T. R. MOORE.

TRANSMISSION DYNAMOMETER.

APPLICATION FILED APR. 4, 1908.

930,605.

Patented Aug. 10, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

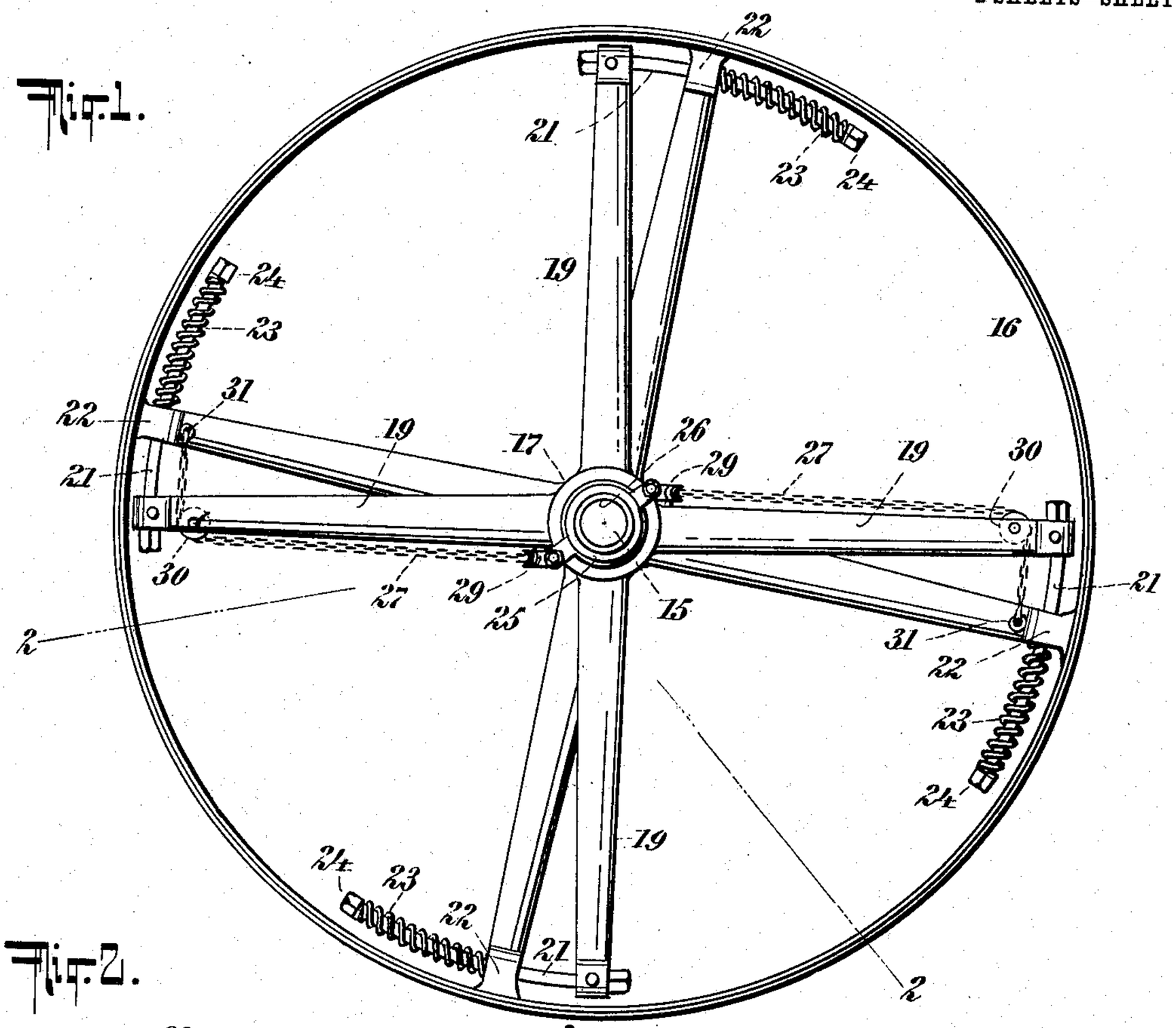

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

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2 SHEETS—SHEET 2.

Fig. 6.

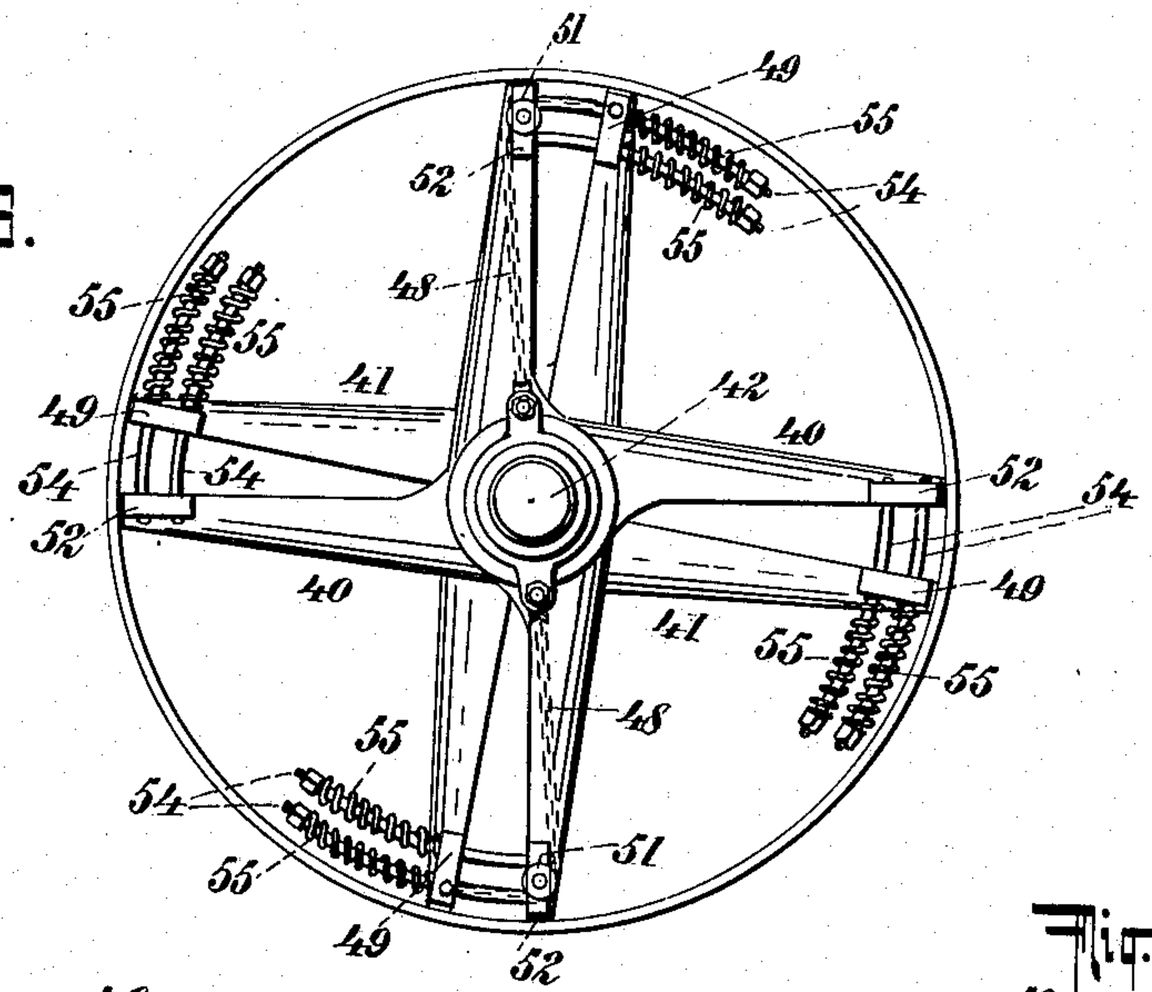


Fig. 7.

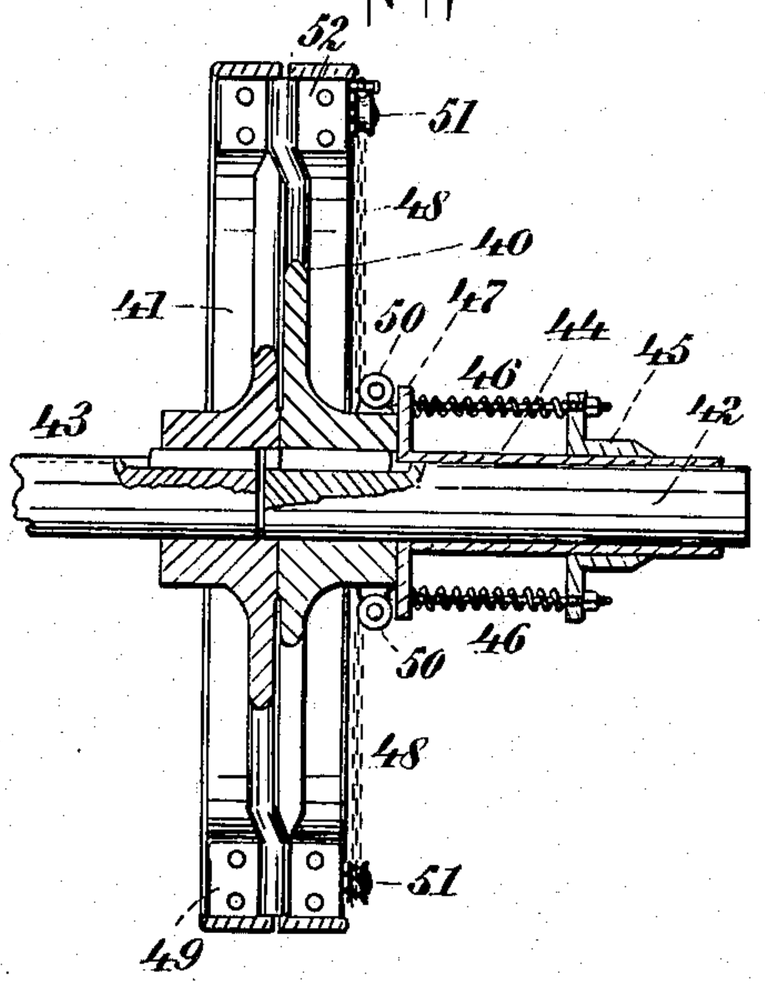


Fig. 8.

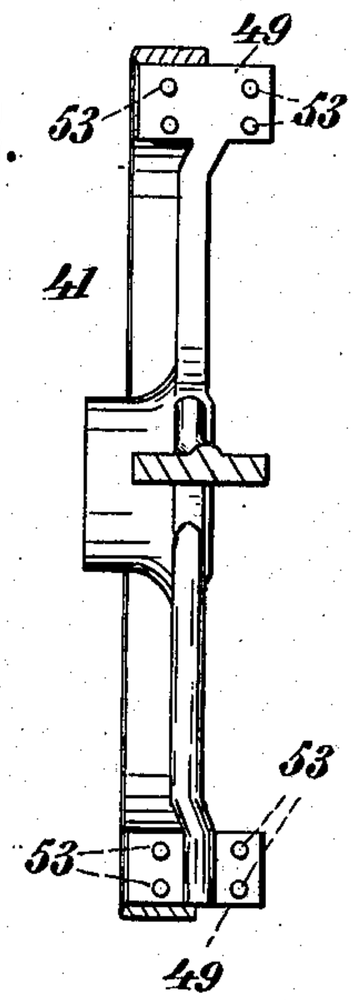
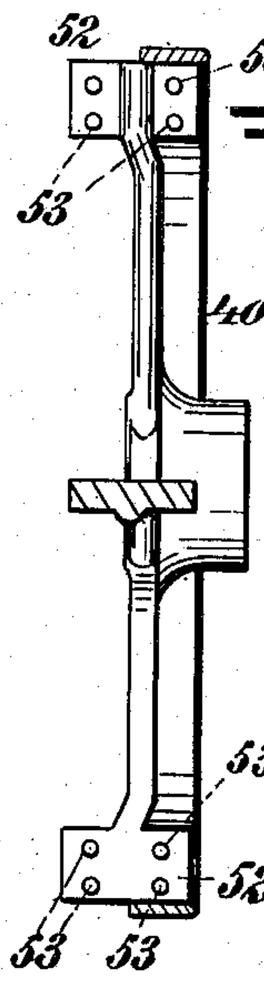


Fig. 9.



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TRANSMISSION-DYNAMOMETER.

No. 930,605. Specification of Letters Patent. Patented Aug. 10, 1909.

Application filed April 4, 1908. Serial No. 425,099.

To all whom it may concern:

Be it known that I, THOMAS R. MOORE, a citizen of the United States, and a resident of Walden, in the county of Orange and State of New York, have invented certain new and useful Improvements in Transmission-Dynamometers, of which the following is a specification.

The invention relates to improvements in dynamometer pulleys, couplings, gears, and the like; and it consists in the novel features, structure and combinations of parts hereinafter described, and particularly pointed out in the claims.

The object of the invention is to afford a simple, inexpensive, efficient and conveniently read dynamometer which when in use will at all times indicate the power consumed.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which:

Figure 1 is a side elevation of a pulley wheel embodying the dynamometer construction of my invention; Fig. 2 is a bottom view (with the pulley turned over to bring its lower side up) partly broken away and partly in section, of the same, the break in the rim of the wheel being at about the dotted lines 2—2 of Fig. 1 and the dynamometer graduated sleeve and slide therefor being omitted from that end of the shaft which appears at the upper portion of Fig. 2; Fig. 3 is a detached side elevation of a sleeve to be applied upon the shaft and having graduations thereon denoting pounds or horse-power and fractions thereof; Fig. 4 is a like view of the slide adapted when in use to move along the graduated sleeve for indicating the pounds or horse-power consumed; Fig. 5 is an end view of the same; Fig. 6 is a side elevation of a coupling embodying my invention; Fig. 7 is a vertical transverse section of the same, and Figs. 8 and 9 are detached vertical sectional views showing the coupling members separated from each other and ready to be assembled in the manner shown in Fig. 7.

In the drawings, referring to Figs. 1 to 5 inclusive, 15 designates a usual shaft, and 16 a pulley wheel comprising a hub, spokes and rim mounted on said shaft. Upon the shaft 15, at opposite sides of the hub of the pulley-wheel 16, are secured spider frames 17, 18, respectively, corresponding with each other and each comprising a hub and radial arms 19, 20, respectively, which extend outwardly to within a suitable distance from the inner surface of the rim of the wheel 16 and are apertured at their outer ends to receive curved rods 21 carried by them, these rods being curved on the arc of a circle whose center is the center of the shaft 15. The wheel 16 is, preferably at the outer ends of its spokes, formed integrally with transverse flanges 22, which are apertured to permit the rods 21 to freely pass through them. The rods 21 are carried by the arms of the frames 17, 18 and thence extend through the apertures of the flanges 22 and beyond said flanges are provided with coiled springs 23 which are retained upon the rods by heads or nuts 24 or other suitable means. The springs 23 are always under tension and normally draw the outer ends of the arms 19, 20 of the frames 17, 18 against the flanges 22 of the wheel 16. When the dynamometer is in use, the arms 19, 20 of the frames 17, 18 will be drawn away and stand off from the flanges 22 in the manner shown in Fig. 1, with the springs 23 under compression and normally acting to restore the ends of said arms to position against said flanges. The movement of the arms 19, 20 toward and from the flanges 22 is utilized to operate slides 25 mounted upon sleeves 26 which are on the shaft 15, one of said sleeves and one of said slides being at each side of the pulley wheel and each slide being connected with the wheel 16, preferably at the flanges 22 thereof, by means of chains or other suitable flexible connections 27. The slides 25 closely fit upon the sleeves 26, without binding thereon, and have beveled outer edges and laterally extending arms 28 at their inner edges to which the chains 27 are connected and whence said chains pass inwardly and over small pulley-wheels 29 carried by the frames 17, 18 and thence outwardly to the outer portions of said frames and around pulley-wheels 30 carried thereby, the outer ends of the chains 27 after passing over the pulleys 30 being secured, as at 31, to the flanges 22 of the main pulley-wheel. The arms 28 on the slide 25 are oppositely disposed so that the chains 27 may exert a uniform pull on said slide, and said chains 27 after passing over the pulley-wheels 29 extend outwardly in opposite directions so that they may be acted upon by opposite radial arms of the frames 17, 18. The slides 25 are normally pressed outwardly by means of coiled springs

32 which are on the sleeves 26 intermediate the flanges 33 thereof and the inner ends of said slides. The action of the springs 32 will keep the slides 25 pressed outwardly and the chains 27 under light tension, and when the opposite radial arms of the frames 17, 18 are moved in a direction from the flanges 22, as shown in Fig. 1, said arms by moving against the chains 27 act to pull the outer ends of said chains toward the pulley-wheel 16, thereby causing the slides 25 to move inwardly along the sleeves 26 under the opposition of the springs 32. When the opposite radial arms of the frames 17, 18 move in a direction toward the flanges 22 they gradually release their pressure on the chains 27 and the springs 32, at such times, move the slides 25 outwardly on the sleeves 26 and keep all slack out of the chains, holding the latter taut. The sleeves 26 are provided with spaced lines or graduations, as shown in Figs. 2 and 3, along which the outer edge of the slides 25 move and which may be used to denote pounds or horse-power.

In the drawings I illustrate a pulley-wheel 16 having two sets of dynamometer devices, one at each side thereof and coöperating therewith, and one set of said devices being shown in Fig. 1, while that at the other side of the pulley-wheel is shown in Fig. 2 and comprises the frame 18 with its radial arms 20, slide 25, sleeve 26, spring 32 and chains 27, the latter passing over the pulley-wheels 29, 30 carried by the said arms and secured at their outer ends to the flanges 22 of the wheel 16. It is to be understood, however, that I do not limit the invention to the duplication of the dynamometer devices at opposite sides of the wheel 16, since my invention is fully embodied in each set of said devices. The springs 32 are light springs and only exert sufficient power to move the slides 25 outwardly and keep the chains 27 taut.

The pulley and shaft shown in Figs. 1 and 2 may be operated in either of two ways, the dynamometer devices making the proper indications under either method of operation. The shaft 15 may be driven by power applied to it and transmit motion to the pulley-wheel 16 from which, by means of a belt, power may be transmitted to the machinery to be driven; or power may be applied to the pulley and transmitted by it to the shaft 15, whence through any suitable or usual connections said power may be transmitted to the machinery to be driven.

If power should be applied to the shaft 15, the pulley-wheel 16 being free thereon, the frames 17, 18 being fast to the shaft will be turned in a direction from the flanges 22 of the wheel 16, as shown in Fig. 1, and partly compress the springs 23 (due to the movement of the rods 21) against said flanges, and thereupon after the springs 23 have been sufficiently compressed to overcome the inertia of whatever is to be driven, the pulley-wheel will follow the movement of the frames 17, 18 and remain in rotation, transmitting its power, through such intermediate mechanism as may be provided, to the work. During the rotation of the frames 17, 18 and pulley-wheel 16 the graduations on the sleeves 26 will indicate the power, either in pounds or horse-power, consumed, the exact amount being indicated at the outer beveled edges of the slides 25. The position of the slides 25 will vary with the distance the ends of the radial arms of the frames 17, 18 may be from the flanges 22 of the wheel 16, and the position of said arms with relation to said flanges will vary with the resistance offered by the work to the wheel 16, the greater the resistance of the work the wider the space will be between the outer ends of the arms of the frames 17, 18 and the flanges 22. The movement of the frames 17, 18 from the flanges 22 creates a pull on the chains 27 and slides 25, the latter thereby being drawn inwardly along the sleeves 26 and denoting by their position along the graduations on said sleeves the amount of power consumed.

If the power were applied to the wheel 16 to be by it transmitted to the shaft 15 and thence from said shaft to whatever it may be desired to operate, said wheel would be rotated in a direction to carry its flanges 22 from the outer ends of the radial arms of the frames 17, 18 and against the springs 23, and after the springs 23 had under such condition become sufficiently compressed to overcome the inertia of the work, the frames 17, 18 and shaft 15 would start in motion and thereafter continue to rotate so long as adequate power remained on the wheel 16. The movement of the flanges 22 in a direction from the outer ends of the arms of the frames 17, 18 results in a pull being exerted on the chains 27 and the inward movement of the slides 25, the same as occurred in the illustration above explained in which the power instead of being applied to the wheel 16 was first applied to the shaft 15 and transmitted to said wheel.

The general purposes of dynamometers are well understood and hence require no elaborate explanation. The present dynamometer is efficient for all of the purposes for which rotative dynamometers are employed. For illustration, the engineer of a factory by observing the position of the slides 25 along the graduations of the sleeves 26 may determine therefrom whether conditions in the factory are normal or otherwise. The engineer would know in advance just about the amount of power required for the factory, and if by looking at the graduations he should see that an excess of power is being consumed, he would be led to find the cause of this condition, which might be due to a

shaft getting out of line or by a hot-bearing or by some obstruction in some part of the machinery. If the graduations indicated a consumption of less than the normal amount of power required for the work, the engineer would endeavor to ascertain what had happened to put the plant out of normal running condition, which might be caused by either a belt slipping or having become broken or by other event.

The invention is also useful in plants where power is sold, and the wheel 16 may be connected with the main line or primary shaft from which the power is transmitted to the several consumers. The friction due to the running of this main line or primary shaft might consume one horse-power, and under such condition when the said shaft is in motion, without any transmitting means from the same being connected therewith, the slides 25 would move on the sleeves 26 one space and indicate the consumption of the one horse-power. Now if a customer should require six horse-power, his belt will be connected onto the main line or primary shaft and this increased load on the wheel 16 will result in the slides 25 being moved inwardly six spaces if such customer were actually using only six horse-power. If the customer should be using eight horse-power instead of the six for which he was paying, the excess would be denoted by the position attained by the slides 25, and if he were consuming less than six horse-power that fact would also be indicated by the position of the slides 25. As many transmission belts as there may be customers may be connected with the main line or primary shaft, and if the first customer were consuming six horse-power and the slides 25 had moved to the seventh space on the sleeves 26, and the second customer desired four horse-power and obtained the same and used no greater amount, the slides 25 would then move inwardly four more spaces, indicating that both the first and second customers were consuming only the total amount of power paid for.

In Figs. 6 to 9 inclusive I illustrate my invention as embodied in a coupling comprising matching members or sections 40, 41 keyed on the respective adjoining ends of shafts 42, 43, one of which may be connected with a source of power and the other with means for giving off power. For illustration, the shaft 42 may represent an engine shaft, or water-wheel shaft, or other shaft operated by power, and the shaft 43 may represent a dynamo-shaft, a line shaft, or other shaft giving off power. The member or section 40 of the coupling is keyed upon the end of the shaft 42 and the extreme end portion of the latter preferably projects into but is not keyed with the hub of the coupling member or section 41, as shown in Fig. 7. The section 41 is keyed on the end of the shaft 43, and the sections 40, 41 are close together and each is composed of a hub, radial arms, and a rim. On the shaft 42 is freely mounted a sleeve 44 corresponding with the sleeve 26 shown in Fig. 3, and upon this sleeve 44 is mounted a slide 45 to indicate by its position on the sleeve 44 the amount of power being consumed. The slide 45 is normally pressed outwardly on the sleeve 44 by means of light spiral springs 46 interposed between the same and a flange 47 on the inner end of the sleeve 44. The slide 45 is connected by chains 48 with flanges 49 of the coupling section 41, said chains extending from the slide 45 through the springs 46 and thence over pulley wheels 50 and thence passing in opposite directions parallel with the face of the coupling section 40 to pulley wheels 51 carried by flanges 52 integral with the coupling section 40, whence said chains pass over said pulley wheels 51 and are fastened at their ends to the aforesaid flanges 49 integral with the coupling section 41. When the sections 40, 41 of the coupling are assembled, as shown in Fig. 7, the flanges 52, 49 thereof match and pass into line with one another. Each of the flanges 52, 49 is formed with four apertures 53 and in these apertures of the flanges 52 are secured curved rods 54, corresponding with the rods 21 shown in Fig. 1, said rods 54 passing from the flanges 52 freely through the apertures 53 of the flanges 49 and being provided beyond said flanges 49 with coiled springs 55, which correspond with the springs 23 in Fig. 1.

When power is applied to the shaft 42 it will set in motion the coupling section 40, and this section will move its flanges 52 in a direction from the flanges 49 of the section 40 until the springs 55 have attained the proper degree of compression, and thereupon the coupling section 41 will follow with and be rotated by the coupling section 40 and transmit its power to the shaft 43. The movement of the flanges 52 of the coupling section 40 in a direction from the flanges 49 of the coupling section 41, results in the pulley wheels 51 drawing on the chains 48 and effecting the inward movement of the slide 45 on the graduated sleeve 44, the position of said slide on said sleeve being governed by the relation of the flanges 52 to the flanges 49. The dynamometer devices presented in Figs. 6 to 9 inclusive operate on identically the same principle as that described with respect to the devices shown in Figs. 1 to 5 inclusive and may, if desired, be used for identically the same purposes described for the construction shown in Figs. 1 to 5 inclusive, in which event the shaft 43 of Fig. 7 would represent the main line or primary shaft and the shaft 42 an engine or motor shaft.

The construction shown in Figs. 6 to 9 inclusive will be found convenient of use for direct connection, and that shown in Figs. 1 to 5 inclusive for belt or indirect connection.

What I claim as my invention and desire to secure by Letters Patent, is:

1. A dynamometer comprising a rotary shaft, a rotary member secured thereon, a second rotary member, and a yielding spring connection between said members, whereby one may start in advance of and finally communicate motion to the other, combined with a slide on said shaft to indicate by its position the power consumed, a graduated scale along the path of said slide, and flexible connections leading from opposite sides of said slide around oppositely disposed portions of said member on the shaft to opposite portions of said second member; substantially as set forth.

2. A dynamometer comprising a rotary shaft, a rotary member secured thereon, a second rotary member, and a yielding spring connection between said members, whereby one may start in advance of and finally communicate motion to the other, combined with a slide on said shaft to indicate by its position the power consumed, a sleeve on said shaft within said slide having graduation scale marks along the path of said slide, a spring on said sleeve confined against said slide and normally acting to maintain said slide in its initial position, and flexible connections leading from opposite sides of said slide around oppositely disposed portions of said member on the shaft to opposite portions of said second member; substantially as set forth.

3. A dynamometer comprising a rotary shaft, a rotary member secured thereon having a hub, spokes and rim, a second rotary member on said shaft having a hub and radial arms, spring connections between said arms and adjacent portions of said member secured on the shaft, whereby one member may start in advance of and finally communicate its motion to the other member, combined with a slide on said shaft to indicate by its position the power consumed, a graduated scale along the path of said slide, and flexible connections leading from opposite sides of said slide around oppositely disposed portions of said member on the shaft to opposite portions of said second member; substantially as set forth.

4. A dynamometer comprising a rotary shaft, a rotary member secured thereon having a hub, spokes and rim, a second rotary member on said shaft having a hub and radial arms, curved rods carried by said arms and extending freely through apertures in adjacent portions of said member secured on the shaft and coiled springs on said rods beyond and bearing against such adjacent portions, whereby one of said members may start in advance of and finally communicate its motion to the other member, combined with a slide on said shaft to indicate by its position the power consumed, a sleeve on said shaft within said slide having graduation scale marks along the path of said slide, a spring on said sleeve confined against said slide and normally acting to maintain said slide in its initial position, and flexible connections leading from opposite sides of said slide around oppositely disposed portions of said member on the shaft to opposite portions of said second member; substantially as set forth,

Signed at New York city, in the county of New York, and State of New York, this 1st day of April A. D. 1908.

THOMAS R. MOORE.

Witnesses:

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CHAS. C. GILL.