

May 18, 1926.

G. S. VERNAM ET AL

1,584,749

CIPHERING DEVICE

Filed Nov. 12, 1924

3 Sheets-Sheet 1

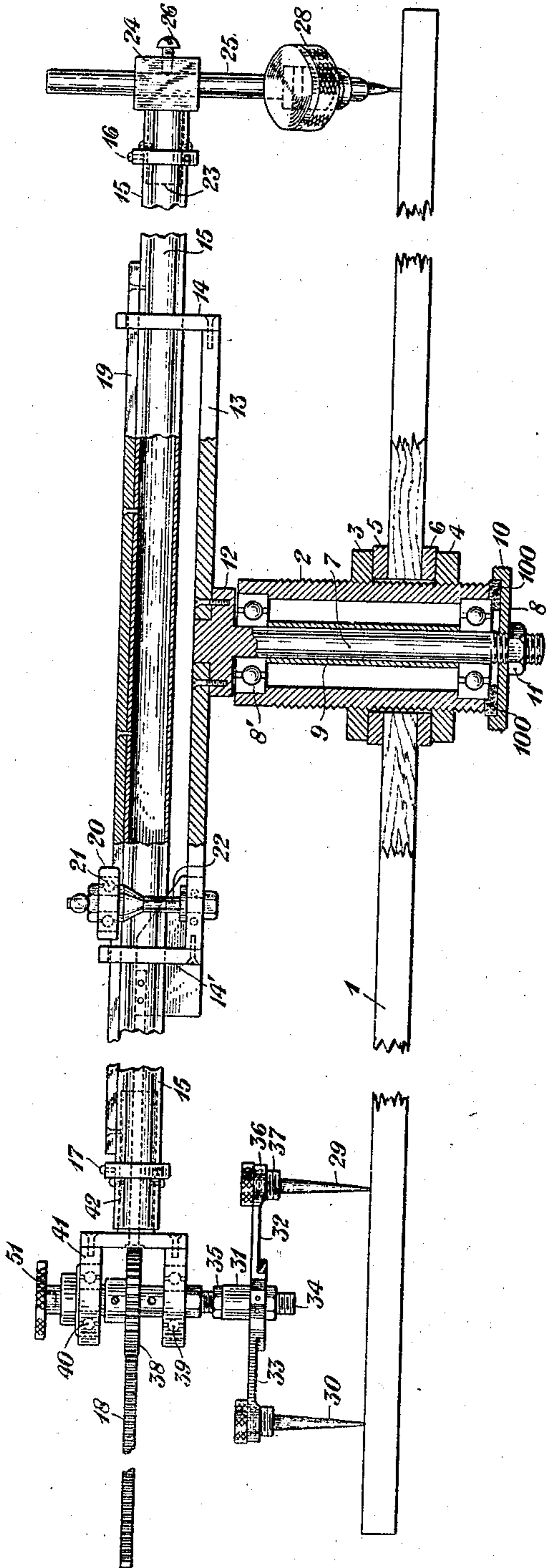


Fig. 1

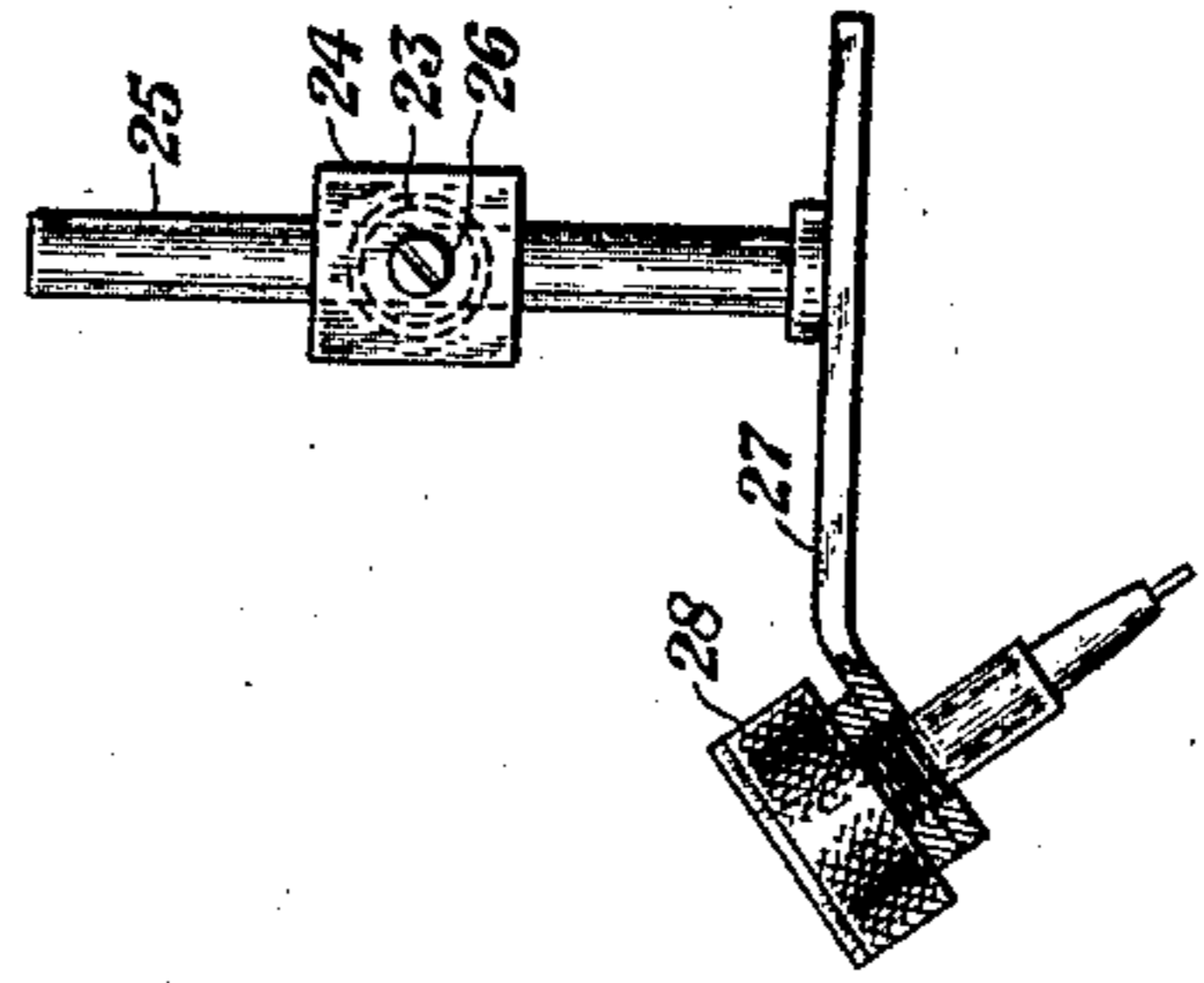


Fig. 3

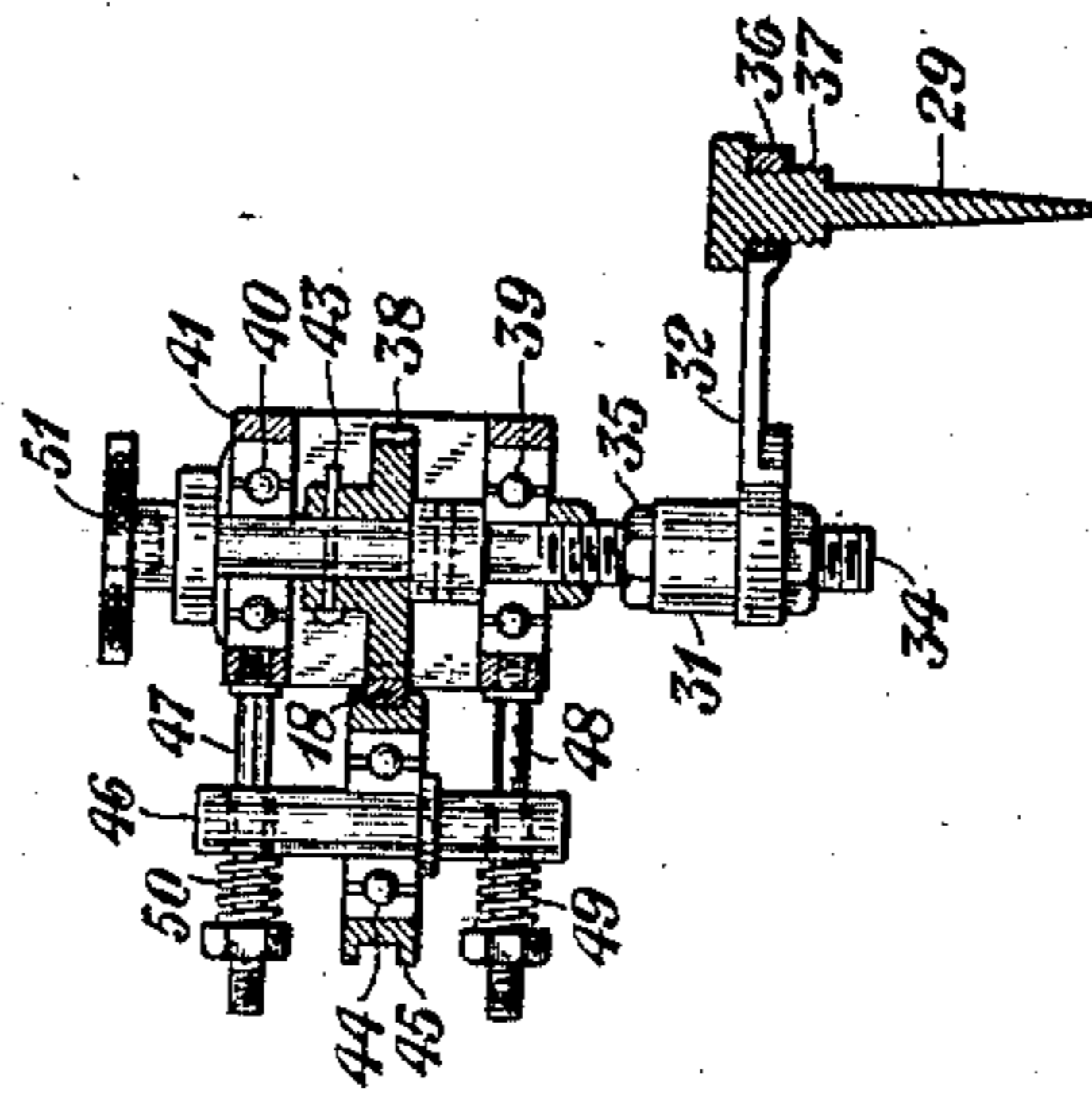


Fig. 2

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3 Sheets-Sheet 2

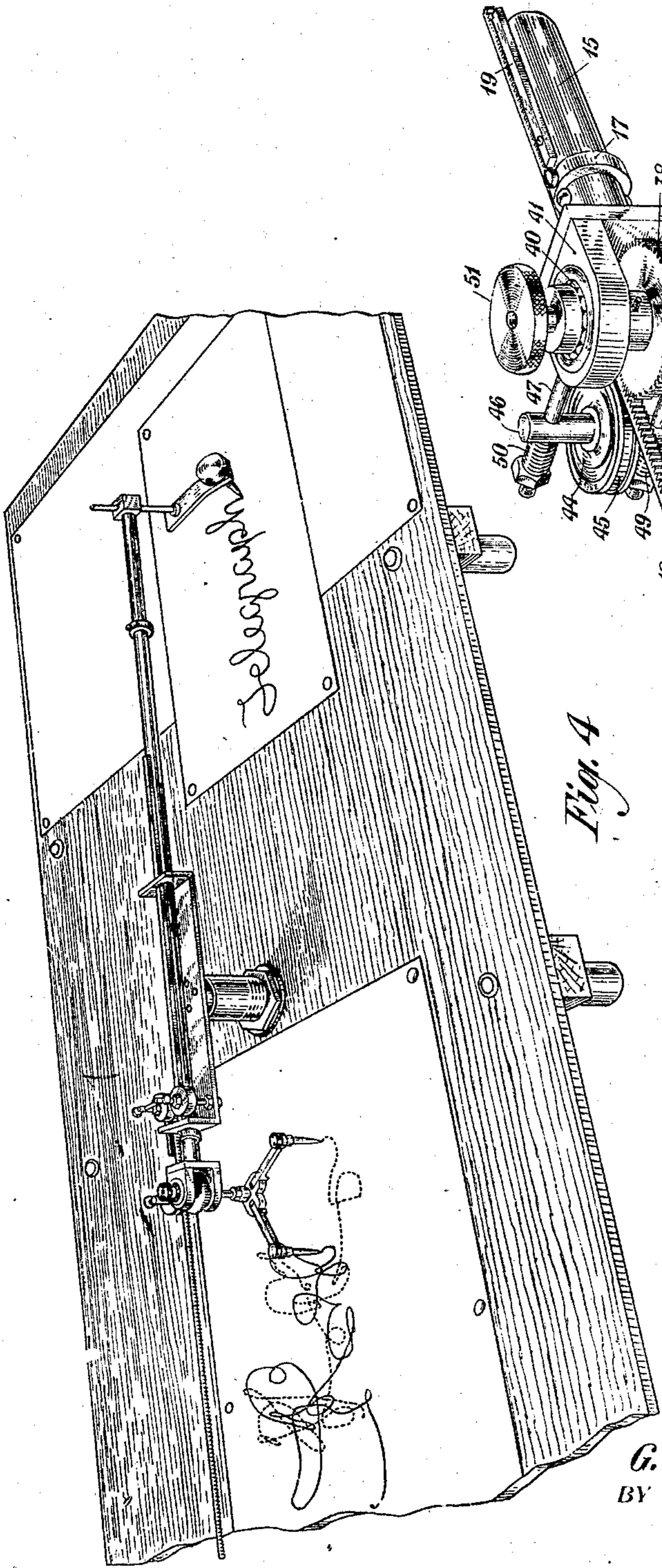


Fig. 4

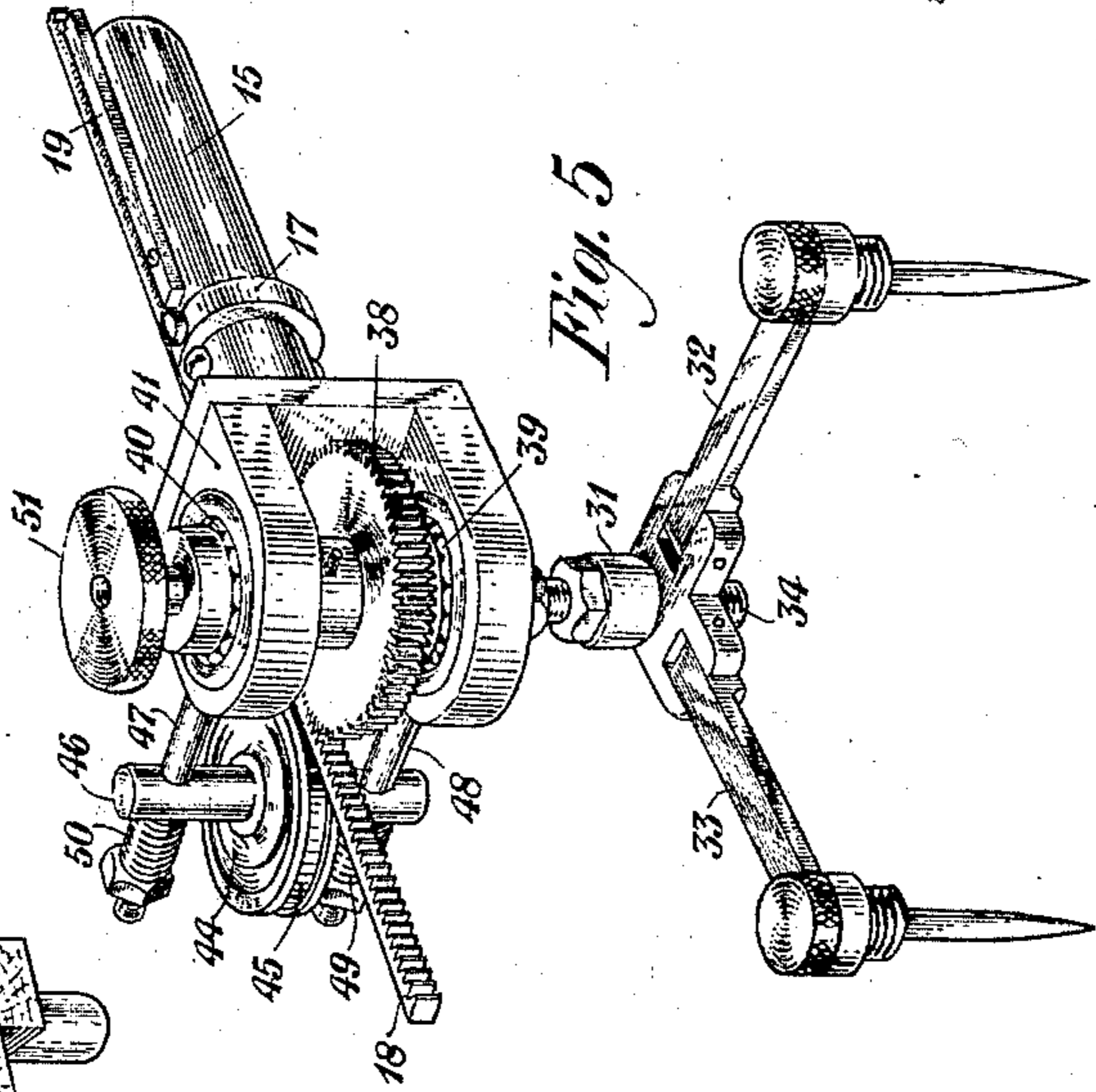


Fig. 5

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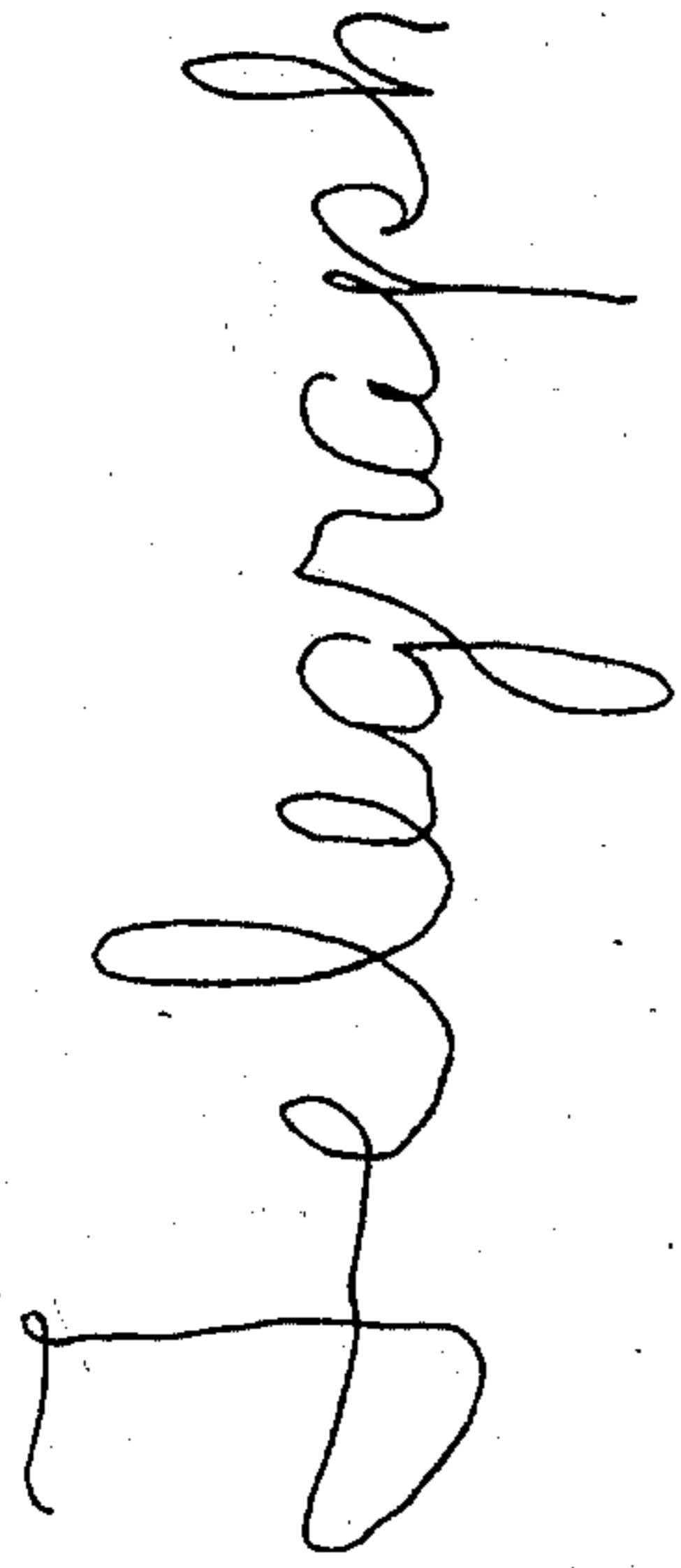
1,584,749

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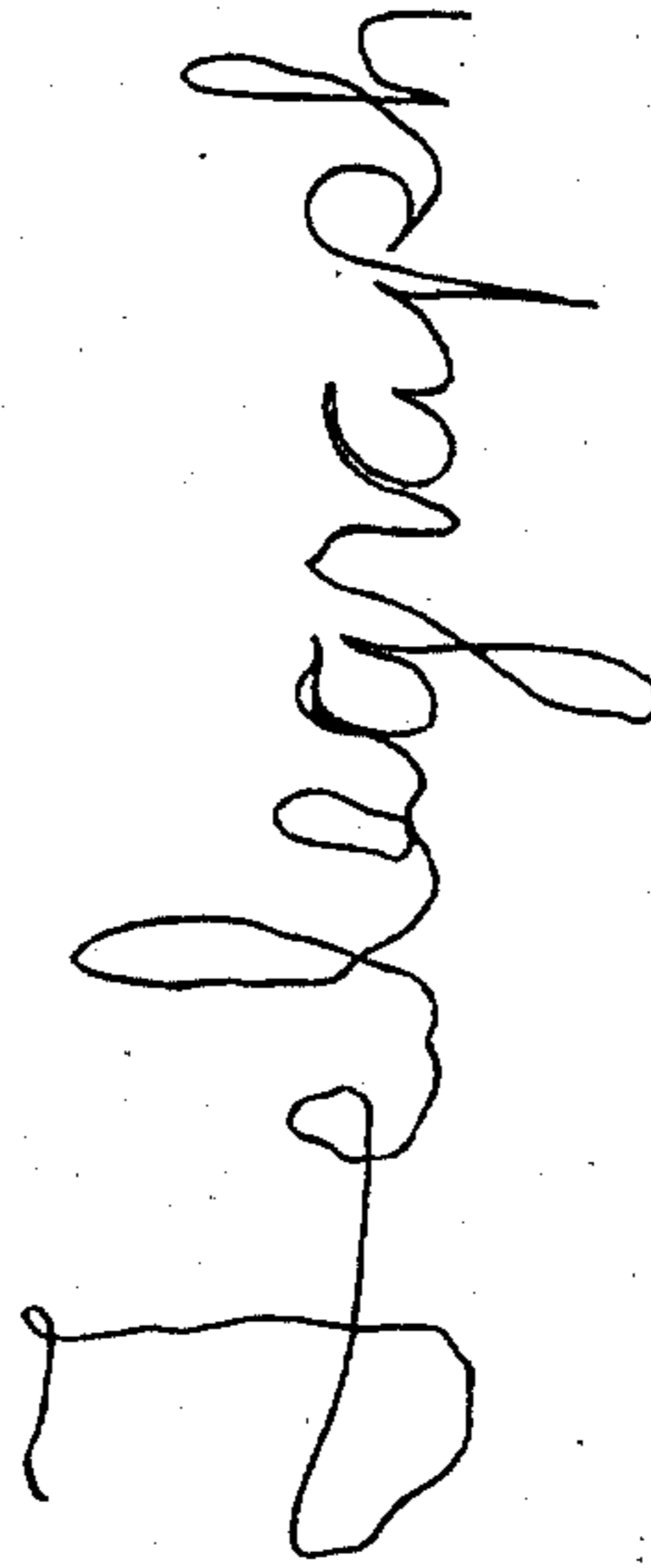
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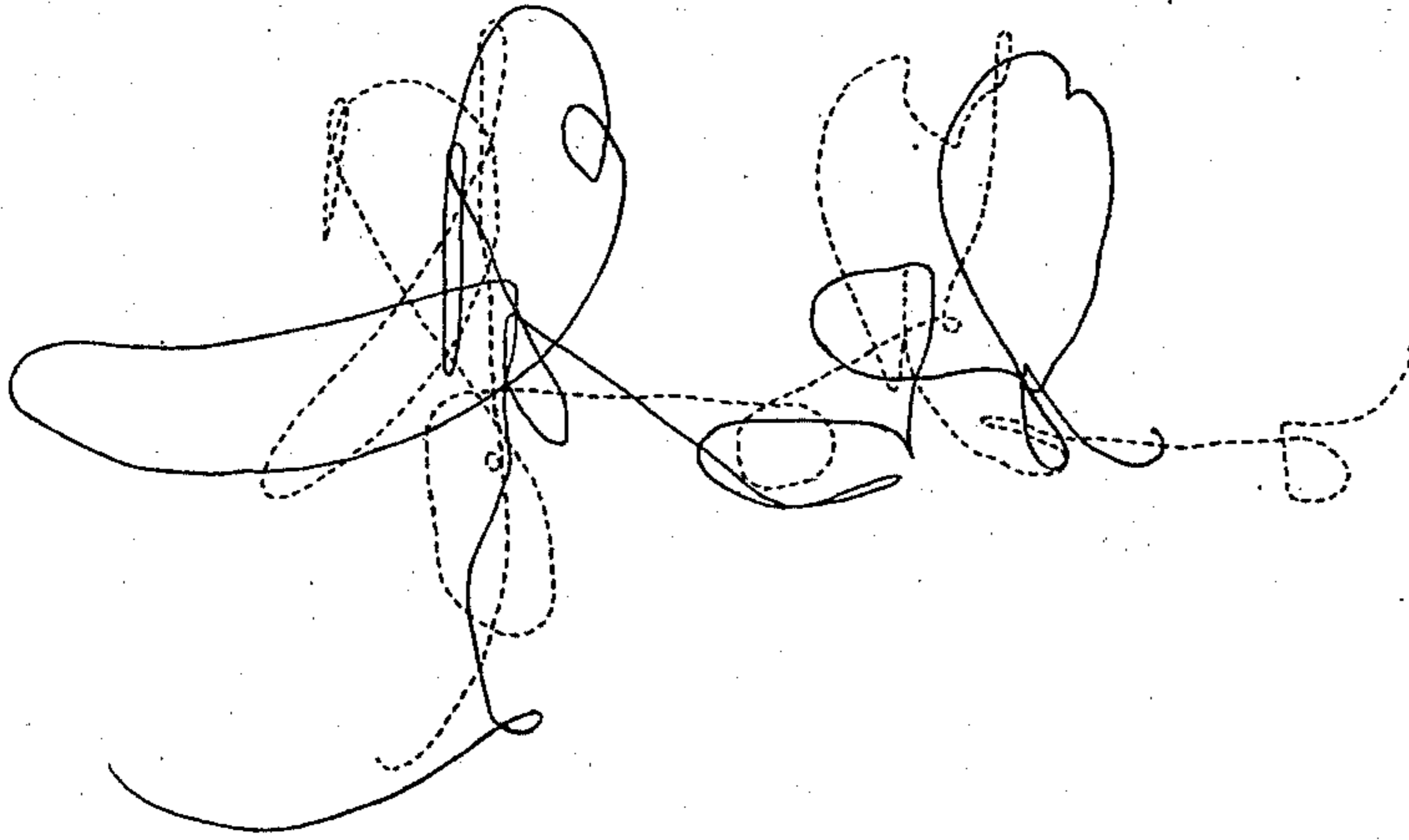
3 Sheets-Sheet 3



*Fig. 6 - Original*



*Fig. 8 - Deciphered*



*Fig. 7 - Ciphered*

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# UNITED STATES PATENT OFFICE.

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## CIPHERING DEVICE.

Application filed November 12, 1924. Serial No. 749,509.

This invention relates to arrangements for secretly transmitting messages. More particularly the arrangements relate to a mechanical device for enciphering and deciphering characters or pictures so that persons who might have unauthorized access to the message during transmission could not understand its true import.

The device of this invention consists of a modified form of pantograph. At one end of the device is a writing arrangement whereby the character or picture of the message may be drawn. The motion thus imparted to the device will operate a tracing arrangement at the other end thereof. The original motion, however, will be so distorted by the device that the tracing arrangement will give a picture or characterization totally different from the original letters or characters. In other words, the original writing motion will cause the device to produce a distorted or enciphered copy which will be unintelligible. The enciphered copy may then be transmitted in its unintelligible form to a distant spot. Here it will be placed under the tracing arrangements of another similar one of the devices of the invention. The tracing arrangements will then be caused to move over, or to trace, the picture or characters of the enciphered message. This motion will then cause the writing arrangements at the other end of the device to reproduce the original picture or characters. Other details and features of the invention will appear more fully from the detailed description hereinafter given.

The invention may be more fully understood from the following description, together with the accompanying drawing in the Figures 1 to 8, inclusive, of which the invention is illustrated. In Fig. 1 is shown a side elevation of the device with portions of the apparatus cut away to show sectional views thereof. Fig. 2 is a sectional view of part of the tracing end of the device, while in Fig. 3 is shown a side view of the writing end. Fig. 4 illustrates the device as it would appear when in use, mounted on a table or drawing board. Fig. 5 gives a perspective view of the tracing end of the mechanism. Fig. 6 shows an original message, such as a word, as written by the writing end of the device. Fig. 7 shows the resulting enciphered message produced by the device.

Fig. 8 shows the original message as actually deciphered by the arrangements of the invention from the enciphered message shown in Fig. 7. Similar reference characters have been utilized to denote like parts in all of the figures.

As illustrated in Fig. 1, the device of the invention is mounted on a base board or table 1, and is supported by a center bearing. The outside shell 2 of this bearing passes through a hole in the table and is held in place by the hexagonal nuts 3 and 4 and the washers 5 and 6 which provide a means for vertical adjustment. The center pivot shaft 7 turns in the ball-bearings 8 and 8', which are supported by the outside shell 2. A collar or tube 9, around the shaft 7, between the two bearings, keeps the inner bearing races properly spaced, while a projecting shoulder 10 on the shell 2 together with a felt washer 100, does the same for the outer bearing races. The felt washer 100 operates to introduce a slight amount of friction so that the ease of rotation of the center pivot shaft 7 may be adjusted. Such an adjustment may be made by tightening the nut 11. The lower end of the shaft 7 is threaded and a nut 11 is screwed against the projecting shoulder 10 to hold the assembly together. The upper end of the shaft 7 has a flat head 12 to which the support for the rest of the device is attached. This support consists of a flat piece 13 attached in the center to the flat head of shaft 7, as shown. The flat piece 13 has short vertical pieces 14 and 14' attached to each end. These vertical pieces form slide bearings for a tube 15. The travel of this tube is limited by adjustable stop rings 16 and 17. A set screw keeps each of these rings in position. Besides supporting the tube, the vertical end piece 14' at the left, supports a rack 18 which projects to the left. Mounted on the top of the tube is a guide piece 19. A circular bearing 20 presses against one side of this guide piece. This circular bearing will rotate about the support 22, affixed to the flat piece 13. Ball-bearings 21 are provided for this circular bearing. A similar support and circular bearing is provided, which will press against the other side of the guide piece 19. These two circular bearings and the guide piece 19 prevent the tube 15 from rotating in its axis, while at the same time,

allowing it to slide through the vertical pieces 14 and 14' without much friction.

To the right end of the tube 15 is fastened a pencil, such as the ink pencil 28, illustrated in Figs. 1 and 3. A plug 23 fits snugly into the end of the tube 15 and is held by screws as shown. This plug has a square head 24 with a vertical hole drilled in it. A post 25 is inserted in this hole and locked in place by the set screw 26. A horizontal piece 27 is affixed to the post and carries the ink pencil 28. The pencil is threaded so that it may be lowered or raised from the horizontal piece 27.

Two cipher pencils, one with red lead and the other with black lead, or pens with different colored inks, are mounted at the left end of the tube 15 by means of the mechanism shown in Figs. 1, 2, and 5. These are shown in the drawing as the dummy pens 29 and 30. In Fig. 1 is shown a side view of the mechanism; in Fig. 2 a sectional view; and in Fig. 5 a perspective view. This mechanism consists of a pencil support mounted on a vertical shaft 34 which is free to rotate. The pencil support consists of two arms 32 and 33, which are 90° apart, and which extend out from a threaded vertical collar 31, which is screwed on the shaft 34. A lock nut 35 holds this collar in place on the shaft. At the outer end of each of the support arms is a collar, such as 36, with a screw 37 by which the pencils or pens, such as 29 and 30, may be held. The support arms 32 and 33 are hinged to the support so that they may be raised when placing the apparatus in position. The vertical shaft 34 carries a gear 38 and is supported by two ball-bearings 39 and 40. These bearings are in turn supported by a housing 41, attached to a plug 42 which extends for a short distance inside of the tube 15, and is held in place by a screw. The gear 38, which is held in place on the shaft 34 by the set screw 43, meshes with the rack 18 heretofore referred to. The rack is pressed against the gear by an idle pulley. This pulley consists of a ball-bearing assembly 44 equipped with a flanged rim 45 and is supported by an auxiliary shaft 46. Two pins, 47 and 48, projecting from the upper and lower bearing housing, pass through holes in each end of this shaft. The pulley is pressed against the rack by the springs 49 and 50. The purpose of the pulley is to hold the rack against the gear and thereby take up all backlash in the gearing. A head piece 51 is affixed to the top of shaft 34 whereby it may conveniently be rotated or moved.

A clear idea of the complete assembly may be had from reference to Fig. 4. In this figure, a complete word, such as the word "telegraph", has just been enciphered. The enciphering process is as follows: A blank sheet of paper is placed under the

pencils, or pens, at both ends of the device, the sheet at the left being carefully placed over guide marks on the table, so that it can be replaced in the same position on any similar machine. As the pencil at the right is moved under control of the operator to record the original message, the cipher pencils at the left make a record of the message in enciphered form. When the pencil at the right moves toward or away from the center bearing of the device, the cipher pencils at the left are turned about the vertical shaft 34 by means of the operation of the rack 18 and the gear 38. This rotation or circular movement is accordingly added to and combined with the original motion of the tracing pencil at the right. The combination of this circular motion, together with the motion due to the pencil at the right, will result in the two cipher pencils at the left producing an absolutely unintelligible set of lines or curves. For example, the word "telegraph" shown as originally traced by the pencil in Fig. 6 will result in the unintelligible arrangement shown in Fig. 7. The cipher shown in Fig. 7 may then be transmitted in any desired manner to a distant point without fear of its import or meaning becoming known.

Preparatory to deciphering on the same or any similar machine, the two cipher pencils are replaced by dummy tracing points 29 and 30. The cipher record, such as shown in Fig. 7, is accurately located in the proper position on the left-hand side of the board and a blank sheet is placed at the right-hand side. The operator now follows the red and black lines with the tracing points corresponding to the red and black pencils, respectively. This may be done by moving the head piece 51 as desired. The result will be that the pencil at the right-hand end will reproduce the original message, as shown in Fig. 8. In Fig. 7, the red line in the cipher message is distinguishable from the black by the difference in shading. It is desirable to have two cipher pencils with different colors to aid in avoiding error in deciphering.

While the invention has been disclosed as embodied in certain specific arrangements, which are deemed desirable, it is understood that it is capable of embodiment in many other and widely varied forms, without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A ciphering device comprising a supporting member, a horizontal member slidably and rotatably attached to said supporting member, writing mechanism rigidly attached to one end of said horizontal member, writing mechanism associated with the other end of said horizontal member, and means controlled by the slidable motion of

said member to impart a rotary motion to said last mentioned writing mechanism.

5 2. A ciphering device comprising a supporting member, a horizontal member slidably and rotatably attached to said supporting member, writing mechanism rigidly attached to one end of said horizontal member, a gear associated with the other end of said horizontal member, writing mechanism controlled by said gear, and a rack attached to said supporting member said rack being adapted to operate said gear to impart a rotary motion to said last mentioned writing mechanism upon the slidable motion of said horizontal member.

10 3. A ciphering device comprising a vertical support member, a horizontal support member rotatably attached to said vertical support member by ball-bearings, a tubular member slidably attached to said horizontal

support member by ball-bearings, writing mechanism rigidly attached to one end of said tubular member, a housing attached to the other end of said tubular member, a vertical shaft rotatably held in said housing by ball-bearings, writing mechanism rigidly attached to said shaft, a gear rigidly attached to said shaft, a rack attached to said horizontal support member, and an idler pulley attached to said housing whereby said rack will mesh with said gear to impart a rotary motion to said shaft and writing mechanism upon the slidable motion of said tubular member.

15 In testimony whereof, we have signed our names to this specification this 7th day of November 1924.

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