

June 13, 1933.

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MACHINE FOR PRODUCING PRINTING PLATES

Filed Oct. 19, 1929

3 Sheets-Sheet 1

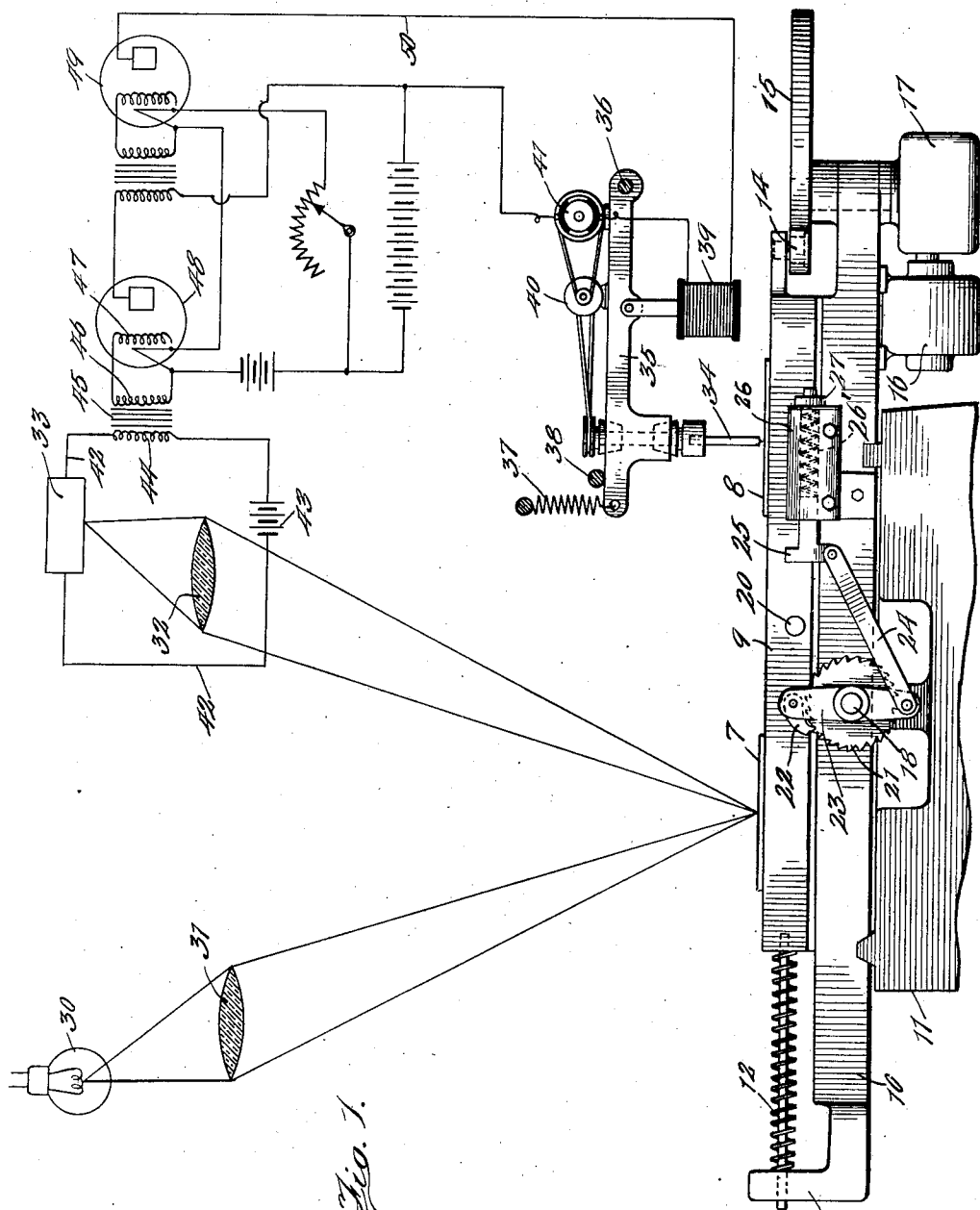


Fig. 1.

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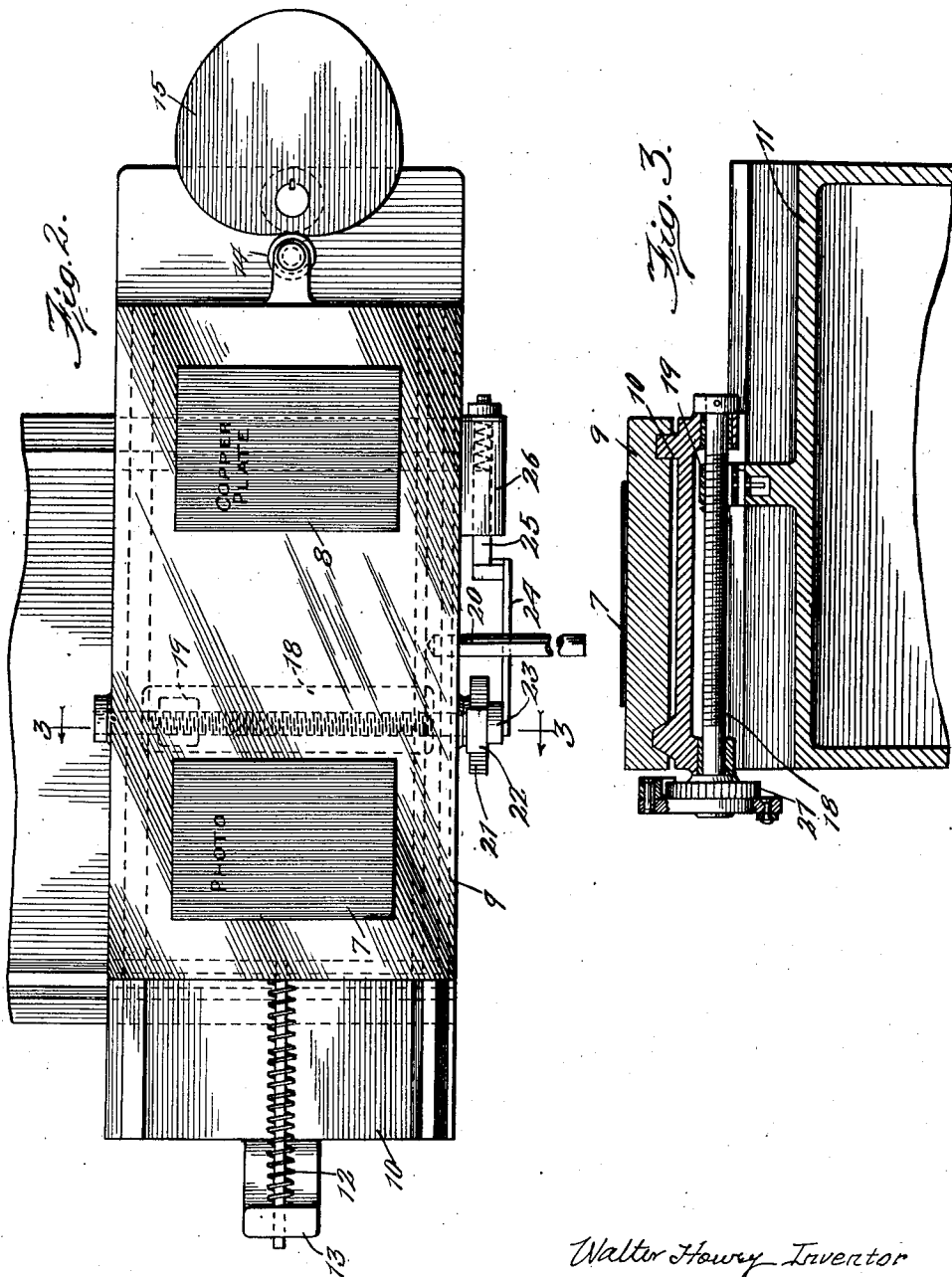
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3 Sheets-Sheet 2



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MACHINE FOR PRODUCING PRINTING PLATES

Application filed October 19, 1929. Serial No. 400,931.

My invention relates to improvements in the process of vacuum tube engraving and it more especially consists of the features pointed out in the claims.

5 The purpose of my invention is to provide an automatic engraving process which eliminates the many steps of half-tone engraving as they are now practiced; that translates a picture into an engraving by means of a light sensitive cell which modifies the input of an amplifying system; that includes vacuum tubes having a plurality of elements; that uses the output of the amplifying system for automatically controlling a cutting tool to
10 engrave the light and shade variations of the picture or photograph in any desired material; and that, in short, produces engravings automatically by means of a photo-electric cell, one or more vacuum tube amplifications, and the power output of the amplifying circuit to direct the engraving tool.

With these and other ends in view, I illustrate in the accompanying drawings such instances of adaptation as will disclose the broad scope of the invention without limiting myself to the specific details shown thereon and described herein.

Figure 1 is a diagram of the engraving machine, with the carriage shown in side elevation.

Fig. 2 is a plan view of the carriage portion.

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

Fig. 4 is a diagram showing a modified arrangement.

Fig. 5 is an enlarged detail of the end of the drill, or reproducing tool.

Fig. 6 is an enlarged section through the printing plate.

40 In the drawings is illustrated a machine more especially intended for making half-tones, or cameo relief plates, in which the ink is deposited on the surface of the plate. Obviously, the machine may be adapted for mechanical gravure work where parallel lines shaded in width are used, or for intaglio plates where the ink is deposited in the recess and the surface wiped off.

50 I may use whatever alternatives or equivalents of construction and cooperating parts

that the exigencies of varying conditions may demand without departing from the broad scope of the invention.

In the adaptation instanced in the drawings the picture or image which is to be translated into an engraving is scanned by a beam of light which successively travels over its entire surface. This beam of light modified by the varying lights and shades of the subject is directed onto the light-sensitive surface of a photo-electric cell, which correspondingly varies the input of an amplifying circuit, the output of which controls the engraved depth and variation of cut of a tapered tool in accordance with the variations of light and shade of the subject.

The picture 7 and the plate 8 which is to be engraved are mounted in spaced relation on the surface of the carriage 9. The carriage is longitudinally slidable on the sub-carriage 10, which is mounted transversely slidable on the base 11. The carriage 9 is resiliently pressed to the right as shown in Fig. 1 by means of a coil spring 12 which bears against a lug 13, integral with the sub-base 10. A cam roller 14 is rotatably mounted on the opposite end of the carriage member 9, and is pressed into contact with the periphery of the driving cam 15 which is rotatably mounted on the sub-base 10. The cam 15 is continuously rotated by means of the motor 16 mounted on the sub-base 10, and connected through any suitable form of speed reducing transmission as represented at 17. The profile of the cam 15 is such that the carriage is reciprocated at an even rate of speed in either direction.

At the end of each reciprocation of the carriage 9, the sub-base 10 is moved laterally by means of the feed screw 18, which is rotatably mounted in the sub-carriage, and engages in a feed nut 19 which is attached to the base 11. This feeding is accomplished by means of a pawl and ratchet actuated by the pin 20, which is mounted on the carriage 9. The ratchet wheel 21 is fixedly secured to the outer end of the feed screw 18, and the pawl 22 is pivotally mounted on the upper end of the lever 23 which is rotatably mounted on the feed screw 18. The lower end of

the lever 23 is connected by means of the link 24 to a plunger 25 which is slidably mounted in a housing 26, secured to the sub-carriage 10. The plunger 25 is resiliently pressed to the left as viewed in Fig. 1 by means of the coil spring 26', this movement being stopped by the collar 27 which is secured on the right end of the plunger 25, and strikes against the housing 26. At the end of the movement to the right, the pin 20 strikes the end of the plunger 25, and moves the ratchet wheel 21 counter-clockwise. When the carriage moves to the left, the pin 20 strikes directly on the pawl 22, and again moves the carriage in the same direction.

The means for directing a beam of light against the picture is shown as comprising a suitable source of light 30 and a lens 31 for focusing the light. The beam is directed against the picture at an angle, and the reflected light is focused by means of the lens 32 upon a suitable photo-electric cell 33. The members 30, 31, 32 and 33 are mounted in fixed relation with the base 11.

The engraving tool 34 is also mounted in a fixed position with relation to the base 11, to operate on the surface of the plate 8. The tool 34 is mounted to rotate in a frame 35 which is pivoted on a shaft 36 which is in fixed relation to the base 11. The frame 35 is resiliently lifted by means of a contractile spring 37 against the fixed stop 38, and is pulled downwardly by means of the electro-magnet 39. A small motor 40 is shown mounted on the frame 35 for rotating the engraving tool, and the motor is also connected for driving a circuit breaker 41, also mounted on the frame 35. From the above description, it will now be seen that the picture is scanned in a series of parallel lines by the light beam, and that the rotating tool travels over the surface of the plate in exactly the same manner as the beam travels over the surface of the picture.

The photo-electric cell 33 is connected by means of a conductor 42 through the battery 43 and the primary coil 44 of a transformer 45. The secondary 46 of the transformer 45 is connected in circuit with the grid 47 of the three-element tube 48 which is connected through the second tube 49 to the circuit 50 to amplify current which flows through the photo-electric cell 33. The circuit 50 includes the electro-magnet 39 and is connected through the interrupter 41 as shown.

Since the amount of current that can flow through the photo-electric cell 33 increases according to the amount of light reflected into the cell, the lighter spots in the picture will increase the amount of energy in the electro-magnet 39 and draw the graver, or cutting tool 34 deeper into the surface of the plate; while less light will be reflected from the darker spots in the picture, and the amount of energy in the magnet 39 and the penetra-

tion of the tool will be proportionately decreased. The fluctuations in the reflected beam will be translated continuously into the amplifying circuits, and to the circuit 50, but the tool will be fed downwardly in an intermittent manner because of the action of the circuit interrupter 41.

In the form shown in Fig. 4, the tool 34 is pulled down by the magnet 51 against a stop 52, and is controlled by the fluctuating currents, as in the preceding form. The tool 34 is mounted to rotate in the frame 53, which is pivoted on a fixed shaft 54. The motor 56 is connected to drive the tool and also the circuit breaker 57. The frame is retracted as before by a spring 58 against a fixed stop 59, but the output circuit 50 is connected through the circuit breaker 57 and the stop controlling electro-magnet 60; and the pulled-down magnet 51 is energized from the local battery 61 through the opposite side of the circuit breaker 57. As the magnet 60 is energized it attracts a diaphragm 62, to which the end of the stop member 52 is attached. The stop member 52 is represented as being slidably mounted on a suitably fixed support 63, and is provided with an inclined cam surface 64 to cooperate with a pointed contacting member 65, which is fixed on the frame 53.

As the reflection of the beam of light from the picture varies, the stop member 52 will be positioned responsive thereto so that the contact 65 strikes on higher or lower portions of the cam surface 64. Since the pulled down magnet 51 is energized at regular intervals and the position of the stop 52 is controlled by the amount of light reflected at the points in the picture, the image will be engraved on the surface 8 ready for printing.

A proposed form of the point of the engraving tool is shown in Fig. 5. The point is profiled so that, for even graduations in depth, the diameter increases in a regular manner; the object being to proportion it so that the area of the surface removed is a direct function of the depth of the cut. Thus, as shown in Fig. 6, the greater portion of the surface is left untouched to represent a dark portion of the picture, a part of the surface is cut away to represent the middle tones, etc., and all of the surface is removed by the tool to represent white portions of the picture.

I claim:

1. A machine for reproducing a picture on the surface of a plate, comprising a transmitter including means for scanning the picture and transforming the variations of shading into electrical pulsations, a translator connected to the transmitter and including a plate cutting tool controlled by said pulsations, and an interrupter for interrupting the electrical pulsations between the translator and the transmitter to cause the tool to cut intermittently.

2. A machine for reproducing a picture on a plate, comprising a transmitter including means for scanning the picture and including means for transforming the variations in the shading of the picture into an electrical pulsating current, a translator connected to the transmitter and including a plate cutting tool having a tapered point, the tool adapted to cut to a depth controlled by said current, and means for interrupting the current to cause the tool to cut intermittently.

3. A machine for reproducing a picture on the surface of a printing plate, comprising means for directing a beam of light to travel continuously over the picture, a means for transforming the variations in the light reflected from the picture into a pulsating electrical current, a plate cutting tool controlled by the current, and an interrupter for the current to cause the tool to cut intermittently.

4. The combination in a machine for reproducing a picture on a plate, of a drill mounted to travel over the surface of the plate and normally raised therefrom, an electro-magnet for feeding the drill into the plate, a photo-electric cell controlling the amount of feeding a circuit including an electrical source and the electromagnet, and an interrupter in said circuit.

5. In a machine for reproducing a picture on the surface of a plate, a translator comprising a movably mounted frame, a drill rotatably mounted in the frame, means for reciprocating the frame to feed the drill into the plate, an adjustable stop for the frame for regulating said feeding movement, and electromagnetic means controlled by the shading on the picture for adjusting the stop.

6. In a machine for reproducing a picture on the surface of a printing plate, a translator comprising a pivotally mounted frame, a drill rotatably mounted in the frame, means for reciprocating the frame to feed the drill into the plate, a movable stop having an inclined surface cooperating with the frame to limit the feeding movement, and photo-electric means for positioning the stop in accordance with the shading of the picture.

7. In a machine for reproducing a picture on the surface of a plate, a translator comprising a movably mounted frame, a drill rotatably mounted in the frame, means for reciprocating the frame to feed the drill into the plate, a movable stop having an inclined surface cooperating with frame to stop the feeding movement of the frame, and electromagnetic means controlled by the shading on the picture for positioning the stop.

8. In a machine of the class described, a holder for an image and for a plate for receiving an engraved reproduction of an image, an engraving tool having a tapered cutting point, a primary electrical circuit, light sensitive means for varying the resistance of said circuit, means for focusing on said sensi-

tive means light reflected from an image on said holder, a secondary circuit with amplifying means therein, and electromagnetic means for operating said drill under the control of said secondary circuit.

9. In a machine of the class described, a holder for an image and for a plate for receiving an engraved reproduction of an image, an engraving tool having a tapered cutting point, a primary electrical circuit, light sensitive means for varying the resistance of said circuit, means for focusing on said sensitive means light reflected from an image on said holder, a secondary circuit with amplifying means therein, an interrupter in said secondary circuit, and electromagnetic means for operating said drill under the control of said secondary circuit.

10. In an engraving machine, a holder for an image and for a plate for receiving an engraved reproduction of an image, an engraving tool having a tapered cutting point, a primary electrical circuit, light sensitive means comprising a photo-electric cell for varying the current in said circuit, means for focusing on said sensitive means light reflected from an image on said holder, a secondary circuit with grid control amplifying means therein, and electromagnetic means for operating said tool under the control of the output of the amplifying means.

11. In automatic engraving, a suitable subject, means for scanning the subject, a photo-electric cell, an amplifying system modulated by the light and shade of the subject impressed on the cell, and means for producing an engraved plate of the selected subject by the output of the amplifying system.

12. In a machine for photo-electric engraving, means for scanning a subject with a photo-electric cell, means for amplifying the current fluctuations of the photo-electric cell, an engraving tool, means for causing the amplified current fluctuations to position the depth of the engraving tool which is so tapered as to engrave areas that are a function of the depth of the cut as directed by the light and shade of the subject scanned.

In testimony whereof I affix my signature.

WALTER HOWEY.