side matcher; and Fig. 7 is a diagrammatic view showing the circuit closers, the electro magnets and the circuits including the same.

The matcher has a forward frame or housing 1, a rear frame or housing 2 and the table or support 3 secured thereto and constituting the support for the sheets during matching. This table is preferably substantially horizontal, the drawings showing the same as slightly higher at its rear than at its forward end, this being for the purpose of permitting both mills to be on the same level and permitting the sheets to have a slight drop on entering the matcher so as to drop one on the other. We do not wish to limit ourselves however, to the inclination shown. The table may, if desired, be inclined to a greater extent than shown, or may be inclined in the opposite direction. As shown, the table is practically horizontal, as the slight inclination is of no assistance and performs no function in the matching of the plates.

The side matchers 4 and 5 are shown as sections of angle bar arranged, one on either side of the central longitudinal line of the table 3. If desired, both of these side matchers may be made movable toward and from each other in order to effect the matching. Preferably, however, the matching bar 4 will be stationary during matching but will be adjustable in order to match sheets of different widths. This adjustment is secured by securing to said bars bosses which extend down through transverse slots 6 in the table and are engaged by screws 7 connected by sprocket wheels 8 and sprocket chain 9 to rotate together. One or both of these screws extends underneath the table 3 to the forward side of the matcher where it is provided with means, such as the squared end 10, for receiving means whereby it may be rotated in order to adjust the position of the matching bar 4.

The matching bar 5 has connected thereto three sets of links 11 which are secured to the upper ends of levers 12 whose lower ends are secured to a rock shaft 13 mounted in suitable bearings formed in the housings 1 and 2. An oscillating movement is imparted to these levers by suitable mechanism, that shown comprising an eccentric 15 on a driven shaft 16 mounted in the housings 1 and 2. The eccentric 15 is surrounded by a suitable strap or pitman box 17, the latter having secured thereto a box 18 for receiving the head 19 of a pitman rod 20. The latter is threaded and passes through a threaded opening in a head 21 formed on a wrist pin 22 secured in an opening in one of the levers 12. The head 19 is rotatable in the box 18 and is yieldingly held therein by means of a spring 23 interposed between said head and a shoulder 24 on the box 18. This is for the purpose of permitting the matching bar 5 to yield in case the plates entering the matcher should be somewhat wider than the position for which the matcher bars have been adjusted. Adjustment of the matching bar 5 to compensate for plates of different widths is secured

by merely lengthening or shortening the pitman rod 20 which can be readily done by rotating the same in the head 21 and box 19, such for instance, as putting a wrench on the squared end 25 of said pitman rod. Lock nuts 26 are provided to lock the pitman rod in its adjusted position.

The end matching is effected by means of a pair of matching heads 30 arranged to engage the rear ends of the plates and mounted to move in longitudinal slots 31 formed in the table 3. These heads are moved by means of levers 32 connected by links 33 to bosses or brackets secured to the heads 30 and projecting down through the slots 31. The levers 32 have their lower ends pivotally mounted at the point 34 and are oscillated by means of a power cylinder 35 which may be either an air, steam or hydraulic cylinder, and whose piston rod is connected to a cross head 36 mounted to slide on ways 37 connected to the levers 32 by a suitable connecting piece 38. The cylinder 35 is a double acting cylinder having a connection 40 to one end for pushing the matching heads 30 forwardly and a similar connection 41 to its opposite end for retracting said matching heads, these connections leading to a four-way valve 42 which communicates also with the supply pipe 43 and the exhaust pipe 44.

From the mechanism described it will be apparent that the side matching is effected by the action of the bar 5 pushing the plates over against the bar 4, while the end matching is effected by the heads 30 pushing against the rear ends of the plates. The means for securing the automatic action of these parts will now be described.

At the forward end of the matcher are the feeding rolls 46 mounted in suitable housings 47 and the top roller being pressed downwardly by means of springs 48 and adjusting screws 49. These rollers are positively driven by means of bevel gears 50 from a line shaft 51 of a suitable table 52 in front of the matcher, which table is for the purpose of feeding the sheets to the matcher. The line shaft 51 will be driven from any suitable part of the mill equipment. The shaft 16 for imparting movement to the side matcher 5 is driven from the line shaft 51 by suitable gearing, such as the sprocket wheels 53 and 54 and sprocket chain 55. The sprocket wheel 54 is loose on the shaft 16 but is given a driving connection thereto by means of the clutch member 57 keyed to the shaft in the usual way and slidable thereon, it being normally held in engagement with the wheel 54 by a spring 58. Said clutch member is shifted in the opposite direction to permit the shaft 16 to remain idle by being provided with a cam groove 60 which is engaged at the proper time by means of a pin 61 which forms the core or armature of a solenoid 62 or other electro-magnet. The arrangement is such that when the solenoid is inactive, the pin 61 drops by gravity to release the clutch member 57, thus enabling the spring 58 to bring said clutch member into engagement with the wheel 54 to impart rotation to the shaft 16 but when said solenoid is energized the pin 61 is raised into the groove 60 and causes the clutch to be disengaged to permit the shaft 16 to stop. The four-way valve 42 is actuated by means of a pair of solenoids, or other electro magnets, 65 and 66, one of said solenoids moving said valve to admit the pressure medium to one end of the cylinder 35 and the other solenoid moving the valve to admit the pressure medium to the opposite end of the cylinder 35.

At the rear of the matcher are a pair of pinch rollers for feeding the pack out of the matcher, the same comprising a top roller 68 mounted in stationary bearings 69 and a vertically movable bottom roller 70; and also a pair of feed rollers 71 for feeding the pack to the second reducing mill shown at 72. These several rollers are mounted in suitable bearings secured to the housings 73 of the reducing mill 72. All four of the rollers 68, 70 and 71 are positively driven. The pinch roll 68 and the top feeding roll 71 are positively driven from the bottom roll 72, by means of a sprocket wheel 74 on the wabbler or neck of said roll and which is connected by a chain 75 to a sprocket wheel 76 mounted on a stub shaft 77 and having secured thereto a pinion 78 which meshes with the pinions 79 and 80 secured respectively to the shafts of the top pinch roll 68 and top feeding roll 71. The bottom pinch roll 70 has secured to its shaft a pair of sprocket wheels 81 and 82, the former of which is connected by a chain 83 to a similar wheel 84 on the wabbler or neck of the bottom reducing roll 72, while the other sprocket wheel 82 is connected by means of a chain 85 to a sprocket wheel 86 on the shaft of the lower feed roller 71. By the gearing described all four of the rollers comprising the pinch rollers and feed rollers are positively driven.

The bottom pinch roller 70 is mounted in a yoke or carrier 90 which is carried by the piston rod 91 of a vertically arranged single acting power cylinder 92. The inlet 93 of this cylinder is controlled by a three-way valve 94 which is operated by means of a pair of solenoids, or other electro magnets, 95 and 96, the solenoid 95 moving the valve to admit the pressure medium to the cylinder 92, while the solenoid 96 moves the same to exhaust the pressure medium therefrom. To the rear of the pinch rollers 68 and 70 is a vertically movable stop or gate 97 suitably guided in the frame and arranged to normally remain elevated and in the path of the movement of the pack being pushed forwardly by the pushing heads 30, the object of this stop being to positively cause the matching of the

sheets in case their frictional contact is such as to cause the plates to move forwardly without matching at their rear ends. This gate 97 is automatically lowered when the pinch roller 70 rises to grip the pack, this being effected by connecting the gate 97 by means of a link 98 to a lever 99 pivoted at 100 and having its opposite end engaging the carrier 90 of the pinch roller 70. Obviously, when the carrier 90 rises the gate or stop 97 is drawn downwardly.

The energization of the several electro magnets 62, 65, 66, 95 and 96 in order to operate the several valves and clutch to secure the operation of the mechanisms in the proper sequence is effected by circuit controlling mechanism as follows: At the forward feed rollers 46 is a transverse rock shaft 101 mounted in suitable stationary bearings and carrying a number of trip arms 102, three such trip arms being shown. These trip arms normally project downwardly in an inclined position as shown in Fig. 5 in the path of the plates being fed into the matcher, and will be moved by said incoming plates to rotate or rock the shaft 101, as will be obvious. Secured to this shaft is a gear segment 103 which engages a similar gear segment 104 mounted on a short stub shaft. Each of these gear segments carries an insulated circuit closing contact comprising an insulated tooth or teeth 105 forming one or several of the teeth of each segment and which, when said segments are rotated, come into contact. Each of these toothed contacts has connected thereto one of the wires of a circuit 106 leading to the solenoid 62 and serving, when the shaft 101 is rotated or rocked by the incoming plates, to close the circuit to said solenoid and project the pin 61 into the groove 60 of the clutch member 57. The shaft 101 has also secured thereto a tripper or wiper 108 which is adapted to coöperate with an arm 109 on a rocking circuit closing member 110, the same carrying a metallic member 111 adapted to bridge the stationary circuit terminals 112 suitably mounted on the frame and included in a circuit 113 leading to the solenoid 65. The arrangement is such that when the shaft 101 is rocked by the incoming sheets the wiper 108 merely rocks the member 110 idly, that is, without closing the circuit, but on the return movement of the shaft 101 this wiper engages the arm 109 in the opposite direction, and rocks the member 110 to close the circuit between the terminals 112 and energizes the magnet 65. The reverse movement of the shaft 101 to effect the closing of this circuit is secured by means of a counter-weight 115 carried on an arm secured to said shaft. In order that the shaft 101 will not return instantly to normal position there is connected to said shaft an arm 116 which is connected to the piston of a dash pot 118 which, it will be understood, effects the slow return of the shaft 101 to normal position under the action of the counter-weight 115. A spring 119 engages the rocking member 110 and holds the same normally in neutral or centered position.

To the rear of the pinch rollers 68 and 70 is a transverse shaft 121 mounted in stationary bearings and carrying a number of trip arms 122, three such arms being shown in Fig. 2 and normally projecting downwardly in an inclined position in the path of the pack coming from the matcher, and will be moved by the end of the pack to cause the shaft 121 to rock or rotate in its bearings. The shaft 121 carries a spring pressed circuit closing member or head 123 which is adapted to cooperate with two pairs of circuit terminals 125 and 126, the pair of said terminals which is bridged depending upon the direction in which the shaft 121 rotates. The terminals 125 are in a circuit 127 including the solenoid 95 while the terminals 126 are in a circuit 128 including the solenoid 96.

Connected to the stop or gate 97 is an insulated contact member 130 arranged, when said stop or gate is pushed downwardly, to contact with an insulated contact member 131. These two contact members are in a circuit 132 including solenoid 66.

The operation of the mechanism described is as follows: The pinch rollers 68 and 70 and feed rollers 71 are constantly driven by the gearing described. Normally the pinch roller 70 is depressed, the stop or gate 97 is elevated and the trip arms 122 lie in the path of the pack. The line shaft 51 is also constantly driven and through the connections described constantly drives the feed rollers 46 and shaft 16 so that the side matcher 5 is constantly moving inwardly and outwardly. The trip arms 102 lie in the path of the plates coming to the matcher. The mechanism is particularly designed for piling and matching a plurality of plates coming to the matcher with one plate following the next in close order, such as is the case where a continuous or tandem train is used for rolling down a slab into a long plate which is sheared into two, three or more sections of uniform length preparatory to matching. When the first of these plates enters the feed rollers 46 it contacts with the trip arms 102 and through the latter rotates the shaft 101, thus bringing the circuit terminal gear teeth 105 into mesh and closing the circuit through the solenoid 62. This elevates the core 61 of said solenoid, projecting the same into the groove 60 of the clutch member 57 and causing the latter to be drawn away from its coöperating member on the gear 54 and thereby stopping the shaft 16 and the movement of the side matcher 5. This in effect, holds the matching mechanism open in order to receive the sheets. During this rocking movement of the shaft 101 the wiper 108 wipes past the

arm 109 on the rocker 110 but, as above stated, without producing any effect. As soon as the first plate passes the trip arms 102 the shaft 101 has a tendency to return to its normal position which, however, is resisted by the dash pot 118. Inasmuch as the several sheets to be matched follow each other in close order the second sheet engages the trip arms 102 before any appreciable return movement of the shaft 101 under the influence of the counter-weight 115 has taken place. Consequently the pin 61 remains in engagement with the clutch member 57 as long as the sheets are following each other in rapid succession. As soon as all the sections of the sheared plate have entered the matcher the shaft 101 comes slowly back to normal position by the influence of the counter-weight 115. This causes the circuit terminals 105 to break the circuit, thus deënergizing the solenoid 62 and permitting the clutch member 57 to be moved by the spring 58 into engagement with the driven wheel 54, thereby rotating the shaft 16 and starting the side matcher 5, which pushes the sheets sidewise against the opposite side stop 4 and thereby accurately match the side edges.

On the return movement of the shaft 101 the wiper 108 engages the arm 109 of the rocker 110, moving the same in the opposite direction and causing the metallic piece 111 to bridge the terminals 112 in the circuit 113, thus energizing the magnet 65 which moves the four-way valve 42 to admit fluid pressure into the outer end of the cylinder 35. This oscillates the lever 32 and causes the matching heads 30 to engage the rear ends of the plates and pushes the same forwardly in the matcher. Ordinarily, this movement will be sufficient to overcome the frictional contact between the plates and accurately match the rear ends thereof and as the plates are all of uniform length their forward ends are thereby also matched. Should however, the frictional contact between the sheets be so great as to prevent their sliding on each other when the rear ends are pushed upon, the continued movement of the heads 30 brings the forward ends of the plates first against the trip arms 122 and then against the stop 97. If the trip arms do not impose sufficient resistance to overcome the frictional contacts of the plates and cause them to be end matched, the stationary stop 97 will give the necessary resistance for this purpose.

The movement of the trip arms 122 due to the pushing of the pack, rocks the shaft 121, thereby bringing the circuit closing member 123 into position to bridge the contacts 125 in the circuit 127 thus energizing the solenoid 95 which moves the valve 94 to admit the pressure medium to the cylinder 92 and raise the bottom pinch roll 70 to grip the pack. This movement also causes the stop 97 to be lowered and in its downward movement the circuit contacts 130 and 131 wipe together, thus closing the circuit 132 and energizing the solenoid 66. The latter moves the four-way valve 42 to release pressure from the outer end of the cylinder 35 and admit pressure to the inner end thereof, thereby withdrawing the pusher heads 30 to their normal position. As soon as the pack has passed the trip arms 122 the latter swing back to normal position thereby bringing the circuit closing member 123 into position to bridge the contacts 126 in the circuit 128, including the solenoid 96, thereby moving the three-way valve 94 to release the pressure medium from the cylinder 92 and permitting the bottom pinch roller 70 to drop, and the latter through the lever 99 elevates the stop 97. The mechanism is now in position to receive a new supply of sheets when the foregoing operations will be repeated.

The mechanism described is entirely automatic, requiring no attendant whatsoever to operate any of the parts. The sheets are fed into the matcher, are matched both at the sides and ends, and are fed out of the matcher entirely automatically. By providing rear end pushers for the end matching it is possible to set the matcher in a horizontal position, or approximately so, so as to enable the plates to be discharged from the matcher on the same level as that on which they were received.

What we claim is:

1. In a matcher, the combination of squaring up means for the sides of the plates forming the pack, and actuating mechanism for said squaring means arranged to be controlled by the plates.

2. In a matcher, the combination of squaring up means for the sides of the plates forming the pack, actuating mechanism for said squaring means, and controlling means for said actuating means, said controlling means being actuated by the plates and arranged to render the matching mechanism inactive while the plates are entering the matcher.

3. In a matcher, the combination of constantly actuated squaring up means for the sides of the plates forming the pack, and mechanism controlled by the plates and arranged to stop said squaring means while the plates are entering the matcher.

4. In a matcher, the combination of constantly actuated squaring up mechanism for the sides of the plates forming the pack, and means arranged to be controlled by the plates for stopping said squaring mechanism while the plates are entering the matcher.

5. In a matcher, the combination of a frame, mechanism for feeding the plates into said frame one on the other, mechanism for feeding the pack out of the frame, and pushing mechanism arranged to engage the rear ends of the plates, squaring the same, and

pushing them into the feeding out mechanism.

6. In a matcher, the combination of a frame arranged to receive the plates one on the other, mechanism for feeding the pack out of said frame, pushing mechanism arranged to engage the rear ends of the plates, square the same and push the pack into the feeding out mechanism, and means arranged to be controlled by the plates for actuating said pushing mechanism.

7. In a matcher, the combination of mechanism for feeding the pack out of the matcher, pushing mechanism arranged to engage the rear ends of the plates, square the same and push the pack into the feeding out mechanism, and means arranged to be controlled by the plates and arranged to control said pushing mechanism.

8. In a matcher, the combination of pushing mechanism arranged to engage the rear ends of the plates and push the same out of the matcher, means arranged to be controlled by the plates entering the matcher for actuating said pushing mechanism, and means controlled by the pack leaving the matcher for returning said pushing mechanism to its original position.

9. In a matcher, the combination of movable side squaring means, movable end squaring means, and mechanism arranged to be controlled by the plates and arranged to actuate said side squaring means and said end squaring means.

10. In a matcher, the combination of movable side squaring means, movable means arranged to engage the rear ends of the plates, match the same and push the pack out of the matcher, and mechanism arranged to be controlled by the plates entering the matcher for rendering said side and end squaring means active.

11. In a matcher, the combination of a horizontal table, squaring up mechanism for the sides of the plates, and pusher mechanism arranged to engage the rear ends of the plates, square the same and push the pack out of the matcher.

12. In a matcher, the combination of a horizontal table, mechanism for feeding plates onto said table one on the other, squaring up mechanism for the sides of the plates, squaring up mechanism for the rear ends of the plates, and mechanism for feeding the squared up pack forwardly out of the matcher.

13. In a matcher, the combination of a horizontal table, squaring up mechanism for the sides of the plates, mechanism for feeding the squared up pack forwardly out of the matcher, and pusher mechanism arranged to engage the rear ends of the plates, square the same and push the pack into the feeding out mechanism.

14. In a matcher, the combination of mechanism for feeding the plates into the matcher, mechanism controlled from the plates for squaring the sides and ends of the plates, and feeding out mechanism.

15. In a matcher, the combination of driven feeding in mechanism, driven side squaring means controlled by the plates, driven end squaring mechanism and driven feeding out mechanism.

16. In a matcher, the combination of a movable stop in the line of feed of the plates, and mechanism arranged to be controlled by the plates for withdrawing said stop.

17. In a matcher, the combination of a movable stop in the line of feed of the plates, squaring up mechanism for the plates, and stop withdrawing mechanism arranged to be actuated from the squaring up mechanism.

18. In a matcher, the combination of a table having its delivery end at such a height with reference to the receiving end that the plates will not move thereon by gravity, a movable stop in the line of feed, side squaring-up mechanism, pushing mechanism arranged to engage the rear ends of the plates and push the same against said stop, and means to withdraw said stop.

19. In a matcher, the combination of a table having its delivery end at such height with relation to the receiving end that the plates will not slide down the table by gravity, side squaring-up mechanism, and pushing mechanism arranged to engage the rear ends of the plates, square the same and push the same out of the matcher.

20. In a matcher, the combination of a movable stop in the line of feed of the plates, pushing mechanism arranged to engage the ends of the plates and push the same against the stop, and stop withdrawing mechanism controlled from said pushing mechanism.

21. In a matcher, the combination of squaring up mechanism for the sides of the plates, a front movable stop, a movable driven roller, mechanism arranged to move the same to grip the pack, and connections therefrom for simultaneously withdrawing the stop.

22. In a matcher, the combination of squaring up means for the sides of the pack, a movable stop, a movable feeding out roller, mechanism actuated by the pack for moving the roller to grip the pack, and connections for simultaneously withdrawing the stop.

23. In a matcher, the combination of a movable stop, a pusher arranged to engage the plates, a feeding out roller, mechanism actuated by the movement of the pack for causing said feeding out roller to grip the pack, and connections for simultaneously withdrawing the stop.

24. In a matcher, the combination of a movable stop, pushing mechanism arranged to engage the plates and push the same against said stop, a movable gripping roller,

mechanism for moving the same to grip the pack and simultaneously withdraw the stop, and means controlled by the pack for actuating said moving mechanism.

25. In a matcher, the combination of movable side matching means, pushing mechanism for engaging the rear ends of the plates and matching the same, a movable feeding out roller, mechanism for moving the same to grip the pack, means controlled by the plates entering the matcher for controlling the side matching means and actuating the end pushing mechanism, means controlled by the pushing of the pack for actuating the roller moving mechanism, and means controlled by the pack leaving the matcher for returning the pushing mechanism and roller moving mechanism to normal position.

26. In a matcher, the combination of a frame arranged to receive the plates one on the other, feeding in mechanism, side squaring mechanism, feeding out mechanism, and controlling means arranged to actuate said mechanisms in sequence.

27. In a matcher, the combination of a table for receiving the plates one on the other, squaring up mechanism for the sides of the plates, squaring up mechanism for the ends of the plates, mechanism for feeding the squared up pack out of the matcher, and a controller arranged to actuate said mechanisms in sequence.

In testimony whereof, we the said PERCY E. DONNER and MILTON W. HOGLE have hereunto set our hands.

PERCY E. DONNER.
MILTON W. HOGLE.

Witnesses:
ROBERT C. TOTTEN,
J. R. KELLER.