No. 808,404. PATENTED DEC. 26, 1905.

F. H. RICHARDS.

MECHANICAL MOVEMENT.

APPLICATION FILED AUG. 9, 1902.

3 SHEETS—SHEET 1.

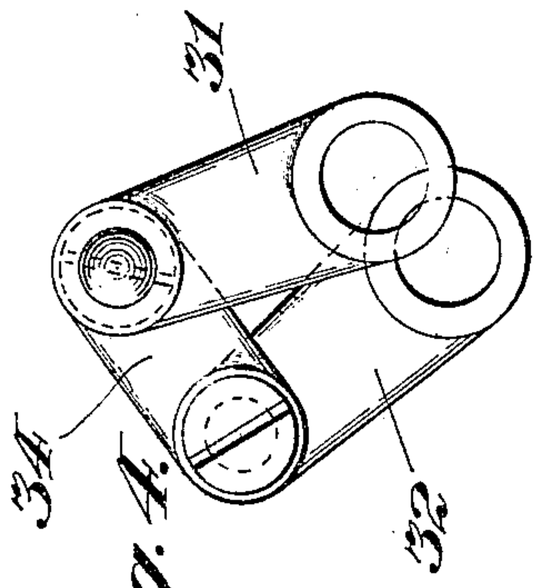

Fig. 4.

Fig. 3.

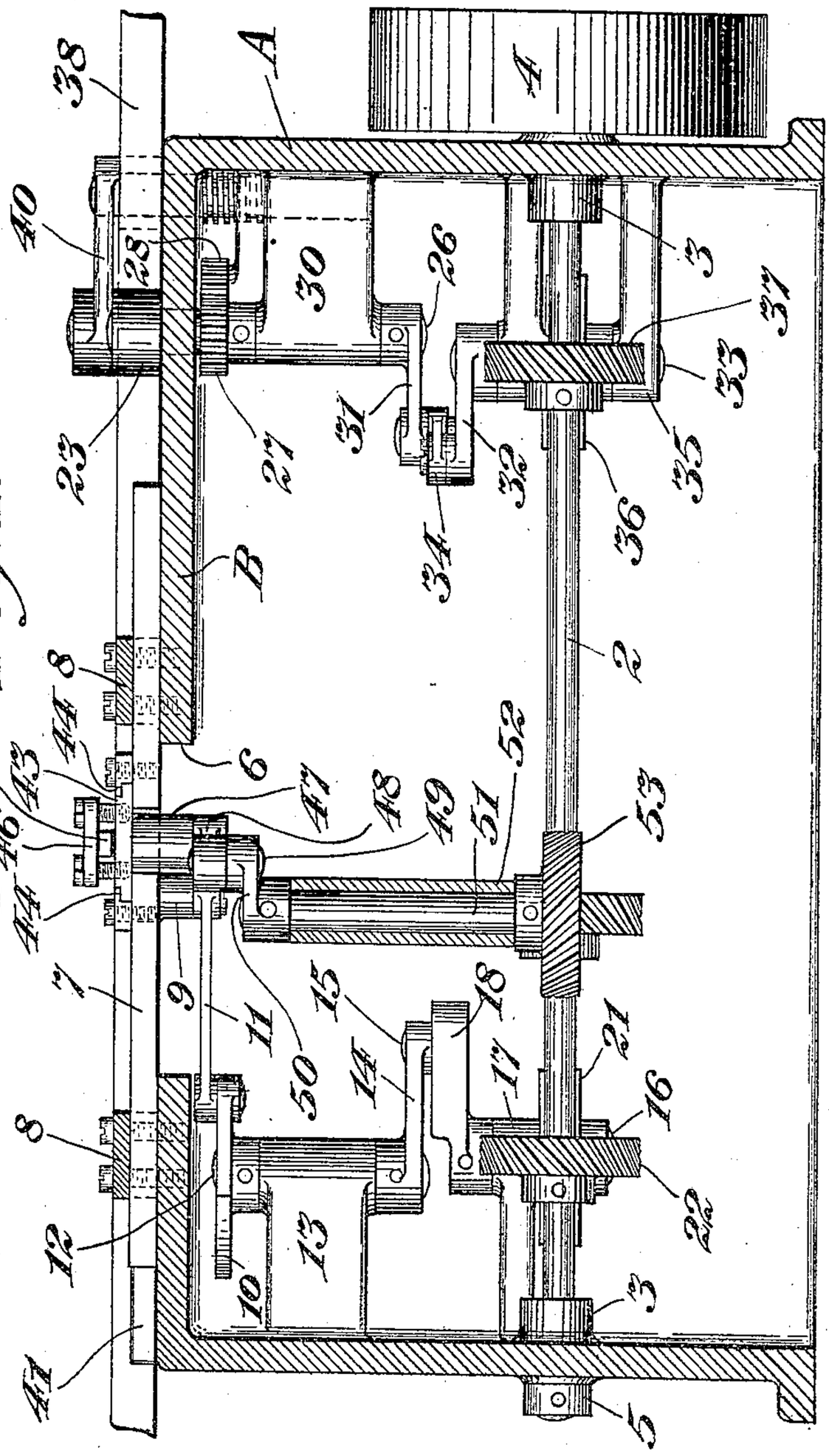

Fig. 1.

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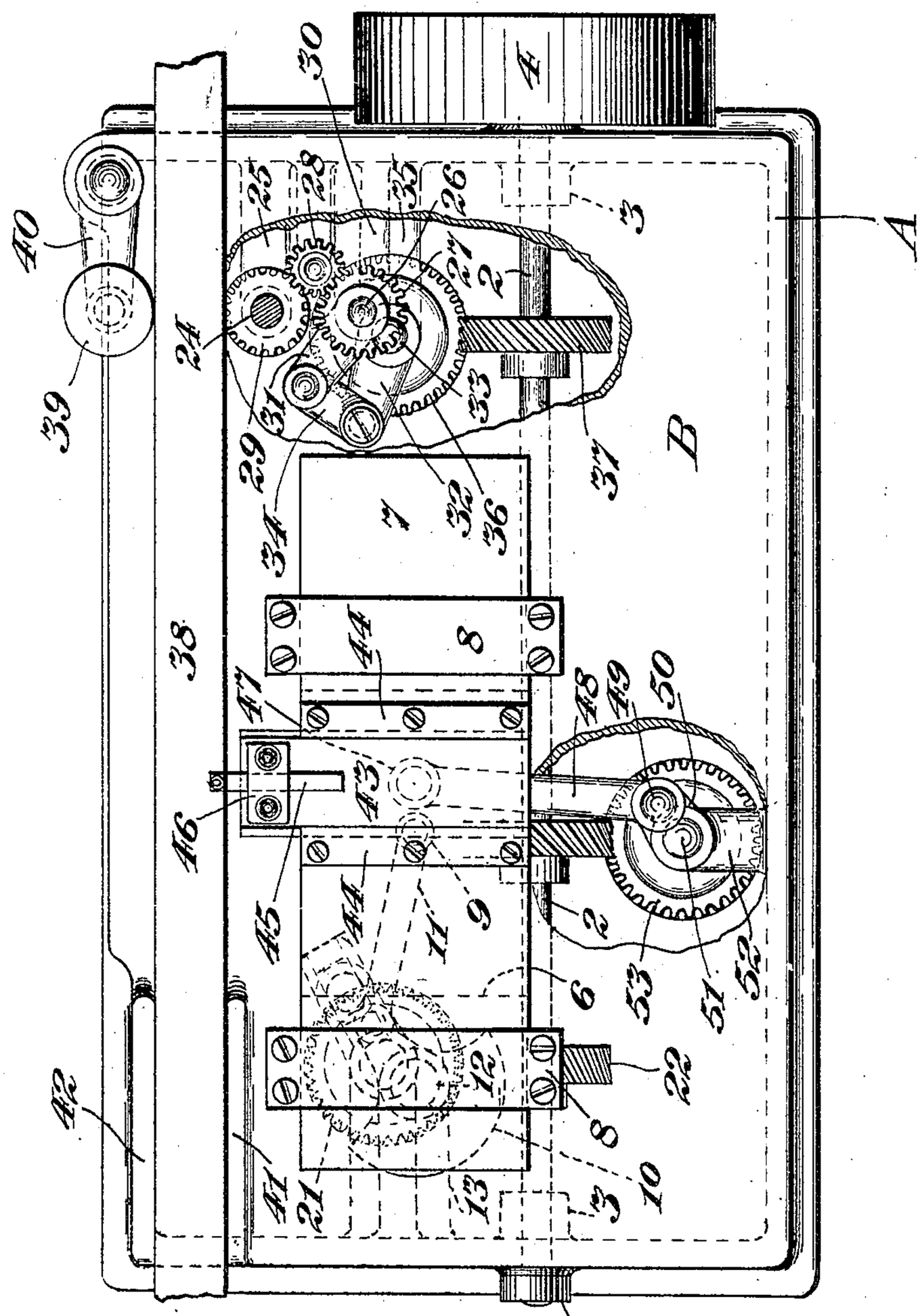

Fig. 2.

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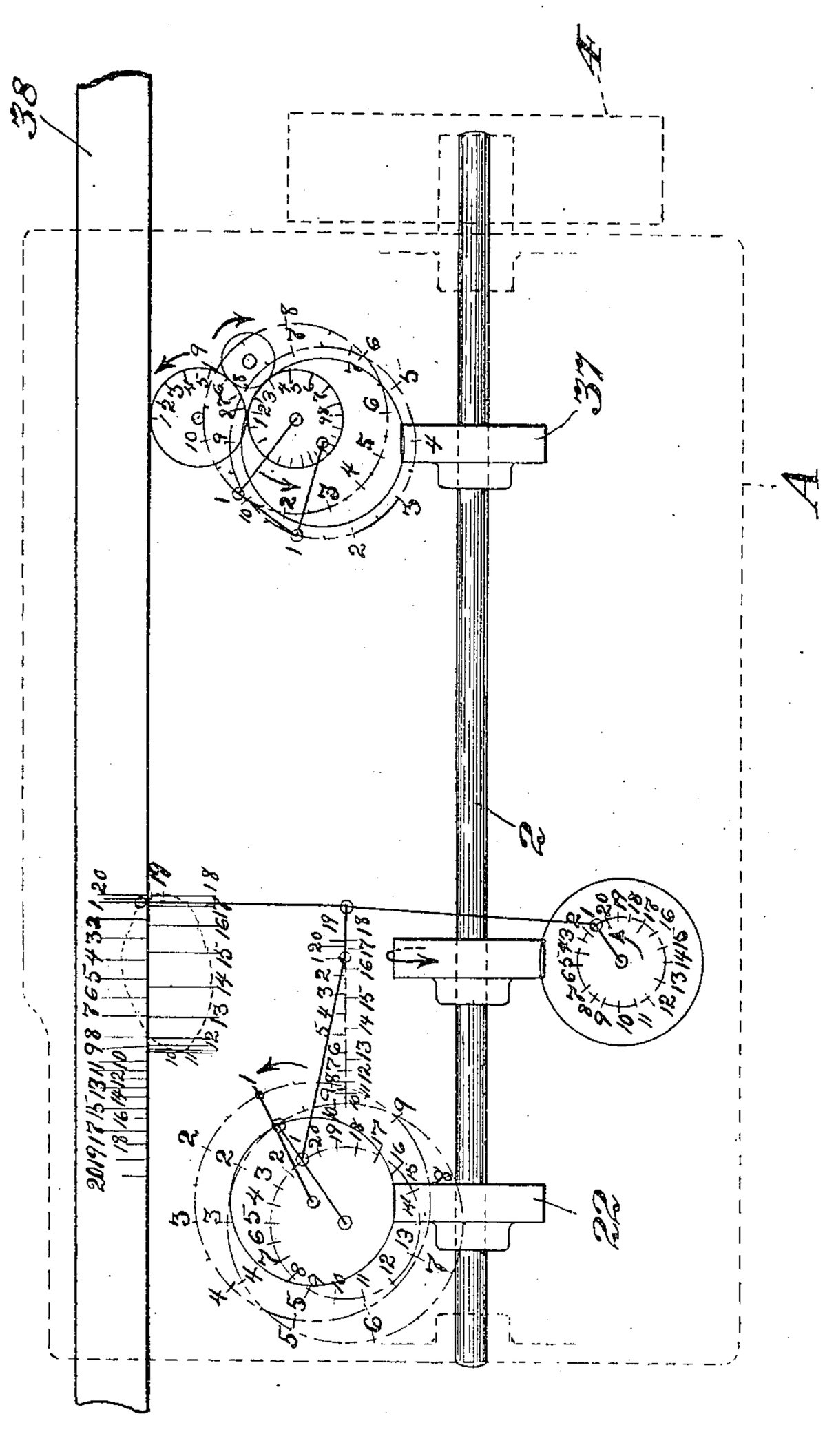

Fig. 5.

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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

MECHANICAL MOVEMENT.

No. 808,404. Specification of Letters Patent. Patented Dec. 26, 1905.

Application filed August 9, 1902. Serial No. 119,045.

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Mechanical Movements, of which the following is a specification.

My present invention pertains to mechanical movements; and one of the objects of the same is to provide a mechanical device or organization of devices capable of modifying movements imparted to the same to attain a circumferential movement of an angularly-movable member corresponding with the movements of a reciprocatable member driven by a link from an angularly-movable member.

Another object of this invention is to provide a mechanical organization in which motion will be imparted from a driver to a continuously-advancing member and also to an advancing and retreating member to effect corresponding movements of said members during an appreciable period in the advance of the advancing and retreating member.

The novel principles involved in this invention are applicable to numerous phases of machine construction and organization wherein it is desired to utilize the circumferential movement of and a reciprocating movement effected by a linked connection from angularly-movable members and produce coincident movements therein, whether accompanying or opposing movements are desired, and the specific objects applying to the different applications of the principle would therefore multiply accordingly.

My invention consists in so organizing mechanical elements as to produce a device wherein the circumferential movement—or, in other words, the development of an angularly-movable member—is caused to correspond to the movement of a reciprocatable member linked to and driven by an angularly-movable member operatively connected to said first member during an appreciable period in the cycle of the initial mover, and it also consists in the application of the principles involved and the combination and organization of elements hereinafter described and claimed.

This principle may be utilized to effect a travel of instrumentalities with a continuously-advancing member during the operation of such instrumentalities with relation to said member, and thus effect a fixed relation between said instrumentalities and said member during the operation of said instrumentalities and repeat said fixed relation at successive periods in the advance of the continuously-advancing member, effecting the said fixed relation between said instrumentalities and said member at successive points upon said member without affecting the continuity of the advance of said continuously-advancing member. For instance, a fixed relation may be successively effected at successive points between said continuously-advancing member and a pointer, stylus, or tool transversely traversable of said continuously-advancing member and maintained during the period of said traverse so that successive straight lines or cuts or figures of predetermined configuration may be made upon said continuously-advancing member or in connection therewith successively without stopping the same.

A few instances of the application of the principle involved in my invention may be pointed out as follows: A cut-off saw may be carried with advancing stock during the operation of said saw upon the stock at successive points, boring-tools may be caused to travel with continuously-advancing stock during their operation upon the stock and return to repeat said travel and operation at a succeeding point on said stock, carving-machine tools may be caused to travel with advancing molding stock during the time they are in the profile of the stock and carried back to repeat the operation at other points upon the stock, &c.

I am aware that an advancing and retreating member has been caused to travel with a continuously-advancing member at successive periods by organizations wherein the diametral movements of the driving-crank have been corrected or augmented to correspond with the uniform movement of a continuously-advancing member by means of superimposed auxiliary members—such as cams, &c.—and that the same has been accomplished through the use of irregular gearing; but I aim to improve upon such constructions by providing a practical organization in which the power applied is more evenly distributed between the several parts with regard to the work to be done.

I have illustrated an organization comprising a mechanical movement involving the principles of this invention in the accompanying drawings, in which like reference characters denote like parts throughout the several views.

Figure 1 is a longitudinal vertical section of said device on the plane of the section cor-

responding with the axis of the main driving-shaft; Fig. 2, a plan view with part of top broken away; Fig. 3, a detail of the carrier-driving cranks; Fig. 4, a detail of the feed-roll-driving cranks, and Fig. 5 a diagrammatical plan indicating twenty successive points of the several parts in a revolution of the driver.

Referring to the drawings, the device is mounted and assembled upon a box-like frame A. A driving-shaft 2 is mounted in bearings 3 3 in the end walls of the frame A horizontally and longitudinally of the frame A. The driving-shaft 2 (see Fig. 1) projects at the right hand without the frame A and is provided with a fast driving-pulley 4 upon its projecting end. The shaft 2 is restricted against longitudinal movement by the hub of pulley 4 and a collar 5, abutting opposite sides of the bearings 3.

The top B of the frame A is apertured at 6, and a carrier 7 is mounted over said aperture at 6 to slide longitudinally of the frame A upon said top B in guides 8 8, said carrier 7 being, however, of such length that it serves as a complete closure for the aperture at 6 throughout its sliding movement.

A stud 9 depends from the carrier 7 through the aperture at 6 and is connected with the wrist of a crank 10 by a link 11. The crank 10 is mounted fast on a short vertical shaft 12, mounted in the line of reciprocation of the stud 9 in a bearing 13, projecting from the end wall of the frame A. The rotation of the crank 10 effects a reciprocation of the carrier 7. A crank 14 is mounted fast on the lower end of shaft 12 and carries a wrist-pin 15.

A short vertical shaft 16 is mounted in a bearing 17, projecting from the end wall of the frame A, and is set eccentrically of the shaft 12. Upon the upper end of shaft 16 a crank 18 is mounted fast, and said crank 18 is provided with a radial slot or groove 19. A block 20 is adapted to slide longitudinally of the groove 19, and the wrist-pin 15 of crank 14 is journaled in central bearing in said block 20. The rotation of the crank 18, as the wrist-pin 15 of crank 14 is engaged therein and the shafts 12 and 16 are eccentric, drives crank 14 and shaft 12 with a continued rotation, but at varying velocities.

A spiral gear 21 is mounted fast on the shaft 16 and meshes with and is driven at the ratio of one to one by a spiral gear 22, fast on the driving-shaft 2.

The varying velocities imparted to the crank 10 are transmitted to the carrier and appear in its reciprocating movement.

A feed-roll 23 is mounted fast on the projecting portion of a vertical shaft 24, said shaft 24 passing through the top B from the interior of the frame A and projecting upwardly. The shaft 24 is mounted in a bearing 25, projecting from the end wall of the frame A. The shaft 24 is driven from a vertical shaft 26 through the gears 27, 28, and 29. The vertical shaft 26 is mounted in a bearing 30, projecting from the end wall of the frame A, and carries a fast crank 31, which is connected to a crank 32, fast on a vertical shaft 33, by a link 34. The vertical shaft 33 is mounted in a bearing 35, projecting from the end wall of the frame A, and is mounted with the same degree of eccentricity with shaft 26 as the shaft 17 is with shaft 12. The shaft 33 carries a fast spiral gear 36, which meshes with and is driven by a spiral gear 37, fast on driving-shaft 2, with the ratio of one to one. The crank 32, because of its eccentricity to crank 31, drives said crank 31 through link 34 with a continued rotation, but at varying velocities. The cranks 18 and 32 are driven in the same direction, but are not set parallel.

The feed-roll 23 is adapted to feed stock (shown at 38) continuously, but at varying velocities, parallelly of the path of reciprocation of the carrier 7. The stock 38 is pressed in contact with the feed-rod 23 by a presser-roll 39, mounted on a spring-arm 40, and is guided through guides 41 and 42, upstanding from the top B. The two sets of eccentrically-mounted cranks are so connected and organized, together with the links 11 and 34, that the movements of varying velocity imparted to the stock 38 and the carrier 7 will coincide during an appreciable period in the advance of the said carrier 7 with the stock 38. This coincidence is effected somewhat in the manner and in accordance with the principle set forth in my application for United States Patent, Serial No. 116,758, filed July 24, 1902, the interposition of the links between the drivers and the members to coincide, however, affecting the organization in some degree. The movements of the several parts are clearly shown in the diagram Fig. 5, the coincident movements occurring between the points 1 and 7. The travel of the stock and carrier during what I choose to term the "coincident period" may not be mathematically exact, but is so close that for practical purposes it suffices.

The construction and organization of the parts using the links 11 and 34 avoid the sliding connections in the yokes used in the construction illustrated in my above-referred-to application.

A slide 43 is mounted on the carrier 7 in guides 44 44 to slide transversely of said carrier. A stylus 45 is secured to the end of the slide 43 in a clamp 46 and is adapted to traverse the stock 38 during the movement of the slide 43 in that portion of its path nearest the said stock. A lug 47 depends from the under side of the slide 43 through an aperture in the carrier 7 and through the aperture at 6 in the top B to the interior of the frame A. A connecting-rod 48 connects the lug 47 with the wrist-pin 49 of a crank 50, fast on a vertical shaft 51. The shaft 51 is mounted in a bearing 52, projecting from the side wall of

the frame A. A spiral gear 53, fast on shaft 51, meshes with and is driven by a spiral gear fast on the driving-shaft 2. The crank 50 is set to move toward and in the direction of movement of the carrier 7 during the period of coincident movement between the carrier and the stock, so that the stylus 45 during said coincidence or between the points 1 and 7 (see Fig. 5) will advance across the stock and return, making a straight line thereon. Another line will be made during the coincident movements at the next revolution of the driver, and so on.

It is obvious that this movement may be applied in many ways without departing from the principle thereof or the spirit of my invention.

Having described my invention, I claim—

1. In a mechanical movement, the combination with a uniformly-rotating driving member, a plurality of independent devices for varying the angular velocity ratio with a continued rotation, a continuously-advancing member driven by one of said devices at the variable peripheral velocity of said device, a crank and a connecting-rod and an advancing and retreating member driven through said crank and connecting-rod by the other of said devices at a velocity coinciding during a portion at least of the forward movement of the advancing and retreating member with the concurrent velocity of the continuously-advancing member.

2. In a mechanical movement, the combination with a uniformly-rotating driving member, a speed-varying mechanism for varying the angular velocity ratio with a continued rotation, a continuously-advancing member driven from said mechanism at varying velocities, a crank and a connecting-rod and an advancing and retreating member driven through said crank and connecting-rod from said mechanism at a velocity coinciding during a portion at least of the forward movement of the advancing and retreating member with the concurrent velocity of the continuously-advancing member.

3. In a mechanical movement, the combination with a uniformly-rotating driving member of a speed-varying transmitting mechanism consisting of a driving-crank driven from said driving member, a driven crank eccentrically mounted to said driving-crank, and a link connecting said cranks, a continuously-advancing member, motion-transmitting means for advancing said continuously-advancing member with a variable velocity by a developed movement from said driven crank, a second speed-varying transmitting mechanism consisting of a varying radius-crank a fixed radius-crank mounted eccentrically of said varying radius-crank and engaging said varying radius-crank, said transmitting mechanism driven from said driving member, an advancing and retreating member movable in line with said continuously-advancing member, and a crank and connecting-rod connection between said advancing and retreating member and the driven element of said second transmitting mechanism, said transmitting mechanisms being organized to effect coincident movements of said continuously-advancing and said advancing and retreating members, during an appreciable period in the advance of said advancing and retreating member.

4. In a mechanical movement, the combination of an advancing member, a roll for advancing said advancing member, a driving member, a speed-varying transmitting mechanism between said driving member and said roll consisting of a pair of eccentrically-mounted cranks and a link connecting said cranks, an advancing and retreating member movable in line with said advancing member and speed-varying transmitting mechanism between said driving member and said advancing and retreating member operative to advance and retract said advancing and retreating member with a velocity coinciding during a portion at least of the forward movement of the advancing and retreating member with the concurrent velocity of the continuously-advancing member.

5. In a mechanical movement, the combination of an advancing and retreating member, a crank and pitman operatively connected with said advancing and retreating member, a driving member, and a variable radius-crank a speed-varying transmitting mechanism between said driving member and said crank consisting of a fixed radius-crank set eccentric to and engaging said variable radius-crank, an advancing member movable in line with said advancing and retreating member, a roll for advancing said advancing member and a speed-varying transmitting mechanism between said driving member and said roll, said speed-varying transmitting mechanisms being adapted to effect substantially coincident movements of said advancing and said advancing and retreating members during an appreciable period in the advance of said advancing and retreating members.

6. In a mechanical movement, the combination of an advancing member, an advancing and retreating member movable in line therewith, a driving member, a roll peripherally engaging said advancing member to advance the same, a speed-varying mechanism consisting of a pair of eccentrically-mounted link-connected cranks between said driving member and said roll, a crank and connecting-rod connected to and for advancing and retracting said advancing and retreating member and a speed-varying mechanism consisting of a fixed radius-crank a variable radius-crank engaged by said fixed radius-crank, between said driving member and said crank, and connecting-rod, said speed-varying mechanisms being adapted to

effect substantially coincident movements between said advancing and said advancing and retreating members during an appreciable period in the advance of said advancing member.

7. In a mechanical movement, the combination of an advancing member, a roll for advancing said advancing member, a driving-shaft, a crank concentric and mounted fast with said driving-shaft, a second crank driven from said driving-shaft and mounted eccentric to said first crank, a link connecting said cranks, an advancing and retreating member movable in line with said advancing member and speed-varying transmitting mechanism between said driving-shaft and said advancing and retreating member said link-connected cranks and speed-varying transmitting mechanisms arranged and adapted for coaction to effect substantially coincident movements of said advancing and said advancing and retreating members during an appreciable period in the advance of said advancing and retreating member.

8. In a mechanical movement, an advancing member, an advancing and retreating member movable in line therewith, a driving-shaft, speed-varying transmitting mechanisms geared to said driving-shaft and operatively connected with said respective members to effect varying movements of said members substantially corresponding in velocity and direction during an appreciable period in the advance of said advancing and retreating member.

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