L. E. MORRISON.

PRINTING MACHINE.

APPLICATION FILED JAN. 2, 1907.

993,612.

Patented May 30, 1911.

8 SHEETS—SHEET 1.

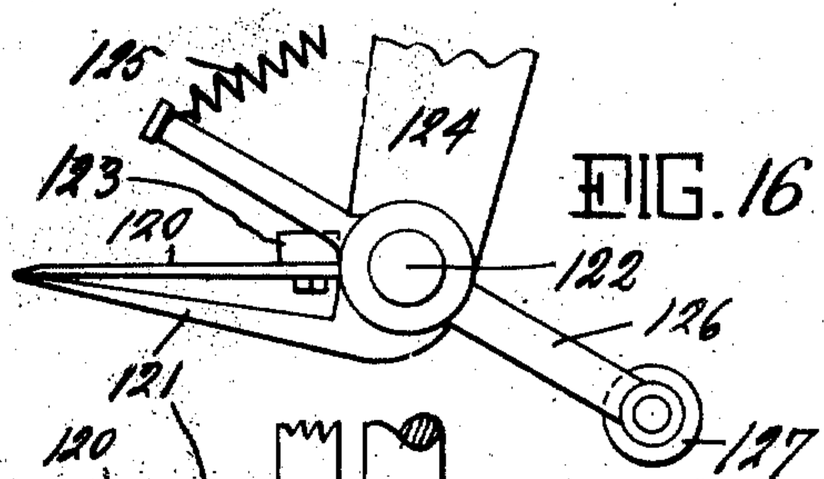

FIG. 16

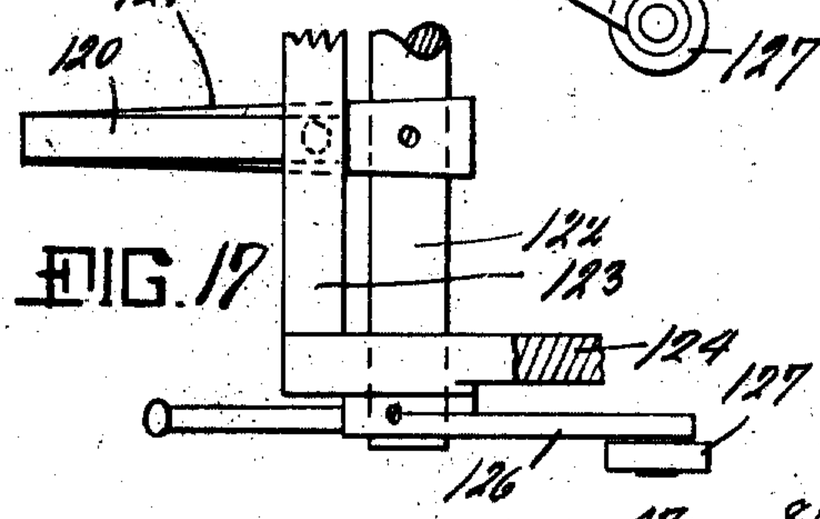

FIG. 17

FIG. 1

WITNESSES

C. Konigsberg.

E. Nicol

Lewis E. Morrison INVENTOR

BY Evan E. A. Konigsberg

ATTORNEY

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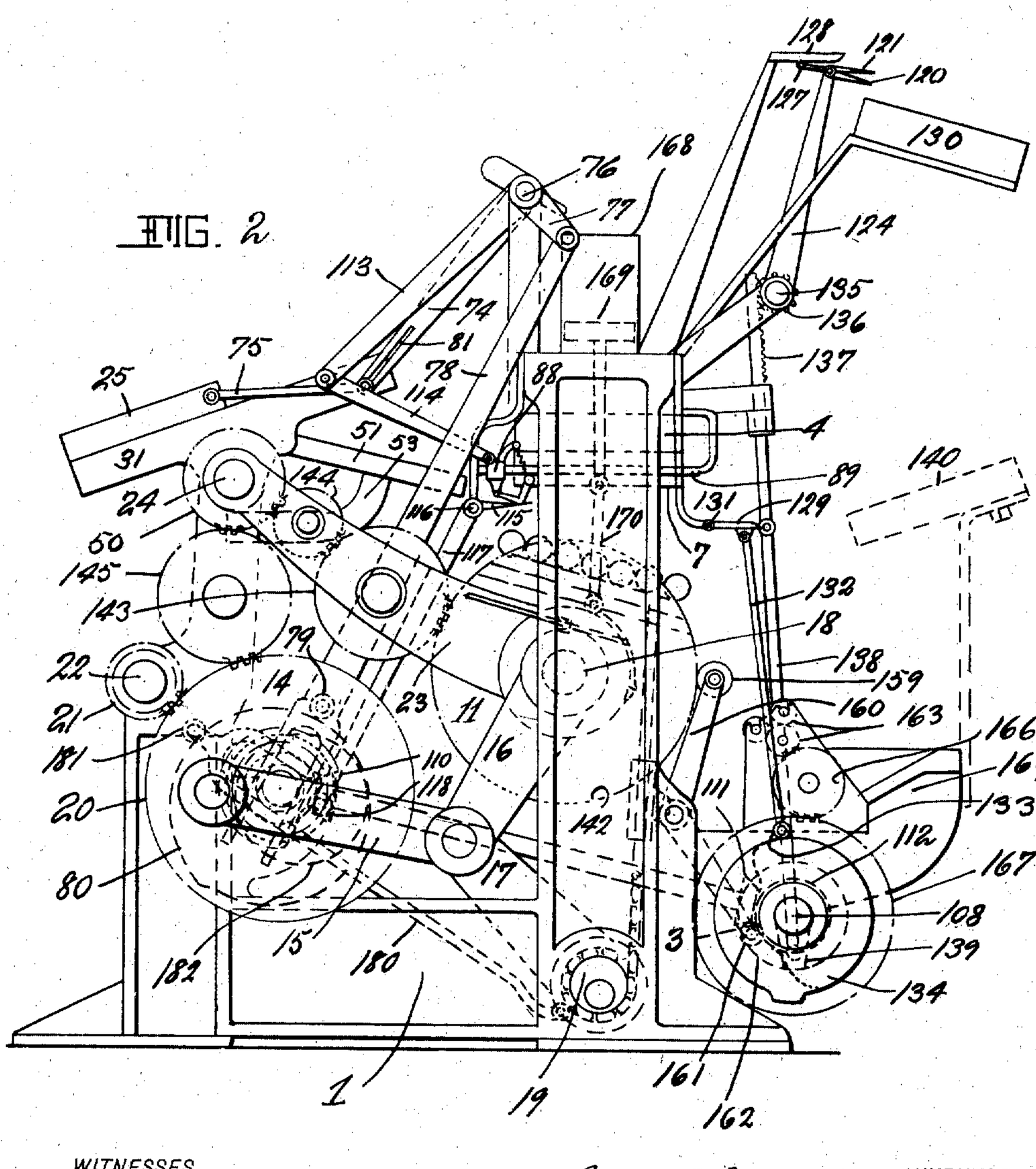
8 SHEETS—SHEET 2.

FIG. 2



WITNESSES

C. Konigsberg

E. Nicol

Lewis E. Morrison INVENTOR

BY

Ivan E. A. Konigsberg

ATTORNEY

L. E. MORRISON.

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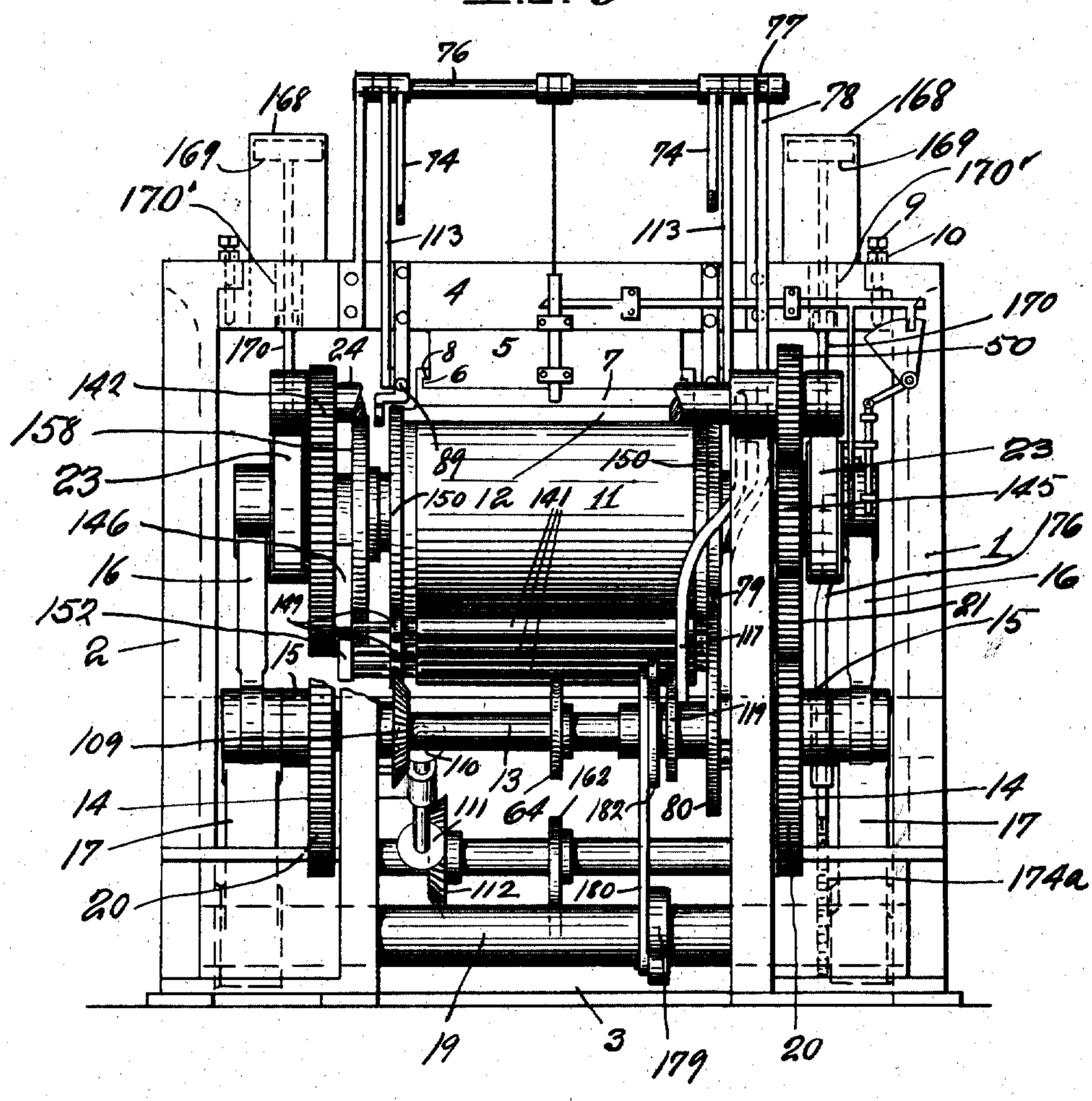
8 SHEETS—SHEET 3.

FIG. 3



WITNESSES

C. Konigsberg.

E. Nicol.

Lewis E. Morrison INVENTOR

BY Konigsberg

Evans E. A. ATTORNEY

L. E. MORRISON.

PRINTING MACHINE.

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8 SHEETS—SHEET 4.

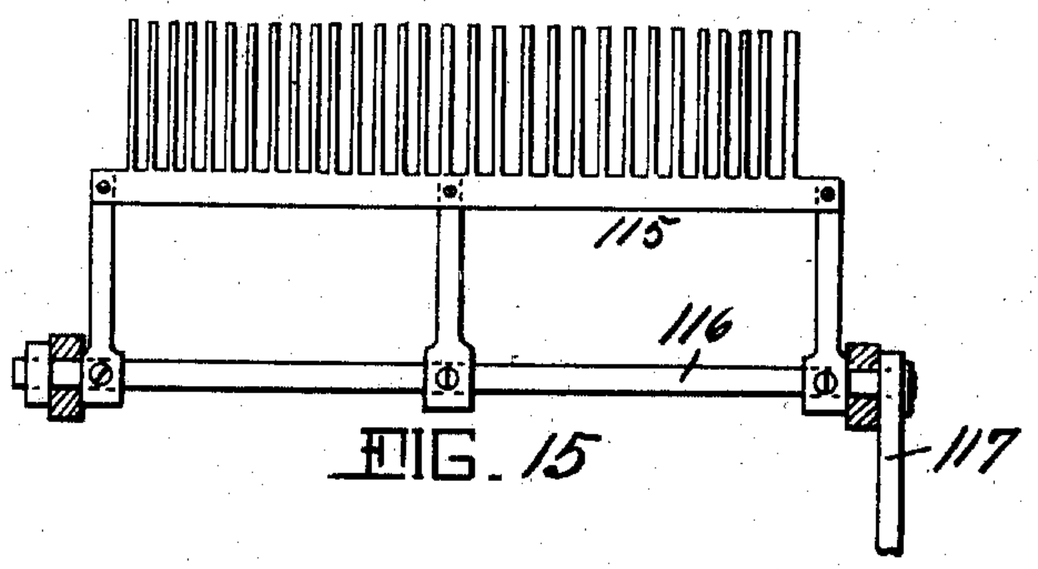
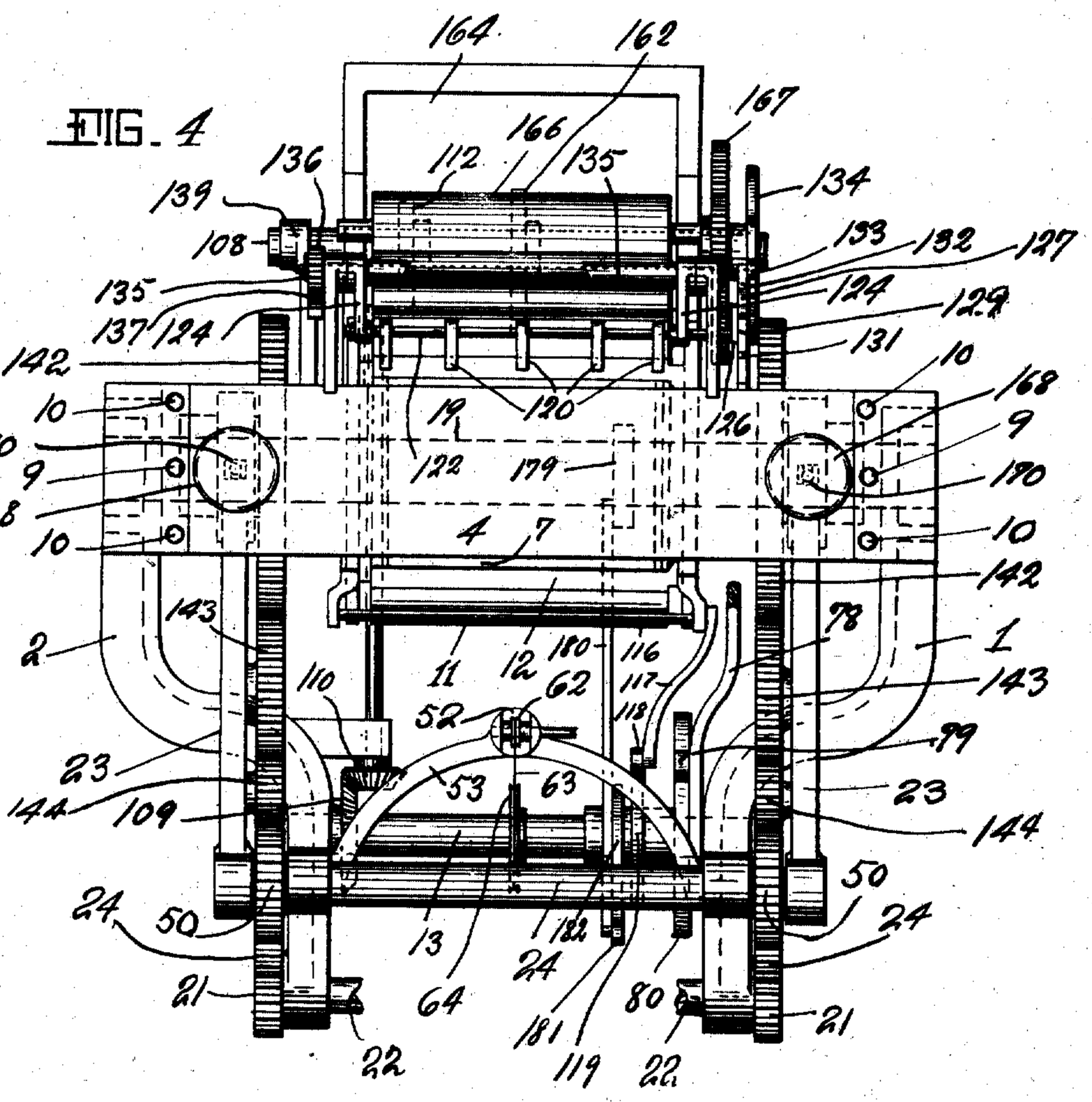


FIG. 15

FIG. 4



WITNESSES

C. Konigsberg

E. Nicol

Lewis E. Morrison INVENTOR

Evan E. A. Konigsberg

ATTORNEY

L. E. MORRISON.

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8 SHEETS—SHEET 5.

FIG. 5

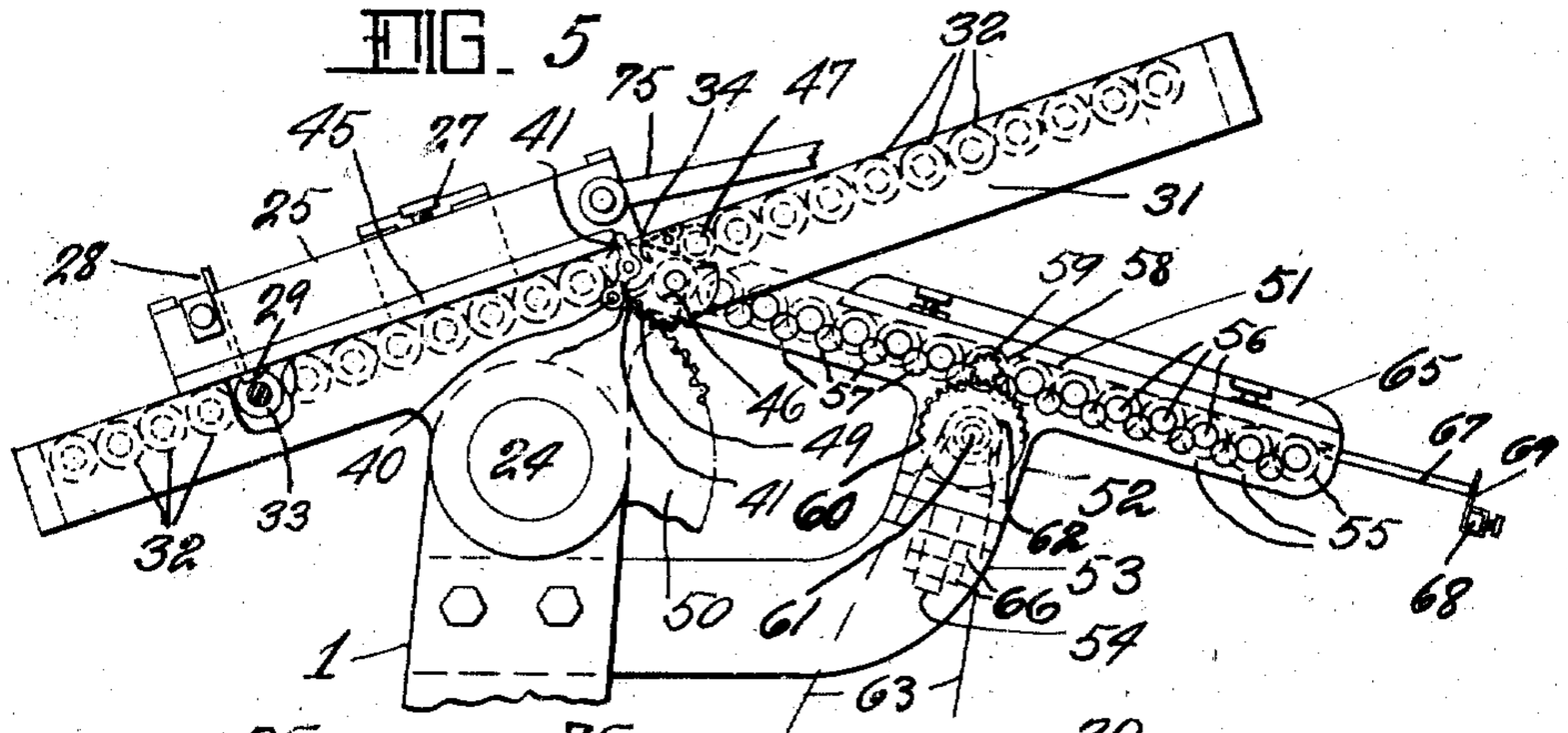
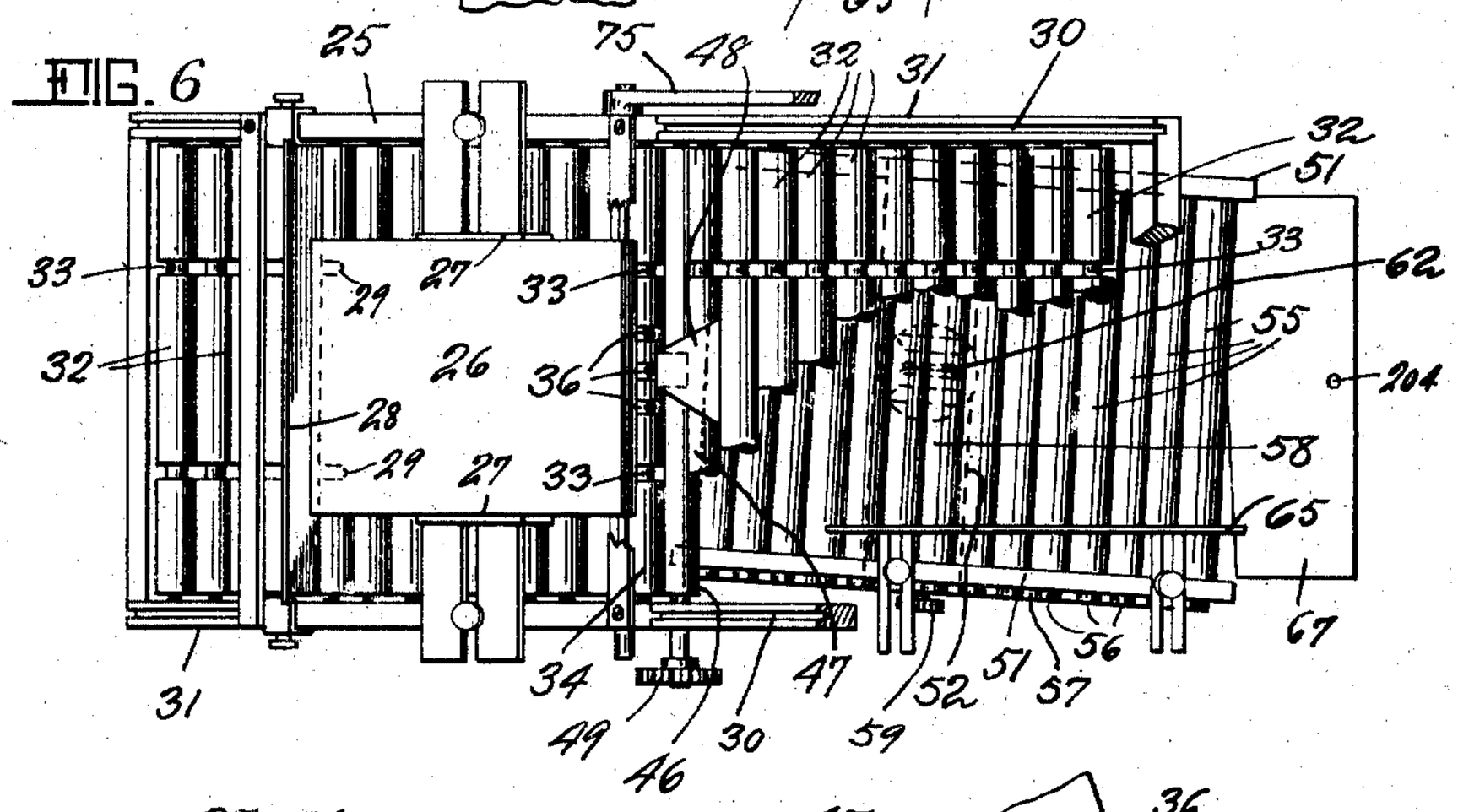


FIG. 6



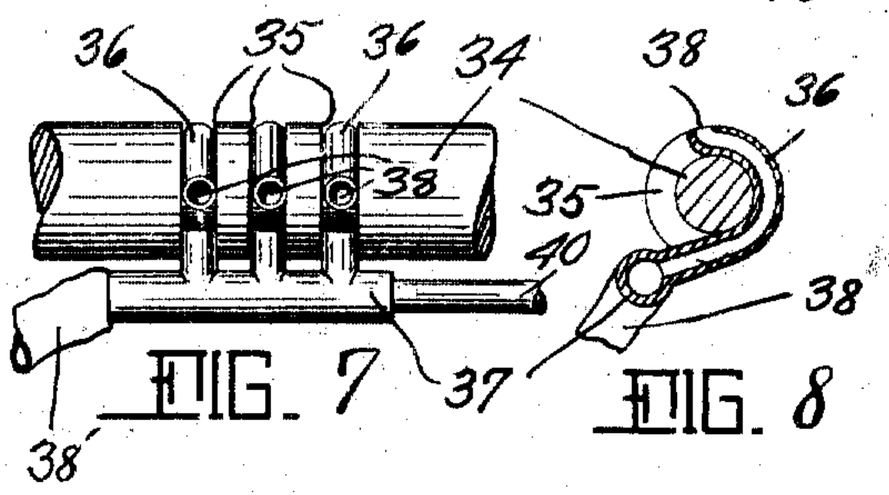


FIG. 7

FIG. 8

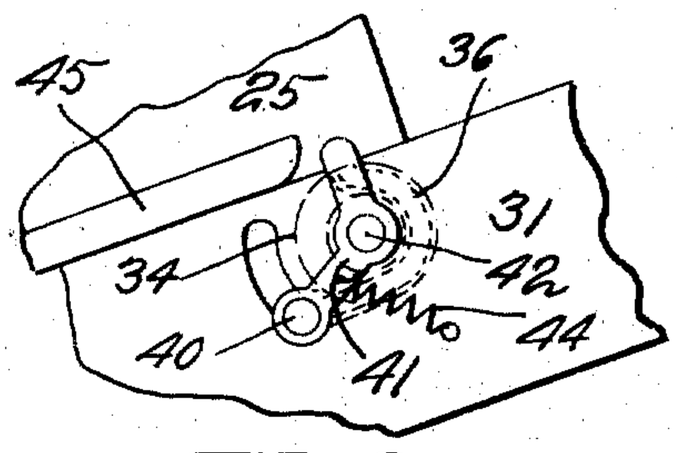


FIG. 9

Witnesses
C. Konigsberg
E. Nicoll

Lewis E. Morrison Inventor

By his Attorney
Chas E. A. Konigsberg.

L. E. MORRISON.

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8 SHEETS—SHEET 6.

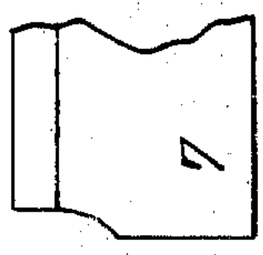


FIG. 10

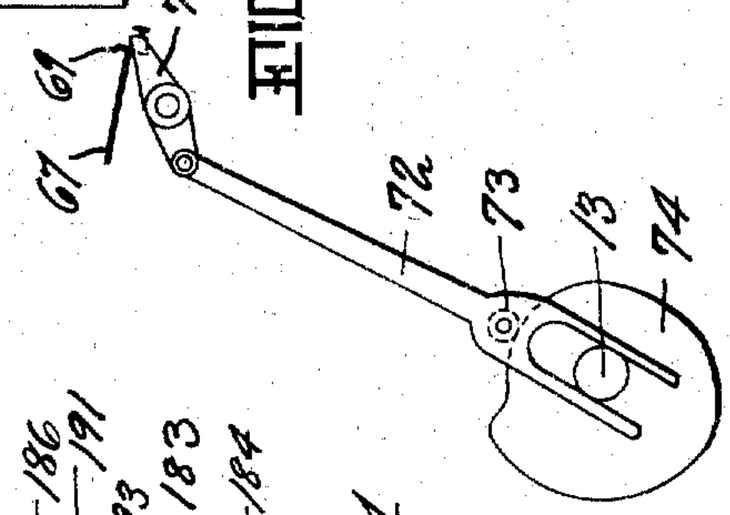


FIG. 11

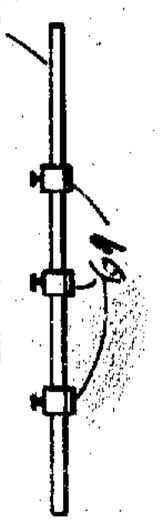


FIG. 26

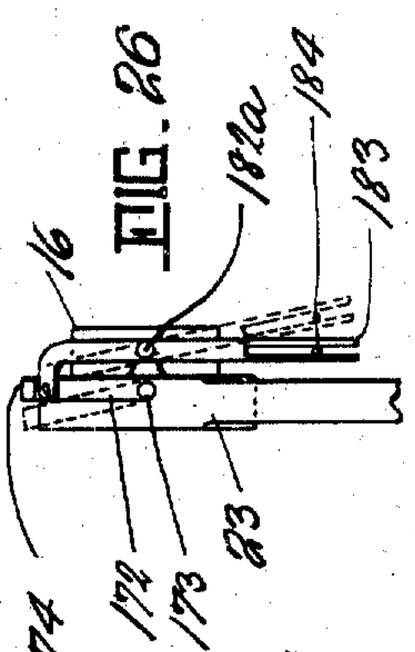


FIG. 25

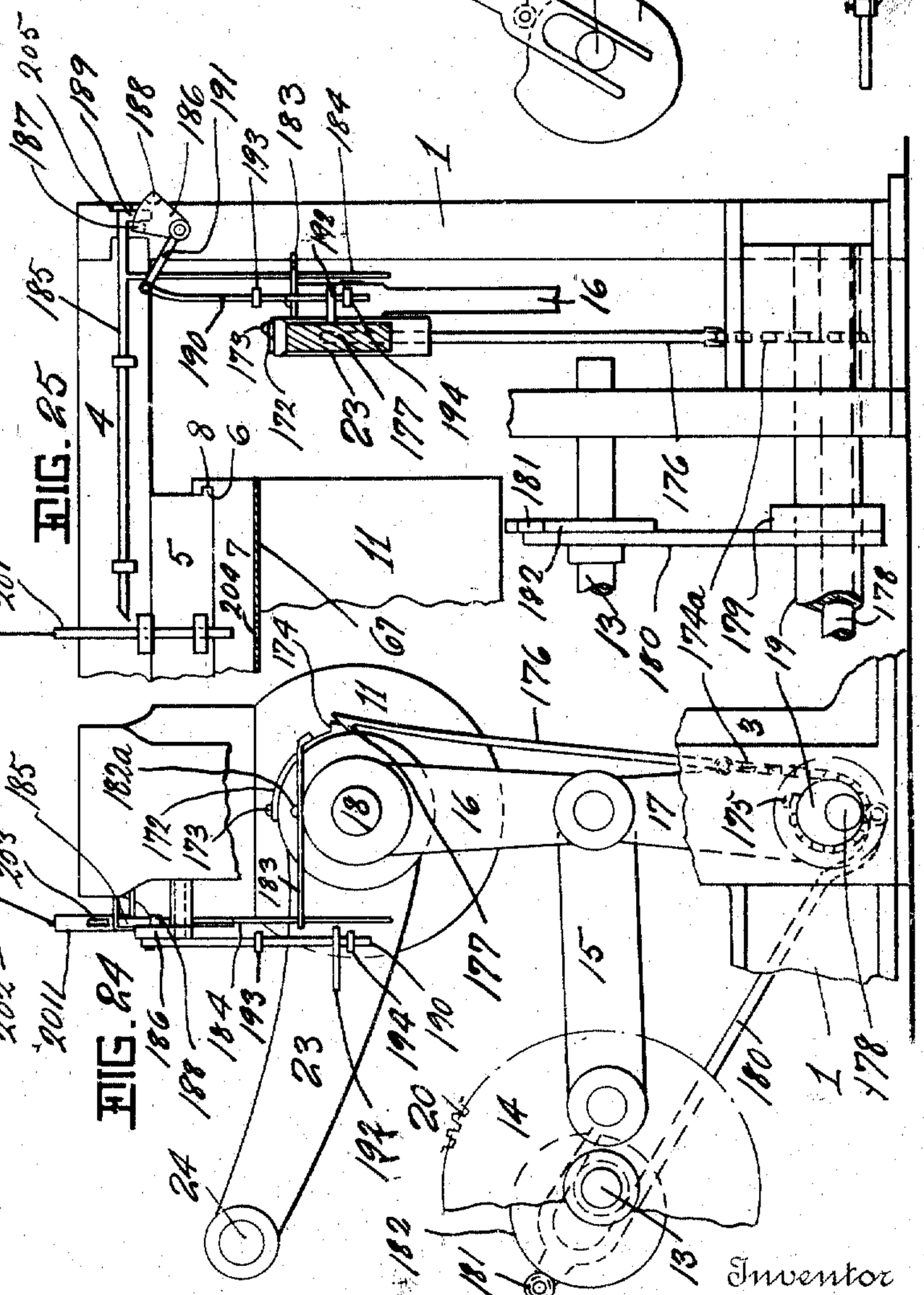


FIG. 24

Witnesses
C. Konigsberg.
E. Nicoll

Inventor
Lewis E. Morrison
By his Attorney
Ivan E. A. Konigsberg.

993,612.

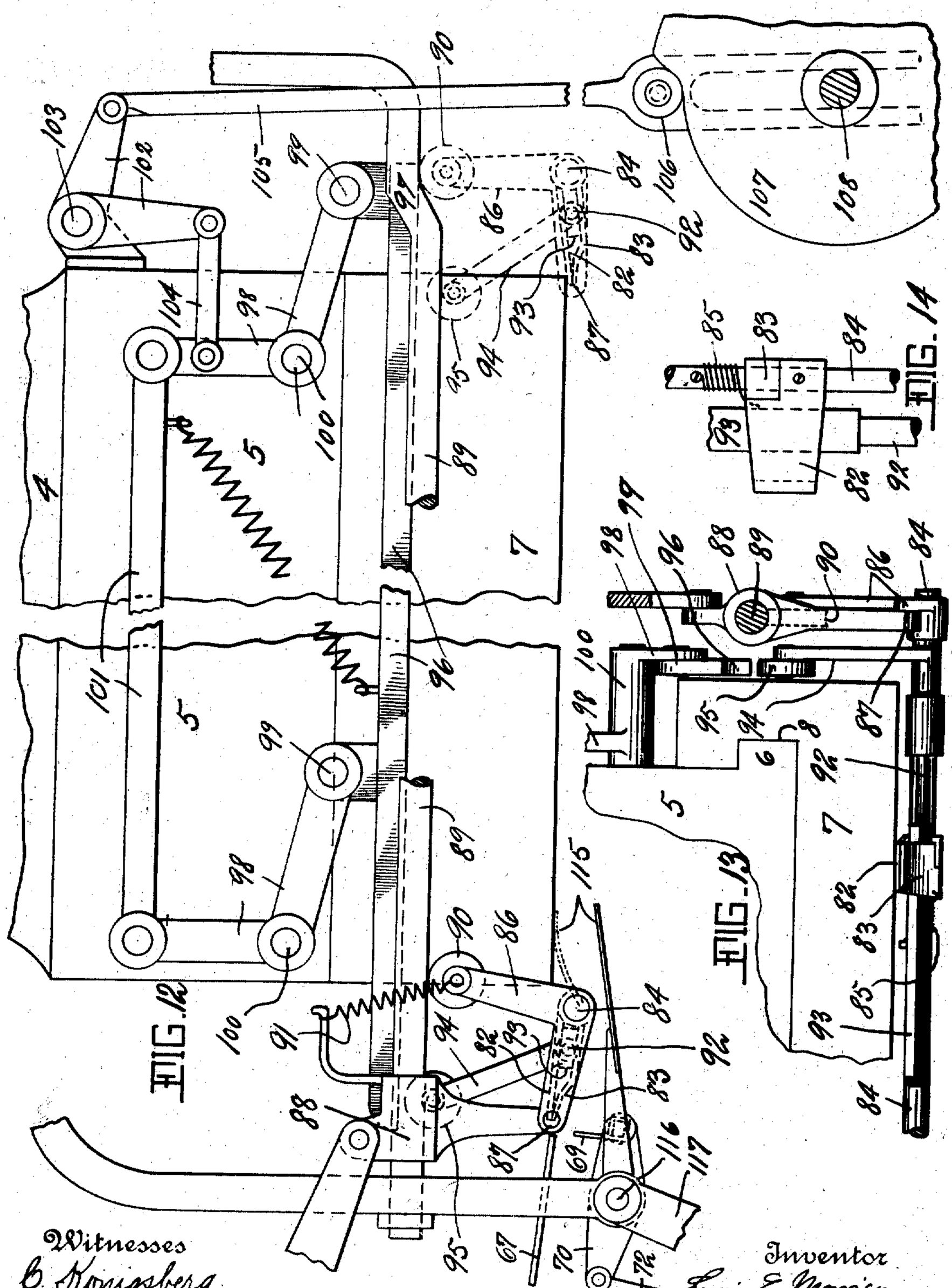
L. E. MORRISON.

PRINTING MACHINE.

APPLICATION FILED JAN. 2, 1907.

Patented May 30, 1911.

8 SHEETS—SHEET 7.



Witnesses

B. Konigsberg.

E. Nicol.

Inventor

Louis E. Morrison

By his Attorney

Frank A. Konigsberg

L. E. MORRISON.

PRINTING MACHINE.

APPLICATION FILED JAN. 2, 1907.

993,612.

Patented May 30, 1911.

8 SHEETS—SHEET 8.

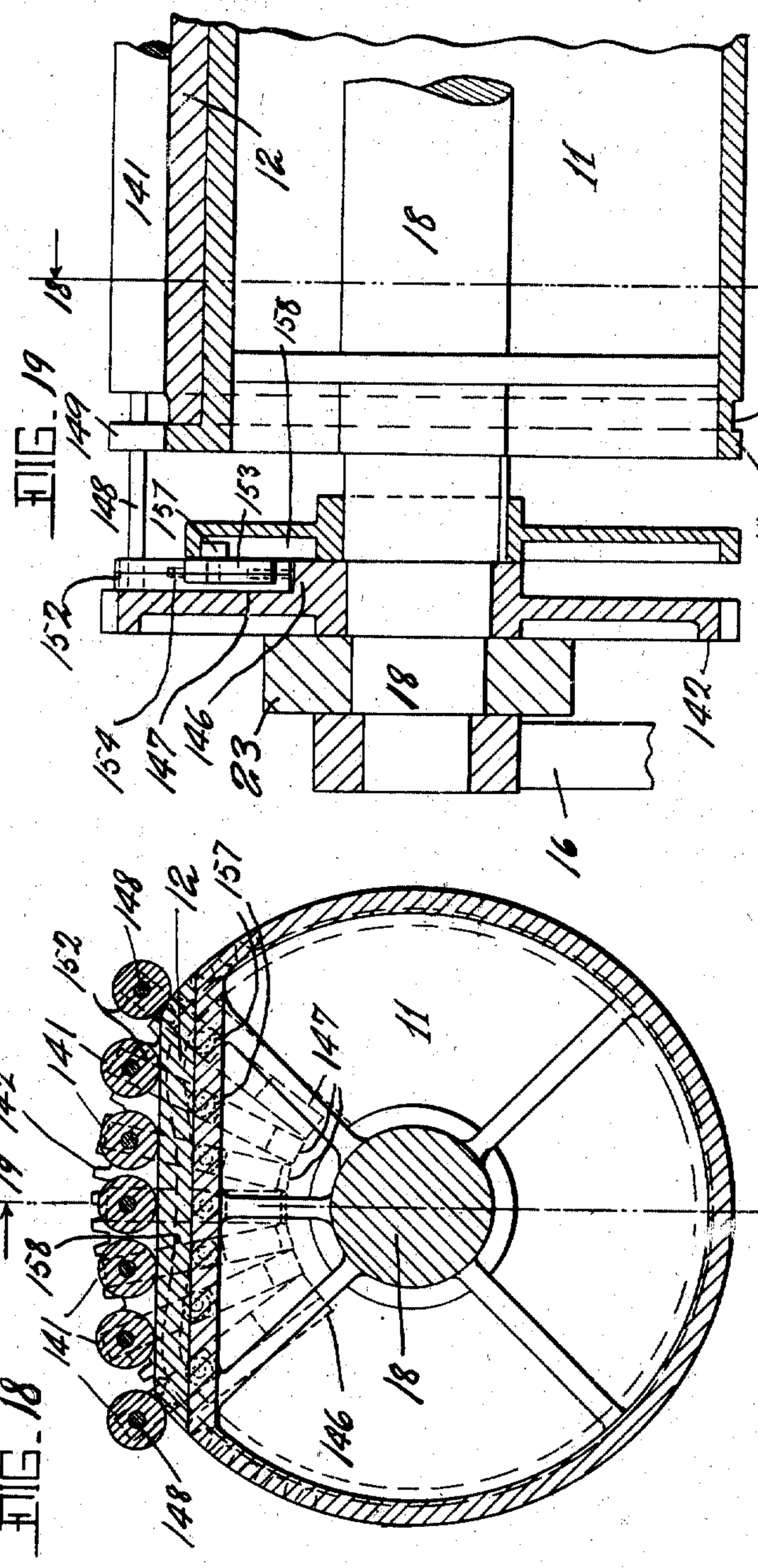


FIG. 19

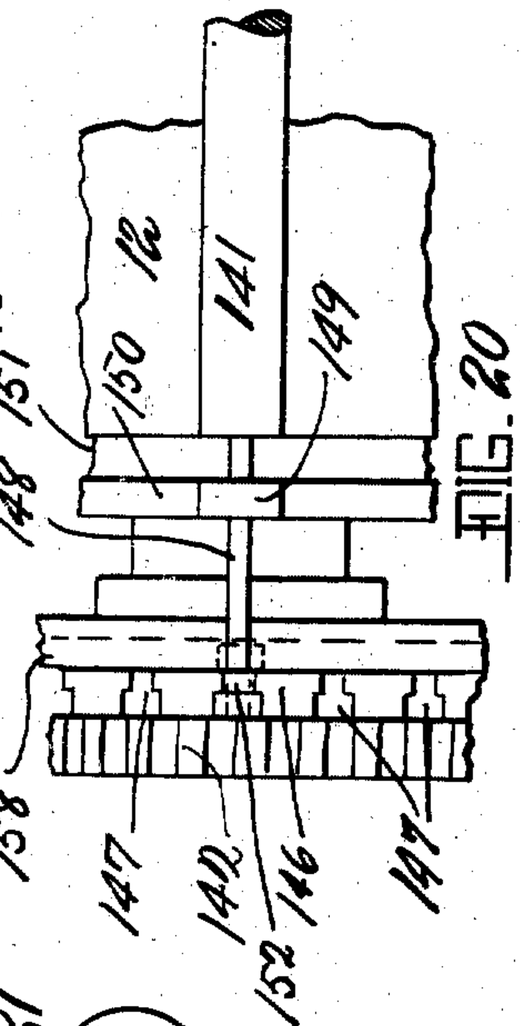


FIG. 20

FIG. 18

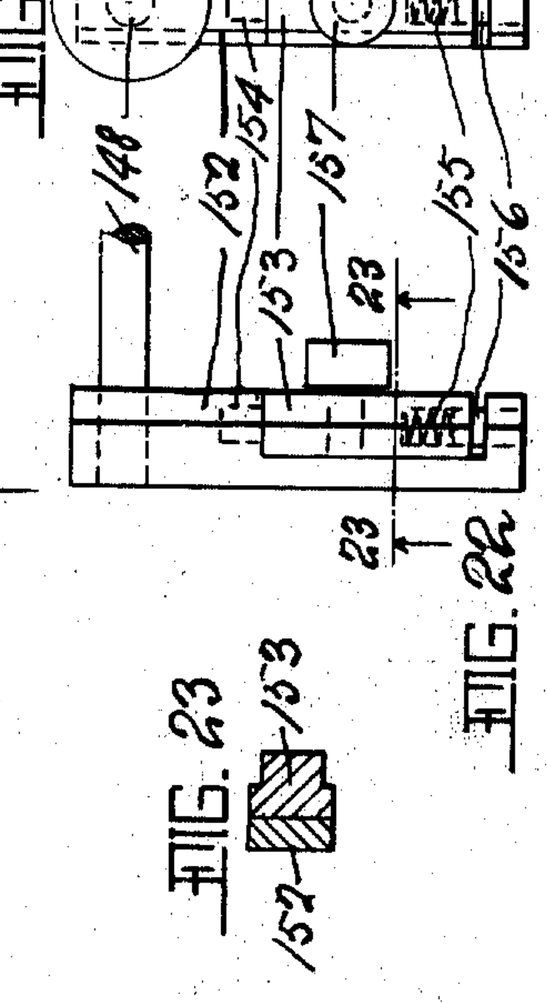


FIG. 21

FIG. 22

FIG. 23

Witnesses
C. Konigsberg.
E. Nicol

Lewis E. Morrison Inventor.

By his Attorney
Frank E. A. Konigsberg

UNITED STATES PATENT OFFICE.

LEWIS E. MORRISON, OF NEWARK, NEW JERSEY, ASSIGNOR TO AUTOMATIC PLATEN PRESS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

PRINTING-MACHINE.

993,612. Specification of Letters Patent. **Patented May 30, 1911.**

Application filed January 2, 1907. Serial No. 350,516.

To all whom it may concern:

Be it known that I, LEWIS E. MORRISON, a citizen of the United States of America, and a resident of the city of Newark, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Printing-Machines, of which the following is a specification.

This invention relates to printing machines and has more particularly reference to the type known as an automatic platen printing press.

The object of the invention is to produce a machine of this character embodying novel and useful features for the purpose of reducing the size and number of parts and to improve the general construction so that the machine may be operated at high speed and all parts be easily accessible for cleaning, etc.

Hence the invention comprises such elements, parts and mechanisms as will be hereinafter described and illustrated in the accompanying drawings, while the novel features will be pointed out in the claims.

In the said drawings: Figure 1 is a side elevation of an automatic platen printing press embodying my invention, with the impression on. Fig. 2 is a similar view with the impression off and details left out. Fig. 3 is view looking in the direction of arrow 3, Fig. 1. Fig. 4 is a plan view with parts removed. Fig. 5 is a side elevation of the sheet separating, feeding and registering mechanisms. Fig. 6 is a plan view of Fig. 5, parts being broken. Figs. 7, 8 and 9 are detail views of the separating mechanism. Fig. 10 is a detail view of the register stop. Fig. 11 is a view of the register stop bar. Fig. 12 is a side elevation of the gripping mechanism. Fig. 13 is a detail view of parts shown in Fig. 12. Fig. 14 is a detail view of the gripper jaws. Fig. 15 is a detail view of the sheet supporting means shown in Fig. 12. Figs. 16 and 17 are detail views of the delivery grippers. Fig. 18 is a sectional view on line 18—18 of Fig. 19 through the form carrying member illustrating parts of the inking mechanism. Fig. 19 is a view on line 19—19 of Fig. 18. Fig. 20 is a plan view of parts of Fig. 19. Figs. 21 and 22 are detail views. Fig. 23 is a view on line 23—23 of Fig. 22. Figs. 24 and 25 show side and front views of the tripping mechanism respectively. Fig. 26 is a plan view of parts shown in Fig. 25.

I pause here to remark that many details are necessarily left out of the first four figures so as to not complicate the general views of the machine.

Referring now in a general way to the first four views it will be seen that the various elements of the machine are supported by a framework comprising the two side frames 1 and 2 braced by a cross piece 3 and the platen beam 4 at the bottom and top respectively. The platen beam is provided with a depending portion 5 having shoulders 6 on which rests the stationary horizontal platen 7, which is provided with grooves 8 for the said shoulders, so that the platen may be readily removed by sliding, and the platen beam, hence the platen, is vertically adjustable by means of the bolts 9 and 10.

Coöperating with the platen is the form carrying member 11 carrying the form 12, which is adapted to slide into and out of position on the said member and may be fastened by any suitable means. The member 11 is in the form of a cylinder part of which is cut away to accommodate the form and the remaining cylindrical surface is utilized as ink distributing surface as will be pointed out later on.

The form carrying member is adapted to oscillate toward and away from the platen as usual and the means employed in this instance are as follows. On the main shaft 13 is mounted a crank disk 14 carrying the link 15 to which is connected the toggle links 16 and 17, one of which is pivoted on the shaft 18 upon which the form carrying member is rigidly mounted, while the other link is pivoted on the eccentric shaft 19. The crank disk is rotated by means of the gear 20 meshing with pinion 21 on shaft 22, to which power for the machine may be applied in any suitable and convenient manner. In order to guide the form carrying member during oscillations the shaft 18 is rigidly fixed in the arm 23 which is pivoted on the shaft 24 in the frame. The axis of the shaft 24 is substantially on a level with

the underside of the platen, as shown. One impression is obtained to each one revolution of the shaft 13 and the two extreme positions of the form are clearly illustrated in Figs. 1 and 2 with the other parts of the machine in their corresponding extreme positions.

I will now describe the various mechanisms in the order in which they act for progressing a sheet through the machine.

Sheet feeding and separating mechanism.—Referring now to Figs. 5 to 9 the reference numeral 25 indicates a box or carriage adapted to reciprocate by means later to be described. The said carriage forms a receptacle for the sheets 26. Adjustable side guides as 27 and a rear guide 28 are provided and the latter carries two hooks or fingers 29 for the support of the rear edges of the sheets. The carriage travels in grooves 30 in the side frames 31 which are suitably braced and form the framework for the feeding and separating mechanism and are in turn mounted fast on the stationary shaft 24. Between said side frames 31 are pivoted a plurality of smooth rollers 32, preferably of hard wood, which are free to rotate. The sheets rest directly on these rollers, so that when the carriage containing the sheet is reciprocated the rollers turn freely under the sheets in the same direction as the carriage travels. In this manner the sheets are moved with the least amount of friction and without being subject to jars and shocks. In order to allow for the passage of the hooks 29 the rollers are grooved as at 33. One of said rollers, that designated as 34 carries the suction means for separating the bottom sheet from the pile. The said roller is provided with a plurality of grooves 35 in which rest the branches 36 of the suction pipe 37, in such a manner that they form no obstruction to the travel of the sheets and are adapted to oscillate in the grooves. The open ends 38 of said branch pipes open directly upward under the sheets. To the one end of the main pipe 37 is attached the hose 38′, the other end of which is connected to the pump 39. (Fig. 1. The means for operating the pump is not shown so as not to complicate this drawing and it is obvious that the same may be operated in any suitable manner, say by cam and roll for instance, from any one-revolution shaft on the machine.) The other end of the main pipe is closed by a rod 40 which extends outwardly through the side frame, outside of which it is attached to a bell crank 41 pivoted on a stud 42 concentric with the axis of the roller 34 so that when said bell crank is rocked the branch pipes oscillate in their grooves. This is easily understood from Figs. 7, 8 and 9. A spring 44 keeps the main pipe in its lowest position and the openings of the branch pipes directly above the center of the roller. The means for rocking said bell crank consists of a long cam 45 on the carriage.

The operation of separating the bottom sheet is as follows: The pile of sheets is placed on the carriage and properly positioned by means of the guides so that the leading edges of the sheets rest directly over the openings 38 of the branch pipes 36. The moment the carriage is pulled forward the suction is applied which separates the bottom sheet, which then turns over around roller 34 as the cam 45 rocks the bell crank 41, and the sheet is delivered in the gap of the two guides or feed rolls 46 and 47, the suction ceases now of course and the sheet passes out between the feed rollers, while the carriage travels forward, the leading edges riding up on the separating lip 48 which may be supported on a transverse rod or otherwise. Having reached the end of its travel the carriage then returns to its initial position which allows the bell crank to clear the cam and assume the first position with the suction mechanism ready for the next sheet. The guide roller 46 is driven constantly in a forward direction by means of the pinion 49 meshing with gear 50 which rotates freely on shaft 24. The sheet passes now onto the registering mechanism.

Registering mechanism.—In constructing the registering mechanism the object has been to compose it of as few parts as possible and particularly to do away with the objections relating to delicate and complicated means for side register, which easily get out of order and cannot be depended on. Referring to Figs. 5 and 6. 51 indicate side frames carried by the bracket 52 supported by and adapted to turn on the bracket 53 bolted to the main frame. A bolt 54 acts as a pivot for the bracket 52 and frames 51. Between said frames are mounted a plurality of smooth rollers 55, preferably of hard wood. Outside the frames on the one side the rollers carry friction rollers (or gears) 56, which mesh with the intermediate friction rollers (or gears) 57. The central roller 58 carries in addition a pinion 59 which meshes with a gear 60 on shaft 61, which in the center carries the pulley 62, which is driven by belt 63 from pulley 64 on the main shaft. (Fig. 1.) By these means the rollers are driven constantly and rapidly in a forward direction only. Adjustable side registering guides as 65, one for each side, are provided.

When it is desired to register say to the right, the bracket 52 carrying the side frames in which the rollers are mounted, and which I shall here and in the claims properly call the registering table, is turned on the bolt 54 into the position shown in Fig. 6 and secured by the lock nuts 66. The right side guide is adjusted and the sheet

passing out through the guide rollers 46 and 47 is carried on the rollers 55 and is crowded toward the side guide onto the plate 67 and against the register stop or stop bar 68. It will now be understood that the driving power for the rollers 55 must be supplied in the center of the table. The slight twist to the right or left does not of course offer any obstruction to the transmission of power from the main shaft to the shaft 61. This means of transferring the sheet and side registering it has been found highly efficient and can be changed from right to left side register in a moment.

The stop bar 68, Figs. 10 and 11 carries adjustable stops 69 and is mounted upon the pivoted levers 70, only one is shown, which is oscillated through the instrumentality of the forked link 72 carrying roll 73 acting on cam 74 on main shaft 13, which cam is so constructed and timed that the stops will be quickly withdrawn to make room for the grippers. The carriage 25 is connected to the arm 74 by the link 75. Arm 74 is fast on rock shaft 76, which is rocked by means of the levers 77, 78, which latter carries a roll 79 coacting with the cam 80. In this manner the carriage is reciprocated and the arm 74 is slotted as at 81 to allow of an adjustment of the stroke and of the travel of the carriage according to the length of sheets handled. In this manner the sheet is separated, fed and registered. Next the sheet is seized by the gripping mechanism.

Gripping mechanism.—The main elements in this mechanism are the grippers, formed by an upper and lower gripper jaw 82 and 83 respectively. See Figs. 12 13 and 14. The grippers as many as needed, are mounted on the fixed shaft 84 in such a manner that preferably the upper jaw is fast on the shaft while the lower jaw is loose on the shaft and held against the upper one by a spring 85. Hence each individual gripper takes care of its own tension and no other means are necessary to keep the gripper jaws normally closed. The shaft 84 is carried by two bell cranks 86 one on either side, the said bell cranks are pivoted at 87 on the carriages 88, which reciprocate on the rails 89. It is of importance to note, that the axis of the pivot 87 is in line with the closing point of the grippers, so that this point always moves parallel to the surface of the platen, thereby leading the sheet in a straight plane under the platen. In other words we have here a straight line gripper motion. The other end of the bell crank 86 carries a roll 90 kept up against the rail by the spring 91. Thus the grippers are guided at two points.

Parallel to and suitably supported by the gripper shaft is a rod 92 which passes between the gripper jaws. That part 93 of the rod passing between the jaws is of rectangular cross section, and at one end a lever 94 is rigidly attached to the rod and carries a roll 95. A cam 96 is provided which, when it descends engages the roll on the lever 94 thereby rocking the rod 92, which rectangular portion forces the grippers apart.

At the right in the drawing the grippers are shown dotted and the rail here is bent as at 97. At this point the spring pulls the bell crank upward as shown, thus bringing the gripper out of the way of the delivery mechanism.

Preferably the parts are so arranged that the cam 96 descends when the grippers are at the end of the forward stroke in time to open them and free the sheet, the cam may then remain down while the grippers move toward the next sheet and when the same is inside the jaws the cam will ascend and the grippers close on the sheet.

The cam is pivoted at two points 99 to the one end of two bell cranks 98 pivoted at 100. The other ends are connected by means of a link 101. The bell cranks are rocked, that is cam operated, by means of bell crank 102 pivoted at 103 and connected to the one bell crank 98 by link 104 and operated by means of link 105 carrying cam roll 106 acting on cam 107 on shaft 108. This shaft is driven from the main shaft by means of bevel gears 109, 110, 111, and 112 as seen in Figs. 1, 2, 3 and 4.

The carriages 88 are operated from rock shaft 76 by means of links 113 and 114. See Figs. 1 and 2.

Means are provided for supporting the sheet as it passes under the platen and also hold the rear edge against the same while it is being printed. These means may take the following form. A brush 115 which may be constructed in any convenient manner of any suitable yielding material and of which one mode of construction is shown in detail in Fig. 15 is pivoted on the shaft 116, which also carries the levers 70, this brush being rocked upwardly against the platen as soon as the leading edge of the sheet has passed under the same and the sheet is drawn by the grippers between the platen and the brush. See Fig. 12. The brush is operated by means of link 117 carrying roll 118 acting on cam 119, see Figs. 1 and 2. While the sheet is being held by the grippers and the brush, the form carrying members move up and the sheet is printed and is then seized by the delivery grippers.

Delivery grippers. See Figs. 1, 2, 4, 16 and 17.—The delivery grippers comprise two gripper jaws 120 and 121. The lower one 121 is mounted rigidly on the shaft 122, while the upper one is carried by a bar 123. The shaft is pivoted in two swinging arms 124 to which the bar 123 is fixed, and the spring 125 keeps the grippers closed. An

arm 126 carries a cam roll 127 which alternately engages the upper fixed and lower movable cams 128 and 129. The upper cam serves to free the sheet and the same may be dropped printed side up in the receptacle 130, see Fig. 2. When the lower movable cam 129 engages the roll 127, the grippers open to seize the sheet from under the platen.

The cam 129 is pivoted at 131, see Fig. 2, and operated by means of link 132, cam roll 133 and cam 134.

The swinging arms 124 are pivoted on shaft 135 adapted to oscillate by means of gear 136 engaging the rack 137, which is operated by means of link 138 connected to the slotted crank 139 on shaft 108. Thus the length of the stroke of the rack hence the swing of the arms 124 may be adjusted, which is important, as it sometimes is desirable to deliver the sheet printed side down, when it will be deposited in the receptacle 140, see Fig. 2 dotted lines, while the cam 128 of course will be moved down a corresponding distance or another cam put on for this purpose.

I will now describe how ink is applied to the form.

Inking mechanism.—In platen presses it has heretofore been the custom to have the inking rollers, which pass over the form, reciprocate. This necessitates a construction in which the movement of the form was large enough and slow enough to allow of the said rollers to pass over the form twice. I provide an inking mechanism in which the distributing rolls rotate and pass over the form but once to each impression, hence I am able to shorten the stroke of the form carrying member, thereby running my press at high speed. Moreover, I provide a greater number of ink rollers and a large ink distributing surface, whereby it is possible to do finer work on the press.

The inking mechanism is illustrated in detail in Figs. 18 to 23, see also Figs. 1 and 4. Also already stated the form carrying member 11 is in the form of a cylinder with a part cut away to accommodate the form and is mounted fast on the shaft 18. A plurality of distributing rollers 141 are provided as is also means for rotating the said rollers around the form carrying member and guide them thereon. On the shaft 18 is rotatably mounted on either side a gear 142 which is driven constantly in one direction by a train of gears as 143, 144, 50, 145 meshing with gear 20 on crank disk 14. Gears 145 turn freely on a stud in the frame, while gears 143 and 144 are carried by studs in the swinging arm 23. Thus these gears mesh and rotate while the arms 23 oscillate. The gears 142 are provided with a thickened portion as at 146 and in the said portion is cut as many T-slots 147 as there are inking rollers and into said slots the bearing pieces for the shafts of the ink rollers are dropped. The inking rollers with adjacent parts are all alike, and I will therefore only describe one of them. The shaft 148 of each inking roll carries two guide rolls 149 which run on tracks 150 one on either end of the form carrying member 11. A slight annular depression 151 between the ink distributing surface and the track takes the overflow. The roller shaft 148 is mounted in bearings 152 which are held by the aforesaid slots 147 and adapted to slide therein. The bearings 152 are fitted with a loose piece 153 held in place by pin 154 and spring 155 working against the plug 156 and a cam roll 157 is mounted in said piece. Said cam roll engages the inside cam 158. It will thus be seen, that as the gears 142 rotate, the inking rolls are carried around the form member and the form itself and are kept against it by reason of the cam rolls 157 and cam 158. The spring 155 compensates for any slight wear of the parts. The ink is put on the surface of the form member by a ductor roll 159, which is carried by the lever 160 pivoted on the frame and provided with a cam roll 161 engaging the cam 162. The ductor takes its supply from one or more ink rollers as 163. 164 indicates the ink fountain. One of the ink rollers 166 is driven from the gear 167. As pointed out this inking mechanism has the advantage of providing a greater number of ink distributing rollers, a large amount of inking surface, hence a more even and smooth distribution than would be possible if the rollers reciprocated, and the movement of the form carrying member can be made very short and rapid, another great advantage.

The cam 158 is splined to the shaft so that it may easily be slid away from the cam rolls thereby making removal of the inking rollers easy for cleaning, etc.

From the foregoing it will be clear that the form carrying member with its adjacent parts and the guide arms with the train of gears altogether represent quite a weight, which, of course requires considerable power to move quickly by means of the crank disk and its connection to the toggle links. In order to relieve this mechanism of its weight and operate these parts as fast as possible and to get the full effect of the so-called "squeeze" in the moment of impression, I have provided a counterbalance of novel and simple design. The main feature of this is that I counterbalance the total weight of the above mentioned parts by means of the natural pressure of the atmosphere, a construction and design which I believe to be wholly new. An inspection of the first four figures shows that on top of the platen beam and directly over the center of the shaft 18 in the arms 23 are mounted two cylinders 168 in which move airtight pistons 169,

the rods of which are connected by links 170 to the arms 23 at 171. The links 170 pass through openings 170′ in the platen beam 4, see Fig. 3. The air in the cylinders above the pistons is exhausted leaving a perfect vacuum, and the diameter of the pistons is so calculated that the atmospheric pressure on the underside of the two pistons equal the total weight of the aforesaid moving parts. As this pressure acts upon the pistons at all times it will be seen that a perfect counterbalance has been produced by very simple but effective means. The advantage of this device is of course a gain in rapidity of operation, less wear on the moving parts, absence of noise and a better impression. As stated, I believe this method of counterbalancing to be broadly new, and it may of course be used in other kinds of machines.

It now remains to describe the means for tripping the impression member, when a sheet misses.

Tripping mechanism.—Referring to Figs. 24, 25 and 26 it will be seen that a lever 172 is pivoted on the arm 23 at 173 and carries a hook 174. Around the eccentric shaft 19 passes a flexible connection or chain 174ª which is fast on said shaft at 175 and to which is attached a rod 176 terminating in a hook 177. Normally these two hooks cannot engage. Means however are provided, whereby when a sheet fails to reach the stop bar 68, the two hooks engage on the upward stroke of the form carrying member, with the result that the shaft 19 is turned around its eccentric center 178 by means of the chain, consequently the center around which the lower toggle link moves is shifted down so that the impression member, upon the straightening of said toggle links, is prevented from reaching the platen or is tripped. The form will stop a slight distance beneath the platen, sufficient to prevent the latter from being inked. The eccentric shaft 19 also carries a collar 179 to which is attached the lever 180, which carries a cam roll 181 co-acting with the cam 182 on main shaft 13. Normally of course this lever remains immovable, while the cam rotates with the shaft. When, however, the shaft 19 has been turned over, as stated, the said lever is pulled down, so that the cam roll 181 will engage the cam 182 on the return stroke of the form. When this happens the cam lifts the roll and also the lever 180 back to position shown in Fig. 24 and the lever consequently turns the shaft 19 over into its normal position and on the next up stroke of the form the same will print, supposing of course, that on the next revolution of the machine a sheet is ready to be acted upon. This, in short, is how the form member is tripped. As stated, means are provided, for causing this result or in other words for causing the two hooks to engage. Said means may be of various constructions, but in the present instance they take the following forms. Pivoted at 182ª on the arm 23 is a lever, the one end of which is attached to the aforesaid hook lever 172, while the other end terminates in a fork 183 in which moves the vertical rod 184. This rod is a part of the reciprocating member 185, which thus by its reciprocations controls the movement of the hook 174. The member 185 is caused to reciprocate by means of a pivoted arm 186, said arm having two stops 187 and 188 between which a finger 189 on the member 185 moves. The arm 186 is "thrown" to one or the other side by the rod 190 connected thereto by link 191. Rod 190 is reciprocated vertically by the projection 192 on the arm 23, which alternately engages two stops 193 and 194 on said rod. On rockshaft 76 is mounted a loose collar 195 having a circular groove 196. This collar is positioned between two collars fast on the rockshaft, one of which 197 has a pin 198 engaging said groove 196. The loose collar is further provided with a weight 199 and an arm 200 to which a member 201 is connected by means of a cord 202. This member 201 is for the purpose of detecting whether or not a sheet is ready on the plate 67 to be seized by the grippers. The operation of these parts is as follows: A sheet is fed onto the plate 67, and the member 201 descends and rests on said sheet on the downstroke of the arms 23, and at the same time the reciprocating member 185 moves toward said detecting member 201 and passes through its opening 203, the projection 192 having engaged lower collar 194 on rod 190 thus throwing arm 186 inwardly. On the upstroke the member 185 is moved outwardly in time to swing the hook 174 out of the way of hook 177 through the connections above described, and the form member will not be tripped. I pause here to remark, that the arm 186 will fall by its own weight to either side as soon as it is brought past the center. The reason for this will presently appear. If on the downstroke of the arm 23 no sheet is on the plate 67, the descending member 201 passes through the opening 204 in said plate, so that, when the reciprocating member 185 moves inwardly it cannot pass through the opening 203 but abuts the side of member 201 and is held there firmly by the weight of the arm 186. This means that the hook 174 is kept out in the way of hook 177 and the form member is tripped. While the detecting member is held down by the member 185 the rockshaft 76 has of course not ceased its motion hence the fast collars also rock and the pin 198 travels idly backward in the groove 196. Hence the reason for this construction. As soon, however, as the form has been tripped and is

ready for the next stroke with a sheet getting into place and the reciprocating member 185 has released member 201 the weight 199 pulls the latter upward and out of the way ready for the next move. A stop 205 limits the outward move of member 185.

Now the difference of this tripping mechanism from other existing constructions can be pointed out and its advantages understood. In most other tripping mechanisms the detecting member 201 or its equivalent acts to actuate the trip directly. This is not desirable, however, inasmuch as this member naturally is of very little strength and finely constructed in order to register the absence or presence of a sheet. In my construction this member acts as a stop only for the reciprocating member 185, which in turn only has the weight of the arm 186 behind it. So that we here have a tripping mechanism actuated directly by the form carrying member, but which mechanism does not act until the detecting member permits it. Hence all the parts may be made strong and substantially without fear of them getting out of order. It is also worth noting that the tripping is not effective suddenly or with a jar, but that the toggle links simply are straightened out at a different point than that when not tripping without changing the speed of the machine.

It is thought that the foregoing describes and illustrates my invention clearly. Many mechanical details have been omitted such as brackets or guides for the different reciprocating parts, or springs for keeping the different cam rolls on their cams, etc., which parts those skilled in the art could easily supply.

While the invention is shown in concrete form, it is obvious that changes may be effected in the various elements without departing from the scope of the invention: Hence I claim all such changes and variations as will come within the legitimate intention and spirit of my invention and within the scope of the claims.

I claim:

1. In a printing machine a pair of pivoted arms, a form member supported in the free ends of said arms, a plurality of cylinders having one end open, pistons in said cylinders from which the air has been exhausted on the one side of the said pistons, connections between the latter and the said swingings arms so arranged that the atmospheric pressure on the one side of said pistons counterbalances the weight of said arms and said form member.

2. The combination of a pair of swinging arms, a form member supported thereby, a pair of vertically supported cylinders having their lower ends open, pistons in said cylinders from which the air has been exhausted above said pistons, connections between the said arms and the said pistons so arranged that the atmospheric pressure on the underside of said pistons counterbalances the weight of said arms and said form member.

3. The combination of side frames, a horizontal platen beam supported thereby, a platen removably secured to the said platen beam on the under side thereof, a form member, operating connections to cause the same to coact with the platen, cylinders placed above and on the said platen beam and having their lower ends open, there being openings in the said platen beam below the said cylinders, pistons in the latter having their lower surface exposed to the atmospheric pressure and moving air tight in the cylinders, and connections between the said pistons and the said form member passing through the said platen beam openings.

4. The combination of side frames, a platen beam supported horizontally between said frames, a platen supported on the under side of the said beam, arms pivoted in the said frames at the same level as the underside of the platen, a form member rigidly supported in the free ends of the said arms, a driving shaft, toggle links interposed between the said form member and the said frames and operating connections between the said toggle links and the said driving shaft for oscillating the said arms.

5. The combination of a platen, a form member, gears journaled at either end of the said form member, inking rollers journaled in the said gears, swinging arms supporting the said form member, gears and ink rollers, a counterbalancing device mounted above said platen and operating connections between the said device and the said swinging arms and means for oscillating the latter.

6. The combination of a platen support, a platen, a gripper mechanism, means for reciprocating the latter below the platen, a shaft supported on the said platen support and below the impression surface of the platen, a resilient brush member carried on the said shaft and adapted to support the rear edge of a sheet against the platen and means for operating the said brush member.

7. The combination of a horizontal platen, a feeding gripper mechanism adapted to reciprocate below the platen, means for operating said mechanism, a shaft secured in front of the said platen, an elastic brush member on said shaft and means for oscillating the said brush member to support a sheet as the latter is carried under the platen by the said gripping mechanism.

8. The combination of a platen support, a platen, a form member, operating means for the latter, a counterbalancing device mounted above the said platen support, operating con-

nections between the said device and the said form member, two rockshafts secured to the platen support, a feeding gripper mechanism, means for operating the same from one of the said rockshafts, a delivery gripper mechanism, means for operating the same from the other of the said rockshafts and operating connections for oscillating the said two rockshafts from the first named operating means.

Signed at New York this 31 day of Dec. 1906.

LEWIS E. MORRISON.

Witnesses:
IVAN KONIGSBERG,
GEO. A. MARSHALL.