

956,951.

M. DRACHMANN.
COPYING MACHINE.
APPLICATION FILED OCT. 15, 1909.

Patented May 3, 1910.
5 SHEETS—SHEET 1.

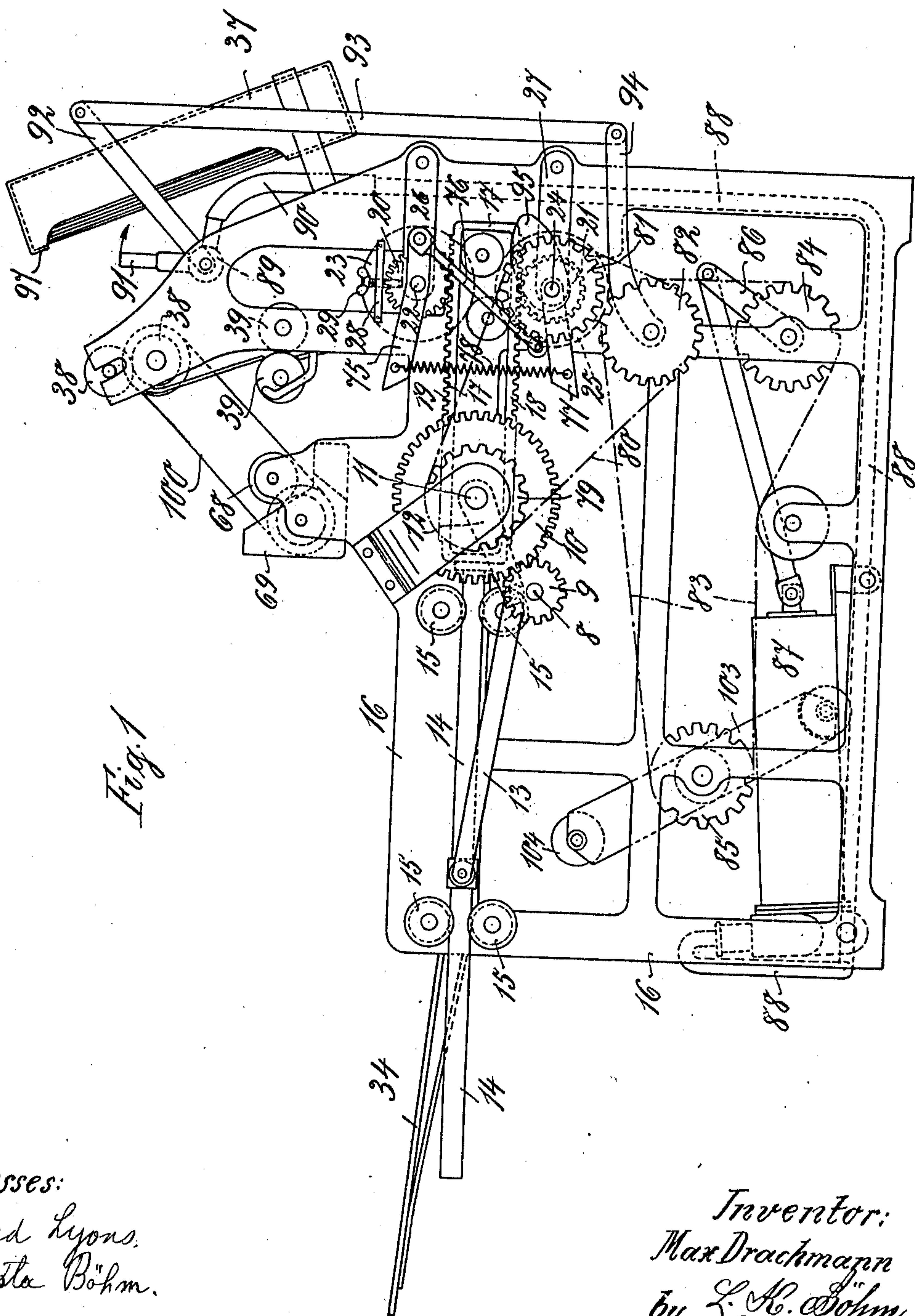


Fig. 1

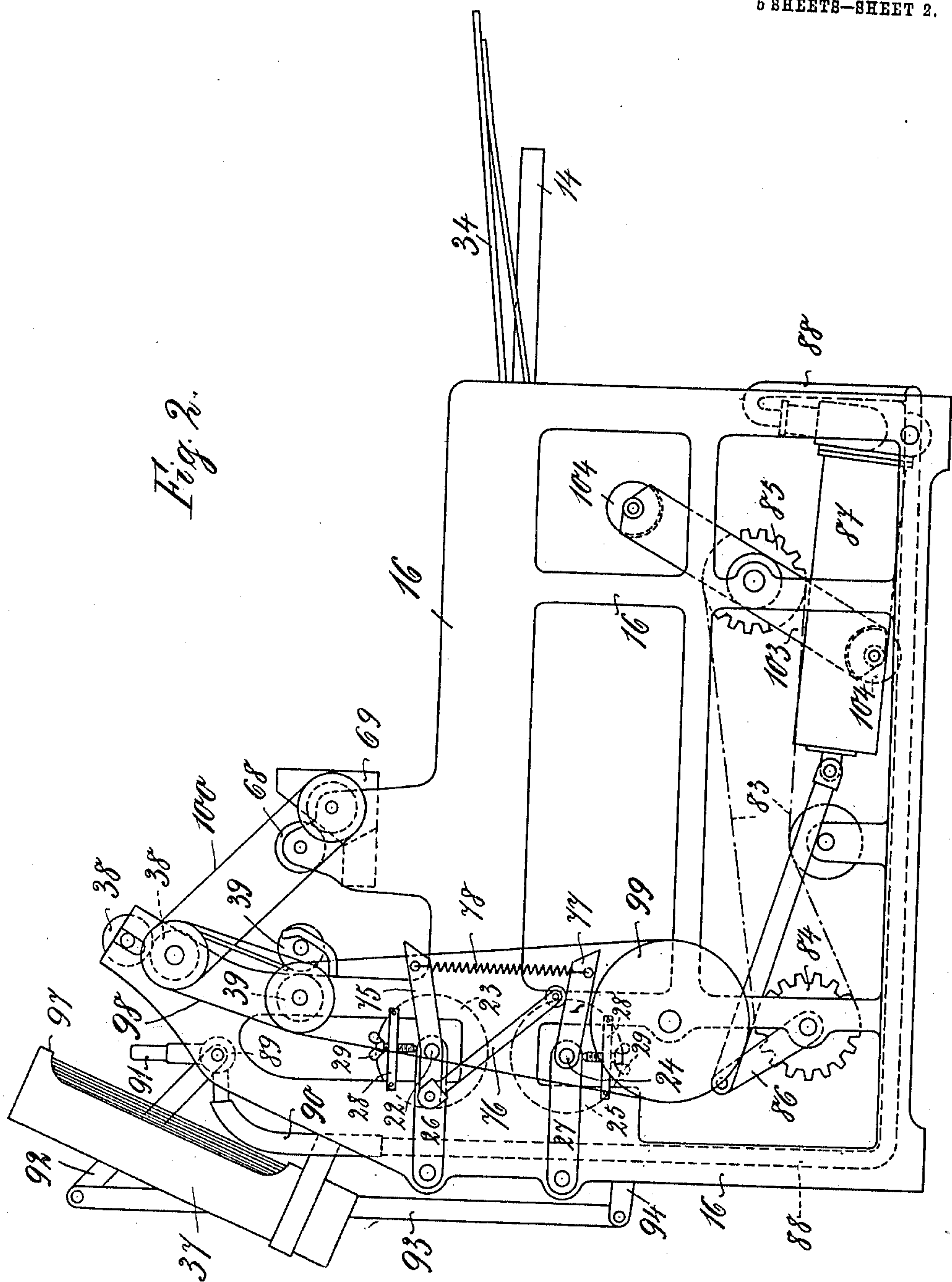
Witnesses:
Alfred Lyons.
Augusta Böhm.

Inventor:
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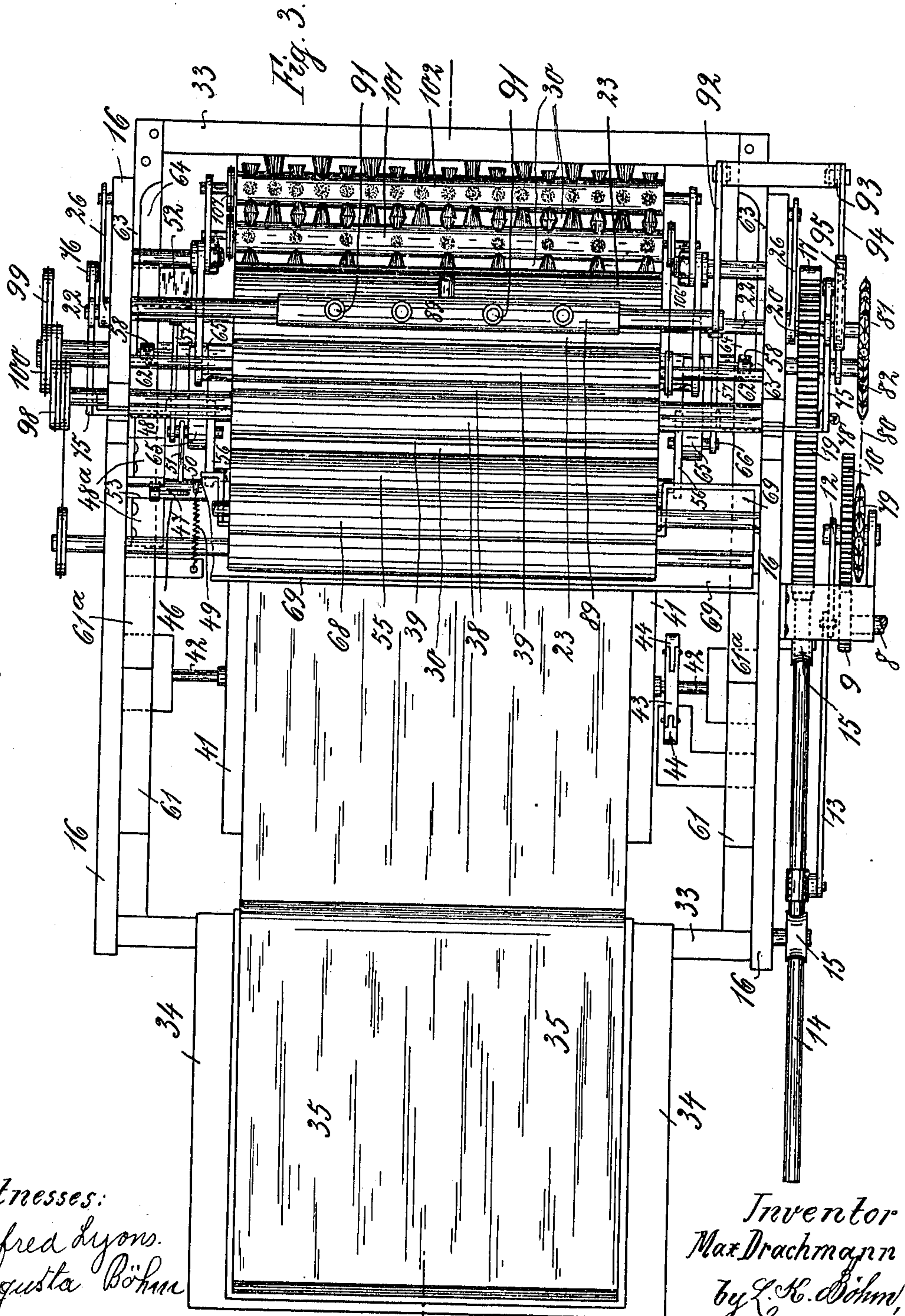
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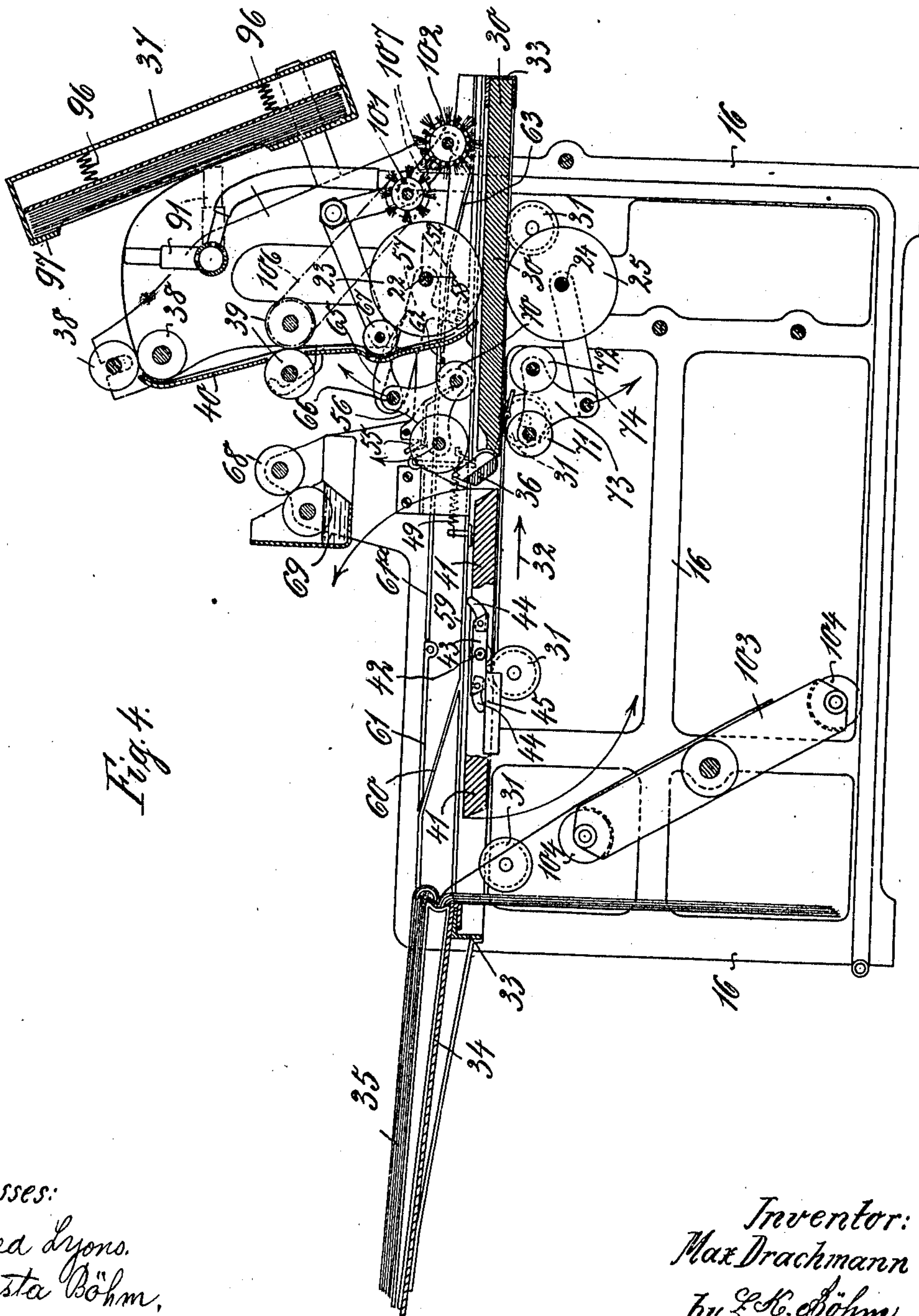


Fig. 4.

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5 SHEETS—SHEET 5.

Fig. 5

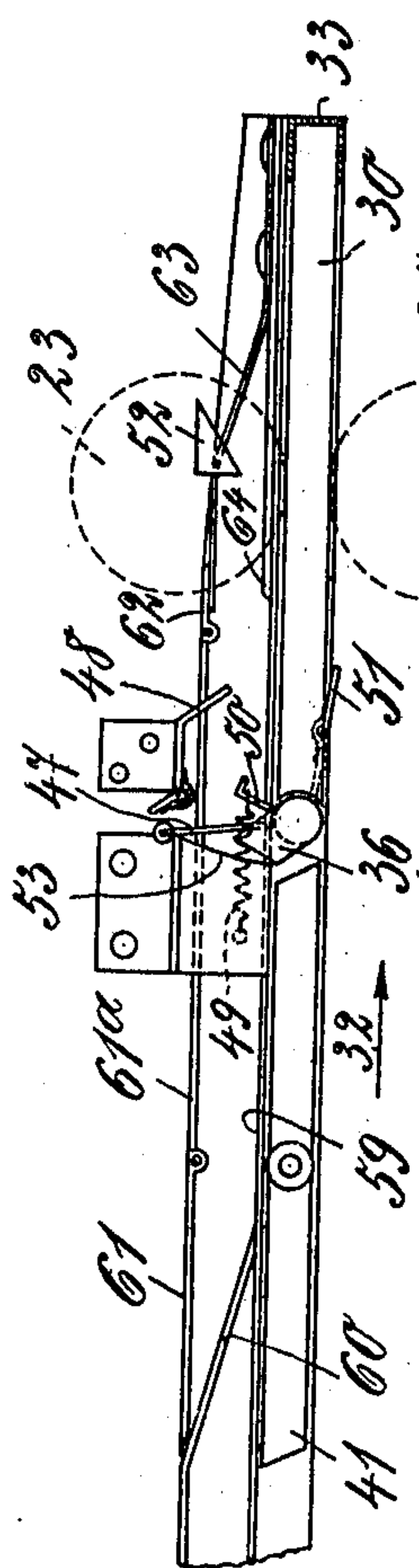


Fig. 6

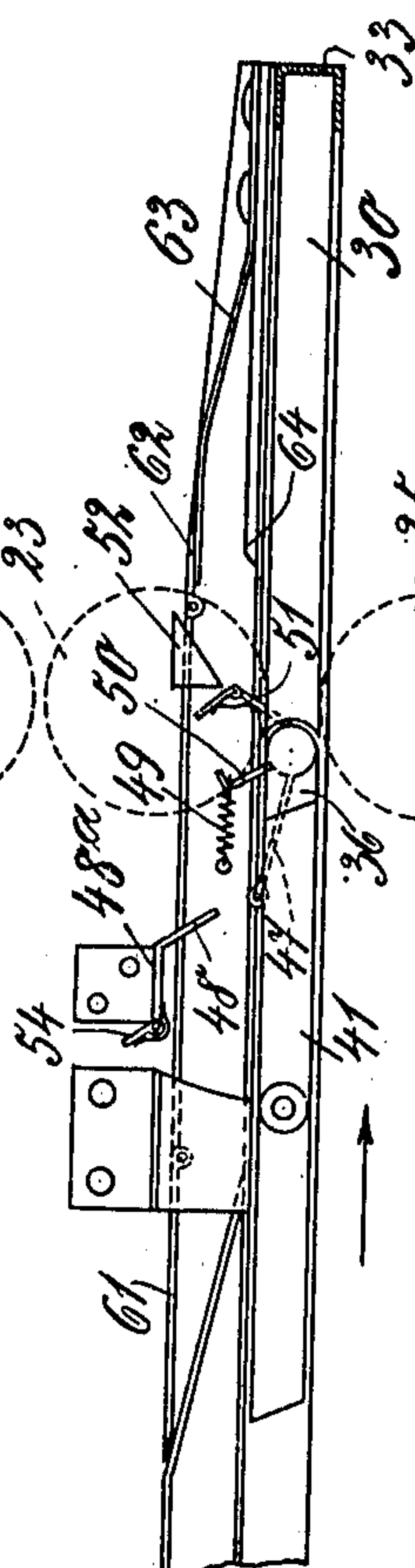
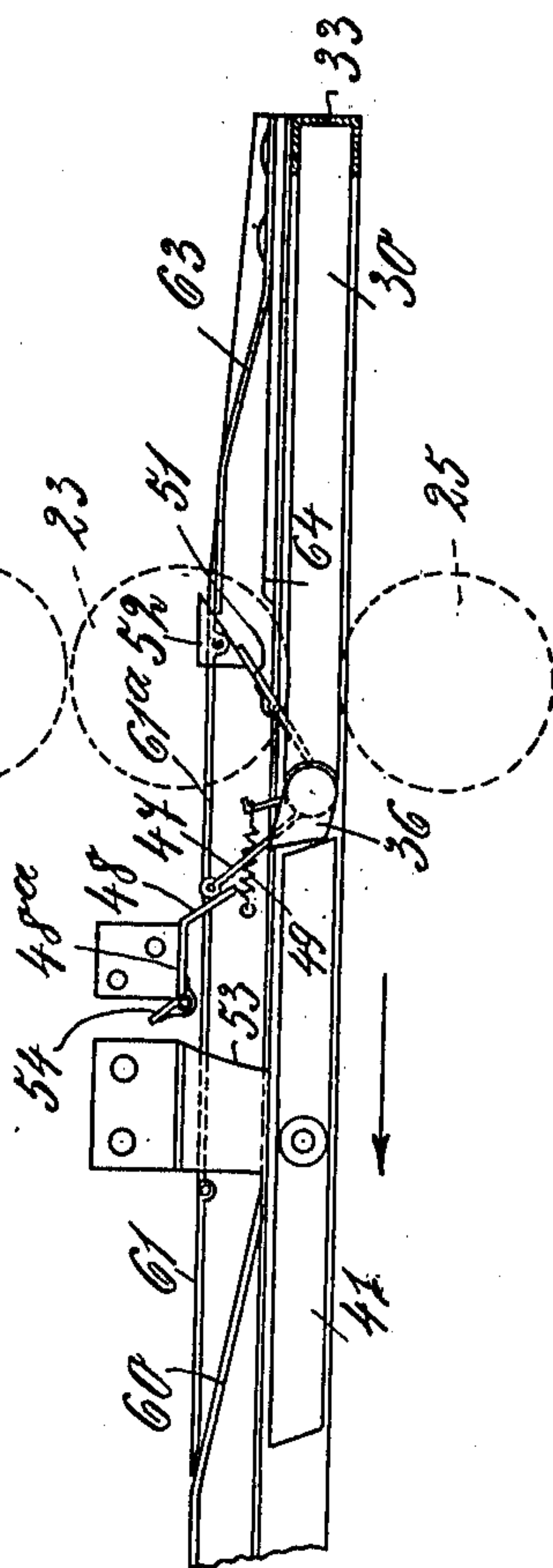


Fig. 7



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UNITED STATES PATENT OFFICE.

MAX DRACHMANN, OF BERLIN, GERMANY.

COPYING-MACHINE.

956,951.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed October 15, 1909. Serial No. 522,721.

To all whom it may concern:

Be it known that I, MAX DRACHMANN, of 40 and 41 Rosenthalerstrasse, Berlin, Germany, engineer, a citizen of the German Empire, have invented certain new and useful Improvements in Copying-Machines, of which the following is a specification.

This invention relates to copying machines and has for its object to provide an improved copying machine capable of copying letters and the like directly into bound copying books.

The improved machine is also capable of copying on loose sheets and roll paper.

For copying on paper which is not suitable for dry copying and which must therefore be wetted, the improved machine may comprise a wetting apparatus for wetting the separate leaves of a copying book. It may also comprise a drying apparatus for drying the leaves of a copying book as soon as possible after copying.

To enable the improved machine to copy as rapidly and accurately as possible, it may be provided with an apparatus to convey the documents to be copied one by one to the copying place, and, after they are copied to lay them into a basket or other receptacle.

The chief feature of the improved machine consists in a plate upon which each leaf of copying paper is laid, separately. This plate together with the leaf of copying paper and the document to be copied placed thereon, is passed to-and-fro between two rolls. The plate is then turned through an angle of 180 degrees about a central axle, and thereby throws off the leaf of copying paper lying on it so that this leaf is laid against the other already copied leaves of the copying book. The copying on the next leaf then takes place on the other side of the plate so that the two sides of the plate come in operation alternately one after the other.

One construction of the improved copying machine is illustrated by way of example in the accompanying drawings in which:

Figure 1 is a side view of a copying machine constructed according to the present invention. Fig. 2 is a side view looking from the opposite side to that shown in Fig. 1. Fig. 3 is a plan of the machine. Fig. 4 is a vertical section through the machine. Figs. 5, 6, 7 are detail views showing the

operating parts of the holding grip for the paper in various positions.

In carrying the invention into effect according to the form illustrated, the shaft 8 is driven by any suitable means such as a motor or a crank. On the shaft 8 there is fixed a pinion 9 gearing with a toothed wheel 10. The toothed wheel 10 is fixed on a shaft 11 which also carries a crank 12. To the crank 12 there is articulated a connecting rod 13 which is pivotally connected at its other end to a rod 14 which is guided between rollers 15, supported in the frame 16 of the machine. In Fig. 1 it will be seen that the rod 14 is at its righthand end expanded into a rectangular frame 17 having teeth 18 and 19 on its longer sides. The teeth 19 gear with a pinion 20 while the teeth 18 gear with a pinion 21. The pinion 20 is fixed to the shaft 22 which carries the press roller 23. The pinion 21 is fixed to the shaft 24 which carries the press roller 25. The shafts 22 and 24 are supported in levers 26 and 27 respectively and means are provided for applying pressure to those levers so as to adjust the pressure applied by the press rollers 23 and 25. In Fig. 1 this pressure adjusting arrangement is clearly to be seen as applied to the lever 26. The other machine parts illustrated cover the pressure adjusting device for the lever 27. The device itself consists simply of a bridge 28 fixed to the frame 16 and a screw 29 adapted to engage in said bridge 28 and press the lever 26.

The rollers 23 and 25 as can be seen in Fig. 1 do not contact with one another. In Fig. 4 it will be seen that between the rollers 23 and 25 there is a member 30. The member 30 is a table guided between the side frames of the machine and supported on rollers 31. The table 30 is free to move back- and forward in the direction of the arrow 32 in Fig. 4. The reciprocating motion of the table is effected by the frictional engagement of the rollers 23 and 25 with the same.

It will be seen that when the driving shaft 8 is rotated the crank 12 is also rotated and thereby the rod 14 is caused to reciprocate. When the rod 14 reciprocates the rollers 23 and 25 are caused to rotate back- and forward through a certain angle. This rotational movement of the rollers 23 and 25

causes the table 30 to reciprocate in a similar manner to the rod 14.

The frame 33 of the table 30 supports a rack 34 on which a bound book of copying paper 35 may be supported.

When it is desired to effect copying a sheet of copying paper from the book 35 is laid on the table 30. The machine is then set in operation and thereby the table 30 moves in the direction of the arrow 32. In the first part of this motion a movable catch 36 is caused to fall down (in Fig. 4) so as to grip the edge of the sheet of copying paper and hold it to the table. Simultaneously with this operation a letter is drawn in the manner hereinafter described from a holder 37 and guided by means of rollers 38, 38, 39, 39, and guide plate 40 beneath the roller 23. It will be seen that the sheet of copying paper and the letter to be copied on to the copying paper pass together between the roller 23 and the table 30. On the return stroke of the table 30, the letter having been removed in a manner hereinafter described, the table with the sheet of copying paper passes into the position illustrated in Fig. 4 and the catch 36 is again opened in the manner hereinafter described.

The part 41 of the table 30 on which the sheet of copying paper is laid is rotatable about an axis 42. On the axle 42 there is fixed a lever 43 having knuckle pieces 44 pivoted thereto. When the table 30 moves from right to left (in Fig. 4), the left-hand knuckle piece 44 moves under a fixed ledge 45. In this way the rotatable table 41 is caused to rotate through 180 degrees. In this way the sheet of copying paper is, after the copying operation, thrown off from the table 41 and laid against the other sheets of the book. The side of the rotatable table 41 formerly facing downward is now facing upward and the machine is in position for recommencing the cycle of operations described.

I shall now describe the mechanism for closing and opening the catch 36. The catch 36 extends over the entire width of the table and is pivoted to the frame 33 at 46. To the pivot of the catch 36 there is fixed an arm 47 (see Figs. 5-7). The arm 47 is provided at its end with a roller adapted to engage with a fixed projecting ledge 48. The projecting ledge 48 is fixed to the side frame 16 of the machine, whereas the arm 47 is carried back- and forward with the table 30. The catch 36 is normally held closed by means of a spring 49 engaging an arm 50 fixed to the pivot of the catch 36. A third arm 51 fixed to the pivot of the catch 36 is hinged at its center and is adapted to co-act with a fixed inclined surface 53.

The operation of the mechanism described

will be understood from Figs. 5-7. Fig. 5 shows the parts in the position which they occupy just before the table starts its motion from left to right in Fig. 1. When this motion commences the arm 47 in Fig. 5 slips along the curved surface 53 which retards the closing of the catch 36 under the action of the spring 49. The amount of retardation of course depends upon the inclination of the curve 53. When the copying paper is gripped in the catch 36 the parts assume the position shown in Fig. 6. The motion from left to right (in Fig. 6) continues undisturbed as the upper part of the hinged arm 51 yields to the impact of the fixed stop 52. When the copying has been completed the return motion of the table commences. During this return motion the hinged arm 51 as shown in Fig. 7 strikes against the stop 52. The arm 51 is so arranged that the upper part cannot be deflected in a clockwise direction from the position illustrated in Fig. 7. The result is that when the table continues its motion from right to left (in Fig. 7), the catch 36 is raised and at the same time the arm 47 is also raised so that its roller is lifted on to the inclined surface 48. The roller of the arm 47 then rides on a horizontal part of the projection 48^a and over a spring held trap 54 on the ledge 48^a. The roller of the arm 47 passes over the trap 54 and the trap immediately springs upward again into the position shown in Fig. 5 so that on the motion of the table from left to right the arm 47 is again free to rotate in a counter-clockwise direction.

Before the copying paper on the rotatable table 41 passes beneath the roller 23 and joins the letter from the holder 37 it is necessary to moisten the paper. This moistening is effected by means of a roller 55. The roller 55 is supported in side levers 56 which in turn are pivoted to side levers 57. The side levers 57 are loosely mounted on the spindle 22 of the roller 23. The lever 57 carries a roller 58 which projects toward the side frame 16 of the machine (see Fig. 3). The roller 58 is adapted to move in the path of a projecting ledge 59 on the side frame 16, see Figs. 3 and 4. The projecting ledge 59 is provided at its extreme lefthand end, as can be seen in Fig. 4, with an inclined part 60, above which there is a hinged trap piece 61. The ledge then continues in a straight line with the trap 61 in Fig. 5, until at the righthand side of said figure a hinged part 62 is reached. The hinged part 62 is normally held in line with the remaining part 61 and 61^a by means of a spring 63, see Figs. 4, 5, 6 and 7.

When the table 30 moves it carries with it its frame 33 and therefore the ledge 59, 60, 61^a. As the ledge 59 moves to the right

from the position shown in Fig. 4, the roller 58 rolls first along the lower ledge 59 and the moistening roller 55 first of all is lowered on to the rotatable table 41 when the roller 58 passes the step 64. When the copying is completed or nearly completed the roller 58 starts to rise on the inclined surface 60. The result is that the lever 57 is oscillated in the direction of the arrow near the numeral 65 shown in Fig. 4. In the meantime the rotatable trap piece 61 rises and allows the roller 58 to come on to the upper ledge 61, 61^a. Before the return motion of the table in the direction of the arrow 32 (in Fig. 4), the trap or door 61 closes. The roller 58 is then riding over the ledge 61^a till it reaches the hinged part 62. The weight of the roller 58 and the parts supported from it causes the hinged parts 62 to descend against the action of the spring 63. The descent of the roller 58 on to the lower ledge is therefore effected without shock.

During the oscillation of the lever 57 in the manner described the lever 56 is also oscillated in a clockwise direction in Fig. 4 and this is effected by a beak-shaped part 65 which is fixed to the pivot 66 of the side levers 56. The beak-shaped piece 65 is adapted to ride on a roller 67. The result is that as the lever 57 is raised on the inclined surface 60 the beak-shaped piece 65 rides on the roller 67 and causes said levers 56 to oscillate in a clock-wise direction about the pivot 66. In consequence the moistening roller 55 is raised upwardly to contact with a wetting roller 68 which is adapted to draw a film of water from a trough 69.

In order that the moistening of the sheet of copying paper may not be excessive a roller 70 conveniently covered with blotting paper is arranged behind the moistening roller 55.

Below the table 30 there are supported two rollers 71 and 72 which are arranged to ride on the other side of the rotatable table 41 during the motion from left to right of the said table in Fig. 4. These rollers are intended to dry the under-surface of the table 41 preparatory to the table being rotated through 180 degrees to receive the next sheet of copying paper. In order to move the rollers upward against the table 41 to effect this drying the brackets 73 on which the rollers 71 and 72 are mounted are carried by side levers 74 which are articulated to move with the lever 57. This is effected by providing the lever 57 with a sleeve passing loosely over the shaft 22 and on this sleeve there is mounted external to the frame 16 (see Fig. 1) a lever 75. The lever 75 is articulated by a connecting rod 76 to a lever 77 which is mounted on the same axis as the lever 74. The levers 75 and 77 are also connected by a spring 78. It will

be seen that when the lever 57 is raised the lever 77 is moved downwardly in Fig. 1, and when the lever 57 is in its lower position and the roller 55 is moistening the copying paper, that the rollers 71 and 72 are raised to bear against the lower side of the table 41. This has the double effect of providing a counter-pressure on the table 41 to counter-act the pressure of the roller 55 and to effect drying of the bottom side of the table 41. It will be seen that the rollers 71 and 72 only contact with the bottom side of the table 41 during the copying movement.

I shall now describe how the letters are taken from the holder 37 and guided to the press roller 23. This is effected by means of air suction. In Fig. 1 it will be seen that co-axially with the toothed wheel 10 there is mounted a chain wheel 79. With this chain wheel there engages a chain indicated by the broken line 80. The chain 80 passes over two wheels 81 and 82. Co-axially with the chain wheel 81 there is another chain wheel with which there engages a chain 83. The chain 83 drives a chain wheel 84 and also the chain wheel 85. Mounted on the spindle of the chain wheel 84 there is a crank 86. The crank 86 is arranged to drive a pump 87. The pump 87 is connected by a pipe 88 with a rotatable pipe 89. A flexible pipe of rubber or the like 90 is provided in a connection to allow the rotation of the pipe 89. To the pipe 89 there are radially fixed a number of open tubes 91 see Fig. 3. The tube 89 has fixed to it a lever 92 adapted to be operated by a connecting rod 93. The lower end of the connecting rod 93 (see Fig. 1) is connected to a lever 94. Mounted to rotate with the chain wheel 81 there is an eccentric organ 95 which is arranged in its rotation to press the lever 94 downward against the action of a spring. The lever 94 is loosely mounted on the spindle of the chain wheel 82 and may be controlled by a spring arranged around the said axis. When the eccentric 95 presses the lever 94 downward the open tubes 91 are rotated clockwise toward the holder 37. The sheets of paper are pressed forward in the holder by means of springs 96. A ledge 97 is provided along the upper edge of the holder 37 to prevent the sheets from falling forward. As the open tubes 91 rotate and come opposite the front sheet in the holder 37, the pump 87 commences its suction stroke and the front sheet in the holder 37 is drawn downward (in Fig. 1), till the upper edge of the paper moves free of the ledge 97. The paper then falls forward and the open tubes 91 commence their return motion under the action of the spring. The sheet of paper sucked by the open tubes 91 is thereby guided between the rollers 38. As can be seen in Fig. 2 the rollers 38 are driven

by means of a flexible cord 98 from the rollers 39. The rollers 39 are in turn driven by a flexible cord from a pulley 99. The method of driving the wetting roller 68 will also be seen from Fig. 2 and consists in a cord 100 taken from the rollers 38. The letter introduced between the rollers 38 is guided by the plate 40 between the rollers 39 and then farther behind the roller 67 to the lower side of the press roller 23.

It will be understood that after the copying operation has been completed by passing the letter and copying sheet below the roller 23 and pressing them together between the said roller and the table 41 that the letter will either tend to adhere to the roller 23 or to the table 41. In order to remove the letter and to deliver it into any convenient receptacle I provide take off rollers 101 and 102. The roller 101 is caused to rotate in the opposite direction to the roller 23 during copying and the roller 102 is also caused to rotate in an opposite direction to the motion of the table. In this way the letter is raised from its contact—either the press roller 23 or the table 41 depending upon which of these two it adheres to.

The required rotation of the take off rollers 101 and 102 which are illustrated as circular brushes is effected by connecting up the roller 101 with an open band 106 to the spindle of the roller 39, while the roller 102 is connected by a cross band 107 with the spindle of the roller 101.

Instead of providing brushes 101 and 102 of course any other convenient form of take off devices may be used.

After the copying operation is completed and the table 41 has thrown off the sheet of copying paper on which a letter has been copied it is advisable to dry the wet sheet and this I propose to effect by means of the heating device 103. The heating device 103 I arrange in the form of a rotary heated casing having rollers 104 at its ends. The rollers 104 are easily rotated and thereby prevent damage to the thin copying paper falling thereon. The rotary heating device is mounted co-axially with the chain wheel 85 and is adapted to receive the sheets of copying paper falling thereon, in the position shown in Fig. 4. The heating device 103 then rotates and throws off the dried sheet of copying paper so that the said dried sheet falls into the vertical position of the already copied sheets shown in Fig. 4.

It will be understood that the machine herein described may be used for various purposes, that is either for copying into a bound book or on separate sheets or a roll of copying paper. It will also be understood that the relative motion of the parts may be produced and arranged in a great variety of ways.

I claim:—

1. In combination in a machine of the type described two press rollers, a slidable frame, a copying table rotatably carried by said slidable frame and adapted to pass between said rollers, means for rotating said table through 180 degrees at the end of each copying process.

2. In combination in a machine of the type described a roller, a rotatable table, means for effecting the rotation, said table and roller being relatively movable, a movable gripping catch on said table for holding a paper sheet to the same and means for operating said gripping catch.

3. In combination in a machine of the type described a frame, a roller rotatably supported in said frame, a rotatable table supported on said frame, means for rotating the table said table and roller being relatively movable, a movable gripping catch on said table for holding a paper sheet to the same, a fixed ledge on the machine frame and means articulated to said gripping catch and co-acting with said fixed ledge for operating said catch as required.

4. In combination in a machine of the type described two rollers, a table movable between said rollers, a movable rack having two rows of teeth thereon and pinions on the spindle of said rollers and engaging in said rack.

5. In combination in a machine of the type described, two rollers, a table free to reciprocate in a tangential path between said rollers, means for pressing said rollers on to said table to fixedly engage the same and means for rotating said rollers backward and forward through a desired angle.

6. In a machine of the type described a paper carrying table, a moistening roller for said paper, said table and moistening roller being relatively movable, a moistening trough, and means for moving the moistening roller into co-action with the moistening trough during one part of the relative movement of the moistening roller and the table and for moving the moistening roller into co-action with the table during another part of the said relative movement.

7. In combination in a machine of the type described a reciprocating table, a moistening roller movably mounted, a moistening trough and means for bringing said moistening roller into co-action with said trough during motion of the table in one direction and for bringing said moistening roller into co-action with the table during the motion of the same in the other direction.

8. In combination in a machine of the type described a reciprocating table, a moistening roller movably mounted, a moistening trough, a frame carrying said mentioned parts, a lever on which said moistening roller

is carried, a fixed ledge on the machine frame, said ledge being shaped and arranged to co-act with the lever carrying the moistening roller to bring the said roller into co-action
5 with said moistening trough during motion of the table in one direction and for bringing said moistening roller into co-action with the table during the motion of the same in the other direction.

10 9. In combination in a machine of the type described a moistening roller, levers on which said roller is mounted, further levers to which said roller carrying levers are pivotally attached, means for oscillating said last mentioned levers and means at-
15 tached to said first mentioned levers for causing the same to oscillate when the second mentioned levers are oscillated.

20 10. In combination in a machine of the type described a press roller, a rotatable table co-acting with said press roller, means for rotating the table a moistening roller co-acting with said table on one side and a drying roller co-acting with said table on the other side.

25 11. In combination in a machine of the type described a press roller, a rotatable table co-acting with said press roller, means for rotating the table, a moistening roller co-acting with said table on one side and a
30 drying roller co-acting with said table on the other side, and means for moving said drying roller toward and away from contact with the table as desired.

35 12. In a machine for copying letters and the like on to copying paper, a press roll, a table on which the copying paper is laid, means for moistening the copying paper before passing it through the press roll and
40 a heating device with which said paper comes into co-action subsequent to its pass through the press.

45 13. In a machine for copying letters and the like on to sheets of copying paper, a press roll, a table on which the sheets of copying paper are to be laid, means for moistening the copying paper before pass-
50 ing it through the press roll, a rotatable heating plate for receiving and throwing off the copying paper-sheets subsequent to the copying process and means for rotating said heating plate.

14. In a machine for copying letters and the like on to sheets of copying paper, a press roll, a table on which the sheets of

copying paper are adapted to be laid, means for moistening the copying paper before passing it through the press roll, a rota-
table heating plate for receiving and throw- 60 ing off the copying paper-sheets subsequent to the copying process, and easily rotatable rollers on the ends of said heating plate.

15. In a machine of the type described a holder for letters or the like to be copied, a series of tubes rotatably mounted, a suction
65 pump with means for operating same adapted to draw through said tubes, a pair of guide rollers, and means for rotating said tubes to suck a sheet from said holder and enter the said sheet between said guide
70 rollers.

16. In a machine of the type described, a holder for letters or the like to be copied, an overlapping ledge on said holder, a series
75 of tubes rotatably mounted, a suction pump with means for operating same adapted to draw through said tubes, a pair of guide rollers, and means for rotating said tubes to suck a sheet from said holder, move it down-
80 ward free of the ledge and then carry the sheet over to enter the same between the guide rolls.

17. In a machine for copying letters, a press roller, a table between which and the
85 press roller the letters to be copied are introduced, means for moving the table, and rotatable members contacting with the press roller and table, the said rotatable members being rotated in an opposite direction to
90 the motion of the paper to lift the said paper from the roller or the table and guide it to a desired exit point.

18. In combination, a book holder, a table on which the leaves of the book in said
95 holder may successively be brought to rest, a press roller, said table and roller being relatively movable, means for guiding let-
100 ters or the like to be copied to said table and roller, means for moistening the leaf of the book lying on the table, means for rotating the table to displace the leaf after the said leaf and letter have passed through the press roller.

In witness whereof I have hereunto set my hand in the presence of two witnesses. 105

MAX DRACHMANN.

Witnesses:

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HENRY HASPER.