No. 837,863.

PATENTED DEC. 4, 1906.

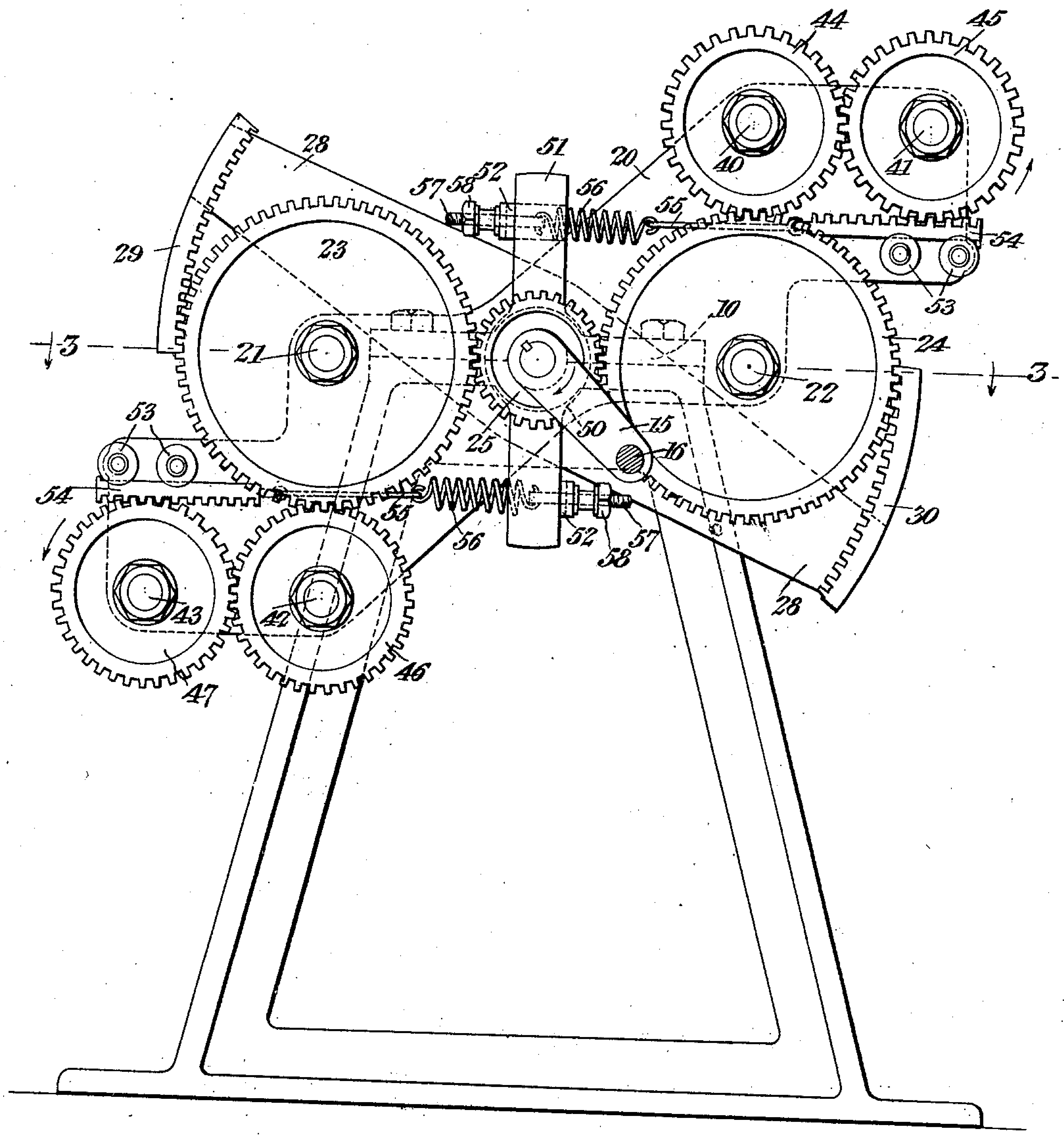
G. MILNER.

MECHANICAL MOVEMENT.

APPLICATION FILED JAN. 29, 1906.

4 SHEETS—SHEET 1.

Fig.1.



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4 SHEETS—SHEET 2.

Fig. 2

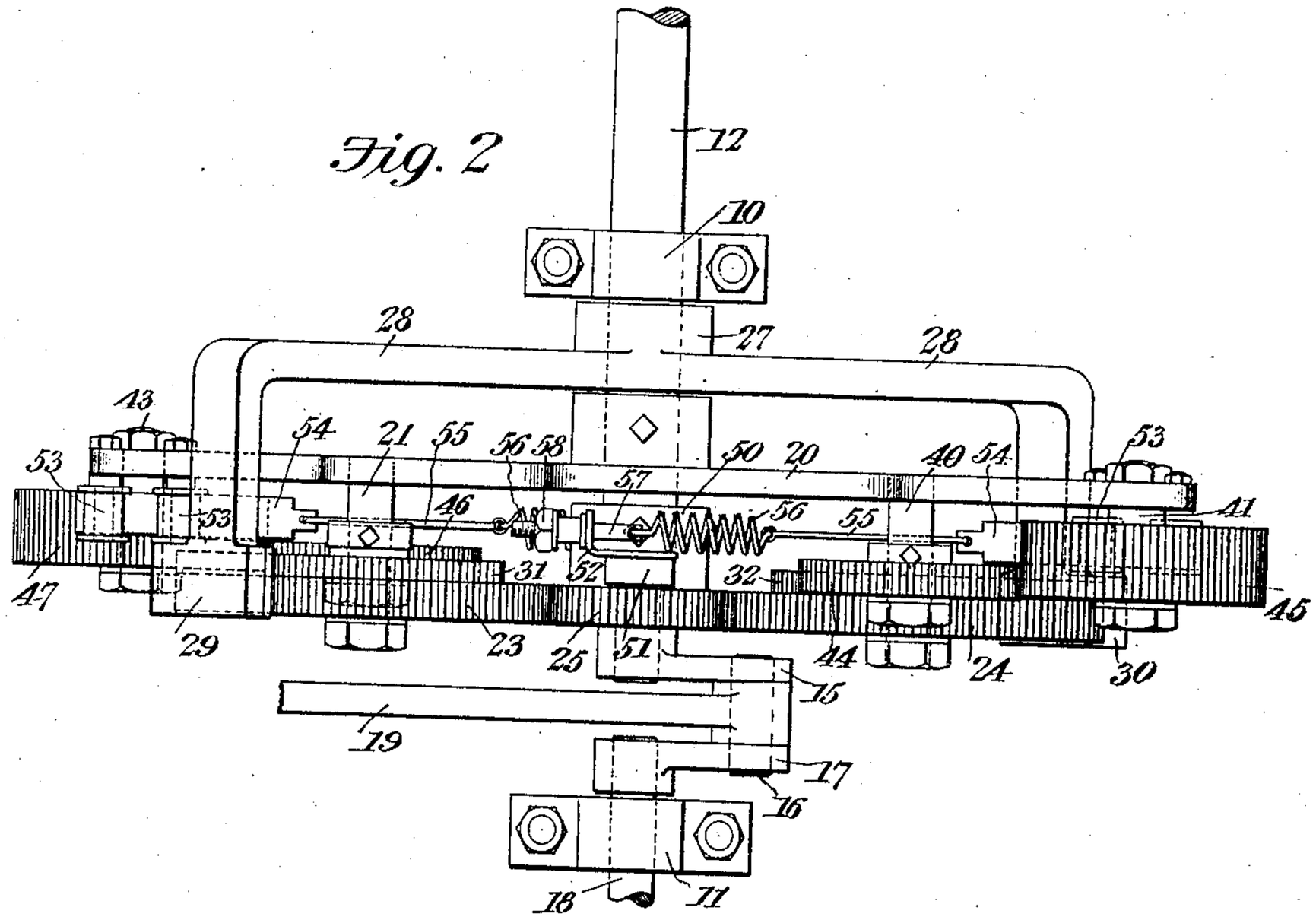
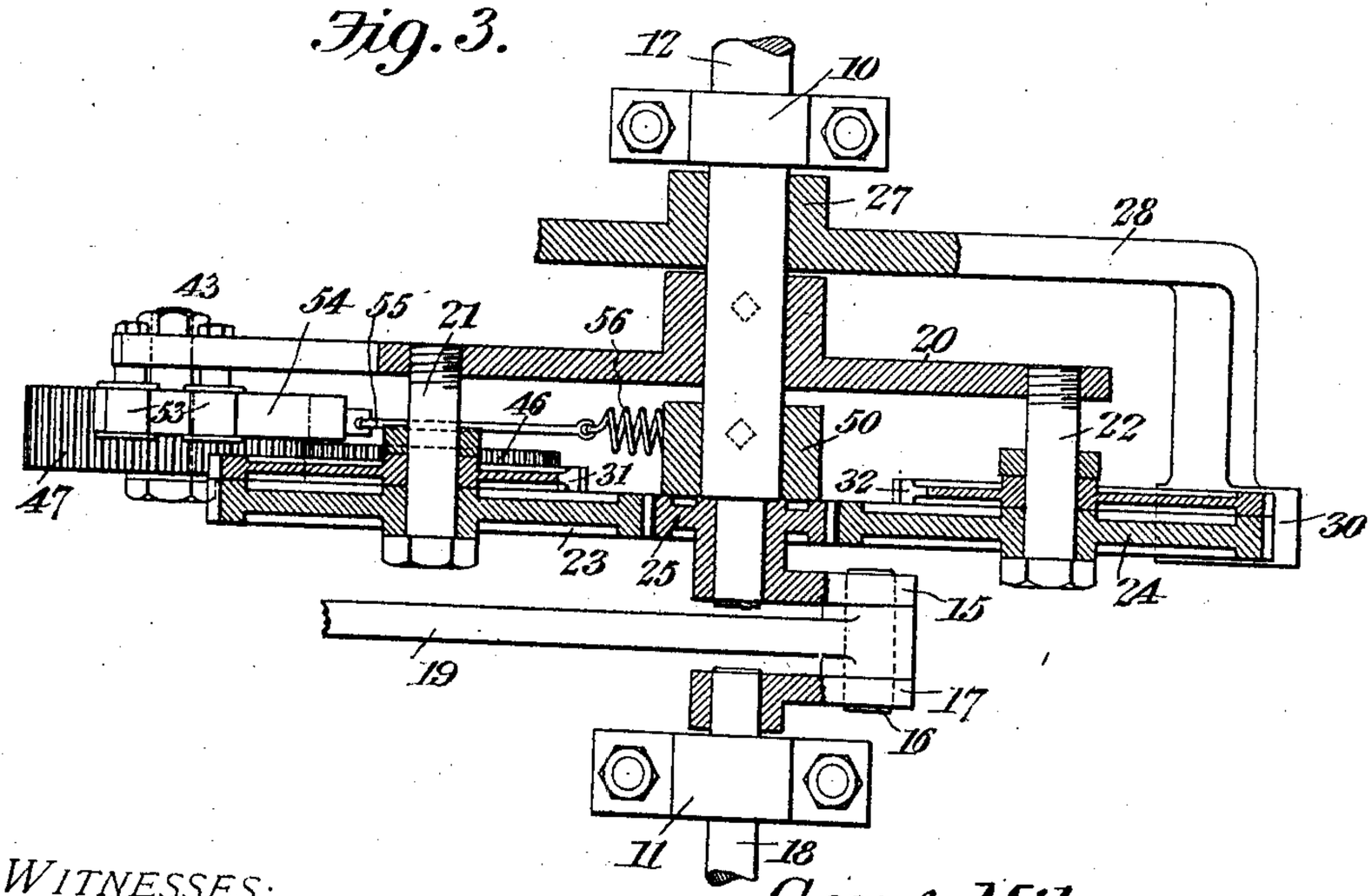


Fig. 3.



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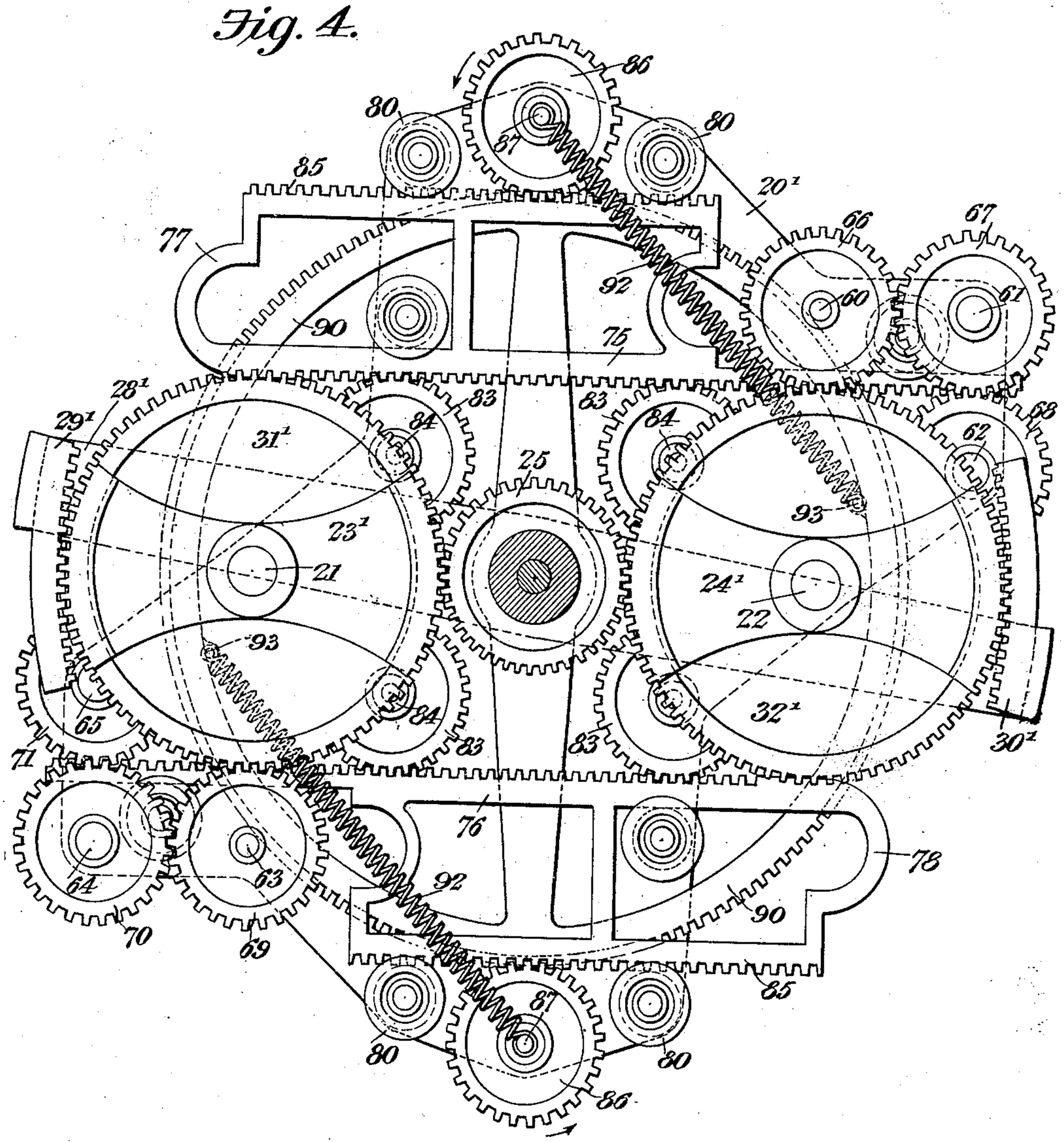
4 SHEETS—SHEET 3.

Fig. 4.



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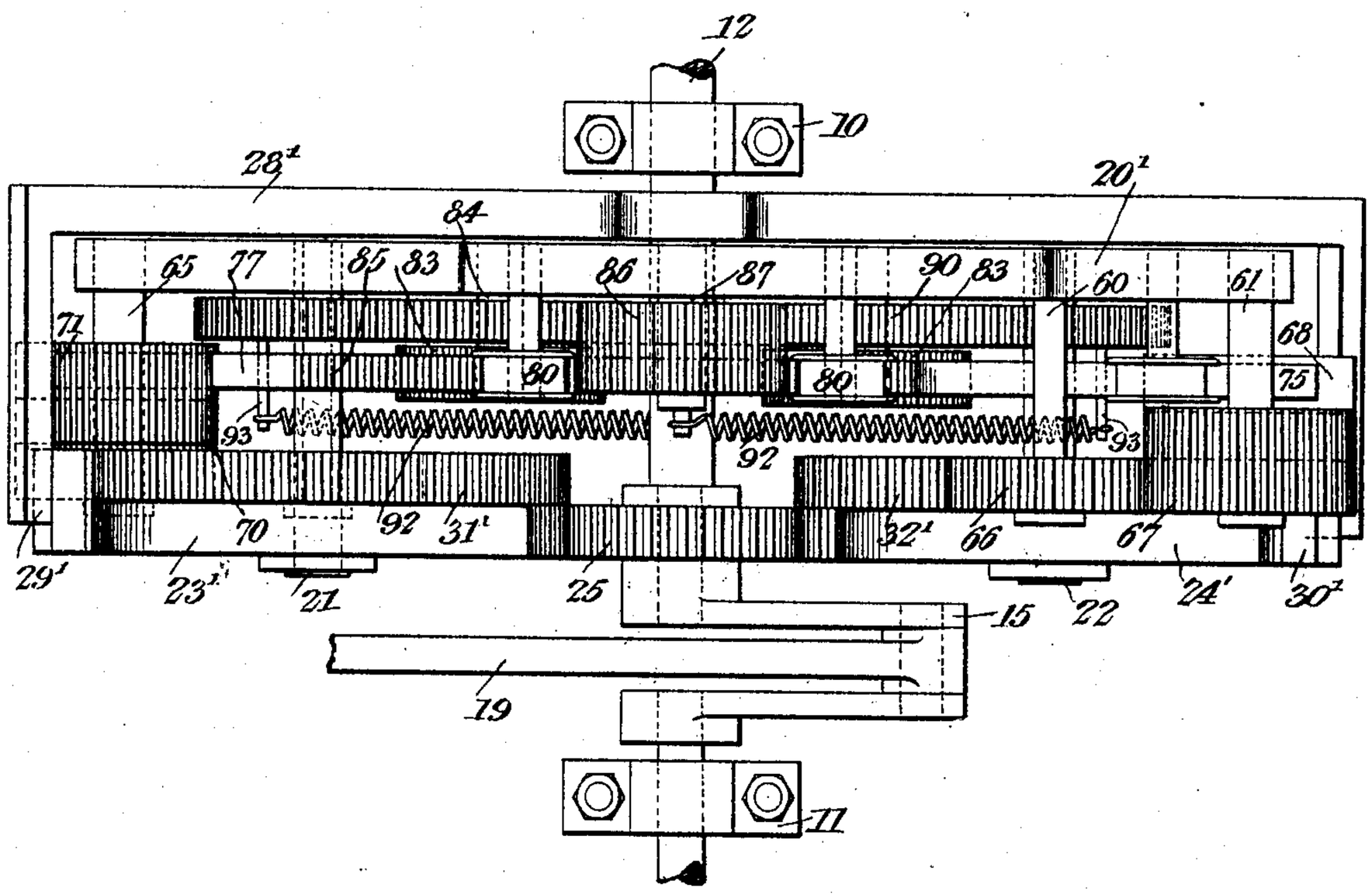
4 SHEETS—SHEET 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE MILNER, OF BROOKLYN, NEW YORK.

MECHANICAL MOVEMENT.

No. 837,863. Specification of Letters Patent. Patented Dec. 4, 1906.

Application filed January 29, 1906. Serial No. 298,501.

To all whom it may concern:

Be it known that I, GEORGE MILNER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a new and useful Mechanical Movement, of which the following is a specification.

This invention relates to mechanical movements or power-transmitting gear, and has for its principal object to provide mechanism whereby the force may be increased between the point of application and the point where the power is to be utilized, and, further, to provide a construction which includes a yieldable member or members so arranged and connected as to permit considerable variation in the load without shock or jar to the transmitting mechanism.

A further object of the invention is to provide transmission-gear in which a yieldable member or members are interposed between the driving and driven elements, the yieldable members being preferably in the form of springs which will yield until their stress overcomes the resistance offered by the driven element and will thereafter automatically take up or compensate for variation in the load or resistance of said driven member.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a front elevation of a mechanical movement or transmission-gear constructed and arranged in accordance with the invention. Fig. 2 is a plan view of the same. Fig. 3 is a sectional view of the mechanism on the line 3 3 of Fig. 1. Fig. 4 is a front elevation of a mechanism of modified construction, also embodying the invention. Fig. 5 is a plan view of the mechanism shown in Fig. 4.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The working parts of the apparatus are supported on a suitable frame, including bearings 10 and 11, there being one or more of the bearings 10, and said bearings supporting a shaft 12, which in the present instance constitutes the driven member. One end of the shaft is reduced in diameter and forms a bearing or support on which the hub end of a crank 15 may rotate independently of the shaft. The crank carries a crank-pin 16, which for convenience is illustrated as supported by a second crank 17, having a shaft 18, that is supported in the bearing 11. The crank-pin 16 receives motion from any suitable source of power through a connecting-rod 19, the latter constituting in the present instance the driving element.

Keyed or otherwise rigidly secured to the shaft 12 is a frame 20, carrying two studs 21 and 22, on which are mounted loose gears 23 and 24, respectively, and both of these gears are in mesh with a pinion 25, that is rigidly secured to or formed integral with the crank 15. The pinion 25 is one-half the diameter of the gears 23 24, so that in transmitting movement to the latter there will be an increase in leverage force exerted.

Mounted loosely on the shaft 12 is a hub 27, carrying a pair of diametrically-opposed arms 28, the outer ends of which are turned at a right angle and are provided with arcuate racks 29 and 30, the rack 29 meshing with the gear 23 and the rack 30 meshing with the gear 24. The teeth of the racks are about double the width of the teeth of the gears 23 and 24 and also mesh with the teeth of incomplete gears or arcuate racks 31 and 32, that are loosely mounted on the studs 21 and 22, respectively.

The frame 20 is provided with a plurality of studs 40 41 42 43, on which are mounted gears 44, 45, 46, and 47, respectively, all of these gears being preferably of the same diameter. The gears 44 and 46 intermesh with the teeth of the gears 32 and 31, respectively, and the gears 45 and 47 intermesh, respectively, with the gears 44 and 46, and said gears 45 and 47 have teeth of a width about twice the width of gears 44 and 46.

Secured rigidly to the shaft 12 is the hub 50 of a two-armed lever 51, and said lever carries brackets 52, facing, respectively, in opposite directions. At a point adjacent to each of the gears 45 and 47 are studs on which are mounted grooved guiding-rollers 53, that serve as supports for longitudinally-movable racks 54, the teeth of which intermesh with the teeth of the gears 45 and 47 at a point to one side of the plane of meshing of

the gears 44 and 46 with said gears 45 and 47. The inner ends of the racks are connected to links 55, and the links are connected to helical tension members 56, the opposite ends of the springs being connected to eyebolts 57, that extend through openings formed in the brackets 52 and are provided with nuts 58 for the purpose of adjusting the stress of the springs.

If power is applied to the crank 15 through the connecting-rod 19 or similar element and the load or the device to be driven is connected to the shaft 12, the first effect of rotative movement of the crank in the direction indicated by the arrow will be to rotate the gears 23 and 24 in the same direction, which movement will be transmitted to the racks 29 and 30. As the racks are connected indirectly to the shaft 12, they will tend to resist movement imparted to them and thereafter tend to prevent rotative movement of the gears 23 and 24, and as a result the leverage force exerted through the gears and transmitted to the studs 21 and 22 will tend to rotate the frame 20, which is rigidly secured to the shaft 12. The movement of the racks 29 and 30 is to an extent proportioned to the resistance of the load of the shaft 12, and this movement is transmitted to the gears 31 and 32 and from thence to the trains of gears 44 45 and 46 47, the gears 45 and 47 being turned in a direction indicated by the arrows and tending to move the racks 54 outward from the arms 51. As the arms 51 are rigidly secured to the shaft 12, the springs 56 will be placed under stress by the outward movement of the racks and the stretching of the springs will continue until the resistance of the load is overcome, whereupon the shaft 12 will be turned and will continue to turn so long as the crank is elevated, while any variation in the load on the shaft will be automatically compensated for by the springs, which will retract if the load lightens and will stretch if the load increases.

In the modified construction illustrated in Figs. 4 and 5 the bearings 10 and 11 and the shaft 12 are the same as previously described and the driving-crank 15, connecting-rod 19, and the crank-carried pinion 25 are also of the construction illustrated in Figs. 1, 2, and 3. The frame 20′, which is rigidly secured to the shaft 12, is somewhat different in construction in order that it may carry the large number of parts employed in this construction. Projecting from this frame are the studs 21 and 22, on which are mounted double racks 23′ 24′, which are in the form of mutilated gears, these being sufficient for the purpose, inasmuch as it is not necessary for the gears to make a complete rotation. To the rear of the double racks or gears 23′ 24′ are gears 31′ and 32′, and these gears, together with the double racks, intermesh with racks 29′ 30′, that are carried by arms 28′, projecting from a hub member that is mounted loosely on the shaft 12. The frame 20′ is provided with sets of studs 60 61 62 and 63 64 65, on which are mounted gears 66, 67, 68, 69, 70, and 71, respectively. The gears 31′ 32′ intermesh, respectively, with the gears 66 and 69, and these in turn mesh with the gears 67 and 70. The gears 67 and 70 are much wider than the gears 66 and 69 and are arranged to mesh with the gears 68 and 71, respectively, and said gears 68 and 71 are also of double width and are arrranged to engage with racks 75 and 76, that are carried by double rack-frames 77 and 78, respectively. These double rack-frames are mounted on guiding-rollers 80, that are carried by studs projecting from the frame 20′, so that said racks are maintained in parallel relation with each other. The rack-frames are further held and guided by a plurality of pinions 83, that are carried by studs 84, projecting from the frame 20′, and engage with the inner racks 75 and 76, these pinions serving merely as supports for the rack-frames. At the outer edge of each of the rack-frames is a rack 85, the teeth of which intermesh with gears 86, mounted on studs 87, projecting from the frame 20′, and when the crank 15 is turned in the direction indicated by the arrow the transmission-gears and racks serve to rotate the gears 86 in the direction indicated by the arrow. The gears 86 are double-width gears and at one side of the racks are arranged to engage with a large center gear 90, that is mounted loosely on the shaft 12, and the rotative movement of the gears 86 tends to move this large center gear in the direction indicated by the arrow in Fig. 1. This movement, however, is resisted by helical tension-springs 92, that extend between pins 93, carried by the center gear, and the fixed studs 87 of frame 20′, and as the springs are placed under stress through the operation of the gears they will tend to pull on the frame 20′ through the stud connections 87 and revolve said frame in the direction indicated by the arrow.

When movement is imparted through the crank 15 to the pinion 25, the movement is transmitted through the gears or double racks 23′ 24′ in the direction indicated by the arrows, and this movement is transmitted to the racks 29′ and 30′ and from thence to the gears 31′ 32′. These gears serve, respectively, to impart movement to the train of gears 66 67 68 and 69, 70, and 71. From the end gears of these trains the racks 75 and 76 receive movement in the directions indicated by the arrows, and this movement is imparted through the racks 85 to the gears 86. The gears 86 seek to turn the large center gear 90, which is mounted loosely on the shaft, and said gear 90 will turn until the stress of the springs 92 overcomes the resistance offered by the load, whereupon

movement is transmitted through the springs to the frame 20′ and from thence to shaft 12, the shaft 12 being revolved and continuing to revolve so long as the pinion 25 is kept in motion, while the springs retract or are placed under greater stress as the load varies.

I claim—

1. In mechanism of the class described, a driving member including a pinion, a driven shaft, a frame rigidly secured to the shaft, a pair of arcuate racks supported loosely on the shaft, gear-wheels supported by the frame and arranged to intermesh with the pinion and the racks, gear-trains supported by the frame and to which motion is imparted by the racks, slidable racks supported by the frame and receiving motion from the final gears of the trains, and a yieldable connection between the racks and the frame to compensate for varying loads on said shaft.

2. In mechanism of the class described, a driving member including a pinion, a driven shaft, a frame rigidly secured to the shaft, a pair of arcuate racks loosely supported on the shaft, gears supported by the frame and of larger diameter than the pinion, said gears intermeshing with the pinion and the racks, and loose gears intermeshing with said racks and receiving movement therefrom, slidable racks supported by the frame, gear-trains supported by the frame and connecting the loose gears to the racks, arms projecting from and rigidly secured to the driven shaft, brackets on said arms, and springs connecting the arms to the slidable racks.

3. In mechanism of the class described, a driving member including a pinion, a driven shaft, a frame rigidly secured to said shaft, a pair of arcuate racks loosely supported on the shaft, a pair of studs projecting from the frame, a pair of gears mounted loosely on each stud, both gears meshing with the racks and one gear of each pair meshing with the pinion, auxiliary studs projecting from the frame, intermeshing gears mounted on said studs to form gear-trains, the primary member of each train being in mesh with the second gear of each pair, a pair of slidably-mounted racks, grooved guiding-rollers carried by the frame and engaging the slidable racks, arms rigidly secured to and projecting from the shaft, brackets on said arms, adjustable eyebolts carried by the brackets, and springs extending from the eyebolts to the slidable racks.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

GEORGE MILNER.

Witnesses:

CLARENCE B. ENSLEY,

CHARLES W. WENDLE.