No. 696,951. Patented Apr. 8, 1902.

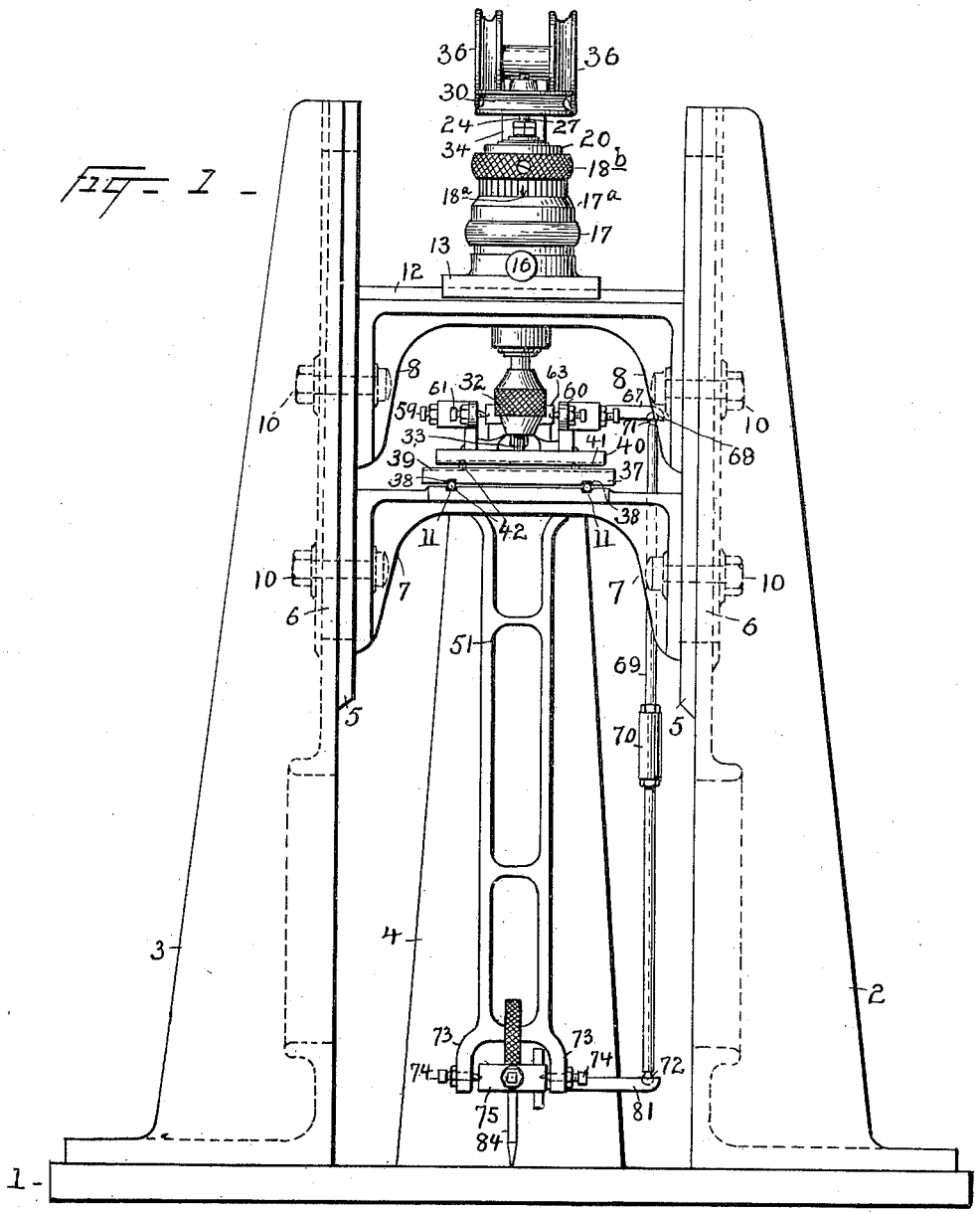
W. S. EATON.

ROUTING OR ENGRAVING MACHINE.

(Application filed Nov. 27, 1899. Renewed Nov. 29, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



WITNESSES

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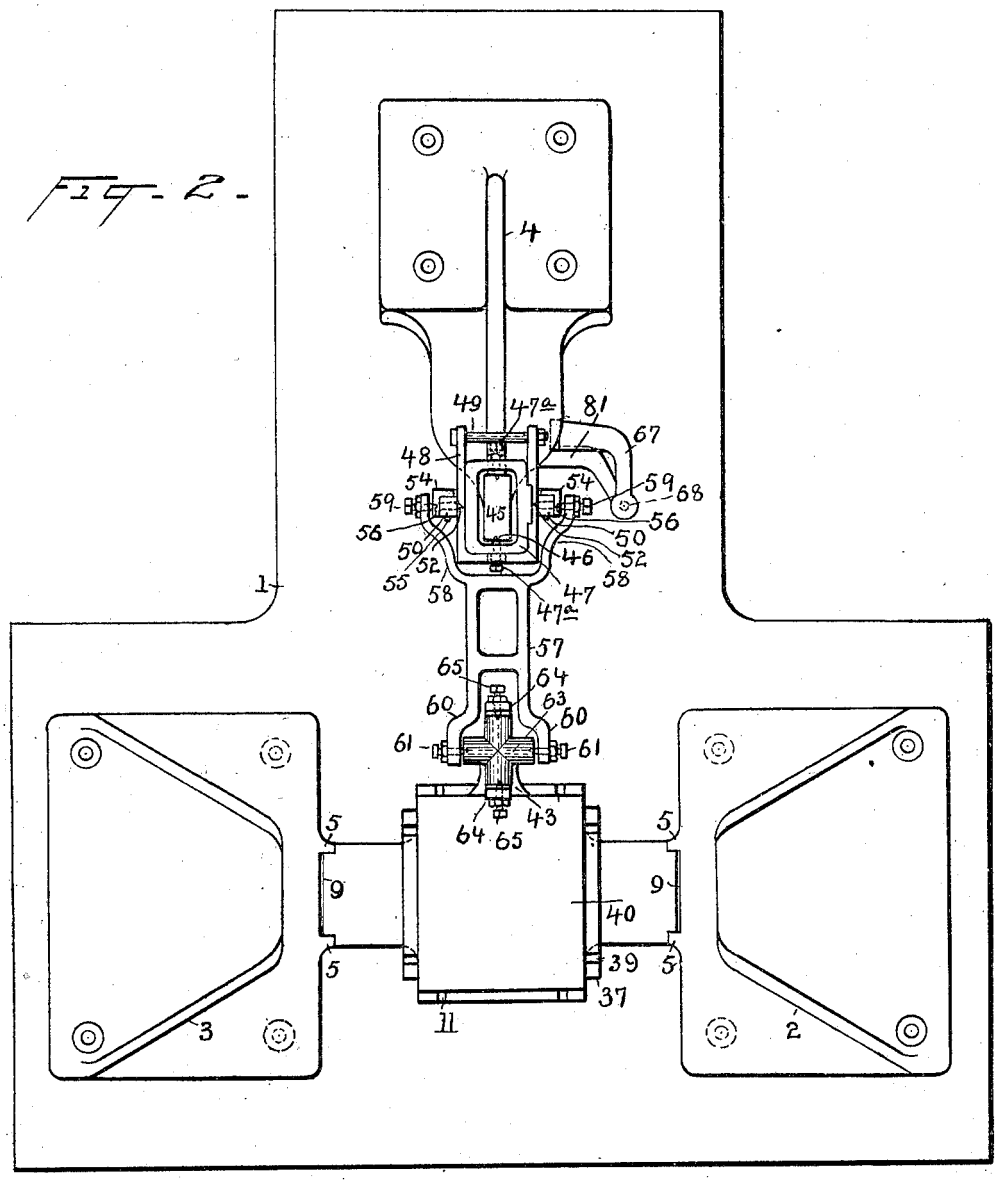
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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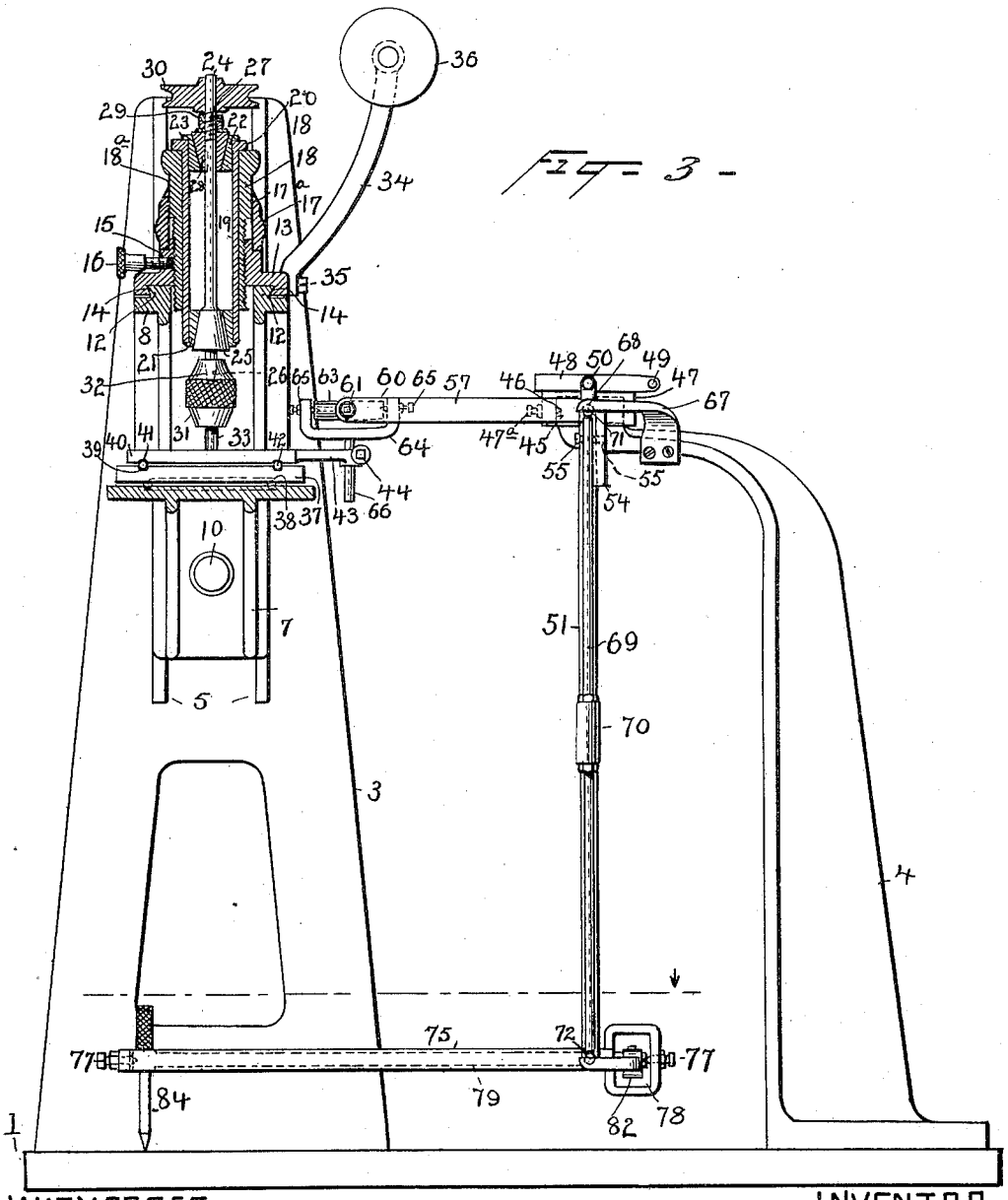
(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

Fig. 4.

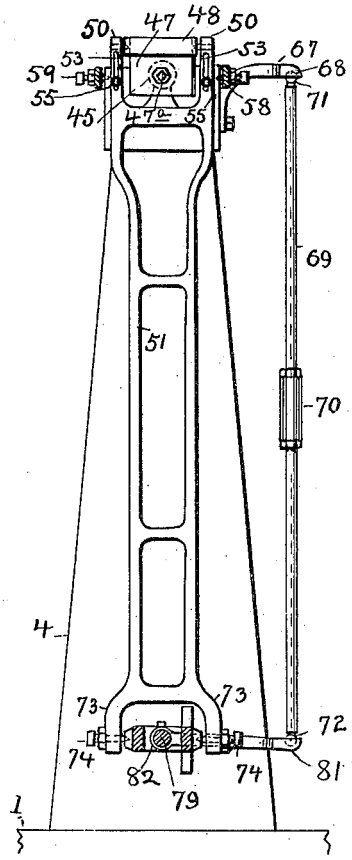
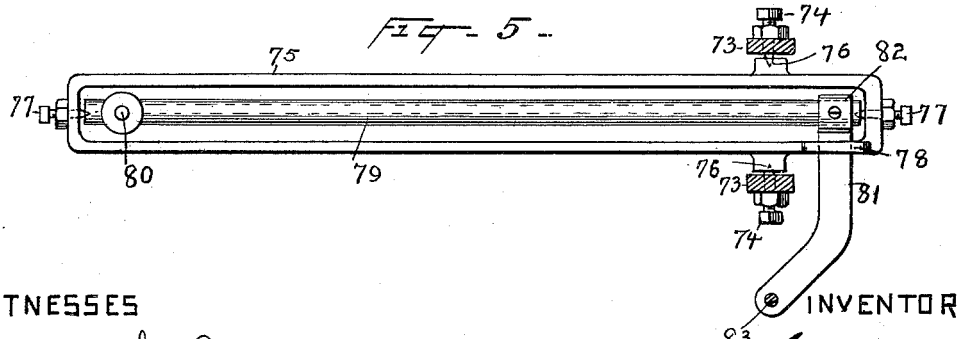


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM S. EATON, OF SAG HARBOR, NEW YORK.

ROUTING OR ENGRAVING MACHINE.

SPECIFICATION forming part of Letters Patent No. 696,951, dated April 8, 1902.

Application filed November 27, 1899. Renewed November 29, 1901. Serial No. 84,096. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. EATON, a citizen of the United States of America, and a resident of Sag Harbor, county of Suffolk, State of New York, have invented certain new and useful Improvements in Routing or Engraving Machines, of which the following is a specification.

My invention relates to improvements in that class of machines known as "routing" or "engraving" machines. I have particularly described my mechanism as the same pertains to a routing-machine—that is to say, one wherein the cutting instrument is caused to revolve during the process of engraving; but it will be understood that it is applicable where a stationary cutting instrument is used. Generally speaking, the instrument is operated on what is known as the "pantograph" plan of reduction.

My present invention relates more particularly to the economical and practical arrangement of parts whereby I accomplish the result, and more particularly the perfect adjustment of which my machine is capable and the arrangement of a leverage system on the pantograph plan, wherein a very perfect universal movement is obtained with a relatively small degree of friction.

This invention also relates to means by which I am able to maintain the tracer in a vertical position during the operation of tracing. It will be readily understood that as the tracer is moved from a central zero position either to the right or left hand, if the tracer-arm is hinged to move only in one direction the tracer will necessarily be tilted out of the vertical plane as it is moved from its zero position. By mechanisms hereinafter described I compensate for this movement by mounting the tracer in a rock-shaft, and by rocking this shaft through a system of universal-jointed levers, secured to a permanent base, I am able to compensate for the inclination of the tracer due to the movement out of the zero position.

My machine is capable of simple engraving or die-cutting or other routing operations.

I have designed this machine more particularly with the view of uniting strength and construction with ease of adjustment and harmony of operation.

I have illustrated my invention in the accompanying drawings, referring to the parts by numerals, like parts being designated by like numerals.

Figure 1 is a front view of my machine in elevation. Fig. 2 is a plan view omitting the bracket 8 and the mechanism supported thereby. Fig. 3 is a vertical section of the parts lying between the uprights 2 and 3 and a side view of other parts. Fig. 4 is a front view of the leverage system. Fig. 5 is a plan of the frame and rock-shaft forming the guide-arm.

I will now proceed to describe the machine in detail.

It is mounted upon a base, as 1. Upon this base I establish three uprights, (designated as 2, 3, and 4.) The upright 4 is turned horizontally at its upper end and forms a bracket on which the lever system is suspended. The uprights 2 and 3 are provided with guides, as 5 5, (shown in Fig. 2,) and also with vertical slots 6 6, (indicated in dotted lines in Fig. 1,) in which the bolts 10 secure the brackets 7 and 8 between the uprights 2 and 3 and in which said bolts move in the adjustment of the brackets.

7 and 8 are brackets provided with tongues 9 9, which slide within the guides 5 5, and 10, &c., are bolts and nuts passing through the brackets 7 and 8 and through the slot 6 to adjustably secure these said brackets to the uprights 2 and 3.

11 represents parallel ways adapted to receive ball-bearings in the top of the bracket 7, and 12 indicates a beveled tongue in the top of the bracket 8.

I will now describe the construction and mounting of the routing-instrument holder employed by me in this machine.

13 is a support with a central vertical screw-threaded aperture through the same, and on the under side thereof are formed beveled ways 14, adapted to slide on the beveled tongue 12 on the top of the bracket 8. 15 is a screw-threaded aperture in said support to receive a set-screw, and 16 is a set-screw for said aperture. 17 is a sleeve mounted on said support 13, having engraved on its surface 17^a a micrometer-scale. (Not illustrated.)

18 is a cylindrical part externally screw-threaded to be screwed into the screw-threaded aperture of the support 13. On the an-

nular portion 18ª is engraved an index-point for the purpose of indicating the relative position of the sleeve 18 with reference to the micrometer-scale 17ª.

19 is a cylindrical part having an annular shoulder 20 at the top thereof and having conical bearings 21 set into the lower portion thereof.

22 is a block adapted to fit into the upper end of the cylindrical part 19, having an annular shoulder 23 to sustain it in that position and having on the interior thereof a conical bearing.

24 is a shaft having mounted thereon a conical hub 25 and being tapered at one end, as at 26.

27 is a screw-thread on the shaft 24.

28 is a conical hub run on the shaft 24 and secured thereon by the set-screws 29.

30 is a pulley mounted on the shaft 24.

31 is a routing-tool holder, one end of which is provided with a conical aperture 32 to receive the tapered end 26 of the shaft 24 and at the other end provided with an aperture and vise to receive and hold the routing-tool 33. I deem it unnecessary to describe the construction of this tool-holder, as it is well-known in the art.

34 is a bracket-arm secured to the support 13 by the bolt 35 and carrying at the other end suitably journaled thereto the guide-pulleys 36 36.

The manner in which these parts last described are put together is as follows: The support 13 is run on the tongue 12, and the sleeve 17 is mounted on said support 13. The cylindrical part 18 is then screwed into the central aperture of the support 13. The cylindrical part 19 is then run into the cylindrical part 18. The shaft 24 is introduced from below through the conical bearing 21. The block 22 is run on the shaft 24, and the conical hub 28 is run on the shaft 24, and by the said screws 29 is fitted to proper adjustment into the conical bearings within said hub 28. The pulley 30 is then put in position on the end of the shaft 24, and the routing-instrument holder is jammed on a tapered end 26 of the shaft 24. It will be readily understood that in this construction I can raise or lower the routing instrument by revolving the cylindrical part 18, which is provided on its periphery with a hatched surface 18ᵇ to give a purchase for the manual operation of the same. The degree of movement of the cylindrical part 18 will be indicated by reading the difference between the micrometer-scale 17ª and the index-point 18ª. A suitable power-belt passes over the pulleys 36 36 to give a rotary motion to the routing instrument.

I will now proceed to describe the construction of my engraving-table, which is mounted to have a right-angular universal movement.

As heretofore stated, the bracket 7 is provided on its upper surface with parallel ways 11. The plate 37 is provided on its under side with parallel ways 38 and on its upper side with parallel ways 39, the ways 39 being at right angles to the ways 38.

40 is a plate, which I term the "engraving-table," provided on its under side with parallel ways 41, parallel with the ways 39.

42 represents balls interposed within the above-described ways between the bracket 7 and the plate 37 and between the plate 37 and the plate 40.

43 is a tongue projecting from the table 40.

44 is a spring-collar, having a bolt and nut secured to the end of the tongue 43.

It will be readily understood that by this system of plates superimposed one above the other with ball-bearing ways at right angles to each other a universal right-angular movement is obtained by the operation of the top plate 40. I therefore connect to this plate a multiple-leverage system constructed according to the pantograph system, in which a system of levers is connected at its other end with a tracing-stylus, and through the operation of the stylus and leverage system I move the table 40 beneath the routing or engraving instrument. I will now describe this system of levers. This system of levers is suspended as follows:

4 is a bracket suitably mounted and having a head, as 45, with center bearings therein, 46, and 47 is a frame having center-bearing points 47ª, which engage 46.

48 is a collar mounted on the frame 47, secured to and adjustable thereon by the lock-bolt and nut 49.

50 represents the bifurcated ends of a vertical lever 51, and 51 is a vertical lever.

52 represents center-bearing points carried in the bifurcated ends 50 50 of the lever 51, which engage 48, and 53 53 are slots in the bifurcated arms 50 50.

54 is a plate attached to the vertical lever 51 by screws 55, passing through slots in the said bifurcated arms 50, said plate being adjustable within said slots by the releasing or tightening of said screws 55. The plate 54 is provided with center bearings 56.

57 is a link having bifurcated arms 58 58, said arms carrying center-bearing points 59, which engage 56. Said link has also bifurcated arms 60 60, carrying center-bearing points 61.

63 is a center-bearing block with four arms and four center bearings at the ends of said arms, said bearings not being designated by number.

64 is a bifurcated frame carrying bearing-points 65 in the arms of said frame.

66 is a vertical rod secured to the frame and adapted to be mounted within the elastic sleeve 44.

67 is a bracket secured to the upright 4 and provided at one end with a socket-bearing 68.

69 is a rod having at either end knobs or ball-bearing ends 71 and 72. This rod is

broken in the center and connected by an adjustment-screw 70, by which it may be adjusted to any desired length.

73 is the bifurcated end of the vertical lever 51, in which are mounted the center-bearing points 74.

75 is a guide-arm frame having center bearings 76 76, by which it is hinged between the center-bearing points 74 74.

77 77 are center-bearing points between which are journaled the rock-shaft 79. The rock-shaft 79 is provided with an aperture, as 80, to receive the tracer 84.

At 78 I have indicated a rectangular portion of the frame 75, forming an aperture through which the lever 81, hereinafter to be described, may freely operate. This lever 81 is secured to the shaft 79 by a collar, as 82, and at the other end, as at 83, it is provided with a ball-bearing socket to receive the knob or head 72 of the rod 69, and 84 is a tracer mounted in the rock-shaft 79.

Having now described the several parts, I will refer briefly to the adjustments of the leverage system. This system interposed between the tracer-stylus and the engraving-table may be adjusted by changing the points of fulcrum to suit the conditions which it is proposed to meet. To begin with, a starting-point is found by bringing all of the points of fulcrum into the same plane. Thus a zero position is found in which the stylus may be moved without affecting any of the operative parts. The degree of movement of the fulcrum of any of the parts away from this center and into other and different planes constitutes the adjustable feature of my leverage system, and by this variable adjustment I may obtain variable results. It will be readily understood from the description already had that I may adjust these fulcrums by releasing the bolts 49 and moving the collar 48 up and down on the frame 47 and securing the same in any desired position and by releasing the screw 55 and moving the plate 54 up or down within the ways in the bifurcated arms of the vertical lever 50.

It is unnecessary for me to explain in detail the variety of sizes and forms of reproduction which I may obtain by varying the points of fulcrum, as last described. The present apparatus is constructed for the reproduction of a reduced figure. The points of fulcrum above referred to may be expressed by reference to the center-bearing points, (designated as follows: 47^a, 52, and 59,) and when I refer to bringing the fulcrum-points into the same plane I mean bringing the center-bearing points into the same plane, and when I refer to moving the center-bearing points out of the same plane I mean moving the center-bearing points so as to change the relative position of the points of fulcrum to a point—as, for illustration, according to the position indicated in the drawings submitted herewith.

The operation of my machine is as follows: The pattern or design to be reproduced is secured upon a tracing-table beneath a tracer, and the operator manually moves the tracer over the surface to be traced, and the movement of the tracer is transmitted, through the leverage system hereinbefore described, to the engraving-table 40, which in turn moves on its mountings in a two-way right-angular movement, which is, in fact, a universal movement. The engraving-table carries the surface to be engraved, and the routing or engraving tool is suitably adjusted with reference to the surface to be engraved by the micrometer-screw 18^b or a larger adjustment by raising or lowering the brackets 7 and 8. As the surface to be engraved is secured to the engraving-table and the engraving-table is moved by the leverage system with every movement of the tracer, it will be manifest that the surface to be engraved moves between the fixed engraving instrument in accordance with the movements of the tracer. I deem it unnecessary here to further describe the pantograph system of reproduction, as this is well understood in the art.

The tracer, as heretofore stated, is mounted in the rock-shaft 79. In a normal position this tracer, the vertical lever 51, and the rod 69 are vertical, and therefore parallel. As the tracer is moved to the right or left the lever 51 and the rod 69 are moved out of the vertical position; but by reason of the fact that the bracket 67 is stationary the arm 81 will be depressed or elevated by the rod 69 with either a right or a left hand movement, and in this depression or elevation of the arm 81 the rock-shaft 79 will be rocked to maintain the tracer 84 in a vertical position. It will be therefore seen that the function of the bracket 67, rod 69, arm 81, and rock-shaft 79 is to maintain the tracer 84 in a vertical position. Thus it will be seen that by the leverage system and guides I am able to transmit from a tracer maintained in a vertical position every motion of such tracer to an engraving-table, which is so mounted as to receive such motion and take such positions as may be transmitted thereto from the tracer.

What I claim is—

1. In a routing-machine, means to support and revolve a routing instrument, which consists of a cylindrical part, suitably mounted, having a central screw-threaded aperture, a second cylindrical part, externally screw-threaded to screw into the first cylindrical part, with means to lock said cylindrical parts together at any position within the limits of the helical movement, a third cylindrical part having an annular shoulder at one end, and having mounted within the same at the other end a conical bearing, a second conical bearing, adapted to fit into and be retained in the other end of said third cylinder,

a shaft carrying two conical bearings, adapted to fit in said conical bearings, the third cylindrical part being run within the second cylindrical part, and means to secure a suitable routing instrument to said shaft, and means to revolve said shaft, substantially as described.

2. In a routing-machine, means to support and revolve a routing instrument, which consists of a cylindrical part having a central screw-threaded aperture and beveled ways in its base, the same being mounted on a bracket having a beveled tongue upon which said beveled ways may play, a second cylindrical part, externally screw-threaded to screw into the first cylindrical part, with means to lock said cylindrical parts together at any position within the limits of the helical movement, a third cylindrical part having an annular shoulder at one end, and having mounted within the same at the other end a conical bearing, a second conical bearing, adapted to fit into and be retained in the other end of said third cylinder, a shaft carrying two conical bearings, adapted to fit in said conical bearings, said shaft having also a tapering end on which the routing-instrument holder is journaled, the third cylindrical part being run within the second cylindrical part, and means to revolve said shaft, substantially as described.

3. In an engraving or routing machine, an engraving-table suitably mounted to have a universal movement, a link pivotally connected to said table by a universal joint, a suspended lever pivotally mounted on a bracket by a universal-joint system, the other end of the link being pivotally connected with the upper end of said suspended lever, a frame pivotally connected with the lower end of said suspended lever, and a rock-shaft journaled in said frame with a tracer secured to said shaft and a lever secured thereto also, said lever having at the other end a socket, a second bracket secured to said bracket and having at the other end a socket and a shaft with ball-heads at either end thereof, said heads being mounted in said sockets, substantially as described.

4. In an engraving or routing machine, a leverage system pivotally connected and mounted as follows: a bracket with a head having a frame mounted on said head with center-bearing points, a collar having center bearings and adjustably mounted on said frame; a bifurcated vertical lever hinged to said collar by center bearings, a plate adjustably mounted on said vertical lever and having center bearings, and a link hinged to said plate by center bearings, said link being pivotally connected at the other end to an engraving-table suitably mounted to have a universal movement; the lower end of said vertical lever being bifurcated, a frame pivotally mounted within said last-mentioned bifurcated arms, a rock-shaft journaled within said frame with a tracer-point secured to said rock-shaft, a rod secured to said rock-shaft at one end, and having a socket at the other end, a second bracket secured to said bracket, with a socket at the end of the second bracket, a shaft having ball-bearing heads at either end thereof mounted one in each of said sockets, substantially as described.

5. In an engraving-machine, a leverage system pivotally connected and mounted as follows: a bracket, a frame pivoted to the head of said bracket, a collar adjustably mounted on said frame, a vertical lever bifurcated at its lower end, suspended from and pivotally connected to said collar whereby through the adjustment of the collar on the frame, the axial connections of the vertical lever may be brought into the same plane or moved out of such plane, an engraving-table mounted to have a universal movement, a plate adjustably mounted on the vertical lever, and connected to one end of the lever, a link pivotally connected at one end by right-angular universal-jointed connections to said engraving-table and connected at the other to said plate, a frame connected to the other end of the suspended lever, a rock-shaft journaled within said frame, a tracer secured to said rock-shaft, an arm secured to said rock-shaft at one end and having a socket at the other end, a second bracket secured to said first-named bracket at one end and having a socket at the other end, and a rod having ball-bearing ends and bearing in said sockets, substantially as described.

6. In an engraving-machine, a tracer mounted on a rock-shaft, means connecting the rock-shaft to the work-table and means maintaining said tracer in a vertical position by rocking said shaft relatively to the connecting means, substantially as described.

7. In an engraving-machine the combination of a suspended lever, a tracer mounted on a rock-shaft journaled at one end of the suspended lever, connections to a work-table, and means maintaining the tracer in a vertical position by rocking the shaft relatively to the connecting means, substantially as described.

8. In an engraving-machine, a lever suspended from a suitable bracket, a guide-arm frame hinged to the lower end of the suspended lever and a rock-shaft journaled in said frame, said rock-shaft carrying at one end a tracer and connected at the other end with a rock-arm, said rock-arm having a socket at one end, a second bracket secured to said first-named bracket at one end and having a socket at the other end, a rod having a knob at each end journaled in said sockets, the parts being mounted and adjusted, substantially as described.

Signed by me at New York, N. Y., this 6th day of November, 1899.

WILLIAM S. EATON.

Witnesses:
EMMA W. FINLAYSON,
THOMAS P. DALTON.