(No Model.) 3 Sheets—Sheet 1.

C. W. PARSONS.

CRANE OPERATING MECHANISM.

No. 504,937. Patented Sept. 12, 1893.

FIG. 1.

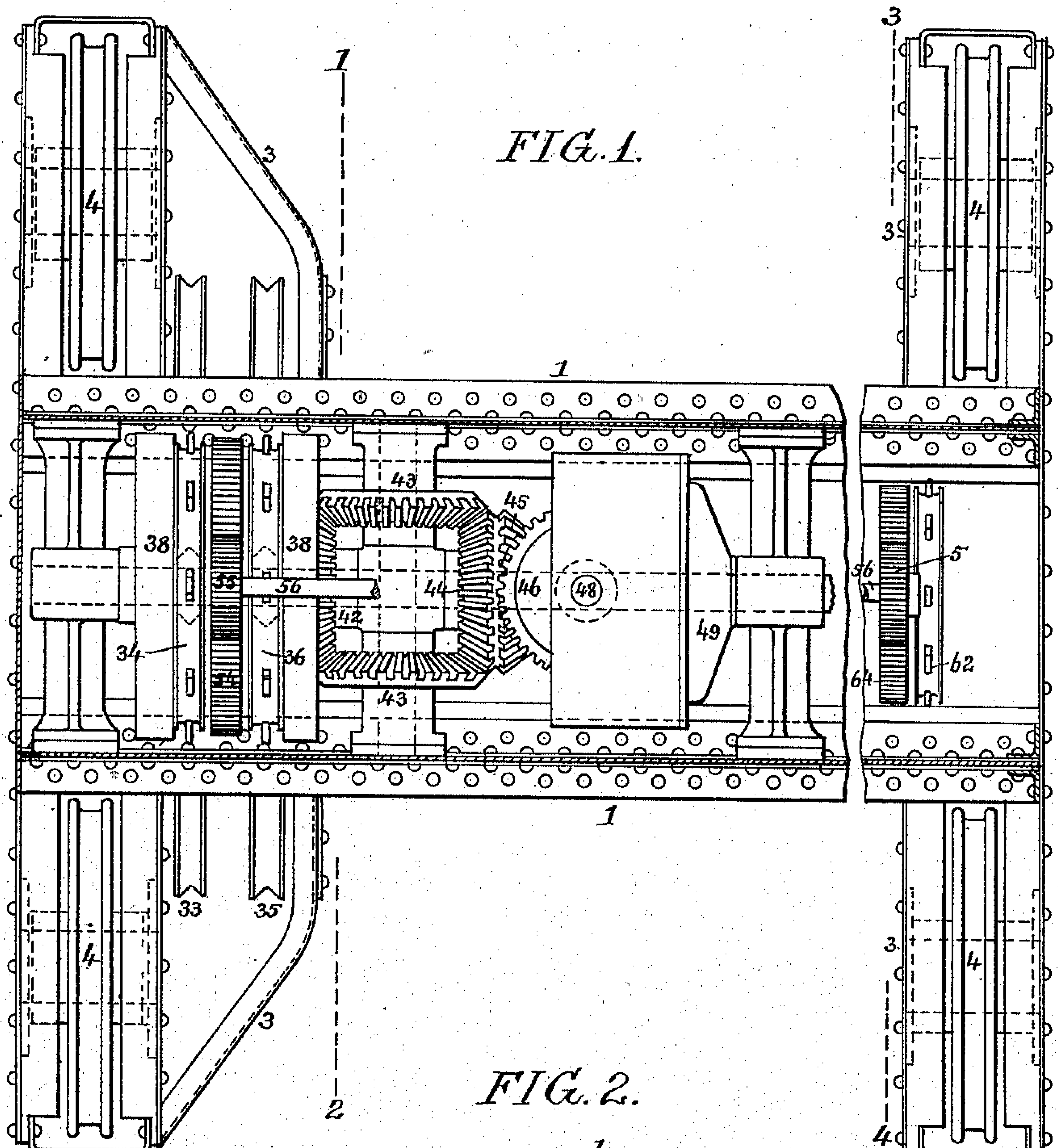
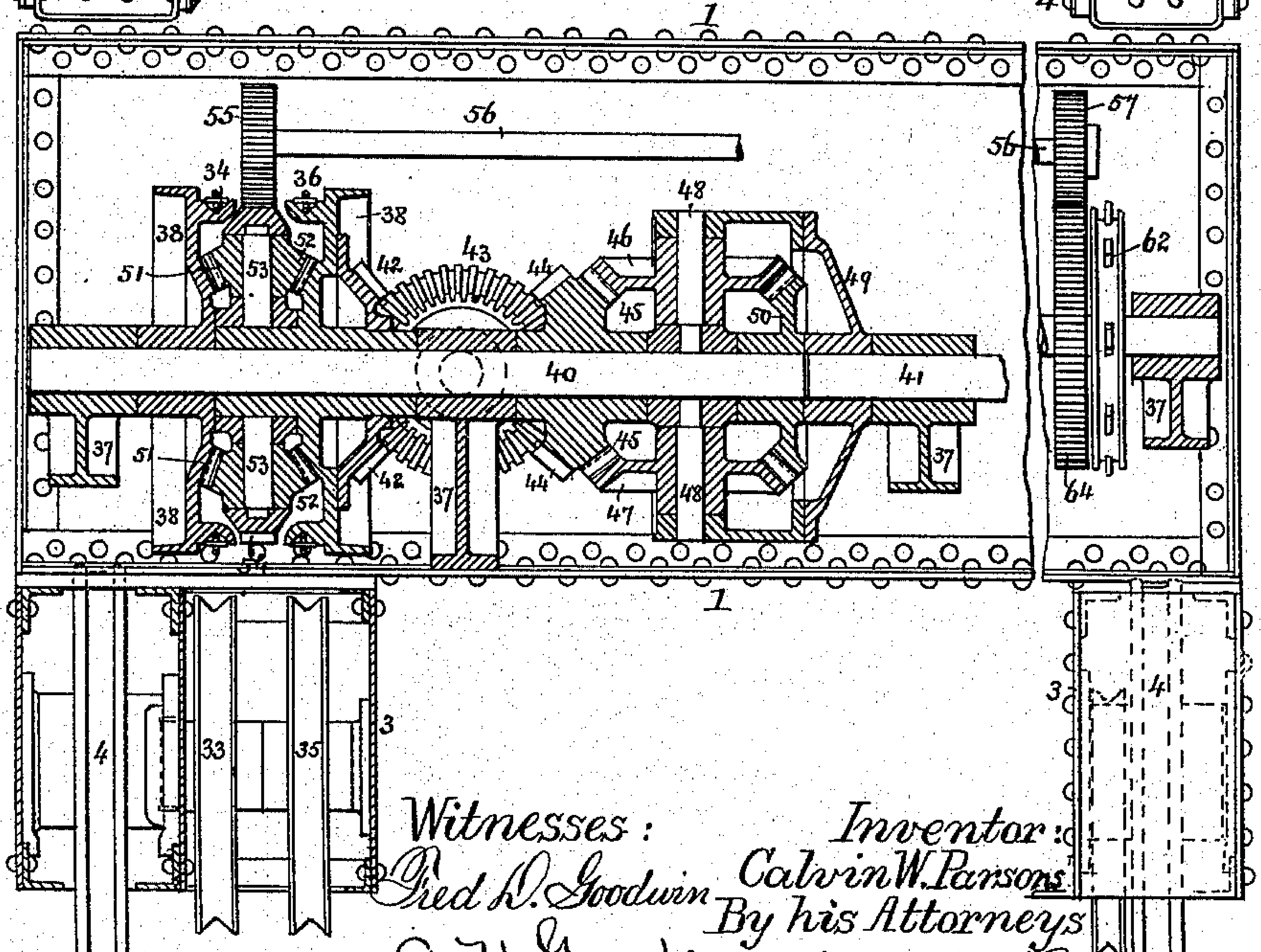


FIG. 2.



Witnesses:
Fred D. Goodwin
A. V. Groupe

Inventor:
Calvin W. Parsons
By his Attorneys
Howson & Howson

(No Model.)

3 Sheets—Sheet 2.

C. W. PARSONS.

CRANE OPERATING MECHANISM.

No. 504,937. Patented Sept. 12, 1893.

FIG. 3.

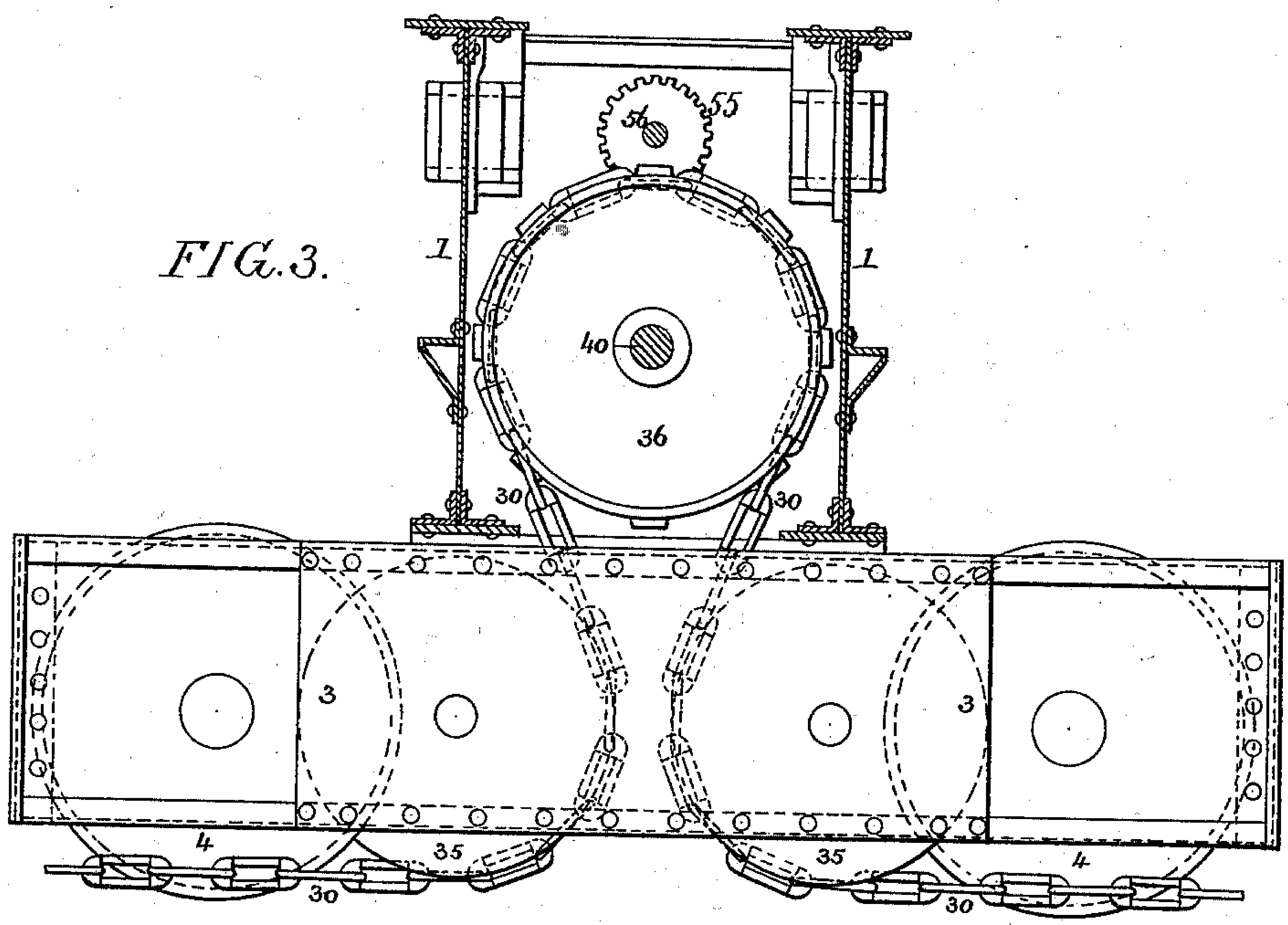
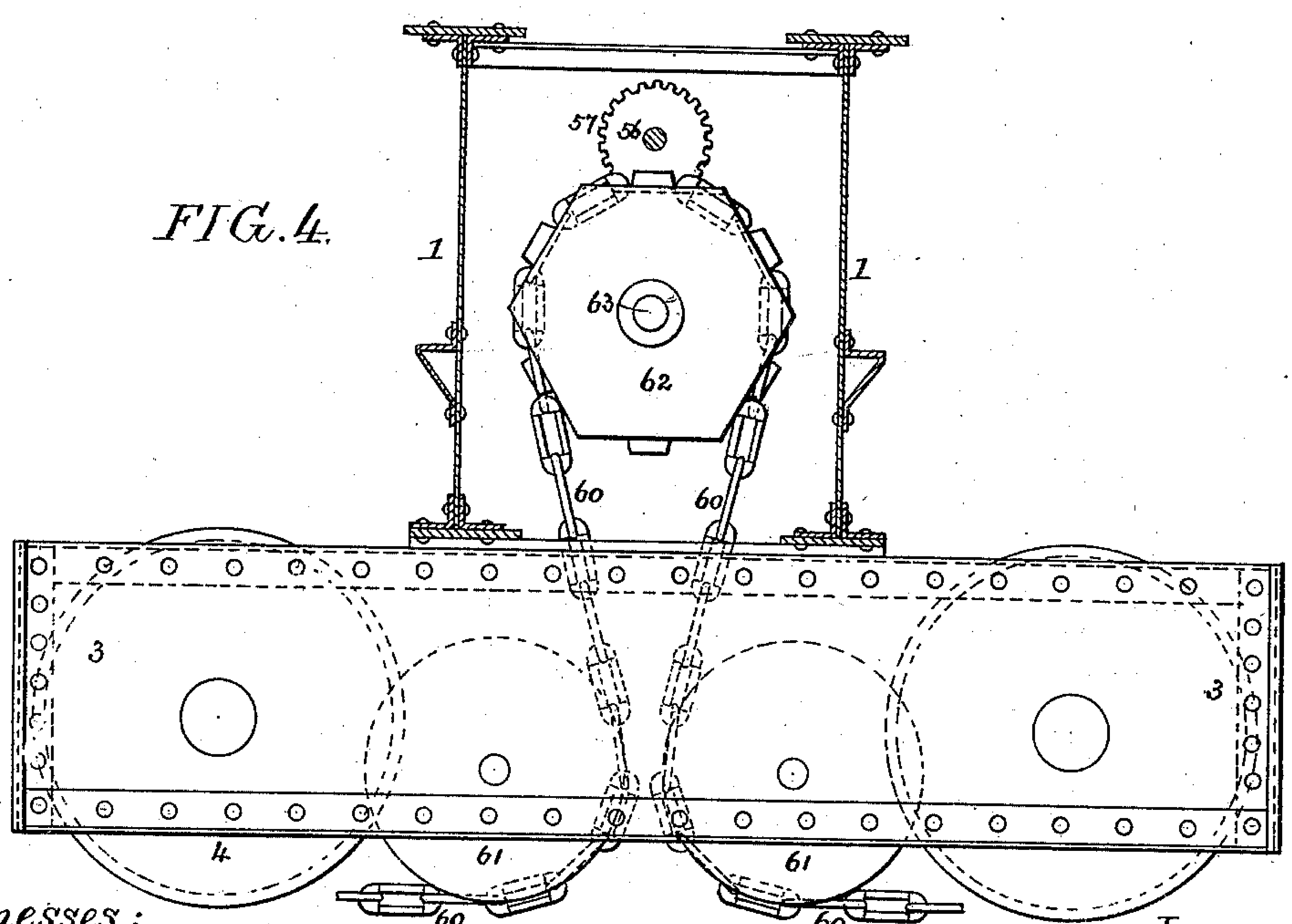


FIG. 4.



Witnesses:

Fred D. Goodwin

A. V. Groupe.

Inventor:

Calvin W. Parsons

By his Attorneys

Howson & Howson

(No Model.)

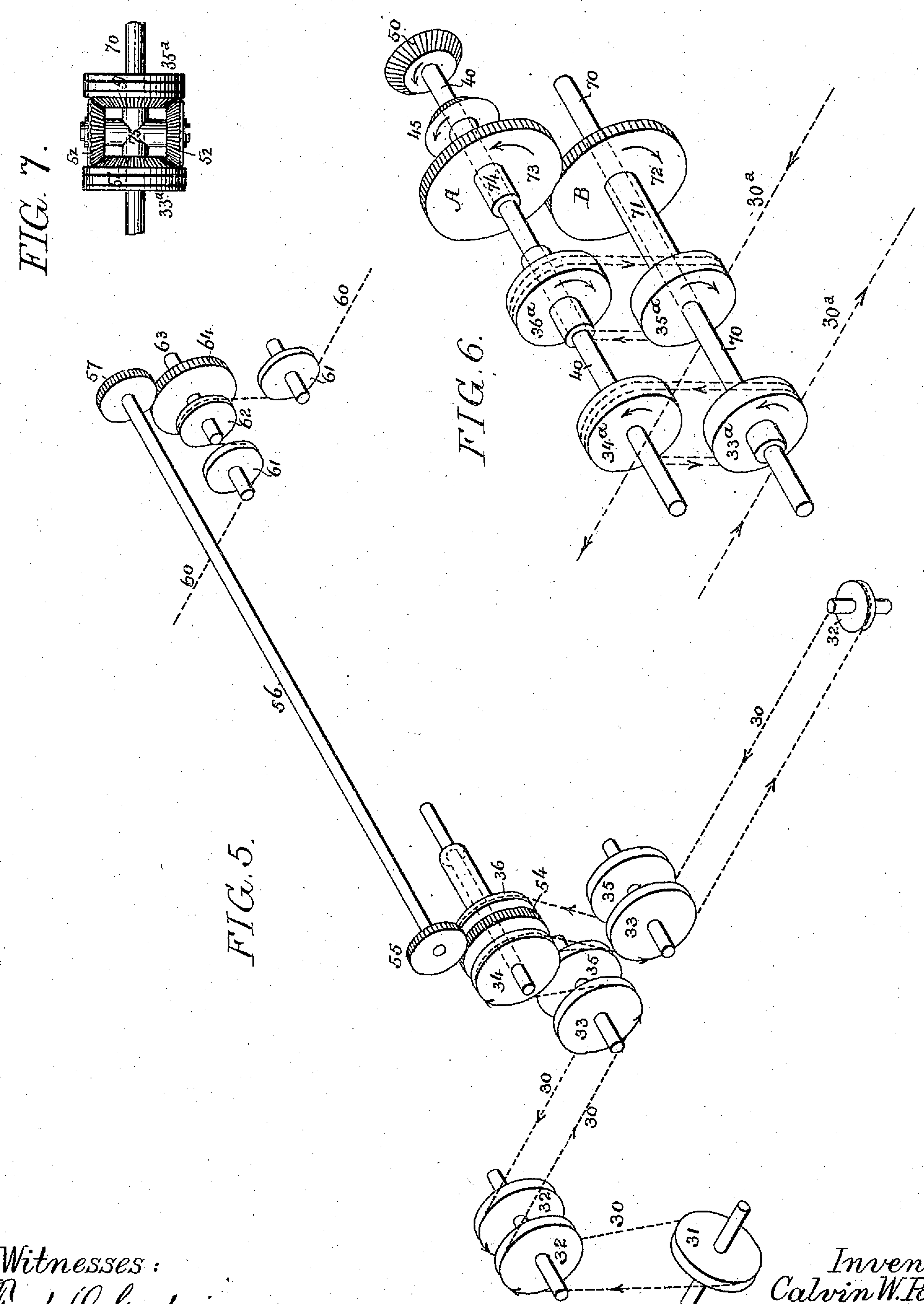
3 Sheets—Sheet 3.

C. W. PARSONS.

CRANE OPERATING MECHANISM.

No. 504,937.

Patented Sept. 12, 1893.



Witnesses:

Fred W. Goodwin

A. V. Groupe

Inventor:

Calvin W. Parsons

By his Attorneys

Howson & Howson

UNITED STATES PATENT OFFICE.

CALVIN W. PARSONS, OF SCRANTON, PENNSYLVANIA.

CRANE-OPERATING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 504,937, dated September 12, 1893.

Application filed July 15, 1891. Serial No. 399,616. (No model.)

To all whom it may concern:

Be it known that I, CALVIN W. PARSONS, a citizen of the United States, and a resident of Scranton, Lackawanna county, Pennsylvania, have invented certain Improvements in Traversing and Driving Mechanism for Cranes and other Movable Structures, of which the following is a specification.

The object of my invention is to provide mechanism whereby a continuously running rope, belt or chain is caused to impart traveling movement to and to drive operating mechanism upon a structure such as the bridge of a traveling crane, or to perform either of these duties, the traveling crane being selected for purposes of illustration, although the invention is equally applicable to walking cranes, gauntrees, transfer tables, traveling, drilling and sawing machines and similar tools, elevators, inclined planes, and all sorts of "wandering" machines.

In the accompanying drawings:—Figure 1, is a plan view of so much of a traveling crane as is necessary to illustrate my invention. Fig. 2, is a view partly in section and partly in elevation of those parts of the crane which are illustrated in Fig. 1. Fig. 3, is a transverse section on the line 1—2, Fig. 1. Fig. 4, is a transverse section on the line 3—4, Fig. 1. Fig. 5, is a perspective diagram illustrating features of the invention. Fig. 6, is a perspective diagram illustrating a modification of some of these features; and Fig. 7, is a side view illustrating another modification.

In Figs. 1 and 2, the bridge of the crane is represented in the form of a girder 1 of any desired construction, which is mounted at each end upon a truck 3, each truck having wheels 4 to be mounted upon rails supported in any suitable manner which the location of the crane may suggest as most appropriate.

Power is applied to the crane by means of a running chain, rope, or belt, which is endless and runs continuously in one direction, a chain being preferred because of the positive character of the drive which can thus be effected. The chain which is represented at 30 in the diagram Fig. 5 passes around a sprocket wheel 31, the shaft of which is suitably mounted in fixed bearings at either end of the runway at the driving end of the crane, power being applied to this shaft by any suitable motor. The chain 30 runs upon suitable guiding and supporting sheaves 32, on the runway, and one run of the chain passes around guiding sheaves 33 and a sprocket wheel 34, while the other run of the chain passes around guiding sheaves 35 and a sprocket wheel 36, these sheaves 33 and 35 and sprocket wheels 34 and 36 being carried by and moving with the bridge of the crane. As the two runs of the chain move in opposite directions, as indicated by the arrows in Fig. 5, the sprocket wheels 34 and 36 also revolve in opposite direction. Hence when the bridge of the crane is standing still, said sprocket wheels will rotate with equal velocity, but if the bridge move in one direction, say toward the end wheels 32 shown in Fig. 5, the sprocket wheel 34 will rotate at a higher speed than the sprocket wheel 36, depending upon the rate of movement of the bridge, and in the same manner, if the bridge is moved in the opposite direction, the sprocket wheel 36 will rotate at a greater velocity than the wheel 34. Hence, if power for lifting or other motion were taken directly from either of the sprocket wheels 34 or 36 it would be variable, that is to say, it would fluctuate according to the speed at which the crane moved along its runways, and according to the direction in which it moved.

In order to supply steady power therefore, I employ the gearing best shown in Figs. 1 and 2, on reference to which it will be observed that the bridge has suitable bearings 37 for the support of two shafts 40 and 41, the latter being the shaft which is to be uniformly driven and from which the power for operating the devices on the bridge is derived. The sprocket wheel 34 is keyed or otherwise rigidly secured to the shaft 40, but the sprocket wheel 36 has a hub which can turn loosely on said shaft, and to said wheel 36 is secured a miter wheel 42 which meshes with a pair of miter wheels 43 hung to suitable transverse spindles in the girder, these wheels 43 meshing with one face 44 of a double miter wheel which turns loosely on the shaft 40, and the other face 45 of which meshes with miter wheels 46 and 47 which are counterparts of each other and are carried by spindles 48 on a frame or spider 49 which is keyed or otherwise rigidly secured to the shaft 41. The miter wheels 46 and 47 are also in mesh with a miter wheel 50 secured to the shaft 40 and having the same number of teeth as the wheel 45. It will therefore be seen that the miter wheels 45 and 50 rotate in the same direction,—that is to say, in the direction of rotation of the sprocket wheel 34, the gearing interposed between the sprocket wheel 36 and the miter wheel 45 serving to reverse the direction of movement of said miter wheel in respect to that of the sprocket wheel 36. So long, therefore, as the sprocket wheels 34 and 36 rotate in opposite directions at equal speeds, the miter wheels 45 and 50 will rotate at equal speeds in the same direction, and the miter wheels 46 and 47, and consequently the spider 49 carrying the same, will be rotated at like speed around the axes of the shafts 40 and 41. There being no movement of said miter wheels 46 and 47 on their own axes, consequently the shaft 41 will be driven in the same direction and at the same speed as the shaft 40. If, however, the sprocket wheel 36 slows up and the wheel 34 rotates with correspondingly greater velocity, owing to the movement of the bridge along its runways as above mentioned, the miter wheel 45 will slacken its speed, and the miter wheel 50 will rotate with correspondingly increased velocity, but in all cases the sum of the speeds of both of the sprocket wheels 34 and 36 and also of the miter wheels 45 and 50 will be absolutely constant, owing to the fact that the speed is derived from a continuous chain having uniform linear velocity in both runs or in all its parts, and as the sum of the speeds is constant, its average must always be constant, and this average is the speed at which the shaft 41 is driven regardless of the variations in the rotative velocity of the sprocket wheels 34 and 36, for the difference in the speeds of the miter wheels 45 and 50 is represented by a corresponding number of rotations of the transmitting wheels 46 and 47 around their own axes; for instance, if the average speed of the sprocket wheels 34 and 36, and hence of the miter wheels 45 and 50, is one hundred revolutions per minute, and the speed of the miter wheel 45 should be dropped to eighty revolutions a minute, that of the miter wheel 50 would increase to one hundred and twenty revolutions a minute, and in imparting one hundred turns to the carrying frame or spider 49 each of the miter wheels 46 and 47 would turn twenty times on its own axis so as to compensate for the twenty extra turns of the miter wheel 50 and the twenty less turns of the miter wheel 45. This is on the supposition that all of the wheels 45, 46, 47 and 50 have the same number of teeth. If the wheels 46 and 47 have a less number of teeth than the wheels 45 and 50 there will be a correspondingly greater number of turns, and if more teeth, a correspondingly less number of turns than above indicated, as will be readily understood. Whatever therefore may be the increase in the speed of one sprocket wheel in respect to the other, the shaft 41 would have a speed representing the constant average of speed of the two sprocket wheels.

The two miter gears 43 and two miter gears 46 and 47 are employed for the purpose of equalizing the strains and steadying the motion, but it will be evident that so far as regards the mere transmission of power, one gear of each of these pairs might be dispensed with.

Each of the sprocket wheels 34 and 36 has a wide rim 38 for the application of a suitable brake band, shoe or other convenient braking device, the operating rod of which is under convenient control of an attendant, and the speed of either wheel can be reduced by the application thereto of a greater or less braking force, and when the braking power is applied to either wheel, that wheel will be compelled to follow the run of the chain with which it engages at a speed depending upon the braking force applied; for instance, if the chain is running at the rate of three hundred feet per minute and the sprocket wheels have a circumference of three feet, representing one hundred turns per minute when the bridge is stationary braking of either wheel so as to reduce its speed by, say twenty-five per cent., will cause it to travel with its engaging chain at the rate of seventy-five feet per minute, the other two hundred and twenty-five feet of movement of the chain during such period of time being devoted to turning the sprocket wheel, which will thus receive only seventy-five turns while the sprocket wheel engaging with the other run of the chain will have seventy-five feet additional circumferential movement, or twenty-five additional turns. It will therefore be seen that by applying a brake to either of the sprocket wheels the bridge of the crane can be caused to move upon its runways in either direction, the speed of such movement being dependent wholly upon the braking force applied; in other words, the back and forth movements of the crane on its runways, commonly called the "bridge movements," are performed by partial or complete seizure of either run of the driving chain by the sprocket wheel engaging therewith, the starting and stopping movements being effected as gradually as desired by the gradual application of the brake. When high speed ropes are used for driving, a very slight amount of braking will produce the desired movement of the bridge.

In order to keep the bridge square upon its runways, the gearing shown in Figs. 1, 2, and 5 is employed. On reference to these figures it will be observed that each of the sprocket wheels 34 and 36 has formed upon it a bevel wheel 51, which wheels engage with bevel wheels 52 carried by short transverse spindles 53 in a spur wheel 54, the hub of which turns loosely upon an extension of the hub of the sprocket wheel 36. When the wheels 34 and 36 rotate with equal velocity the pinions 52 will turn on their journals and no rotative movement is imparted to the spur wheel 54, but if there is an increase in the speed of one sprocket wheel and a corresponding decrease in the speed of the other, the pinions 53 will, in addition to their axial revolution move in an orbit around the shaft 40, and the spur wheel 54 will turn in the direction of the sprocket wheel having the highest velocity with a speed of rotation equal to one-half of the difference between the speeds of the two sprocket wheels, and as no difference in the rotative velocity of the sprocket wheels 34 and 36 can exist without corresponding movement of the crane along its runways, it follows that the spur wheel 54 will rotate precisely as it would if it was geared into a fixed rack laid above it and parallel with the runways. By means of a spur pinion 55 and shaft 56, the movement of the spur wheel 54 is transmitted to a pinion 57 at the off end of the crane. This pinion 57 may be geared directly or indirectly with a rack laid along the runway for said off end of the crane, so that the latter will thus be propelled positively, and in unison with the driving end, but instead of the rack I prefer to use a chain, which, while as positive as a rack, cannot be slipped or clogged with dirt.

In Figs. 4 and 5 therefore 60 represents a standing chain extending along the runway at the off end of the crane, and suitably secured to said runway at either end of the same, this chain being led around sheaves 61 and over a sprocket wheel 62 secured to a shaft 63 which has a spur wheel 64 meshing with the spur pinion 57 on the squaring shaft 56, so that movement of said shaft 56 in either direction will cause the wheel 62 to run along the chain at precisely the same rate of speed as the driving end of the crane. It is manifest that as this squaring shaft 56 has a positive rate of movement, corresponding with that of the bridge of the crane, it can, if desired, be geared to the truck wheels of said bridge so as to rotate the same, as in other cranes. If swift running ropes or belts are employed in place of the chain 30, friction gears may be advantageously substituted for the toothed gearing shown and described, and such other constructive modifications as commend themselves can also be made.

In Fig. 6 for instance, I have shown a construction which may be adopted with advantage when a rope is employed for driving instead of a chain, this construction being especially suitable for small quick-moving cranes. In this case the sprocket wheels 34 and 36 are replaced by sheaves or drums 34^a and 36^a, and like sheaves or drums 33^a and 35^a are employed, there being but one of each of these instead of two as in Fig. 5, and beneath the shaft 40 is a shaft 70 upon which said sheaves 33^a and 35^a are mounted so as to turn loosely. The drum 34^a is secured to the shaft 40 which also carries at its inner end a miter wheel 50 as before, the drum 36^a turning loosely on the shaft 40, and the drum 35^a being carried by a sleeve 71 which has a spur wheel 72 meshing with a spur wheel 73 on a sleeve 74 which turns loosely on the shaft 40 and carries the miter wheel 45. The forward moving run of the rope 30^a on reaching the drum 33^a is rove several times around said drum and the drum 34^a, thence passes on to the guide pulley, and on returning is rove in the same manner around the drums 35^a and 36^a. In this construction the gearing which in the construction shown in Figs. 1 and 2, is interposed between the sprocket wheel 36 and miter wheel 45 is dispensed with, and the mechanism simplified to that extent. The brake rims 38 may be attached either to the drums 34^a and 36^a or to the drums 33^a and 35^a, preferably to the latter.

Various modifications of the squaring mechanism are possible within the scope of my invention, for instance the wheels 33 and 35 in the construction shown in Figs. 1 to 5 may be sprocket wheels, and may carry bevel wheels 51 engaging with bevel wheels 52 on a spider keyed to the spindle on which said wheels 33 and 35 turn, so that a prolongation of said spindle constitutes the equivalent of the shaft 56; in fact, the spur wheel 54 shown in Figs. 1, 2 and 5 constitutes a spider for carrying the bevel wheels 52; but in that case, as the central shaft of the spider has to perform other duties, said spider is geared to a special squaring shaft, but when other wheels than the wheels 34 and 36 are employed to operate the squaring devices, this difficulty is not encountered, and said central shaft may be employed to transmit the movement of the spider to the off end of the crane or other structure; for instance, in Fig. 7 I have shown a construction in which the drums 33^a and 35^a carry the bevel wheels 51, which mesh with bevel pinions 52 on a spider 75 which is keyed to the shaft 70, which can be prolonged so as to take the place of the shaft 56.

For the purpose of avoiding objectionable alternative phrases I have, in the claims, used the word belt to indicate the driving rope, belt, chain or the like, and the word wheel to indicate a wheel, pulley, drum or equivalent device.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. Traverse mechanism for cranes or other traveling structures, comprising a driving belt, a pair of wheels located upon the traveling structure and rotated by engagement with the going and returning parts of said driving belt, means for retarding or differentiating the speed of said wheels, a squaring shaft, traverse mechanism operated thereby, and gearing whereby difference in the speed of said wheels is caused to effect rotation of said squaring shaft in proportion to such difference in speed, substantially as specified.

2. The within described means for effecting the uniform rotation of a shaft upon a traveling structure, said means comprising a continuously running driving belt, a pair of wheels, one engaging one run of said belt, and the other engaging the other run of the same, and eqalizing gearing through the medium of which each of said wheels is connected to the shaft to be driven, substantially as specified.

3. The within described means for imparting movement to a traveling structure and for uniformly rotating a shaft thereon, said means comprising a continuously running driving belt, a pair of wheels, one engaging one run of said belt, and the other engaging the other run of the same, friction brakes for regulating the speed of rotation of said wheels, and equalizing gearing through the medium of which each of the wheels is connected to the shaft to be driven, substantially as specified.

4. The combination of the traveling structure carrying a shaft, as 40, to be driven, a continuously running driving belt, a pair of wheels carried by the traveling structure and engaging respectively with the forward and backward runs of said belt, bevel wheels connected respectively to said belt wheels, and a frame, as 49, mounted upon and free to rotate with the shaft to be driven, said frame carrying one or more bevel wheels meshing with those of the belt wheels, substantially as specified.

5. Traversing mechanism comprising a continuously running driving belt, a pair of wheels carried by the structure to be traversed, and engaging respectively with the forward and backward runs of said driving belt, means for regulating the speed of rotation of each of said wheels, a squaring shaft, and means for operating the latter, comprising bevel wheels connected to the belt wheels, and a spider which carries one or more pinions engaging with said bevel wheels, substantially as specified.

6. Traversing mechanism comprising a continuously running driving belt, a pair of wheels carried by the structure to be traversed and engaging respectively with the forward and backward runs of said driving belt, means for regulating the rotation of said wheels, a squaring shaft, gearing whereby difference in the speed of rotation of the belt wheels is caused to effect a corresponding rotation of the squaring shaft, a squaring chain, and a wheel engaging therewith, said wheel being driven from the squaring shaft, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CALVIN W. PARSONS.

Witnesses:
H. M. WALTON,
H. H. EATON.