March 6, 1951 D. H. HEARLE 2,544,225

PANTOGRAPH ENGRAVING MACHINE

Filed April 13, 1946 7 Sheets-Sheet 1

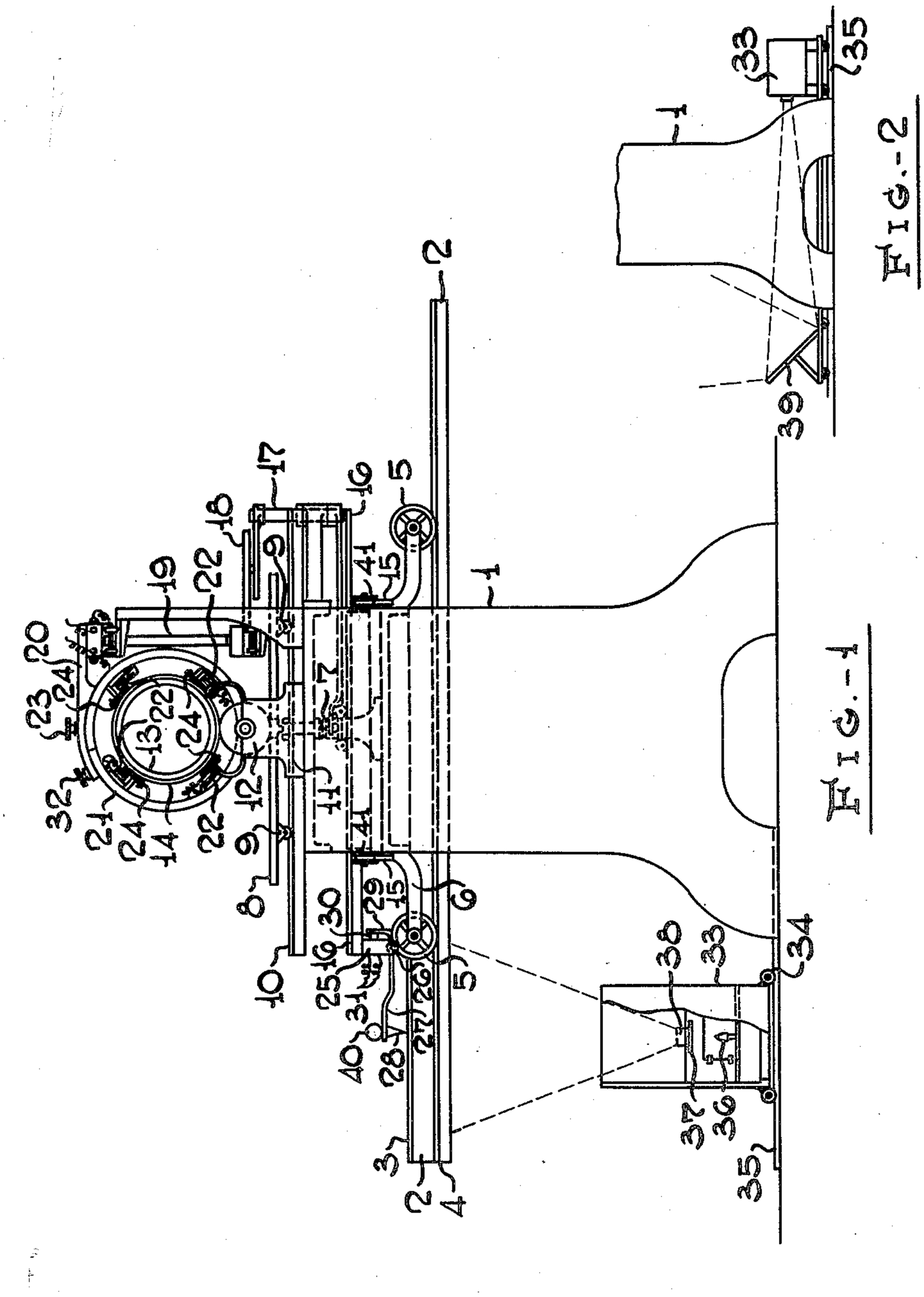

FIG. 1

FIG. 2

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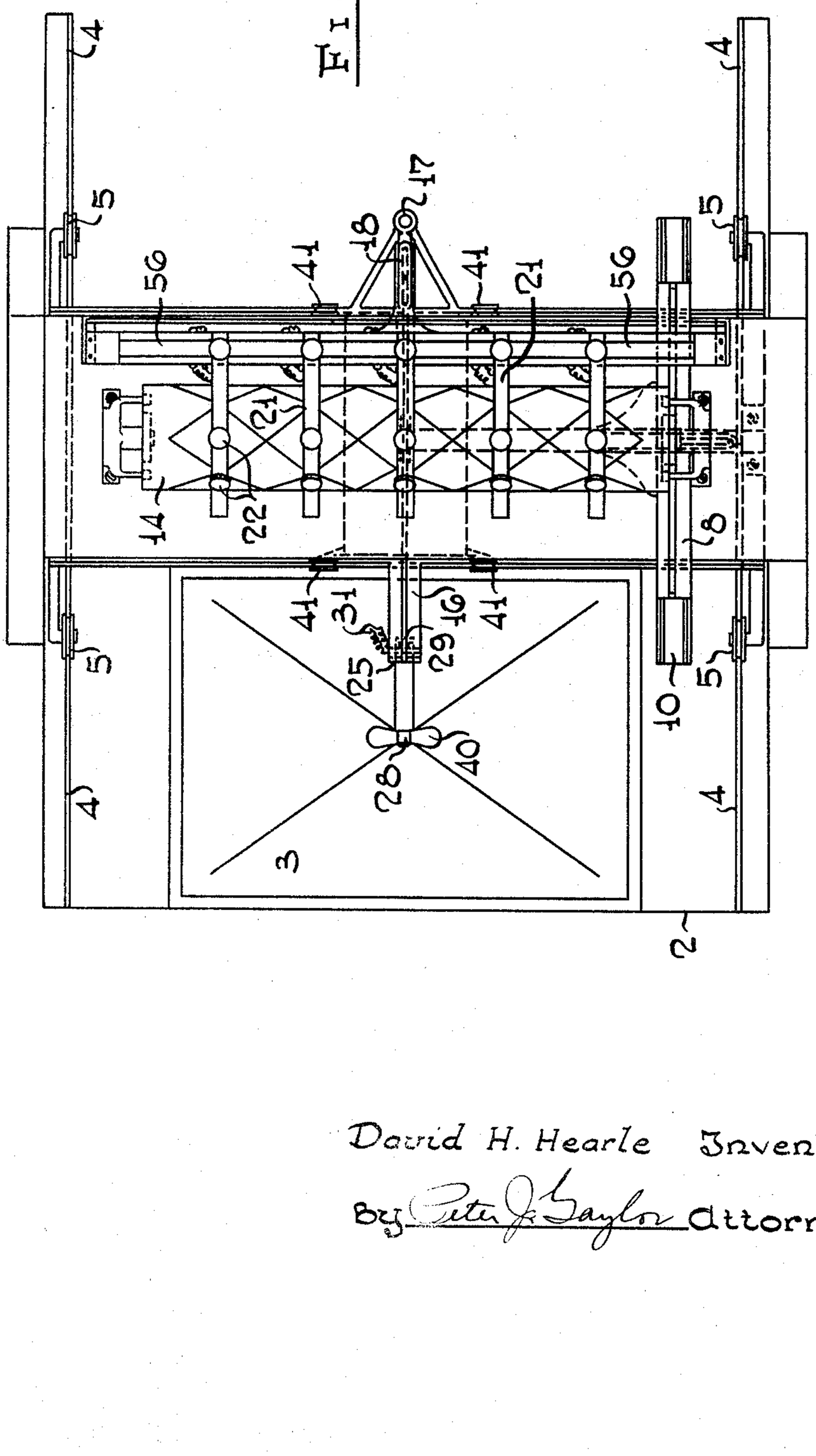
Fig. 3



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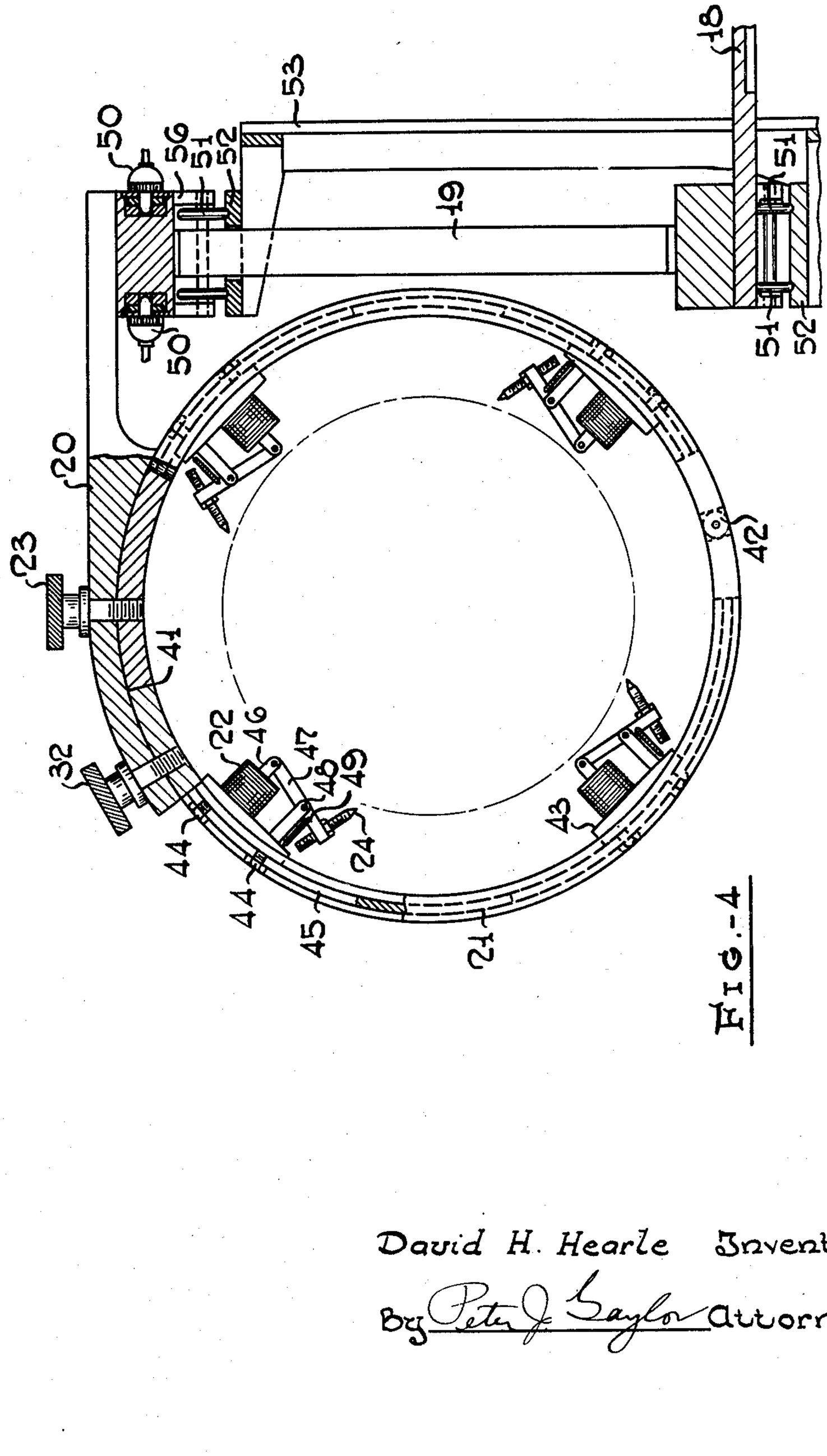

FIG.-4

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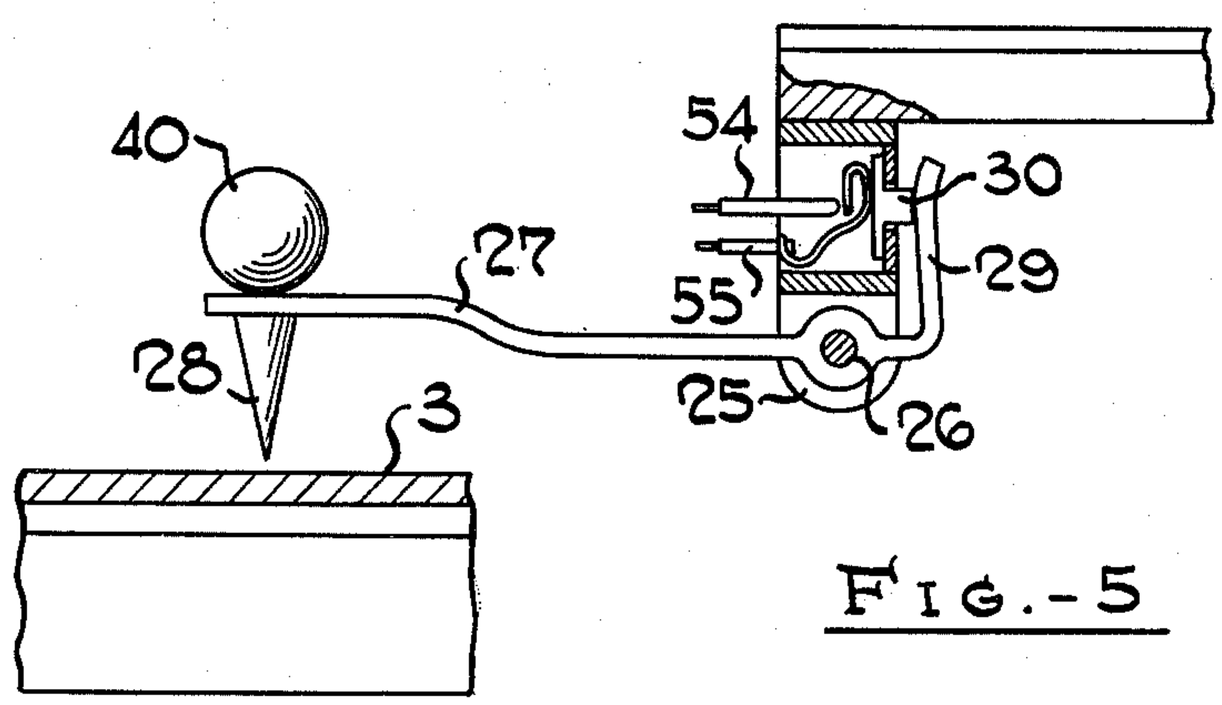

FIG.-5

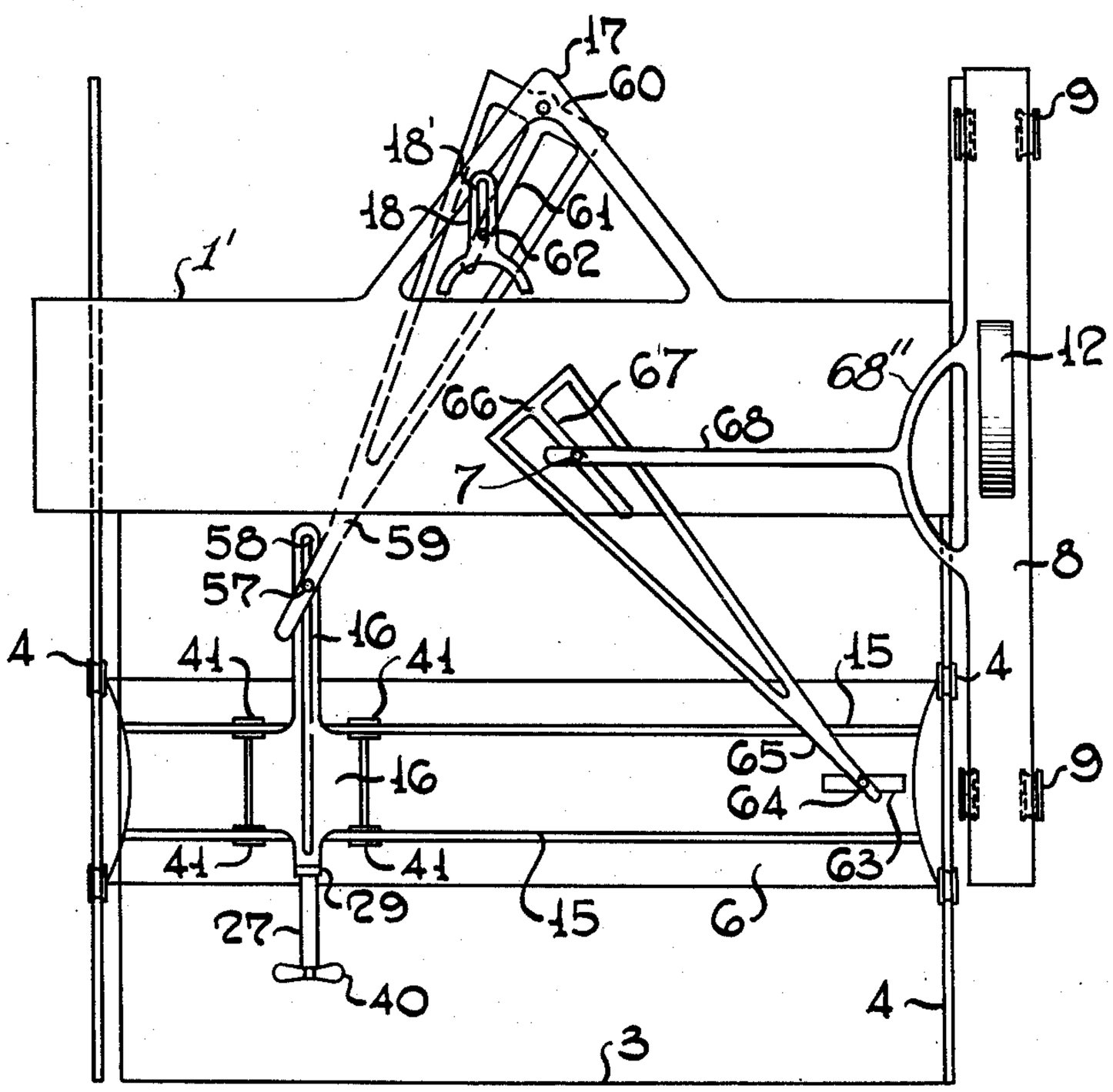

FIG.-6

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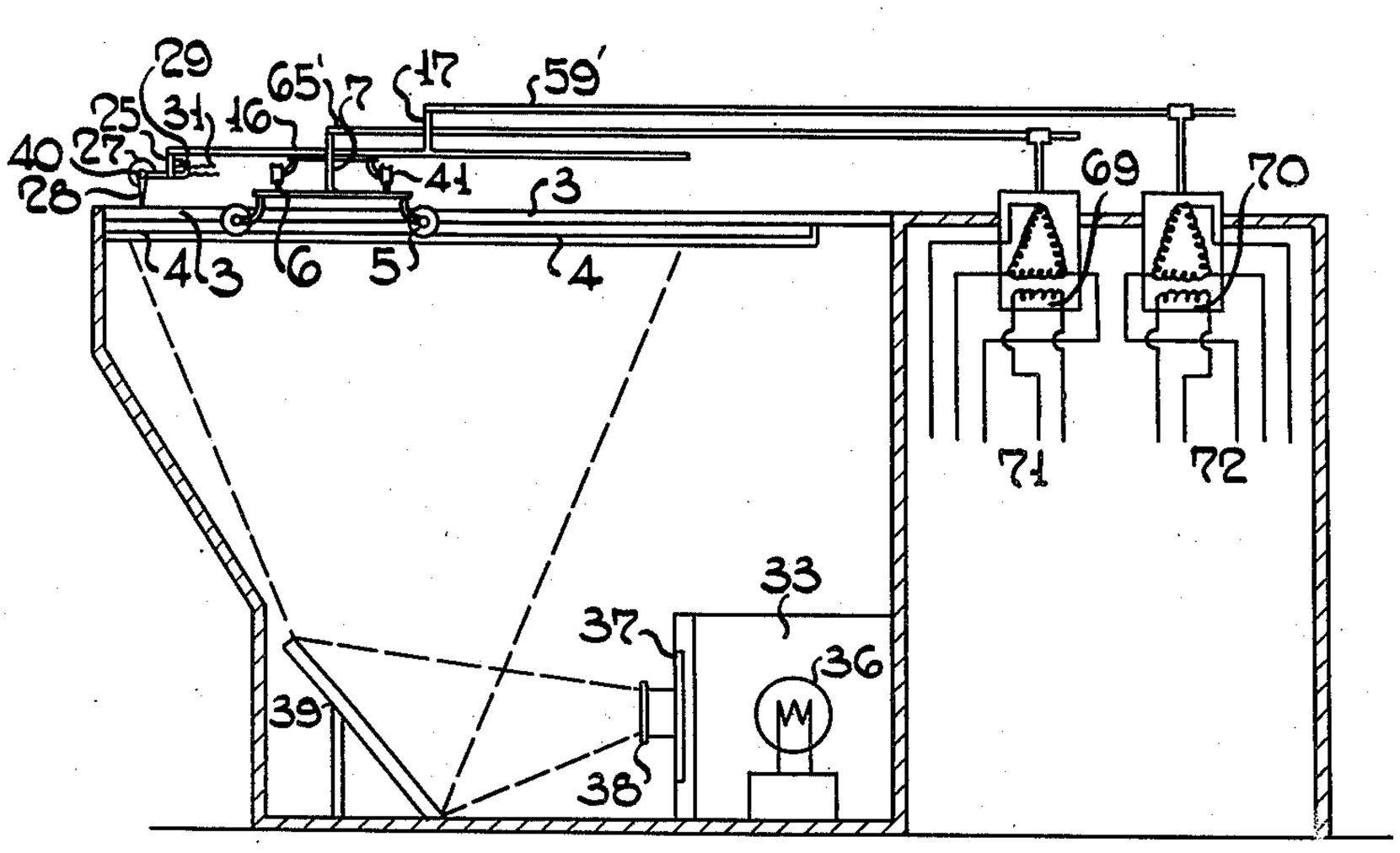

FIG.-7

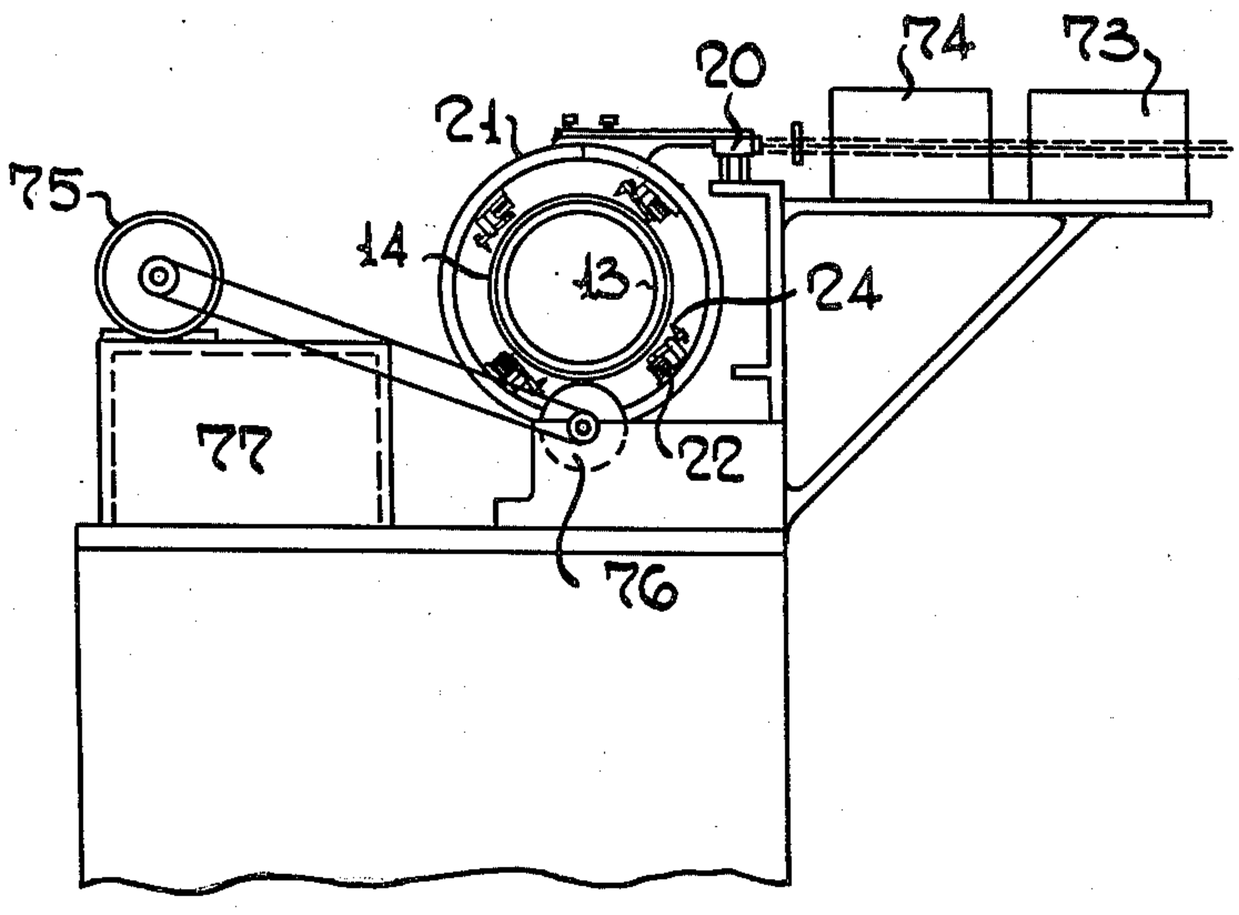

FIG.-8

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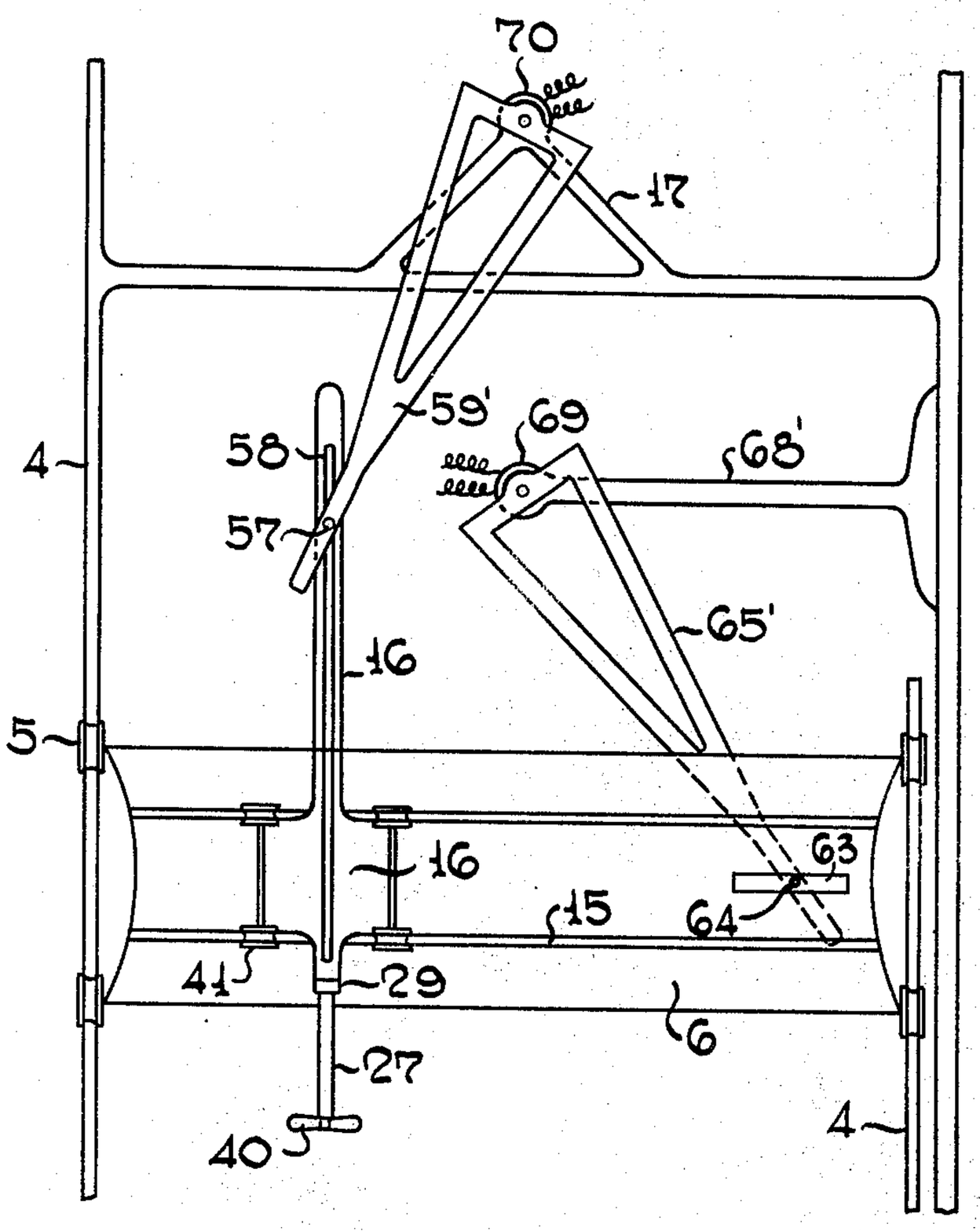

FIG.-9

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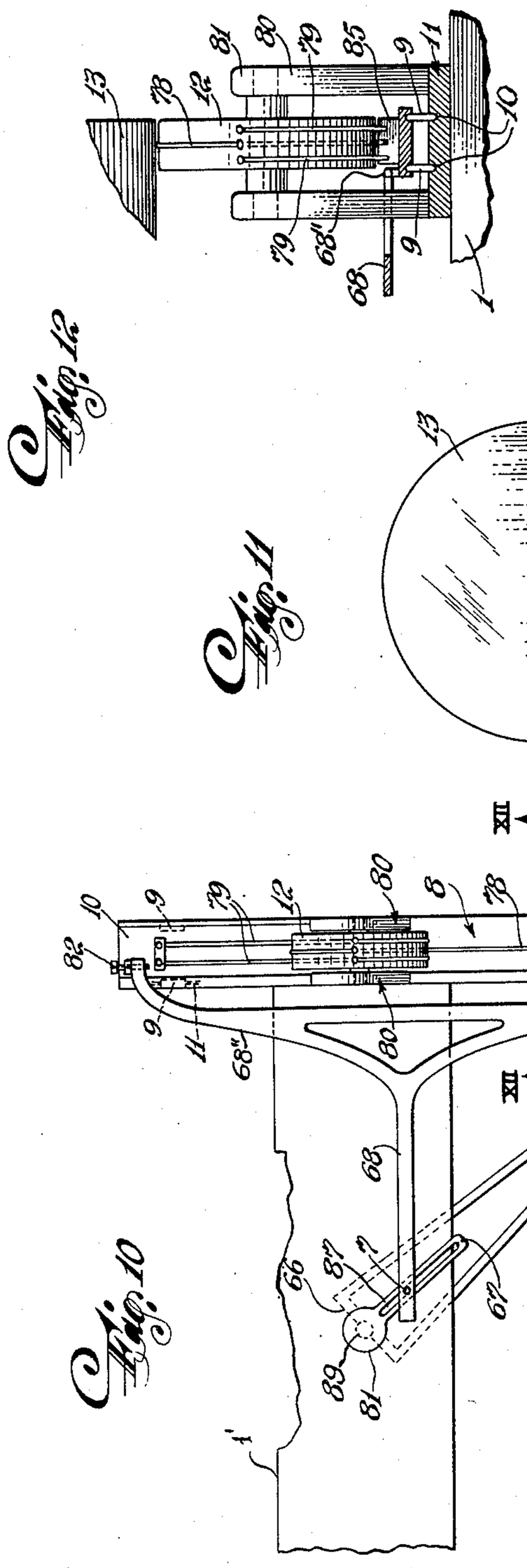

Fig. 12

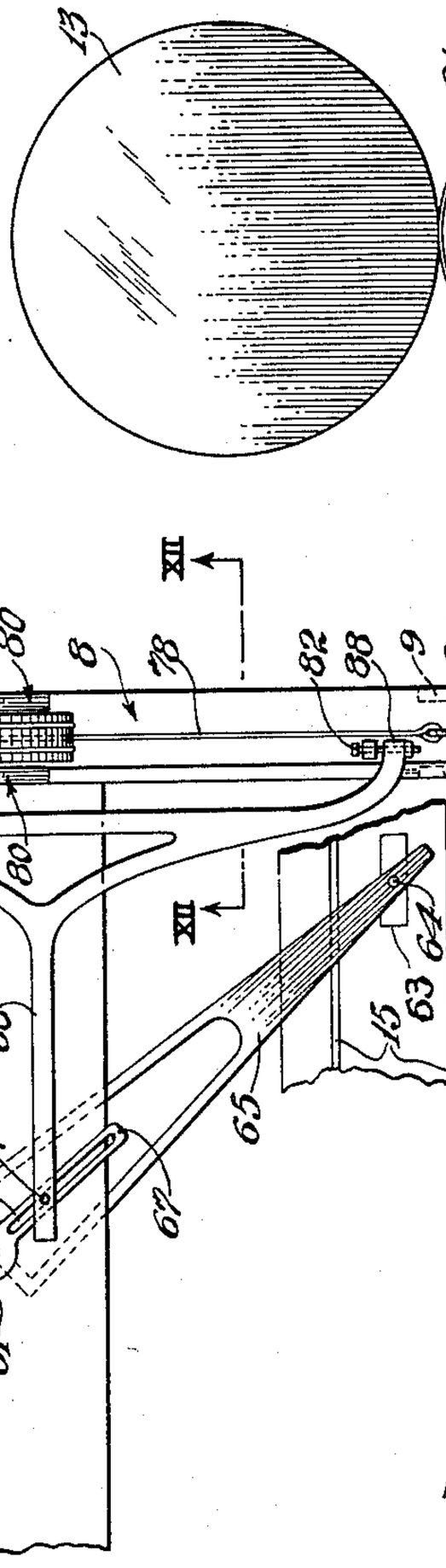

Fig. 11

Fig. 10

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PANTOGRAPH ENGRAVING MACHINE

David H. Hearle, Rutherford, N. J.

Application April 13, 1946, Serial No. 661,929

3 Claims. (Cl. 178—18)

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The present invention deals with a pantograph engraving machine for making textile prints. More specifically, it deals with an improved method of tracing the design and transferring it onto the copper matrix.

In the conventional method of engraving textile designs, an engraved, etched and painted master plate is nailed on to a table, whereupon the operator traces the design from the master plate by the use of a stylus connected mechanically to lever and gear assemblies. These transfer the motion of the stylus to one or two diamond points which scratch the design onto the varnished copper matrix roll. Usually one diamond point is employed, although sometimes two oppositely located points are used. The use of more than two diamond points around the matrix is not practical due to the intricacy of mechanical gearing required.

The present invention overcomes many of the disadvantages of the conventional system by providing first, a camera image for the tracing stylus, and second, an electrical transfer method which will enable the operator to double and, in many cases, quadruple his production of designs.

The invention will be more clearly understood by reference to the drawings in which the same numbers refer to similar parts in the different figures.

Figure 1 shows a side view of one embodiment of the invention, while Figure 2 shows a modified form for projecting the image of the pattern. Figure 3 shows a top view of the same machine. Details of the engraving cylinder section are shown in Figure 4, while Figure 5 illustrates some of the features of the stylus arm assembly. In Figure 6 is shown the method employed for transmitting the planograph motion from the stylus to the diamond engraving points. A system employing synchro motors for transmitting the motion is illustrated in Figure 7 while Figure 8 shows a servo unit receiving assembly. A method of transferring the planograph motion to the synchro motors is shown in Figure 9.

A top view, partially cut away showing the right portion of a modification of the pantograph actuating means for rotating the matrix is illustrated in Figure 10, while Figure 12 is a front view of a portion of Figure 10 taken along XII—XII. A side view of the unit illustrated in Figure 10 is depicted in Figure 11, which also shows the matrix as it is rotated.

In the embodiment illustrated in Figures 10 to 12, pivot 89 attached to wide portion 66 of arm 65 extends through stationary table portion 1' of

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base 1, and from its upper protruding portion 81 extends arm 67 holding slot 87 in which rides pivot 7 of arm 68 which, in turn, is connected via side arms 68'' to moving table 8. Table 8 rotates roll 12 by gearing or other conventional alternative means such as straps 78 and 79 attached to table 8 at 84 and 85 respectively. Roll 8 may be attached to base 1 by headstocks 80 holding bearings 81 in which rotates the shaft of roll 8. Arms 68'' are attached to table 8 by screws 82 which pass through sleeves 88.

Figure 1 represents a machine designed according to the present invention. Numeral 1 represents a base or frame on which is mounted table 2 having a frosted glass top 3 and grooved side rails 4. Riding on rails 4 are rollers 5 carrying carriage 6, one of the motion transmitting units which transmits forward and backward motion through member 7 to forward and backward-moving side table 8 having rollers 9 which ride on rails 10 fixed to projection 11 of frame 1. Table 8 is geared to roll 12 which is in frictional contact with cylinder 13, on the outside of which is mounted the varnished copper matrix 14. Thus a forward or backward motion of carriage 6 will cause a similar movement of table 8, resulting in a rotation of cylinder 13 on which the matrix is mounted.

Carriage 6 is provided with rails 15, positioned at right angles to rails 4 and carrying carriage 16 which has rollers 41 riding on rails 15. To the end of carriage 16 is attached transmitting member 17 which transmits motion to members 18 and 19. Member 19 carries arm 20 to which is attached hollow cylindrical section 21 by means of screws 23 and 32. Mounted inside cylinder 21 are solenoids 22 which actuate diamond points 24. Thus it can be seen that any side motion of carriage 16 will be transmitted to hollow cylindrical section 21 moving it at right angles to the rotational direction of cylinder 13.

The front end of carriage 16 has a projection 25 on the end of which is pivot 26 to which is connected arm 27 bearing stylus 28 on one end, and lever 29 on the other, the latter bearing electrical contact 30 which makes contact with an electrical switch housed in projecting arm 25. Electrical leads for this switch are shown by 31. Thus it can be seen that any movement of stylus 28 will be transmitted by the mechanism described, to rotate cylinder 13 and/or effect a side-wise motion of cylindrical section 21. Depressing handle 40 of stylus 28 to glass plate 3 moves electrical contact 30 into the switch in projecting arm 25, thereby closing the circuit and

actuating solenoids 22 which cause the diamond points 24 to scratch the varnished surface of matrix 14, thereby exposing the copper surface for etching.

Under table 2 is projector 33 having rollers 34 riding on rails 35. An illumination source 36 allows light rays to pass through design 37 and lens 38, thereby throwing an image of the design on the ground glass screen 3 mounted on table 2. This image on screen 3 is traced with stylus 28 and transmitted to copper matrix 14 by the method just outlined. Provision may be made to lock projector 33 in place on the rails 35, once the desired position is attained. Instead of this method of projecting the image, it is possible to employ the system shown in Figure 2, where the projector is placed out of the way behind base 1 and a reflector 39 is employed to reflect the image projected from 33 and throw it on screen 3.

A top or plan view of the machine is shown in Figure 3. It will be observed that the annular hollow cylindrical sections 21 are concentrically arranged around matrix 14 and the cylinder on which it is mounted. The solenoids 22 and the cutting diamonds are mounted on the inside surface of cylindrical sections 21. It is possible to move the sections 21 on shaft 56 and thus locate the cutting diamonds at any point over the matrix 14.

Details of cylindrical section 21 and its supporting arm 19 are given in Figure 4. The cylinder is split at 41 and hinged at 42. By unscrewing screw 32 it is possible to open the cylinder and make any changes inside, as desired. Solenoids 22 are mounted on bases 43 which are attached to cylinder 21 by screws 44 which ride in slots 45 cut out of cylinder 21 and thus make it possible to position the solenoids wherever desired. When the solenoid 22 is actuated by a current, armature 46 is pulled into the coil. This causes diamond point 24 to be pushed out away from the cylinder wall by lever 47 pivoted at the top of projecting arm 48. Spring 49 attached to the lever near the diamond point retracts the point when the electrical circuit is opened and the current is cut off. Arm 20 holding cylinder 21 contains electrical plugs 50 for supplying the current from switch 29 to solenoids 22. Sidewise motion of cylinder 21 is affected by rolling rollers 51 mounted on arm 20 and rolling on track 52 on member 53 fastened to frame 1.

Figure 5 shows details of the stylus and the electrical switch. The projecting arm 25 of carriage 16 has attached to it arm 27 pivoted at 26 and having hand knob 40 above stylus 28 on one end, and up-bent lever arm 29 on the other end. This lever arm contacts button 30 of the contact switch enclosed in 25, numerals 54 and 55 designating the electrical contacts of the switch.

The mode of operation of the planograph action will be better understood from Figure 6 (in which cylinders 14 and 21 are not shown). As stylus handle 40 is moved sideways, carriage 16 moves with it on rollers 41. An extension of carriage 16 has a pivot 57 sliding in groove 58 which acts as a fulcrum for arm 59. This arm is split and the side wide section is joined and pivoted at pivot 60 which is fastened to extension 17 of the stationary table portion 1' of base 1. Inside of the wide section of arm 59 is central lever 61 having, at its end, pivot 62 which rides in slot 18' of arm 18 (disposed above table 1'), which moves support 19 (Fig. 1) carrying the cylindrical sections 21 in which are mounted the diamond engraving points. Thus it can be seen how a sidewise motion of the stylus will slide the diamond engraving points sidewise along the matrix 14.

When stylus handle 40 is moved forward and backward, carriage 6 on rollers 4 will move similarly. In carriage 6 is slot 63 in which rides pivot 64. Attached to pivot 64 is arm 65 which is pivoted at 66 to table 1' and which also widens and is joined at the wide part at 66 from which lever arm 67 extends. A pivot 7 fastened to arm 68 extends into lever 67. Arm 68 is fastened to carriage 8 which is in frictional contact with wheel 12 which rotates cylinder 13 bearing matrix 14. Carriage 8 rolls on rollers 9. Thus it can be seen how a forward-backward motion of the stylus will cause a rotation of the matrix for positioning, prior to the engraving operation.

Another embodiment of the present invention is shown in Figure 7 in which the numerals represent equivalent members of those in Figure 1. As the stylus 28 is moved, the forward-backward motion is transmitted to arm 65' which rotates the shaft of a synchronous motor 69. Sidewise motion is transmitted to arm 59' which rotates the shaft of synchro motor 70. Leads 71 and 72 of synchro motors 69 and 70, respectively, are run to the receiving servo motors shown in Figure 8. As the shaft of synchro motor 70 is rotated, a corresponding rotation is registered by servo motor 73 (connected with it), which in turn controls the power motor 74 of the servo unit, causing it to move bar 20 the required distance. Since bar 20 carries cylindrical section 21, the latter is moved the same distance, thus positioning the matrix by sidewise motion.

Also, as the shaft of synchro motor 69 is rotated, the shaft of servo motor 75 (connected with it) is also moved the same distance. Since servo motor 75 controls power motor 76, the latter, when actuated by 75, rotates cylinder 13 on which is mounted matrix 14. Electrical contact at 29 (Figure 6) causes solenoids 22 to impress diamond points 24 upon matrix 14. The power supply for the motors is shown as 77.

One method which may be employed for transmitting the planograph motion to synchro motors 69 and 70 is shown in Figure 9. Arms 68' and 17 are fixed to frame 1 and synchro motors 69 and 70 are mounted thereon. The mechanism is otherwise similar to that disclosed in Figure 6. It is apparent that when servo units are employed, the transmitting unit may be remotely located from the receiving or engraving unit, since the connections between the two are electrical ones.

I claim:

1. In a pantograph machine for engraving a metal matrix cylinder used for making textile prints and provided with a stylus carrying an electric switch, said stylus being connected with the pantograph and employed for tracing an original design, said machine also employing engraving points operated by solenoids for cutting the design into the matrix, the improvement comprising a hollow cylindrical section concentrically disposed around the matrix cylinder sufficiently far away therefrom to allow space for the solenoids and engraving points, the solenoids being mounted inside of the hollow cylindrical section and actuated by current flowing from the stylus switch, a lever arm adjacent to each solenoid and carrying the engraving point at one end and connected to the armature of the solenoid at the other, said engraving points being forced against the matrix by the lever arm when the

solenoid is actuated by the current, means for retracting the points from the matrix when the current flow is interrupted, means for moving the hollow cylindrical section by pantographic action from the stylus and means for rotating the matrix within said hollow cylindrical section of pantographic action from the stylus.

2. A machine according to claim 1 having arms for transmitting the pantographic motion, synchro motors moved by said motion and other synchro motors interconnected with the first-mentioned synchro motors for effecting a positioning of the matrix to the extent determined by the movement of the first-mentioned synchro motors.

3. A machine according to claim 1 having en-

graving points in more than two positions around the matrix.

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