(No Model.) 5 Sheets—Sheet 1.

F. J. DIBBLE.

ELECTRIC TELEMETER TRANSMITTER.

No. 490,012. Patented Jan. 17, 1893.

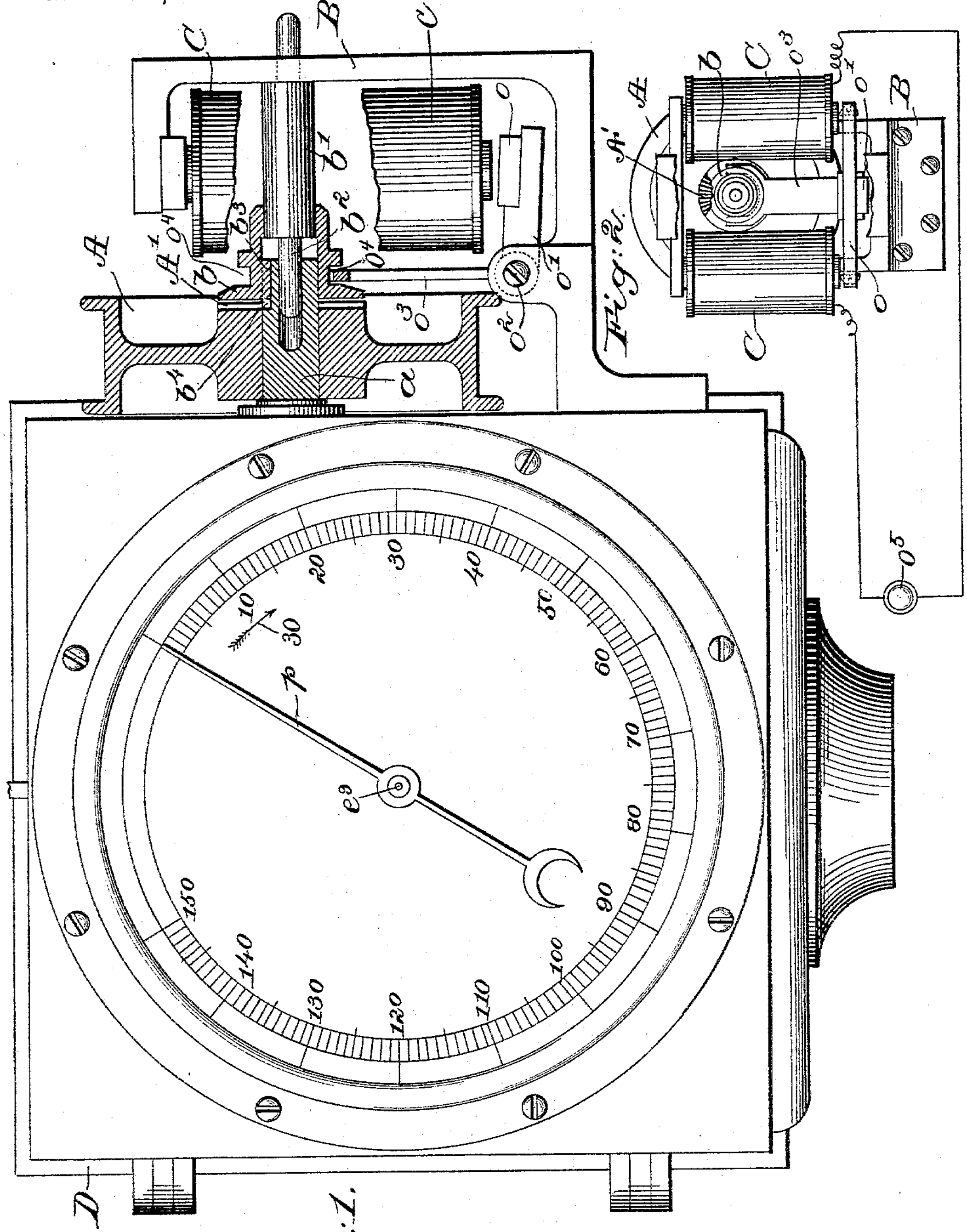

Fig: 1.

Witnesses.
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by Crosby & Gregory attys

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F. J. DIBBLE.

ELECTRIC TELEMETER TRANSMITTER.

No. 490,012. Patented Jan. 17, 1893.

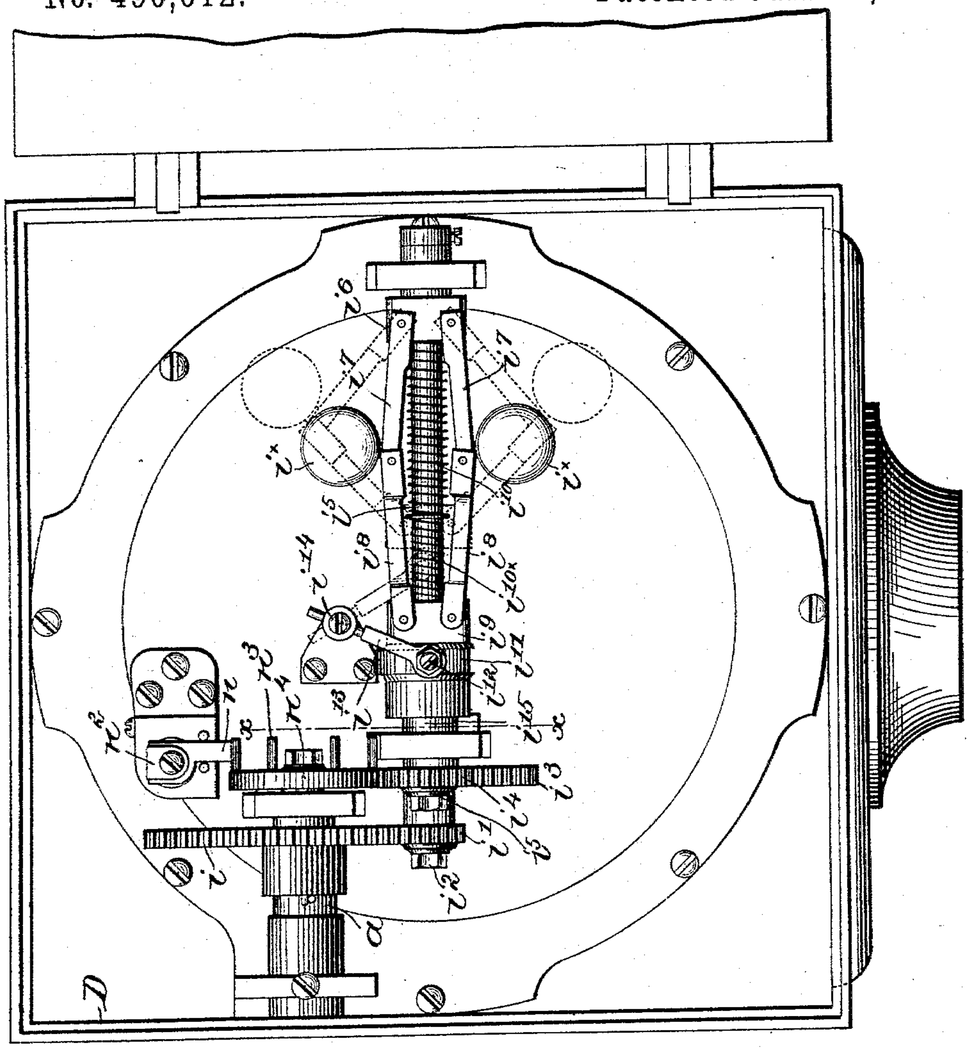

Fig. 3.

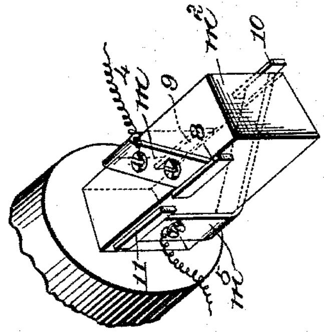

Fig. 6a

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F. J. DIBBLE.

ELECTRIC TELEMETER TRANSMITTER.

No. 490,012. Patented Jan. 17, 1893.

Fig: 7.

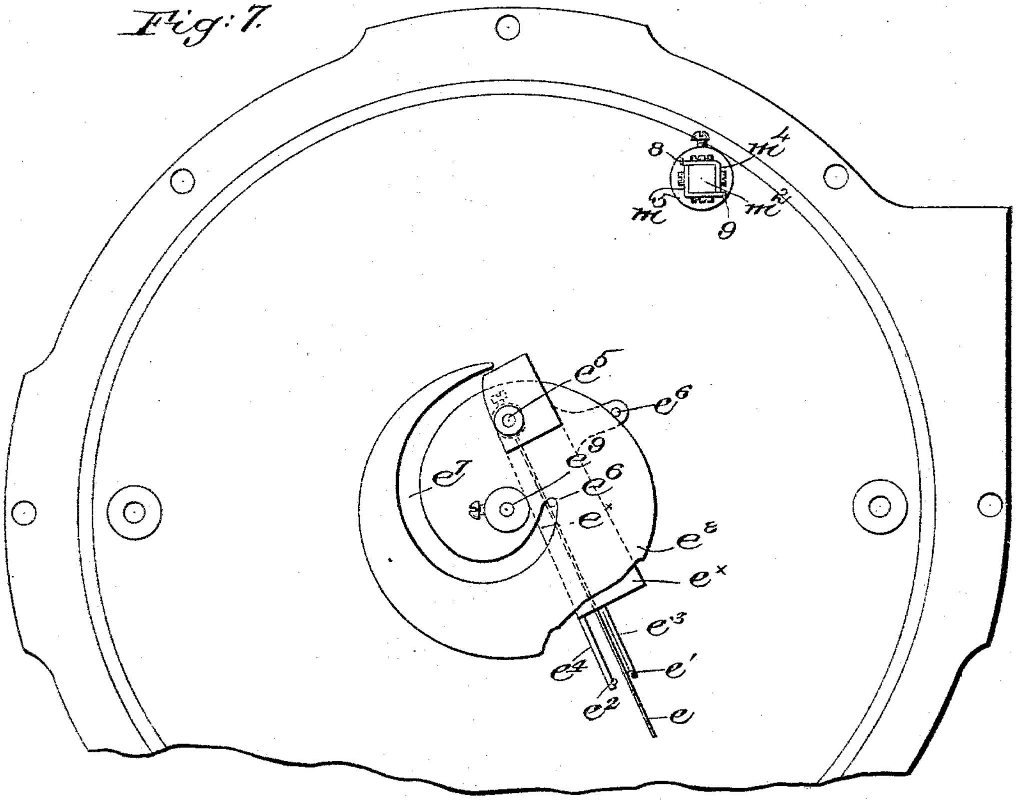
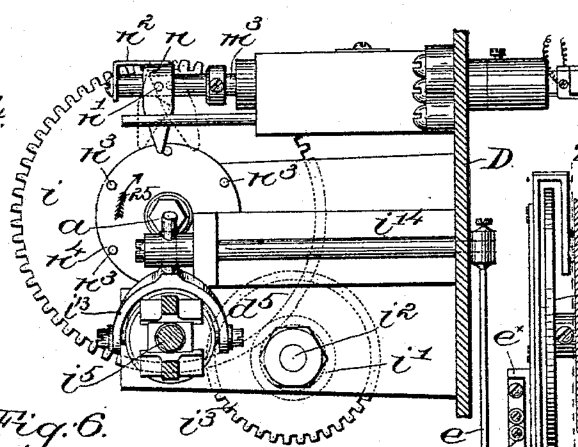


Fig: 4.



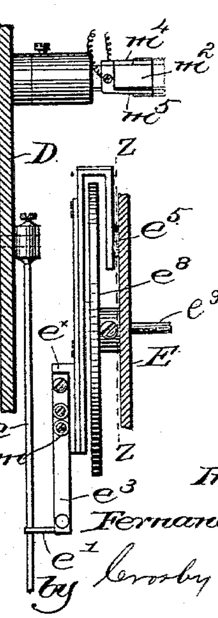
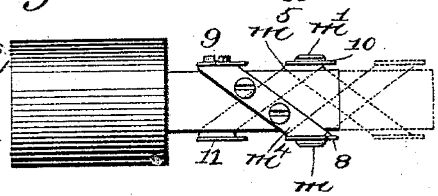


Fig: 6.



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(No Model.)

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ELECTRIC TELEMETER TRANSMITTER.

No. 490,012. Patented Jan. 17, 1893.

Fig: 5.

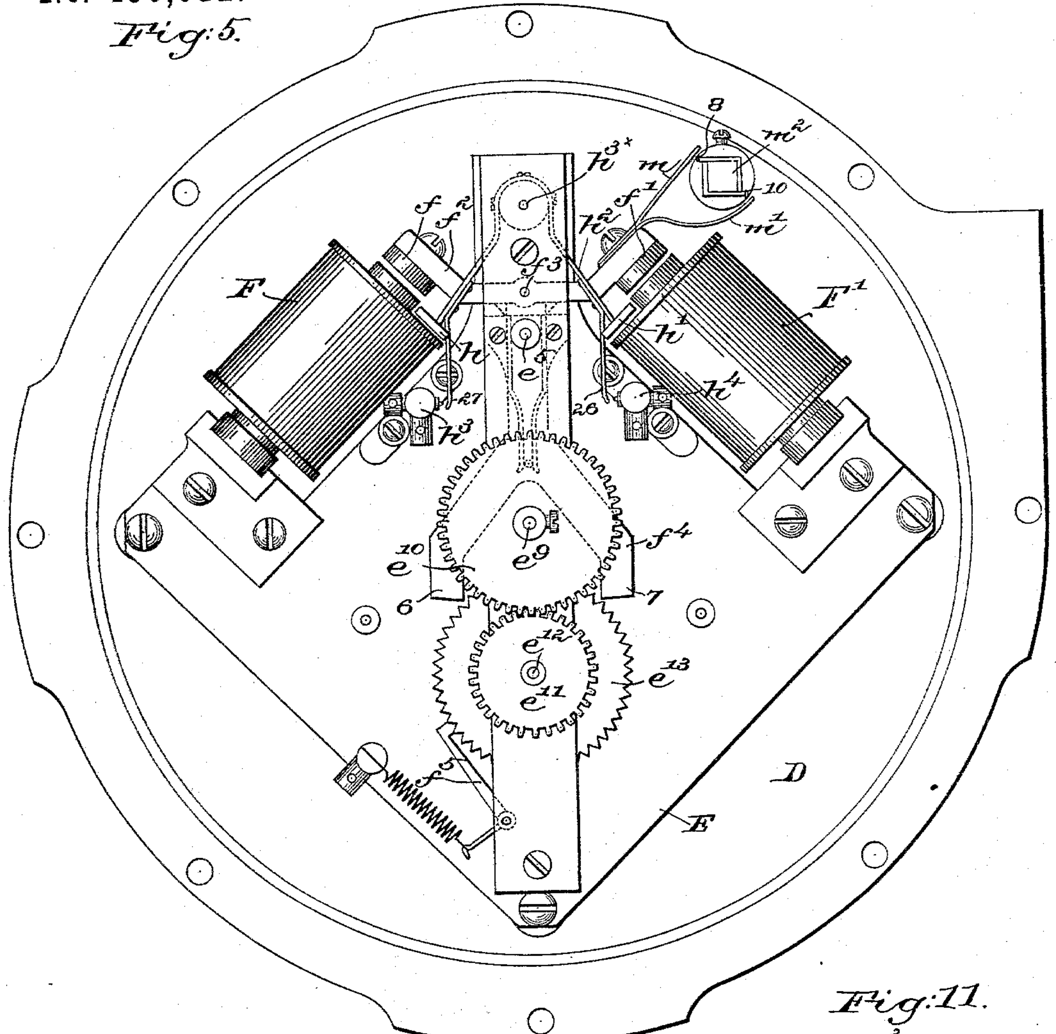


Fig: 10.

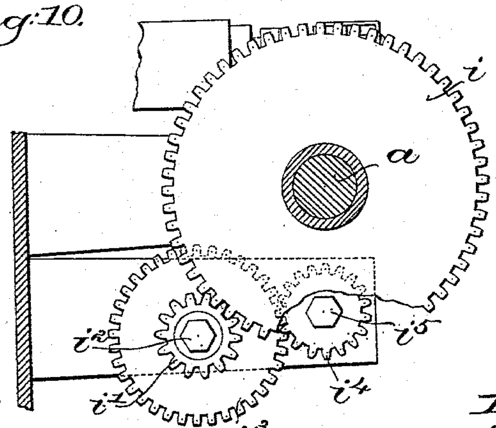
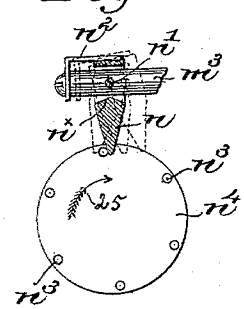


Fig: 11.



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(No Model.) 5 Sheets—Sheet 5.

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ELECTRIC TELEMETER TRANSMITTER.

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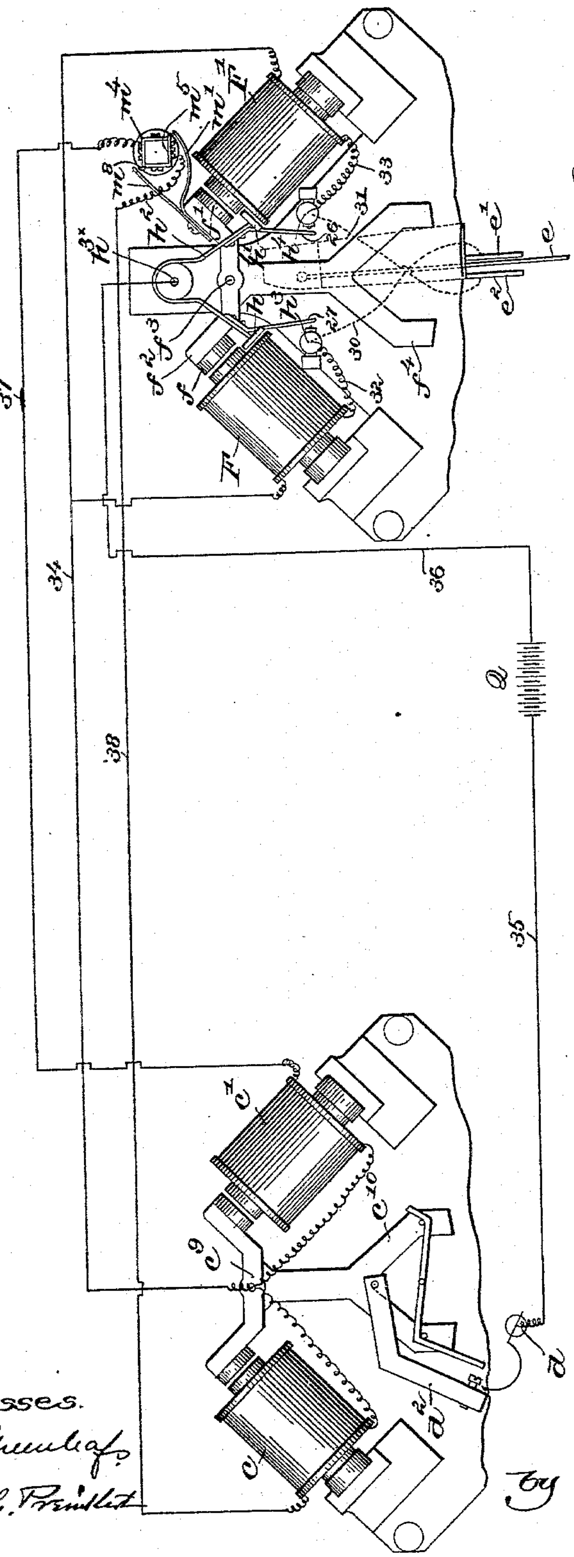

Fig: 8.

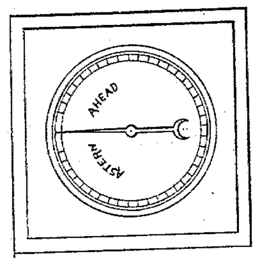

Fig: 9.

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UNITED STATES PATENT OFFICE.

FERNANDO J. DIBBLE, OF PEABODY, MASSACHUSETTS.

ELECTRIC TELEMETER-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 490,012, dated January 17, 1893.

Application filed November 21, 1891. Serial No. 412,670. (No model.)

To all whom it may concern:

Be it known that I, FERNANDO J. DIBBLE, of Peabody, county of Essex, State of Massachusetts, have invented an Improvement in Telemeter Systems, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object the production of a telemeter system, capable of indicating and recording not only the speed but the direction of movement of a rotating shaft.

The particular features of which the invention consists will be hereinafter described and specified in the claims.

Figure 1 represents in face view a telemeter transmitting device, a portion of the electrically-controlled clutch mechanism being represented in section; Fig. 2, a detail end view on a smaller scale of the clutch mechanism; Fig. 3, a rear side view of the device shown in Fig. 1, with the door thrown back to expose the actuating parts; Fig. 4, a section on the dotted line x—x, Fig. 3, looking to the left; Fig. 5, a view similar to Fig. 1, with the face-plate or dial removed; Fig. 6, a detail on an enlarged scale, showing the switching device by which the direction of rotation is indicated and recorded; Fig. 6^a, a perspective detail of the same; Fig. 7, a partial face view back of the face-plate, Fig. 5, or on the second line z—z Fig. 4 to show the contact arm and its co-operating movable contacts, with the cam for moving them; Fig. 8, a diagram view, showing the arrangement of circuits to be described; and Fig. 9, a view of the indicating device, to show the dial. Fig. 10, a rear side view of a part of Fig. 4; and Fig. 11, a detail to illustrate the action of the dog n.

Referring to the drawings, A represents a revolving pulley or member, represented as loosely journaled on the shaft a, and which may be belted to or otherwise driven from any shaft, the speed and direction of rotation of which are to be determined and recorded.

The pulley A will preferably be connected with the shaft a through the medium of a clutch mechanism, said pulley, as herein represented, having the face of its hub provided with a series of radially-arranged teeth A′ to co-operate with similarly arranged ratchet teeth upon the face of a head b, fast upon the sliding shaft b', journaled at one end in a suitable bracket or support B, and at its opposite end having a spindle or journal b^2, fitted to slide in a suitable recess formed in the end of the shaft a, said head b having a key b^3, fitted to slide in a corresponding groove b^4 in the shaft a.

The head or clutch member b may be moved into engagement with the pulley A, by any suitable mechanism, but I have herein shown and prefer to employ an electrically-controlled mechanism,—as for instance the electro-magnets C, carried by the bracket B, the armature o of which has its carrier o' pivoted in said bracket at o^2 and provided with an upwardly-extended arm o^3, forked at its upper end to straddle the head or clutch member b in a suitable groove o^4, see Figs. 1 and 2, so that whenever the electro-magnets C are energized by the closure of a circuit through any suitable press-button or switch o^5 at any point, the attraction of the armature o will move the clutch member b into engagement with the rotating pulley A and thereby cause a like rotation of the shaft a.

Referring to Fig. 3, a rear side view of Fig. 1, and to Figs. 4 and 10 the shaft a, within the casing D is provided with a toothed wheel i, in mesh with a pinion i' on a counter-shaft i^2, said counter-shaft also having fast upon it a toothed wheel i^3, in mesh with and driving a pinion i^4 on the governor shaft i^5, journaled in suitable bearings within the casing, said shaft at one end having fast upon it a hub i^6 Fig. 3, to which are pivoted at diametrically opposite points the toggle links i^7, carrying the balls $i^{\times}$ and in turn pivoted to like links i^8, jointed at their opposite ends to the sliding sleeve i^9, springs i^{10}, $i^{10\times}$ being interposed between the fixed hub i^6 and the sliding sleeve i^9, which normally separate the same to maintain the parts in their full-line position, Fig. 3, such construction being the same as the usual ball governor now in common use. The sliding sleeve i^9 has a peripheral groove i^{11} to receive the roll stud i^{12} on the free end of the arm i^{13}, fast on one end of the spindle i^{14}, journaled in the back plate of the casing D, and at the opposite or front side of said casing carrying the contact arm

e, see Figs. 4 and 7. The contact arm e normally lies between the two contact pins e', e^2, on the arms e^3, e^4, which latter are insulated from each other and carried by a carrier $e^\times$, pivoted at its upper end on a shaft e^5, journaled in suitable bearings in the face-plate E, Figs. 4 and 5. The insulated carrier $e^\times$ for the contacts e', e^2, is provided with a pin e^6, fitted to move in the cam slot e^7, formed in the plate e^8, fast on the inner end of a staff e^9, journaled in the face-plate E and having at its outer end a toothed wheel e^{10} (see Fig. 5), in mesh with a pinion e^{11} on a shaft e^{12}, which latter carries the toothed driving wheel e^{13}, see Fig. 5.

The contact pins e', e^2, are arranged in circuit respectively with the electro-magnets F, F', the main armatures f, f' of the said magnets being attached to opposite ends of the armature-carrier f^2 pivoted at f^3 in the frame carried by the plate E, and provided with a depending forked lever or pallet f^4, the ends 6, 7 of which are arranged at opposite sides of the axis of the driving wheel e^{13} and to co-operate with one or another of the teeth on said wheel, so that vibrations of the said pallet in one or the other direction will rotate the said wheel in one or the other direction, a spring-controlled pawl f^5 serving to assist in the rotation of the said wheel and to retain the latter in position. The electro-magnets F, F' are also provided with auxiliary armatures h, h', carried by the arms of the U-shaped carrier h^2, pivoted at $h^{3\times}$ and having its ends 26, 27 lying normally between and out of contact with the fixed contacts h^3, h^4, see Fig. 5.

The armature-carrier f^2 at one end has secured to it two contact springs m, m', arranged to span the insulated block m^2 on one end of a spindle m^3 see Fig. 4, mounted to slide in suitable bearings in the back-plate of the casing D, said block m^2 having mounted upon its opposite faces two diagonal contact plates m^4, m^5, having their opposite ends upturned, see Figs. 6 and 6^a, to form contacts 8, 9, 10, and 11, the contacts 8 and 11 lying upon the upper left-hand edge of the block, Fig. 6^a, while the contacts 9 and 10 lie upon the lower right-hand edge of the said block, said contacts being in position to be acted upon by the contact springs m and m', see Fig. 5, as the armature-carrier is vibrated by the electro-magnets F and F'.

By reference to Figs. 5, 6 and 6^a, it will be seen that if the armature f' be attracted by its magnet F', the spring m will first engage the contact 8 on the plate m^4, while if the armature f be attracted by its magnet F, the spring m' will engage the contact 10 on the plate m^5; but if the block m^2 carrying the contacts and the spindle m^3 on which said block is mounted be moved bodily to the right, Figs. 4 and 6, the contact 11 on the plate m^5 will be moved into the position previously occupied by the contact 8 on the plate m^4, while the contact 9 on the plate m^4 will be moved into the position previously occupied by the contact 10 on the plate m^5; so that if the armature f' be now attracted, the spring m instead of engaging the contact 8 on the plate m^4, will engage the contact 11 on the upturned end of the plate m^5; while, if the armature f be attracted, the contact spring m', instead of engaging the contact 10 on the plate m^5 as before, will now engage the contact 9 on the downturned end of the plate m^4; so that in the one instance, attraction of the armature f will close a circuit through the plate m^5, and attraction of the armature f' will close a circuit through the plate m^4; while in the other instance, with the block m^2 moved bodily to the right, attraction of the armature f will close a circuit through the plate m^4, whereas attraction of the armature f' will close a circuit through the plate m^5. The spindle m^3 is moved longitudinally to effect this change of position of the block m^2, by means of a dog n, see Figs. 4 and 11 pivoted at n' to the inner end of the said spindle m^3, said dog being acted upon and retained in a normal vertical position by a spring n^2, see Fig. 4. The depending end of the dog lies in the path of movement of the several pins n^3, projecting from the front face of a disk n^4, made fast on the inner end of the shaft a, see Figs. 3 and 4. the rotation of the said disk by said shaft in one or the other direction causing the dog to be turned or tipped on its axis in one or the other direction, according as the pins strike it from one or the other side and turn it on its pivot in order that they may pass by. The limiting wall $n^\times$ of the dog, see Fig. 11, prevents vibration of the dog in either direction sufficient to permit the pins n^3 on the disk n^4 to pass beneath the dog, it being necessary for the pins, after they have tipped the dog as far as it will tip or until its limiting wall strikes the spindle m^3, to thereafter move the dog and spindle bodily before them in order to pass by.

By reference to Figs. 4 and 11, if the disk n^4 be rotated in the direction of arrow 25, the first pin n^3 as it strikes the depending dog, will tip it on its pivot n' until the limiting wall $n^\times$ strikes against the spindle m^3 and prevents further tipping of the dog, after which continued movement of the pin, it being impossible to tip the dog further, will move the dog and the spindle to which it is pivoted bodily to the right into the position represented in dotted lines Fig. 11, the pin thus moving the dog and spindle bodily a sufficient distance to permit it to pass beyond the end of the dog, which will thereafter be returned by the spring n^2 to its vertical or center position on the spindle, the latter however, remaining in its position as moved by the dog. After the dog and spindle have thus been moved bodily to the right by the first pin to strike the dog, the tipping movement of the dog, with the spindle in this new position, is sufficient to permit the pins to pass freely by. Conversely, assuming the spindle to have been moved bodily to the right as just described, if the shaft a and disk n^4 be rotated in the direction opposite to that indicated by arrow 25, the first pin n^3 will strike the depending dog n, tip the same on its pivot until the limit of its movement is reached, when the said dog and the spindle m^3 to which it is pivoted will be moved bodily to the left, in order that the pin may clear the dog to thus return the block m^2 and contacts to their original full-line position. When once moved into one or the other of its extreme positions, the tipping movement of the dog n is sufficient to permit the pins n^3 to pass freely by; but a change of direction of movement of the said pins must necessarily move the dog bodily to its opposite extreme position before the tipping movement of the same will permit the pins to pass freely by. The contact arm e, and the armature-carriers f^2 and h^2 are electrically connected with the base of the instrument; while the fixed contacts h^3, h^4, and contacts e', e^2 are insulated from the base of the instrument.

Referring to Fig. 8, the contacts e', e^2 are connected respectively by wires 30, 31 with the fixed contacts h^3, h^4, which in turn are connected by wires 32, 33 with the electro-magnets F, F', said magnets being also connected with the line-wire 34 which extends to the pivotal shaft of the armature-carrier of any suitable indicating or recording device, herein represented as similar to that shown and described in my patent No. 474,771, dated May 10, 1892, to which reference may be had, like letters of reference representing like parts. The contact post d of the said receiving device is connected by a wire 35 with one pole of a battery Q, the other pole of which is connected by wire 36 with the pivotal point f^3 of the armature-carrier f^2 or to the base of the instrument. The contact plate m^4 on the reversible block m^2 is connected by a wire 37 with the magnet c' of the receiving device; while the contact plate m^5 of the said block is connected by wire 38 with the magnet c of the said receiving device, the operation of the system then being as follows,—Assuming the shaft, the speed and direction of movement of which are to be determined, to be in rotation, the pulley A being also rotated thereby, the circuit through the electro clutch magnets C will be closed by the circuit-closer o^5, causing the armature o to throw into engagement the clutch mechanism, as described, to cause the shaft a to be rotated in unison with the pulley A, when the rotative movement communicated to the shaft a will cause the balls $i^\times$ of the governing device, Fig. 3, to be moved away from the axis of the shaft i^5 by centrifugal action, as indicated by dotted lines, and to move the sliding sleeve i^9 to the right, a distance corresponding to the speed of rotation of the shaft, said sleeve as it is moved causing a rotative movement of the spindle i^{14} carrying the contact arm e, and causing the said arm to engage the contact pin e^2 and close the circuit from the battery by wire 36 to the base of the instrument, contact arm e, contact e^2, wire 31, contact h^4, wire 33, electro-magnet F', thence by wire 34 to the receiving instrument, and back to the battery again, such circuit causing the magnet F' to attract its auxiliary armature h', to thus bring the end 26 of the U-shaped carrier h^2 into contact with the fixed contact h^4, thereby shunting out the contact arm e and its contact e^2, and permitting the current from the battery Q to flow through the wire 36, base of instrument, direct to the contact h^4, through the carrier h^2, thence by wire 33, magnet F', wire 34, to the armature-carrier c^9 of the receiving instrument, thence through the circuit-breaking lever d^2, contact d, wire 35, to the battery. It is necessary to shunt out the contact arm and contact for the reason that the engagement of one with the other is so delicate and unsteady at times as to prevent a full strong current from the battery sufficient to operate the device to pass through it; but this imperfect contact is utilized simply as a means to move the light armature carrier h^2 which by its movement closes the circuit firmly and steadily through the contact h^4, and permits the full current from the battery to pass through the magnets and to operate the various parts with certainty. As the auxiliary armature is attracted as described, to close the circuit between the carrier h^2 and contact h^4, the full current from the battery is permitted to pass through the magnet F', so that the latter will attract its main armature f' and bring the spring m into engagement with the contact 8 on the plate m^4, permitting the current from the battery Q to pass through the wire 36, base of the instrument, armature-carrier f^2, contact spring m, contact plate m^4, wire 37, magnet c' of the receiver, thence to the armature-carrier c^9, and back to the battery through the wire 35 as before, causing the said magnet c' to attract its armature and through the pallet c^{10} rotate its indicating arm one point to the left, Fig. 9, to indicate by the distance moved the number of revolutions per minute which the rotating shaft is making, and by the direction of its movement in connection with the word "astern," printed upon the dial at that side of the vertical line, see Fig. 9, indicating that the direction of the rotation of the shaft is in accordance with the meaning of the word "astern." As the staff e^9, carrying the indicating pointer p of the transmitter, is rotated one point by the attraction of the armature f' of the magnet F', the cam surface of the groove e^7 in the plate e^8 on the inner end of said staff, will act upon the pin e^6 on the carrier $e^\times$ to move the contact e^2 away from and out of engagement with the contact arm e, while the circuit will be broken at the receiver by the circuit-breaking lever d^2, as described in the patent referred to, to permit the parts to resume their normal position. Should the contact arm remain in engagement with the contact e^2 and follow it as it is moved, the circuit will, of course be immediately closed again as soon as it is broken by the circuit-breaking lever d^2 in the receiver, thus rotating the pointer p another point to indicate an increased speed and sending another impulse through the receiving magnet c' to move the receiving pointer another point to indicate the increased speed; such operation being continued until the contact e^2 has been moved beyond the limit of movement of the contact arm e, thus breaking the circuit between the contact arm and contact, the indicating pointers and recording arm having in the mean time been moved by the successive impulses, sent over the line as described, around to such a position as to indicate the maximum speed of rotation of the shaft, and at the same time indicating, by the direction in which it has been moved, the direction of rotation. If, now, the speed of the shaft a should decrease, the balls $i^{\times}$ will approach nearer to their axis of rotation to cause the contact arm e to retreat a certain distance and engage the contact e', the circuit being then traced from the battery through line 36, contact arm e, contact e', wire 30, contact h^3, wire 32, magnet F, wire 34, through the receiver and back to the battery, such impulse attracting the auxiliary armature h to close the circuit through the arm 27 of the carrier h^2, to thus shunt out the contact arm and contact as before and permit a current from the battery to pass through wire 36, carrier h^2, contact h^3, wire 32, magnet F, to the wire 34 and back to the battery as described, such current attracting the main armature f and bringing the contact spring m' into engagement with the contact 10 on the plate m^5, and completing the circuit from the battery through wire 36, armature-carrier f^2, spring m', contact 10, and plate m^5, wire 38, through the receiving magnet c, circuit-breaking lever d^2 and wire 35 back to the battery, causing the said receiving magnet c to attract its armature, move the pallet c^{10} to the right to move the indicating pointer of the receiver and the recording arm one point back toward their original normal position, the attraction of the armature f of the transmitting device having at the same time moved the pallet f^4 to the right and caused a rotation of the toothed wheel e^{13} in a direction opposite to that indicated by the arrow, and moving the pointer p on the transmitting device one point back toward its normal position opposite to that indicated by the arrow 50, such opposite movement of the staff e^9 on which the pointer p is mounted, moving the contact e' away from and out of engagement with the contact arm e. Should the speed continue to decrease, the contact arm will follow the return movement of the contact e' until the shaft has reached a period of rest or until the minimum speed has been reached, when the contact e' by the last impulse sent over the line, will have been moved away from the contact arm, the circuit being in the mean time broken after each impulse by the circuit-breaking lever d^2 of the receiving device, the indicating pointer and recording arm of the receiver being also moved back in unison with the pointer of the transmitting device. In whichever direction the shaft a is revolved, the balls $i^{\times}$, acting through the sliding sleeve i^9, will operate through the contact arm e to send impulses indicating an increased speed through the electro-magnet F′ and impulses indicating a decreased speed through the magnet F, as previously described, there being nothing at the transmitter to indicate the direction of rotation of the shaft; but it is necessary to indicate at the receiver not only the speed of the shaft, but the direction of rotation as well. Therefore it is necessary that the magnet F′ of the transmitter which responds to impulses indicating an increased speed should co-operate in the one instance with the receiving magnet c' to move the indicating pointer of the receiver in one direction to indicate an increased speed for one direction of rotation of the shaft; while the said magnet F′ must co-operate with the other receiving magnet c when the direction of rotation has been changed, for the reason that as the pointer of the receiver is moved in one or the other direction from its center line to indicate whether the shaft is revolving in one or the other direction, so must the magnet c' in one instance and the magnet c in the other instance constitute the forward magnet,—that is, to move the pointer to indicate an increased speed. This change of co-operation between the magnets is effected by the sliding block m^2 with its contact plates m^4, m^5, arranged and moved as previously described, so that while the shaft is rotating in one direction, the impulses from the magnet F′ indicating an increased speed will be sent through the receiving magnet c', while the impulses from the magnet F indicating a decrease of speed will be sent through the receiving magnet c until the shaft a shall have reached a period of rest; when immediately as it begins its rotation in the opposite direction, the sliding block m^2 will be moved as described from its full-line to its dotted-line position, Figs. 4 and 6, so that as the shaft increases its speed of rotation in the opposite direction, the impulses from the magnet F′ indicating an increase of speed will be sent through the spring m and contact plate m^5 to the receiving magnet c', instead of as before through the same spring m and contact plate m^4 and receiving magnet c'; so that the receiving magnet c, which before received impulses from the magnet F to indicate a reduced speed, will now receive its impulses from the magnet F′ to move the pointer and recording arm in the opposite direction to indicate an increased speed, but in the opposite direction. The receiving magnet c' is by the same movement of the sliding block m^2 placed in like manner in connection with the transmitting magnet F, so that impulses indicating a reduced speed will be sent through the receiving magnet c', which now acts as the magnet to retract the pointer and recording arm, to indicate the reduced speed. Rotation of the disk e^8 on the staff e^9 acts through the cam surface e^7 and pin e^6 to move the contacts forward after each closure or impulse preparatory to the circuit being again closed by further movement of the contact arm, the said cam surface acting to increase the movement of the contacts between successive intermissions as the disk is rotated, the said contacts being moved a less distance between intermissions when the pin e^6 lies at that end of the cam surface nearest the staff e^9, than when the said pin occupies a position farther out on the cam surface toward its periphery.

If a single spring i^{10} of equal tension throughout to co-operate with the governing balls $i^\times$ were employed, it would necessarily be of such tension in order to properly control the balls at a high speed of rotation, that it would not permit the balls to respond quickly at a low speed, as when the shaft a is started. Such being the case, the shaft a might acquire a certain number of revolutions per minute, while the pointer p which is moved only by the governing device would not show any speed at all, as a certain speed would have to be acquired before the governing balls would act on the spring to move the indicating pointer. To obviate this I preferably provide a second spring $i^{10\times}$, which is of less tension than the spring i^{10} and which will permit the balls $i^\times$ to be more sensitive and respond to a low rate of speed of the shaft a, as when the latter is being started, the spring $i^{10\times}$ being fully compressed after a certain number of revolutions per minute have been attained, when the strong spring i^{10} will then act as the governing spring for the device at the higher speeds.

In lieu of the spring described, I may employ a high graduated spring, having a greater tension at one end than at the other, so that it may be easily compressed at a low rate of speed, but the tension of which, as the speed increases, will correspondingly increase.

The circuit-controller o^5, which controls the operation of the clutch mechanism, is herein represented as located at a point remote from the said clutch mechanism, and preferably at the same point as the receiver.

I claim—

1. In a telemeter system, a rotating shaft, a contact arm moved by variations in the speed of rotation of said shaft, a movable contact, an electro-magnet in circuit with said contact, its armature, and an indicating device actuated by movement of said armature, substantially as described.

2. In a telemeter system, a rotating shaft, a contact arm moved by variations in the speed of rotation of said shaft, a movable contact, an electro-magnet in circuit with said contact, its armature, an indicating device actuated by movement of said armature, and a device controlled by, and to indicate the changes in, the direction of rotation of said shaft, substantially as described.

3. In a telemeter system, a rotating shaft, a contact arm moved by variations in the speed of rotation of said shaft, two movable contacts between which said contact arm moves, two transmitting magnets in circuit respectively with said contacts, two receiving magnets, armatures therefor, and an indicating device controlled by movement of said armatures, and a switch operated by changes in the direction of rotation of said shaft, to determine which of the receiving magnets shall be controlled by the respective transmitting magnets, substantially as described.

4. In a telemeter system, a rotating shaft, a contact arm moved by variations in the speed of rotation of said shaft, two movable contacts between which said contact arm moves, two transmitting magnets in circuit respectively with said contacts, armatures for said magnets, a longitudinally-movable spindle, two contacts arranged upon each of two opposite sides thereof, the diagonally-opposite contacts being in circuit with each other, two contact springs spanning said spindle and adapted when vibrated by said armatures to act upon two of the opposite contacts not in circuit with each other when said contacts are in one position, and to act upon the other two opposite contacts not in circuit with each other when said latter contacts have been moved into position between the said springs, two receiving magnets in circuit respectively with the two pairs of contacts in circuit with each other, and an indicating device controlled by said receiving magnets, substantially as described.

5. In a telemeter system, a rotating shaft, a contact arm moved by variations in the speed of rotation of said shaft, two movable contacts between which said contact arm moves, two transmitting magnets in circuit respectively with said contacts, armatures for said magnets, the springs m, m', the sliding spindle m^3 moved by changes in direction of rotation of said shaft, the diagonally-arranged insulated contact plates m^4, m^5, formed to present contacts 8, 9, 10, and 11, two receiving magnets in circuit respectively with said contact plates, and an indicating device controlled by said receiving magnets, substantially as described

6. In a telemeter system, a rotating shaft, a disk thereon carrying a pin, a longitudinally-movable spindle, a dog flexibly connected thereto and lying in the path of movement of said pin, and adapted to move said spindle in one or the other direction according as the pin strikes the dog upon one or its other side, and a switch device operated by movement of said spindle, substantially as and for the purpose specified.

7. In a telemeter system, a rotating shaft, a disk thereon carrying a series of pins, a longitudinally movable spindle, a spring-controlled dog pivoted thereto and having a limited vi-

bratory movement, said dog being acted upon by the pins on said disk to cause movement of the spindle upon change of direction of rotation of the disk, and an electric switch device operated by movement of the said spindle, substantially as and for the purpose specified.

8. In a telemeter system, a rotating shaft, the governor balls $i^{\times}$, and a contact arm moved by movement of said balls toward and from their axis of rotation, two movable contacts between which said contact arm moves, two transmitting magnets in circuit respectively with said contacts, armatures for said magnets adapted by their movements to move said contacts in one or the other direction, and an indicating device also controlled by movement of said armatures, substantially as described.

9. In a telemeter system, a rotating shaft, the governor balls $i^{\times}$, and a contact arm moved by movement of said balls toward and from their axis of rotation, two movable contacts between which said arm moves, two transmitting magnets in circuit respectively with said contacts, armatures for said magnets, a staff rotated by movement of said armatures, and a cam thereon to move said contacts by rotation of said staff, and an indicating device controlled by movement of said armatures, substantially as described.

10. In a telemeter system, a revolving member, a shaft, an electrically-controlled clutch mechanism between said member and shaft, a contact arm moved by variations in the speed of rotation of said shaft when caused to rotate by said member, a movable contact, and an electro-magnet in circuit therewith, its armature, and an indicating device also at a distant point actuated by movement of said armature, substantially as described.

11. In a telemeter system, a revolving member, a shaft, a clutch mechanism between said member and shaft, an electro-magnet controlled from a distant point to operate said clutch mechanism, a transmitter operated by said shaft, and an indicating instrument located at said distant point and controlled by said transmitter, substantially as described.

12. In a telemeter system, a rotating member, a shaft, and a clutch mechanism between the two controlled from a distant point, a controlling magnet to operate the said clutch mechanism, a contact arm moved by variations in the speed of rotation of said shaft when caused to rotate by said member, a movable contact and electro-magnet in circuit therewith, its armature, and an indicating device located at said distant point and connected electrically with and actuated by said armature, substantially as described.

13. In a telemeter system, a rotating member, a shaft, and a clutch member between the same, a controlling magnet to operate the said clutch mechanism, a contact arm moved by variations in the speed of rotation of said shaft when caused to rotate by said member, a movable contact and electro-magnet in circuit therewith, its armature, an indicating device located at said distant point and connected electrically with and actuated by said armature, and a circuit-controller located at said distant point and in circuit with said controlling magnet, to operate substantially as described.

14. In a telemeter system, a rotating shaft, a hub i^6 fast thereon, sliding sleeve i^9, toggle links connecting the same, and the governor balls connected with said links, having weak springs i^{10}, $i^{10\times}$ interposed between said hub and sleeve, a contact arm moved by said sleeve, a movable contact to co-operate with said contact arm, an electro-magnet in circuit with said contact, its armature, and an indicating device actuated by movement of said armature, substantially as described.

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

FERNANDO J. DIBBLE.

Witnesses:
FREDERICK L. EMERY,
GEORGE F. RANDLETT.