(No Model.) 2 Sheets—Sheet 1.

F. A. GLEASON.

DYNAMOMETER.

No. 294,377. Patented Mar. 4, 1884.

Fig. 1.

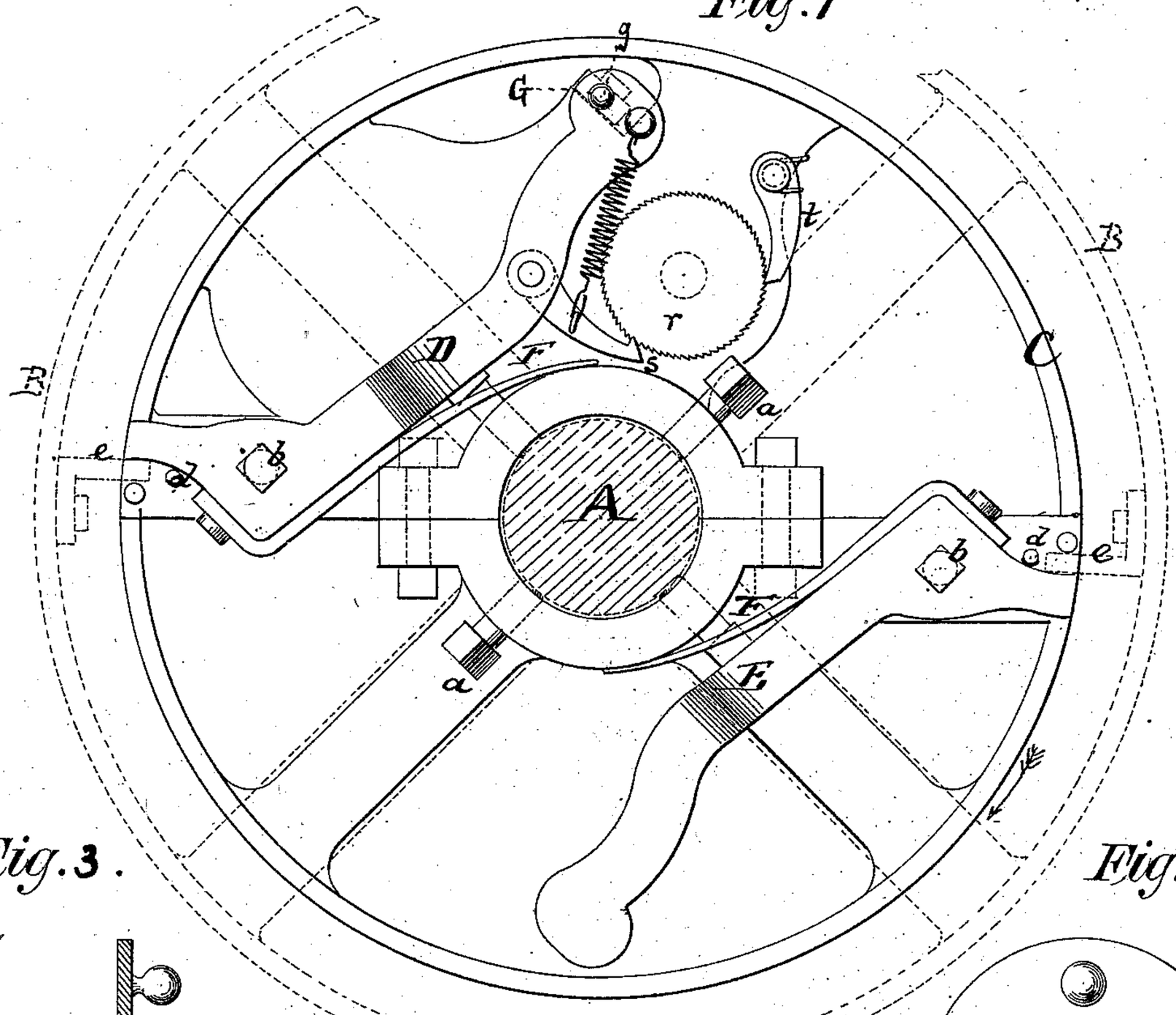


Fig. 3.

Fig. 4.

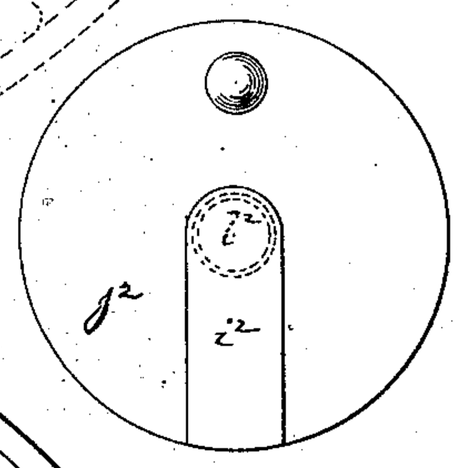
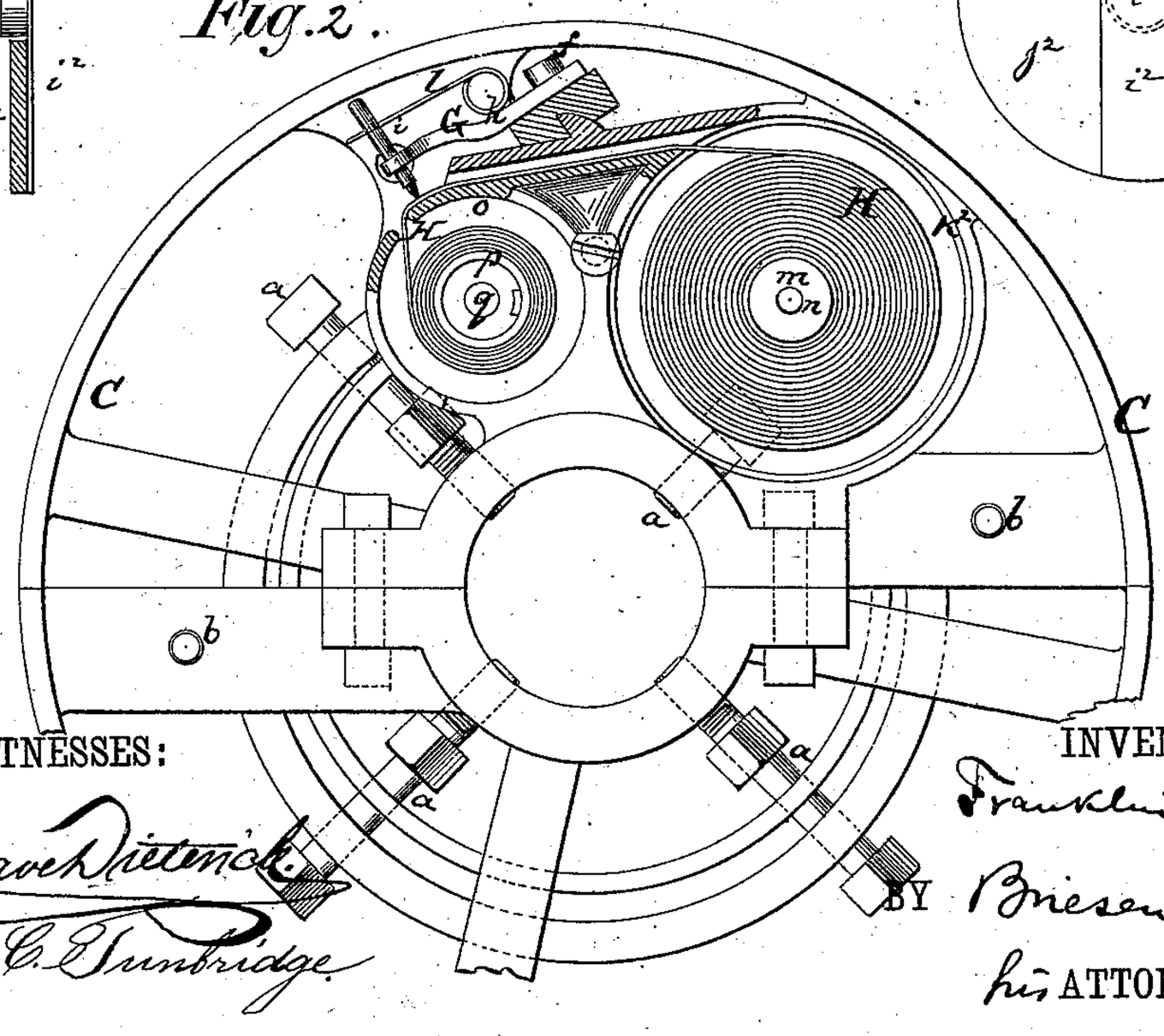


Fig. 2.



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his ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

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DYNAMOMETER.

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Fig. 5.

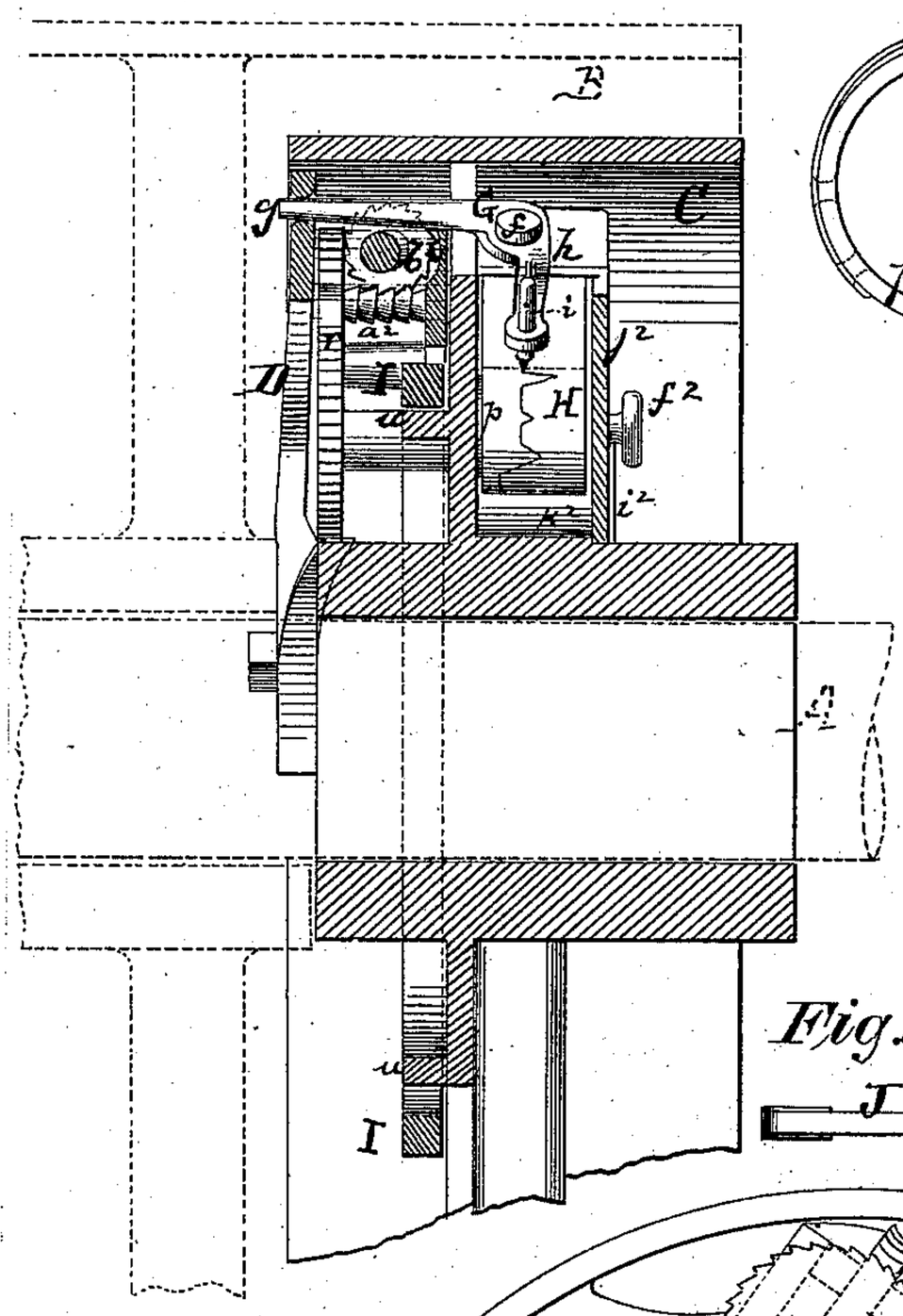


Fig. 8.

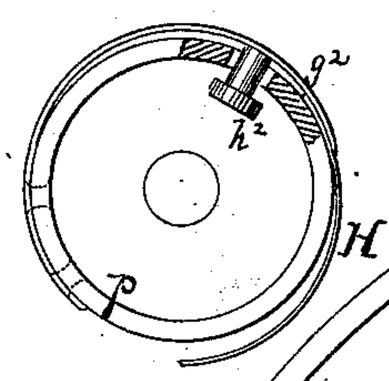


Fig. 7.

Fig. 11.

Fig. 9.

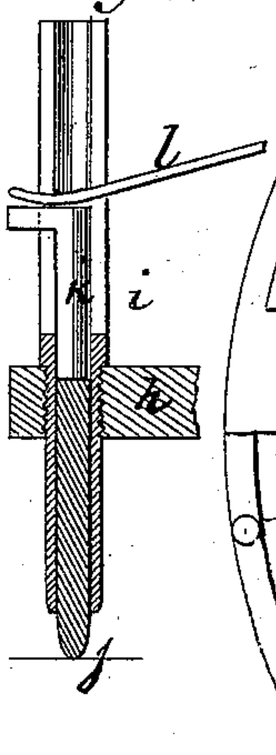
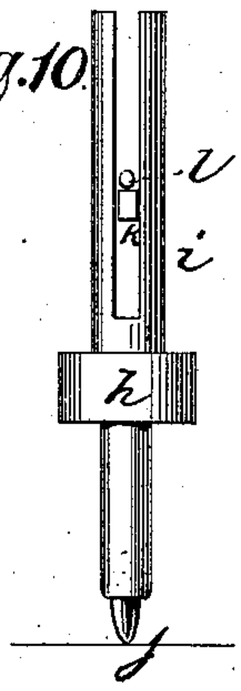


Fig. 6.

Fig. 10.



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UNITED STATES PATENT OFFICE.

FRANKLIN A. GLEASON, OF BROOKLYN, ASSIGNOR OF ONE-HALF TO JOHN H. SWARTZ, OF OYSTER BAY, NEW YORK.

DYNAMOMETER.

SPECIFICATION forming part of Letters Patent No. 294,377, dated March 4, 1884.

Application filed June 15, 1883. (No model.)

To all whom it may concern:

Be it known that I, FRANKLIN A. GLEASON, of Brooklyn, in the county of Kings, State of New York, have invented an Improved Dynamometer, of which the following is a specification.

Figure 1 is a face view of my improved dynamometer, showing its general plan of construction, but without certain attachments thereon that are shown in several figures. Fig. 2 is a reversed face view, partly in section, of the construction shown in Fig. 1. Fig. 3 is a central section of the disk that is placed against the supply-coil of registering-tape. Fig. 4 is a face view of that disk. Fig. 5 is a vertical section taken on the plane of the line *c c*, Fig. 6, of the completed apparatus. Fig. 6 is a face view of the apparatus completed with the exception of the actuating-levers. Fig. 7 is a face view of the completed apparatus. Fig. 8 is a face view, partly in section, of the spool for receiving the registering-tape. Fig. 9 is a vertical section of the pencil-holder; Fig. 10, an elevation of the same; and Fig. 11, a detail plan view of the lever which, in the construction shown in Figs. 6 and 7, causes the registering-tape to move.

This invention relates to a dynamometer, which is an instrument for measuring the amount of power taken from a driving-pulley or other driving-gear.

The invention consists in a new combination of certain spring-levers with the pulley or wheel of the dynamometer, whereby the operation of the actuating pulley or gearing is equalized in its effect upon the registering mechanism.

The invention also consists in sundry details of improvement that are hereinafter more fully specified.

In the accompanying drawings, the letter A represents the shaft, upon which the dynamometer is mounted, and around which the pulley B, which is indicated by dotted lines in Figs. 1 and 5, revolves, said pulley being mounted upon another shaft (not the shaft A) or hung loose upon the shaft A.

Upon the shaft A is mounted, and to it is secured, by set-screws *a* or otherwise rigidly fastened, a wheel, C, which, with its spokes or framing, constitutes the body of the dynamometer. To the spokes of this wheel are pivoted, so far as the principle of the invention is concerned, which is more clearly shown in Fig. 1, by pins *b b*, two levers, D and E, which are connected with certain preferably flat springs F, that bear upon the hub of the wheel C and tend to so swing the levers D E that their shorter arms bear against certain pins *d*, which project from the spokes of the wheel C.

From the driving-pulley B extend lugs *e* (which are shown by dotted lines in Fig. 1) into contact with the short arms of the levers D E.

The apparatus works on the principle, namely, that when the wheel B is turned in the direction of the arrow, which is shown in Fig. 1, the lugs *e* will bear against the short arms of the levers D E, and will thereby carry the wheel C around with it in the same direction, and the more power is taken from the shaft A, which is so revolved by the wheel C—or, in other words, the more resistance the wheel C offers to its revolution by the contact with the wheel B—the farther will the short arms of the levers D E be swung away from the pins *d* while when the resistance is lessened the levers D E will approach in the same ratio toward the pins *d*. The motion thus imparted to the levers D E on their pivots is to be utilized, according to my invention, for recording on a tape within the wheel C the degree of the resistance, and thereby the extent of power actually absorbed. To this end only one of the levers D E is utilized for registering purposes, and the other lever, E, is used simply for balancing purposes as to resistance and also as to the weight of the wheel C. In other words, if the lever D were used alone, the lug *e*, which actuates it, would in moving upward meet with a greater resistance than in moving downward, as it has the weight of the lever D to overcome in moving upward, while said weight assists it in moving downward; hence the registration would not be perfect during each revolution, while by adding the lever E the registration is equalized during the entire revolution.

To a spoke or other part of the framing of the wheel C is pivoted, by a pin, *f*, Fig. 2, a small elbow-lever, G, of which one arm, *g*, extends through a slot or hole in the long arm

of the lever D, while the other arm, *h*, of the lever G carries a pencil-holder, *i*, in which a pencil is held. This pencil-holder *i* is more clearly shown in Figs. 9 and 10, and is a tube screwed or otherwise fastened into the arm *h* of the elbow-lever G, and containing within it the pencil *j*, that projects below the lower end of said tube, and continuing likewise above said pencil, a sliding plug, *k*, which is pressed downward upon the pencil by a spring, *l*, which spring enters through vertical slots in the upper part of the tube *i*, as is also clearly shown in Fig. 2. The spring *l* tends to hold the pencil in contact with the registering-tape H, and to crowd it down as its point is being worn off. The registering-tape H, which may be of paper or other suitable fabric, is taken from a small drum, *m*, that is loosely hung upon a pin, *n*, said pin projecting from the face of the framing of the wheel C. (See Fig. 2.) From this coil the tape passes over a table-like support, *o*, which is a fixed attachment to the wheel C, to a bobbin or spool, *p*, which is mounted upon a short shaft, *q*, that has its bearings in the framing of the wheel C.

Upon the shaft *q* is mounted a ratchet-wheel, *r*, into which engages a spring-pawl, *s*, that is pivoted to the lever D. A retaining-pawl, *t*, also enters the teeth of the wheel *r*.

It follows that as the apparatus, which has thus far been described with reference to Figs. 1 and 2 is put in motion, the lever D, whenever greater power is applied, will be swung on its pivot *b*, so as to push the pawl *s* over one or more of the teeth of the wheel *r*, and, after the excess of power that causes such a motion of the lever D ceases, the spring F will bring the lever D back toward its normal position, and will thereby cause the pawl *s* to turn the wheel *r*, thus winding the registering-tape further upon the spool *p*. Thus, the paper can be moved ahead from time to time under the influence of the varying degrees of power that are absorbed by the shaft A. At the same time, whenever the lever D moves, the lever G, carrying the pencil, is also moved, so as to cause the pencil to traverse the face of the registering-tape, thus making a mark which indicates the extent of the power that had been absorbed at each period intervening between a motion of the registering-paper.

As far as described, it will be seen that the registering-tape is not moved with a degree of speed that bears any relation to the rotations of the wheel C, and the mechanism so far described is of advantage only for showing during a given period of time how frequently variations in the power taken up by the shaft A have taken place and the extent of each variation. But in order to apply this instrument to the chronological measuring of power, and to ascertain by its movements not only the extent of the variation, but also the period of time during which it takes place, the attachment shown in Figs. 5, 6, and 7 may be employed. These attachments consist, substantially, in means for moving the paper a certain distance during every revolution of the wheel C. To this end the framing of the wheel C is provided within its rim with an annular flange, *u*, which at one place has a notch or recess, *v*, cut out of it, said notch or recess being clearly indicated in Figs. 6 and 7. Around this annular flange *u* is placed a loose ring, I, of larger internal diameter than the external diameter of the flange *u*, so that normally this ring will have the tendency to lie on the flange in manner indicated in Fig. 5.

To the framing of the wheel C is pivoted a lever, J, (see Fig. 11,) from which a pin, *w*, projects at one side, so as to be in contact with the inner periphery of the loose ring I. The lever J also carries the pawl *s*, which gears into the ratchet-wheel *r*. In this construction it will be perceived that the pawl *s* is no longer attached to the lever D, Fig. 1. When the wheel C revolves the pin *w* will, whenever it arrives vertically above the axis of the shaft A, drop under the influence of the loosely-suspended ring-weight I, into the notch or recess *v*, as in Fig. 6; but when, after half a revolution of the wheel C, the pin *w* arrives vertically beneath the axis of the shaft A, it will find below it a space sufficiently large intervening between the flange *u* and ring I to enable it to drop out of the notch *v*, and will be drawn out of that notch at that time by the spring *x*, with which the lever J is connected. The power of the weight I to press the pin *w* into the notch *v* in the position of parts shown in Fig. 6 exceeds the counteracting power of the spring *x*. Whenever the pin *v* is, by the force of the spring *x*, pulled out of the notch in the flange *u*, it is moved farther away from the axis of the shaft A, the result being that the lever J will carry the pawl *s* one or more teeth, as may be prearranged, over the teeth of the ratchet-wheel *r*, and when the pin *v* is, by the weight of the ring I, crowded back into the notch *v*, as in Fig. 6, said pin is thereby moved nearer to the axis of the shaft A, and with it the lever J, the result being that the pawl *s* will now turn the ratchet-wheel to the extent of the play given to the pawl. Thus I produce in the ratchet-wheel *r* intermittent rotary motion, which will harmonize with the rotation of the wheel C itself, and this motion can be utilized to give a certain intermittent feed to the registering-tape. The most convenient arrangement for this purpose is a worm-wheel connection, a^2, from the shaft of the wheel *r* to a transmitting-shaft, b^2, thence, by a ratchet-worm, d^2, on shaft b^2, to a ratchet-wheel, e^2, on a shaft, f^2, which shaft f^2, in this construction, carries the spool *p*, upon which the registering-tape is wound. A spring, n^2, bears on the shaft b^2, as in Fig. 6, and holds it in contact with the wheel e^2. When for any reason the ratchet-wheel e^2 is to be turned back, the shaft b^2 can be raised off it against the spring n^2 until the wheel e^2 has been turned back as far as described.

It will be seen that by the construction shown

in Fig. 6 the tape no longer is wound directly upon the shaft of the ratchet-wheel *r*, as in the construction shown in Figs. 1 and 2, but is wound upon a shaft, f^2, which gears into the shaft of the ratchet-wheel *r*. The elbow-lever G, with its pencil-holder *i*, remains the same in both constructions; but in the construction shown in Fig. 6 the advantage is gained for some uses of dynamometers of recording, owing to the uniform motion of the paper, with reference to the motion of the wheel C independent of the variation in the degree of power taken, the time which transpired during the consumption of any given amount of power that was absorbed by the shaft A.

The spool *p* for receiving the registering-tape H is more clearly shown in Fig. 8, and is provided on its outer periphery with a curved spring, g^2, of which one end is riveted or otherwise fastened to the circumference of the spool *p*, while the other loose end bears by the pressure of said spring against the circumference of the spool. From this spring extends a pin, h^2, through an aperture in the rim of the spool into the interior thereof. Whenever a new registering-tape is to be applied, the attendant pushes against the end of this pin h^2, and thereby lifts the free end of the spring g^2 off the spool, making room for inserting the end of the tape H, which, upon releasing the pin h^2, will now be clamped to the spool by the spring g^2 with sufficient force to enable it to be properly retained by said spool and carried around with it in manner described. The drum *m*, which is loose on the pin *n*, (see Fig. 2,) is prevented from turning spontaneously by a spring, i^2, (see Figs. 3 and 4,) which is affixed to the disk-shaped cover j^2, that is placed over the box k^2, in which the coil H is contained. This spring i^2 carries a plug, l^2, which passes through the center of the disk j^2, and bears against the end of the drum *m*, so as to retain it in place sufficiently to prevent spontaneous displacement without preventing it from turning under the influence of the ratchet action that feeds the tape, substantially as hereinbefore described.

In order to vary the action of the lever D with reference to varying degrees of power to which the instrument may be adjusted, I have invented means for shifting its fulcrum, and thereby lengthening or shortening its shorter arm, so that as this arm gets shorter more power will be needed to move the lever D against the resistance of the spring F than is needed when the said arm is lengthened. This arrangement for regulating the position of the fulcrum is shown in Figs. 6 and 7, and consists in rigidly attaching to the spokes or other part of the framing of the wheel C, for each of the levers D E, a notched or grooved projection, m^2, which is clearly shown in Fig. 6, and in combining therewith a movable plate, J^2, having series of teeth on one side that correspond with the notches or grooves in the projection m^2, and one tooth, n^2, on the other side. The lever D, and also the lever E, of course, for both must be adjusted alike, has several notches, o^2, for receiving in one of them the projection or tooth n^2. The plate J^2 is slotted to receive and be movable on the pin *b*, all as shown in Fig. 7. Now, in order to change the fulcrum of the lever D from the position shown in Fig. 7, it is only necessary to shift the plate J^2 to the right or to the left as to its engagement with the projection m^2, and thereby carry its tooth n^2 into another notch of the lever D. If the plate J^2 is shifted nearer to the axis of the shaft A, it will engage into the notch of the lever D which is nearest to said shaft, and will thereby make the short arm of the lever D longer, the tooth n^2 constituting the fulcrum of said lever. If the plate J^2 is shifted toward the periphery of the wheel C, the short arm of the lever D will be made shorter.

In order to facilitate the attachment of this apparatus to a shaft that has already been hung, without requiring such shaft to be taken off its bearings, I construct the dynamometer-wheel C in two halves, as clearly shown in Fig. 6, which halves are joined after they have been applied to the shaft by suitable bolts, p^2. This enables me to fasten the dynamometer to any shaft without disturbing the latter.

I claim—

1. The combination of the dynamometer-wheel C with the lever D and mechanism, substantially as described, for recording the movements of the lever D on a tape, and with the lever E and the lugs *e e* on the actuating-pulley B, all arranged for the purpose of balancing the apparatus, substantially as specified.

2. The combination of the dynamometer-wheel C with the two levers D E and the two springs F F, and with the actuating-wheel B and its lugs *e e*, that bear against both of said levers, substantially as described.

3. The combination of the dynamometer-wheel C, having annular flange *u* and notch *v* therein, with the loose ring I, lever J, having pin *w*, pawl *s*, and ratchet-wheel *r*, all arranged for converting the continuous rotation of the wheel C into intermittent rotation of the ratchet-wheel *r*, substantially as described.

4. The combination of the dynamometer-wheel C, having notched flange *u*, with the ring I, lever J, pin *w*, spring *x*, pawl *s*, ratchet-wheel *r*, intermediate gearing, a^2 b^2 d^2, and shaft f^2, upon which the registering-tape is wound, substantially as specified.

5. The combination of the dynamometer-wheel C, having notched flange *u*, with the loose ring I, lever J, having pin *w*, pawl *s*, ratchet-wheel *r*, spool *p*, and mechanism, substantially as described, for conveying the motion of said ratchet-wheel *r* to the spool *p*, and with the lever D, elbow-lever G, pencil-holder *i*, and spring F, substantially as herein shown and described.

6. The slotted pencil-holder *i*, combined with the plug or slide *k*, sustaining-lever G, and spring *l*, substantially as described.

7. The spool *p*, combined with the spring

g^2 and pin h^2, for the purpose of clamping the end of the tape H, substantially as specified.

8. The combination of the box k^2 and drum m, contained therein, with the cover j^2, spring i^2, and plug l^2, substantially as described.

9. The combination of the dynamometer-wheel C, having toothed projection m^2, with the slotted plate J^2, having series of teeth on one side and one tooth, n^2, on the other side, and with the lever D, having notches wherein to receive the tooth n^2, substantially as described.

10. The dynamometer-wheel C, made in two parts, which can be fastened onto a shaft already hung, in combination with the connecting-bolts p^2, substantially as specified.

This specification of my invention signed by me this 13th day of June, 1883.

FRANKLIN A. GLEASON.

Witnesses:
JOHN H. SWARTZ,
WILLY G. E. SCHULTZ.