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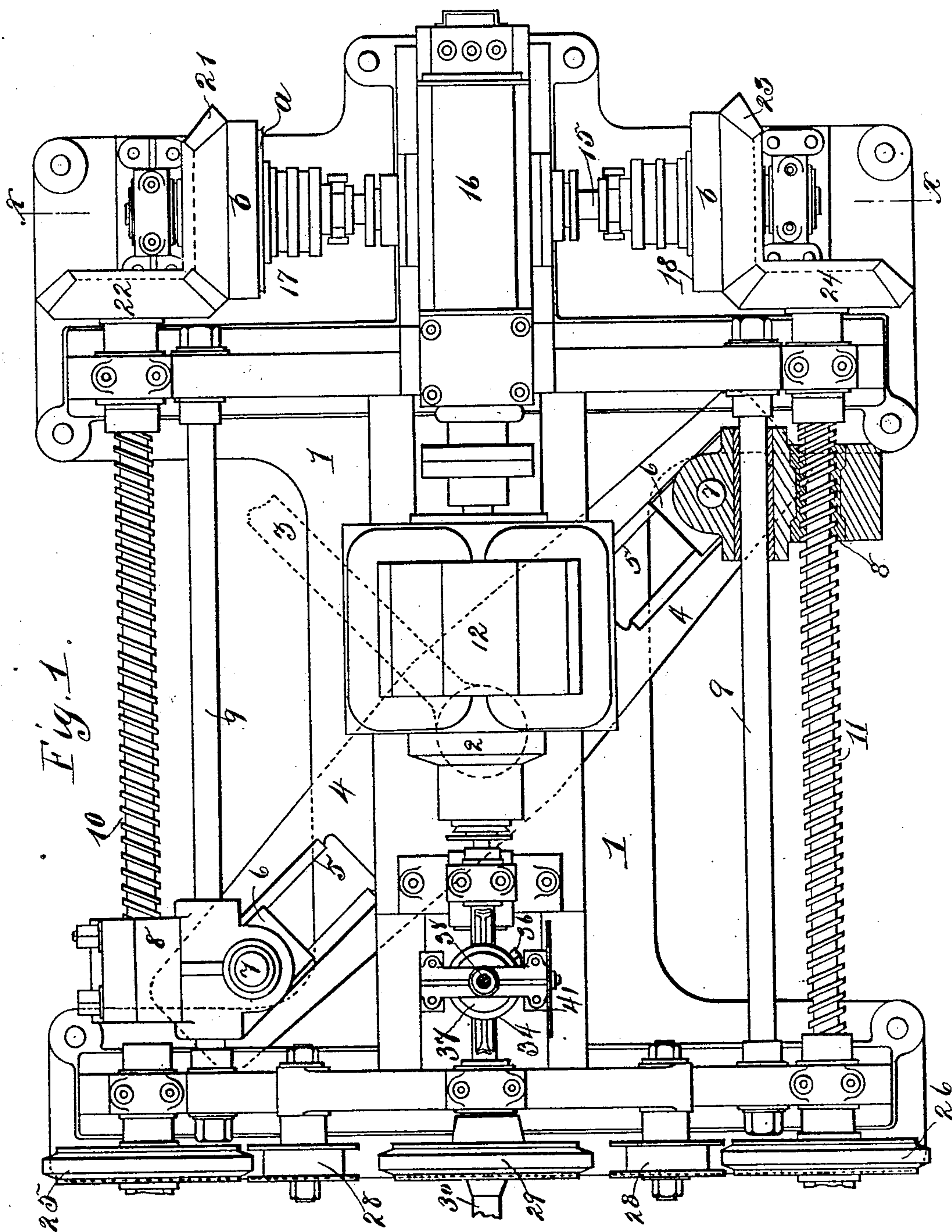
(No Model.)

4 Sheets—Sheet 1.

G. S. GRIMSTON & A. H. DYKES.
ELECTRICAL STEERING GEAR.

No. 549,636.

Patented Nov. 12, 1895.



WITNESSES
De Witt C. Tanner.
W. Clyde Jones.

INVENTORS:
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and Alfred H. Dykes.
BY *Parton & Mawr.*
ATTORNEYS.

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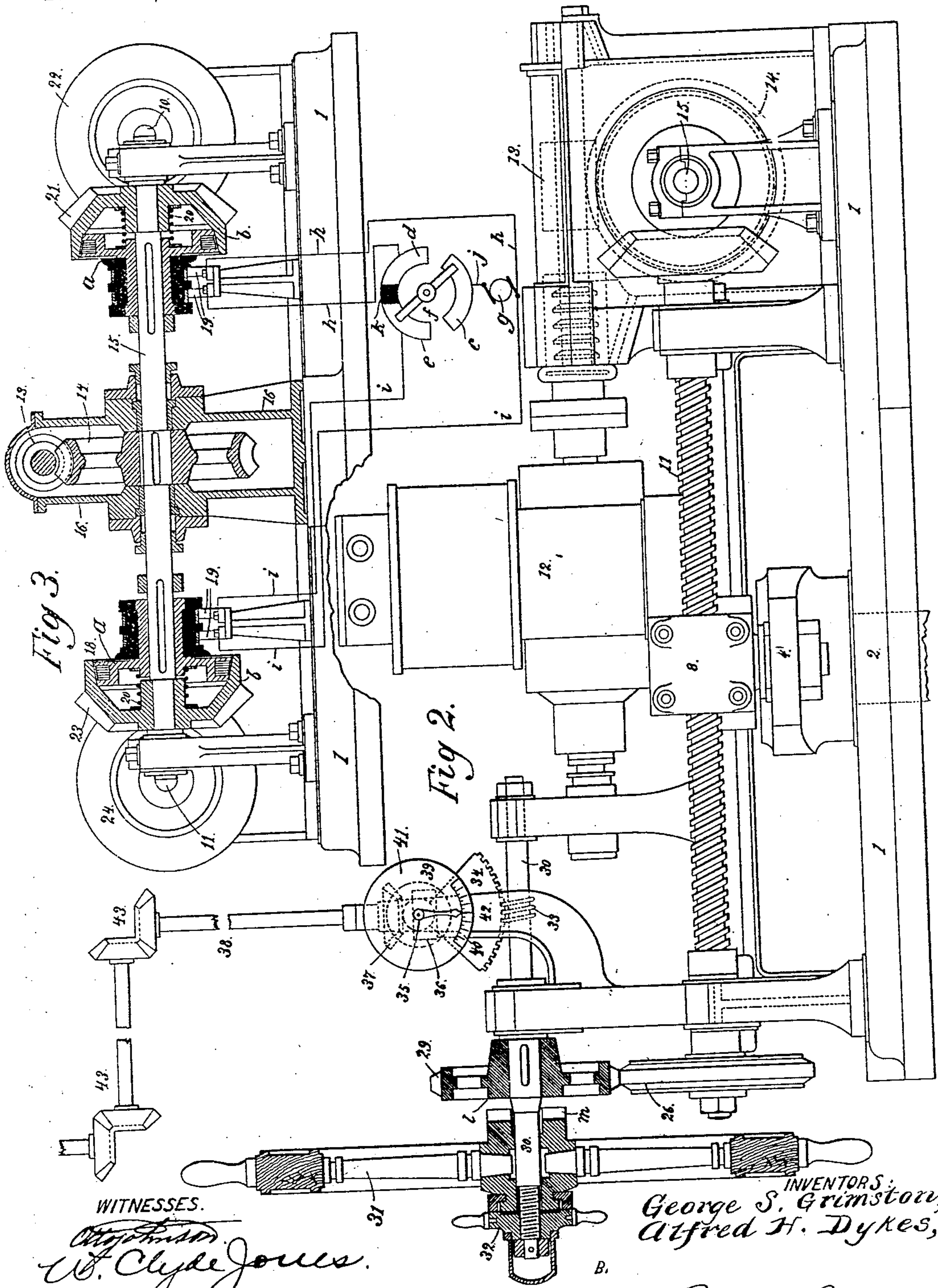
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(No Model.)

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W. Clyde Jones.

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Fig 5.

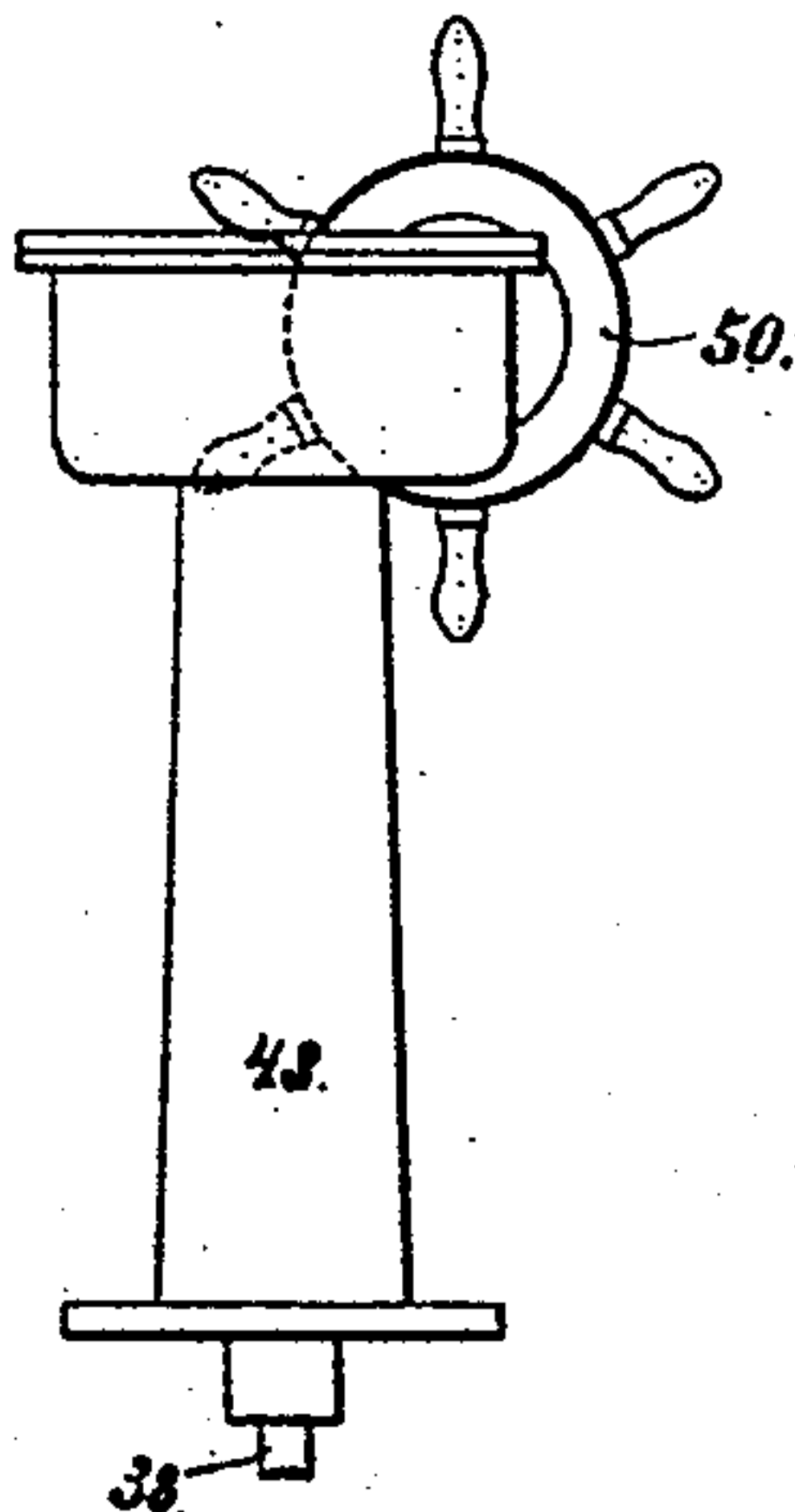


Fig 6.

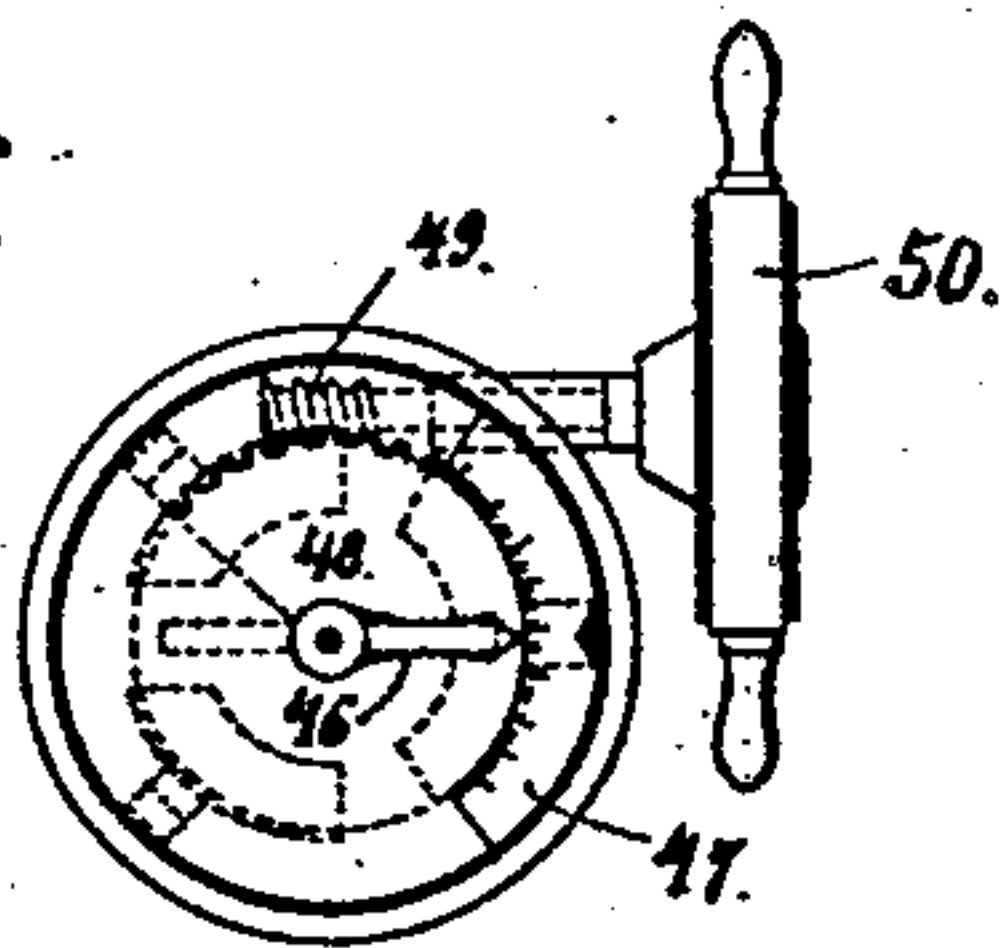


Fig 7.

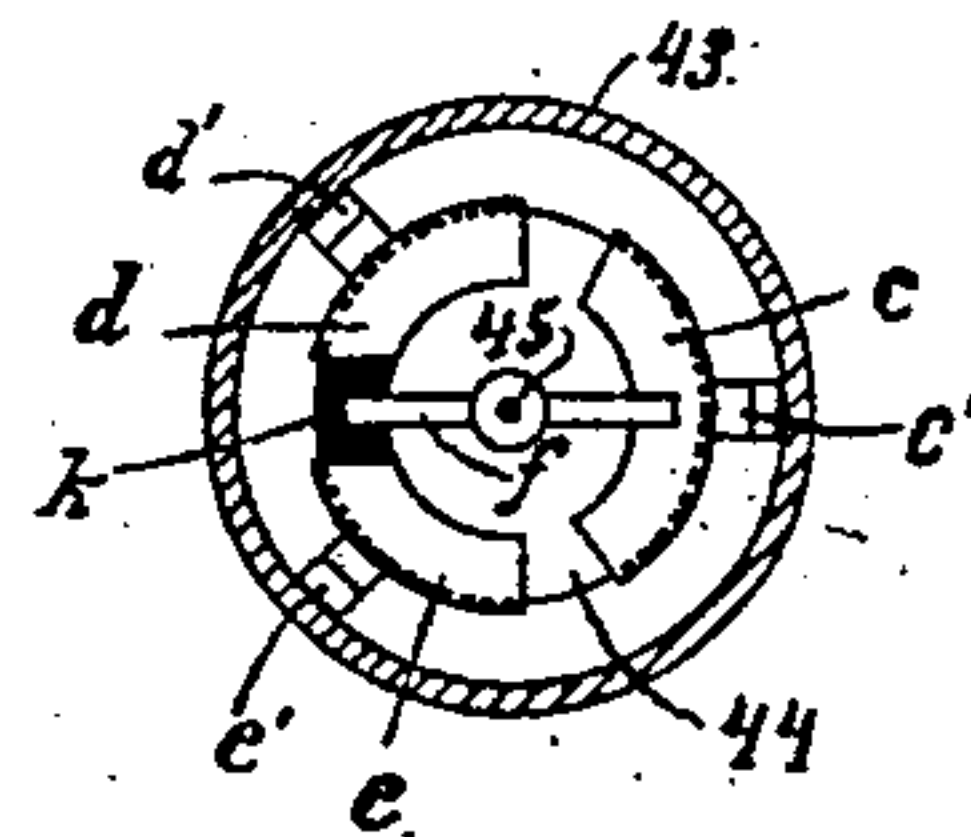
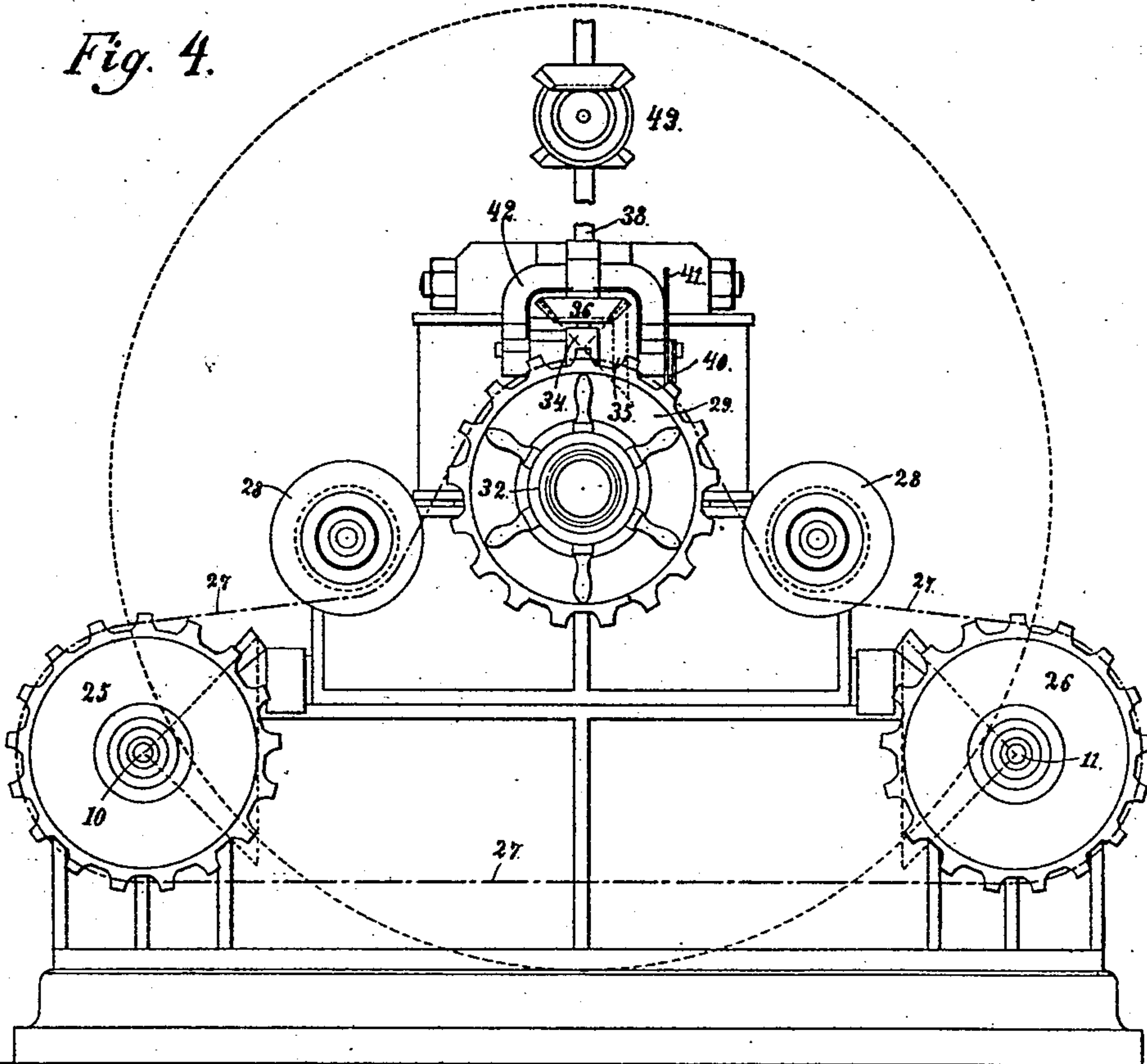


Fig. 4.



WITNESSES.

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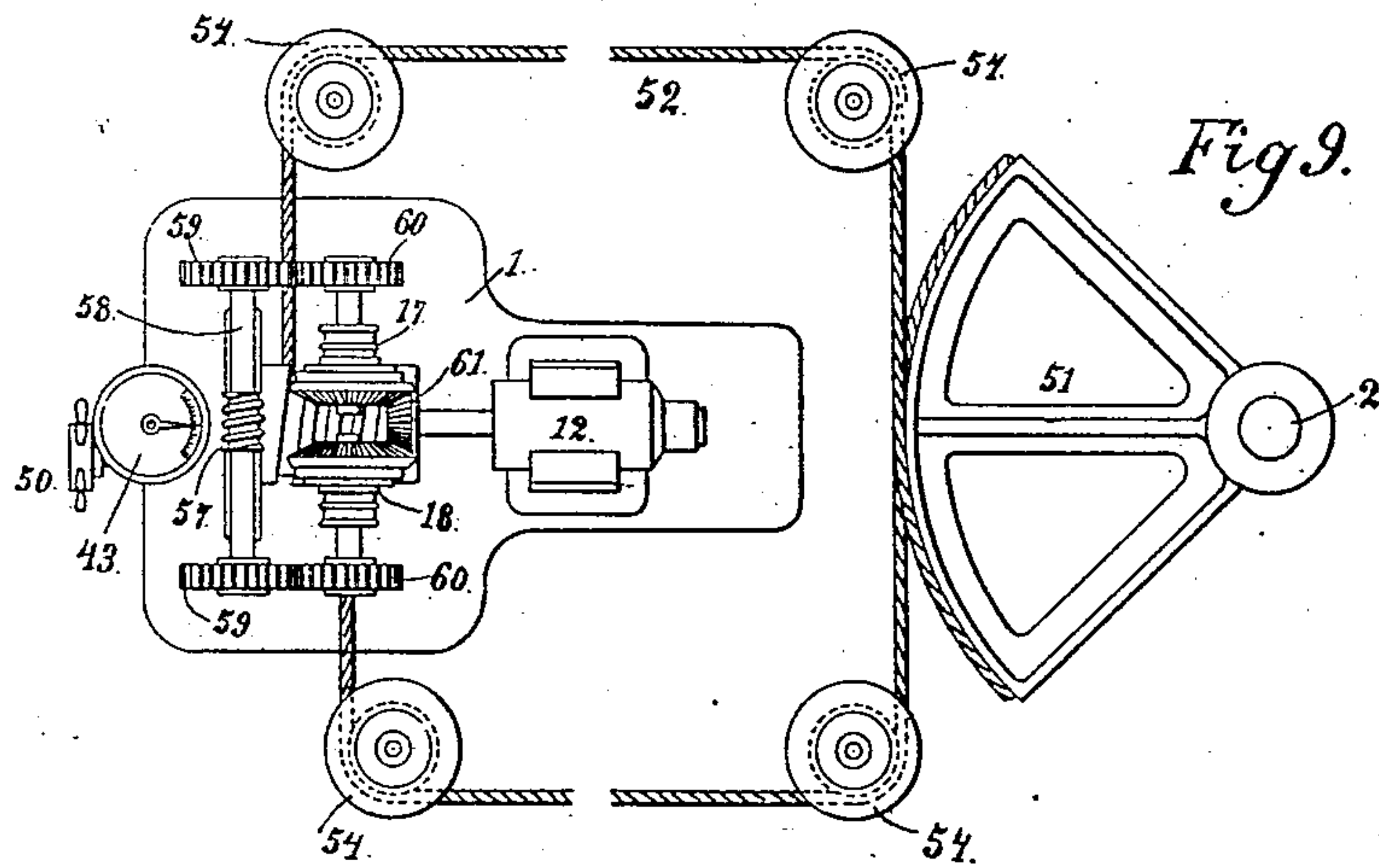
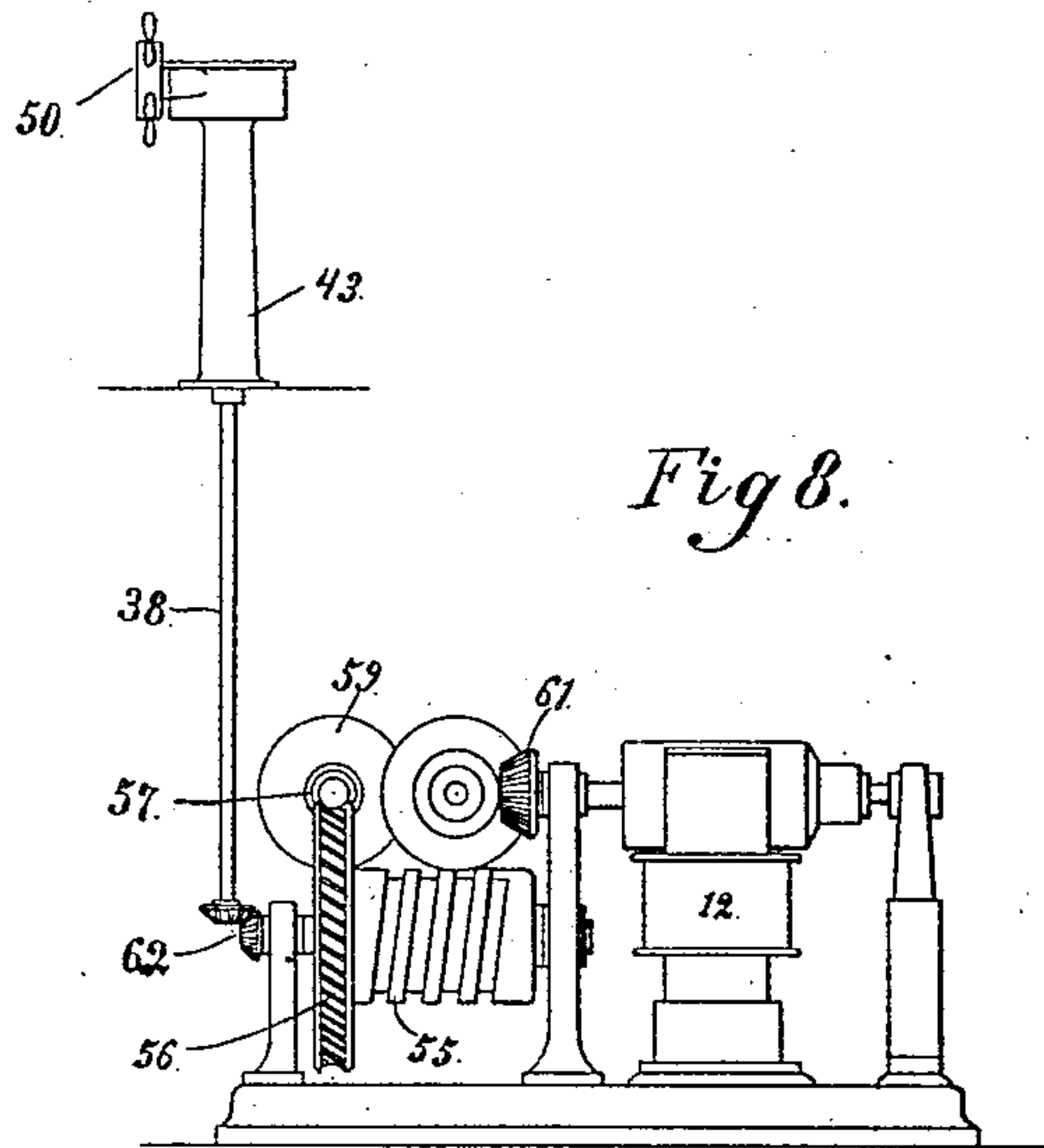
(No Model.)

4 Sheets—Sheet 4.

G. S. GRIMSTON & A. H. DYKES.
ELECTRICAL STEERING GEAR.

No. 549,636.

Patented Nov. 12, 1895.



WITNESSES

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UNITED STATES PATENT OFFICE.

GEORGE SYLVESTER GRIMSTON AND ALFRED HERBERT DYKES, OF
LONDON, ENGLAND.

ELECTRICAL STEERING-GEAR.

SPECIFICATION forming part of Letters Patent No. 549,636, dated November 12, 1895.

Application filed April 9, 1895. Serial No. 545,065. (No model.) Patented in England July 23, 1891, No. 12,525, and May 2, 1892, No. 8,268.

To all whom it may concern:

Be it known that we, GEORGE SYLVESTER GRIMSTON, residing at Claremont, Glenlucce Road, Westcombe Park, London, and ALFRED HERBERT DYKES, residing at No. 3 Mount Terrace, Charlton, London, in the county of Kent, England, have invented new and useful Improvements in Electrical Steering-Gear, of which the following is a specification, and for which Letters Patent have been granted in Great Britain, No. 12,525, dated July 23, 1891, and No. 8,268, dated May 2, 1892.

This invention relates to an electrically operated and controlled steering-gear for vessels, and has for its object to provide simple, compact, substantial, and effective apparatus of this character whereby the steering of a vessel may be effected from an electric motor by or through the agency of clutch devices (preferably electromagnetic) and gearing interposed between the clutches and the rudder head or post, all under control by a pilot or steersman who simply turns a small hand-wheel on an electric switch-stand. Parts of the switch-stand are geared with the rudder mechanism to automatically cut the clutch mechanism out of electric circuit, thereby causing the rudder to stop at any desired position which had been indicated and predetermined by the last preceding movement of the hand steering-wheel.

A further object of the invention is to provide for actuating the rudder by hand and independently of the electrical apparatus and while using a portion of the mechanism interposed between the electric motor and the rudder.

The invention will first be described and then will be particularly defined in claims hereinafter set forth.

Reference is to be had to the accompanying drawings, forming part of this specification, and in which similar characters indicate corresponding parts in the several views.

Figure 1 is a plan view of a preferred form of the steering gear or apparatus, partly in horizontal section. Fig. 2 is a side view thereof, partly in vertical section. Fig. 3 is a vertical transverse section taken on the line *x x* in Fig. 1. Fig. 4 is a front end view of the apparatus with the hand steering-wheel re-

moved and its periphery indicated by a dotted line. Fig. 5 is an elevation of the electrical switch-stand. Fig. 6 is a plan view of the stand. Fig. 7 is a sectional plan view thereof, showing the contacts; and Figs. 8 and 9 are respectively an elevation and plan of a modified form of the apparatus.

We will describe the invention with more special reference at first to Figs. 1 and 7 inclusive, of the drawings.

In the bed-plate 1 of the steering-gear is formed the upper bearing of the vertical post 2 of the rudder 3 of a vessel. (Not otherwise shown.) To the post 2 is fixed centrally a horizontal bar 4, having at each end a longitudinal slot 5, in which is fitted a sliding block 6, to which is pivoted by a pin a nut 8, which is guided on a bar 9, arranged preferably inside of the adjacent operating-screw. There are two of these screws 10 11, one having right-hand threads and the other having left-hand threads, and both screws are journaled in suitable bearings on standards rising from the bed-plate 1.

In a central plane above the rudder-post is supported any approved type of electric motor 12, whose armature-shaft carries a worm 13, which engages a worm-wheel 14, fast on a transverse shaft 15; journaled in boxes rising from the bed-plate 1. The worm-gearing is protected within a casing 16. On the shaft 15 are two magnetic clutches 17 18, each comprising a member *a*, splined to the shaft to turn with it and having suitable wire-coil winding and on an insulated portion of its hub provided with two contact-rings, which are respectively connected to opposite ends of the coil and to which corresponding insulated commutator-brushes 19 are adapted. The other member *b* of each clutch receives within it the member *a* and is normally loose or revoluble on the shaft 15, and between the two parts of each clutch is placed an expanding-spring 20, which separates its members *a b* immediately the current is cut out of the clutch. To the part *b* of the clutch 17 is fixed or on it is formed a bevel gear-wheel 21, which constantly gears with a like bevel-wheel 22, fast on the screw 10, and the member *b* of the other clutch 18 carries a bevel gear-wheel 23, which engages another bevel-wheel 24, fast on the other screw 11.

In the diagram of Fig. 3 of the drawings are shown the three contacts *c d e* and movable contact plate or brush *f* of the switch-stand, hereinafter more fully described, and a suitable electric generator *g*. The brushes 19 of clutch 17 connect by wires *h h* with the contact *d* and one terminal of the generator, and the brushes 19 of the other clutch 18 connect by wires *i i* with the contact *e* and the same generator-terminal, while the contact *c* is wired at *j* to the other terminal of the generator. The contacts *d e* are separated by a neutral space insulating *k*, which when the brush *f* is on or over it precludes passage of current from the generator to either of the clutches. By setting the brush *f* over upon the contact *d* a current will be sent to the clutch 17 to couple its members, and the members of the clutch 18 will be coupled by a passing current when the brush *f* is adjusted upon the other contact *e*. The contact *c* connects by the brush with either contact *d e*.

On the shafts 10 11, respectively, are fixed at the front of the apparatus the chain-wheels 25 26, over which passes an endless chain 27, which after running under suitable guide wheels or rollers 28 28, journaled in standards rising from the bed-plate, also passes over an upper chain-wheel 29, which is fixed to a shaft 30, journaled above and parallel with the main screws 10 11. This chain-wheel 29 has a suitable clutch face or member *l*, which is adapted for engagement by an opposed clutch member *m* on the hub of a suitable large hand steering-wheel 31, which is journaled on a protruded end of the shaft 30. The extremity of this shaft is screw-threaded, and on this thread is fitted the body portion of a clamp-wheel 32, which has an inner attached part provided with an inwardly-extending flange or tongue, which loosely engages within a groove on the hub of the hand steering-wheel 31. With this construction and when the clutch *l m* is uncoupled, as shown in Fig. 2 of the drawings, the chain-wheel 29 will be rotated in one direction or the other by or from the wheel 25 or 26, and the hand steering-wheel 31 will not rotate with the parts 29 30 32 while the steering-gear is operated electrically; but when the rudder is not electrically operated it may be operated by hand by engaging the clutch members *l m* and coupling the hand steering-wheel 31 with the upper chain-wheel 29. This is effected by turning the wheel 32 upon the threaded portion of the shaft 30, which moves the hand steering-wheel 31 inward to engage the clutch.

In Figs. 1 and 2 the chain-wheels 25, 26, and 29 are indicated in diagram, the teeth and chain being omitted. The wheels as actually constructed are illustrated in Fig. 4.

On the shaft 30 is a worm 33, which engages a worm-gear segment 34, to whose rocking shaft is fixed a bevel gear-wheel 36, which engages a horizontally-revoluble bevel-gear 37, from whose vertical shaft 38 the disk of the electrical switch-stand carrying the contacts *c*

d e is actuated. The shaft of the gear-wheel 36 also carries an index-finger 39, adapted to move over a scale 40, held to a plate 41, fastened to the bracket arm or yoke 42, which sustains the bevel-gearing. The index 39 indicates to the hand steersman the position of the rudder. The shaft 38 will extend directly upward to the switch-stand should it be most convenient to locate the stand immediately above the steering-gearing; but should the switch-stand be otherwise located various trains of shaft and bevel-wheel gearing 43 will be interposed as may be necessary to cause rotation of the switch-stand contact-carrying disk or plate from the main screws 10 11 and the shaft 30, carrying the hand steering-wheel 31.

Should the hand steering-gearing not be employed in direct connection with the rudder-operating screws or mechanism, the shaft 38 or any equivalent device actuating the contact-disk of the switch-stand may be operated in any approved manner mechanically from the main screws 10 11 to turn said contact-disk as the rudder is turned to port or starboard. Furthermore, any approved electrically-operated motors or devices may be interposed to turn the contact-carrying disk proportionately to and dependent upon the movement of the rudder through the medium of electromagnetic or electrical clutch devices wired to the disk-contacts and a generator, substantially in the manner above described.

The electrical switch-stand (shown more clearly in Figs. 5, 6, and 7 of the drawings) is made with a suitable hollow pedestal 43, through which runs the shaft 39, to which is fixed the horizontally-revoluble disk or plate 44, to which are fixed the three contacts *c d e* and insulation *k*, and these contacts are respectively provided with metallic lugs *c' d' e'*, to which the wires *j h i*, respectively, are attached. These wires run down within the pedestal of the stand to connect with the electromagnetic clutches 17 18 in the manner shown diagrammatically in Fig. 3 of the drawings.

Upon any suitable spindle or journal bearing within the head of the switch-stand, and preferably on a reduced upper end of the contact-disk carrying-shaft 38, is placed loosely a sleeve 45, to which are fixed the brush or plate *f*, adapted to the contacts *c d e*, and an index-finger or pointer 46, which moves around a relatively-fixed scale 47 in the pedestal. The sleeve 45 may be actuated to synchronously turn the brush *f* and index 46 in any preferred manner. We prefer to use a worm-wheel sector 48, fixed to the sleeve and engaged by a worm 49 on the shaft of a hand-wheel 50, journaled in bearings on the pedestal. A glass plate closes the top of the pedestal and protects the inner parts of the switch-stand.

From the foregoing description the operation will be readily understood, and is as follows: Supposing the hand steering-wheel 31

to be uncoupled and the apparatus to be worked electrically, it is obvious that by turning the hand-wheel 50 in one direction or the other the brush *f* will be turned more or less and the index 46 will move over the scale 47 any desired distance corresponding to the number of points it is desired to change the course of the vessel. The brush *f* will be moved with the index and to either pair of contacts *c d* or *c e*, depending on whether the course of the vessel is to be changed to starboard or port and as indicated by the index 46 at the scale 47. With the brush connecting one pair of contacts the electric circuit will be closed to the clutch 17 and with the brush on the other pair of contacts the circuit will be closed to the other clutch 18. Should the current be first sent through the clutch 18, its members *b* will be engaged with its member *a*, thereby locking the gear 23 and causing it to rotate with the shaft 15 to rotate the gear 24 and its screw 11 and sprocket-wheel 26 and, through the drive-chain 27, rotating the wheel 25 and its screw 10 in the same direction as the reversely-threaded screw 11 and moving the nuts 8 8 on the two screws in reverse directions simultaneously, thereby turning the rudder-post bar 4 as the blocks 6 slide in the bar-slots 5 and adjusting the rudder by or from the motor 12 through the screws and nuts, which exert equal power at opposite ends of the rudder-bar. Should the current first be sent to the clutch 17, the two screws would be turned in reverse direction and the rudder will be accordingly adjusted, one engaged clutch adjusting the rudder to starboard and the other engaged clutch adjusting it to port. The drive-chain 27 while turning one of the screws from the other also turns the wheel 29, thereby rotating the shaft 30, and through its worm 33 and the interposed gearing 34 35 36 37 will rotate the shaft 38 of the switch-stand in proper direction to turn the disk 44 back to a position to carry its insulation *k* or an equivalent space between the contacts *d e* again under the brush *f*, thereby cutting out the current from the engaged clutch and permitting separation of its members *a b* by their interposed spring 20 and stopping the screw mechanism whereupon the movement of the rudder will cease when it shall have been adjusted to either starboard or port for a distance predetermined by the steersman at the wheel 50 and indicated by the index 46 on the switch-stand scale 37 when the steersman last adjusted the brush *f* to switch the lately-operated clutch into electric circuit. When the course of the vessel is again to be changed, the steersman will turn the wheel 50 in proper direction until the index 46 registers on the scale 47 the desired number of points the rudder is to be moved to either starboard or port and the proper clutch will be engaged to shift the rudder accordingly and until the contact-disk 44 is again turned back to normal position for disengaging the clutch, when the in-

sulation *k* again comes under the brush and the rudder stops at the desired predetermined position.

Obviously it is not essential that the two main screws 10 11 have right and left hand threads, respectively, as they may both have like threads if the front chain or other gearing which drives one screw from the other be arranged to turn the screws in opposite directions, and the shaft 38 of the switch-stand may be coupled with the modified front gearing to effect return of the contact-plate 44 to carry the insulation *k* under the brush to cut out the electric current from either clutch 17 or 18, substantially in the manner above described. Gear-wheels may also be substituted for the chain and sprocket wheels within the scope of the invention.

In the modification sufficiently shown in Figs. 8 and 9 of the drawings the rudder-post 2 carries the usual segmental arm 51, from which ropes or chains 52 53 lead in opposite directions around suitable guide-pulleys 54 to connect with a barrel 55, whose shaft carries a worm-wheel 56, engaged by a worm 57 on a shaft 58. This shaft carries at each end a gear-wheel 59, which engages a gear-wheel 60 on the shaft of one member of a magnetic clutch. There are two of these clutches 17 18, the loose members of which carry bevel gear-wheels, both of which are in gear constantly with a bevel gear-wheel 61, fast on the armature-shaft of an electric motor 12, to which current will be supplied from any suitable generator. Bevel-gears 62 give motion to the switch-stand shaft 38 from the shaft of the barrel 55.

The operation of the electromagnetic clutches 17 18 is substantially the same relatively to the driving-gearing 59 60 and the switch-stand 43, with its electrical contacts and hand-wheel 50 for operating the same, as hereinbefore described for the screw-operated steering-gearing. It will be readily understood that when one clutch is put in circuit one pair of engaged gears 59 60 will, through the shaft 58, worm 57, and worm-wheel 56, turn the barrel 55 in one direction to put the rudder to starboard, and when the other clutch is put in circuit the other pair of engaged gears 59 60 will, through the intermediate gearing, turn the rudder to port, and the movement in either direction will be stopped by the gearing 62 38, turning the switch-stand contact-plate to put the engaged clutch out of electrical circuit and allow its bevel-wheel, which the motor-wheel 61 engages, to again run loosely upon its shaft.

Modifications other than those above named may be made within the scope of the invention.

The electrical clutches employed may be similar to those shown in United States Patent No. 503,727, granted to Ernest Richter and Carl Hoffmann, dated August 22, 1893.

Having thus described our invention, we claim—

1. In electrical steering gear, the combination, with the rudder post bar and two screws, one coupled to each end of the bar, of two electro-magnetic clutches, each adapted for coupling with the screw gearing, a prime motor operating the clutches and screws to turn the rudder to starboard or port as determined by the clutch for the time being engaged with the motor and screw gearing, and a source of electric energy in circuit for magnetizing either clutch.

2. In electrical steering gear, the combination, with the rudder post bar and two screws, one coupled to each end of the bar, of two electro-magnetic clutches each adapted for coupling with the screw gearing, an electric motor operating the clutches and screws to turn the rudder to starboard or port as determined by the clutch for the time being engaged with the motor and screw gearing, and a source of electric energy in circuit for magnetizing either clutch and for operating the electric motor.

3. In electrical steering gear, the combination, with the rudder post bar and two screws, one coupled to each end of the bar, of two electro-magnetic clutches each adapted for coupling with the screw gearing, an electric motor operating the clutches and screws to turn the rudder to starboard or port as determined by the clutch for the time being engaged with the motor and screw gearing, a source of electric energy in circuit for magnetizing either clutch; an electric switch stand having three contacts movable by or from the rudder gearing and a brush adapted to complete circuit through one contact and either of the other two contacts, or to break circuit; electrical connections being provided between the switch stand contacts and the generator; and means for turning the switch stand brush any predetermined distance to simultaneously complete circuit to one of the clutches and cause a predetermined limited extent of movement of the rudder in either direction.

4. The combination, in an electrical steering gear, and with the rudder post 2, and its bar 4, having end slots 5, 5, of sliding blocks 6, 6, fitted in said slots, screws 10, 10, guides 9, 9 parallel thereto, nuts 8, 8, threaded on the screws 10, 10, and fitted to these guides, and mechanism for rotating the screws simultaneously, substantially as described.

5. The combination, in an electrical steering gear, and with the rudder post 2, and its bar 4, having end slots 5, 5, of sliding blocks 6, 6 fitted in said slots, screws 10, 10, guides 9, 9, parallel thereto, nuts 8, 8, threaded on the screws 10, 10, and fitted to these guides, a transverse shaft 15, two electro-magnetic clutches 17, 18, one member of each clutch being fast and the other member loose on said shaft 15, gearing 21, 22, 24 connecting the clutches with the screws, means for rotating the shaft, and a source of electrical energy in circuit for magnetizing either clutch, substantially as described.

6. The combination in an electrical steering gear and with the rudder post 2 and its bar 4, having end slots 5, 5, of sliding blocks 6, 6 fitted in said slots, screws 10, 10, guides 9, 9, parallel thereto, nuts 8, 8, threaded on the screws 10, 10 and fitted to these guides, a transverse shaft 15, two electro-magnetic clutches 17, 18, one member of each clutch being fast and the other member loose on said shaft 15, an electric motor 12, worm gearing 13, 14, coupling it to the shaft 15, gearing 21, 22, 23, 24, connecting the clutches with the screws, and a source of electric energy in circuit for operating the motor and magnetizing either clutch, substantially as described.

7. The combination in an electrical steering gear and with the rudder post 2 and its bar 4, of screws 10, 11 having nuts 8, 8, coupled to the bar, electro-magnetic clutches 17, 18, geared to operate the screws from a prime motor, a source of electric energy in circuit for magnetizing either clutch, wheels 25, 26 on the screws 10, 11, a parallel shaft 30, having a clutch and driving wheel 29, a chain 27, engaging the wheels 25, 26, 29, a hand steering wheel 31 on the shaft 30, said parts 29, 31 having opposing clutch members *l*, *m*, and devices adjusting the hand steering wheel to engage or disengage the clutch *l*, *m*, substantially as described.

8. The combination, with the rudder operating gearing including two electro-magnetic clutches and a source of electric energy in circuit for magnetizing either clutch, of an electric switch stand provided with a revoluble disk or plate 44 carrying contacts *c*, *d*, *e*, and adapted for operation from the rudder adjusting gearing, a brush *f* adapted to either pair of contacts *c*, *d* and *c*, *e*, electric circuit connections between the two clutches and the switch stand contacts, and means for turning the brush to close the desired circuit for coupling either clutch into action, substantially as described.

9. The combination, with the rudder operating gearing including two electro-magnetic clutches and a source of electric energy in circuit for magnetizing either clutch, of an electric switch stand provided with a revoluble disk or plate 44 carrying contacts *c*, *d*, *e*, and adapted for operation from the rudder adjusting gearing, a brush *f* adapted to either pair of contacts *c*, *d* and *c*, *e*, electric circuit connections between the two clutches and the switch stand contacts, means for turning the brush to close the desired circuit for coupling either clutch into action, a scale 47 on the stand, and an index 46 moving with the contact brush, substantially as described.

In testimony whereof we affix our signatures in the presence of two witnesses.

GEORGE SYLVESTER GRIMSTON.
ALFRED HERBERT DYKES.

Witnesses:

WILMER M. HARRIS,
T. T. BARNES.