(No Model.) 2 Sheets—Sheet 1.

A. WILSON.

DYNAMOMETER.

No. 300,821. Patented June 24, 1884.

Fig. 1.

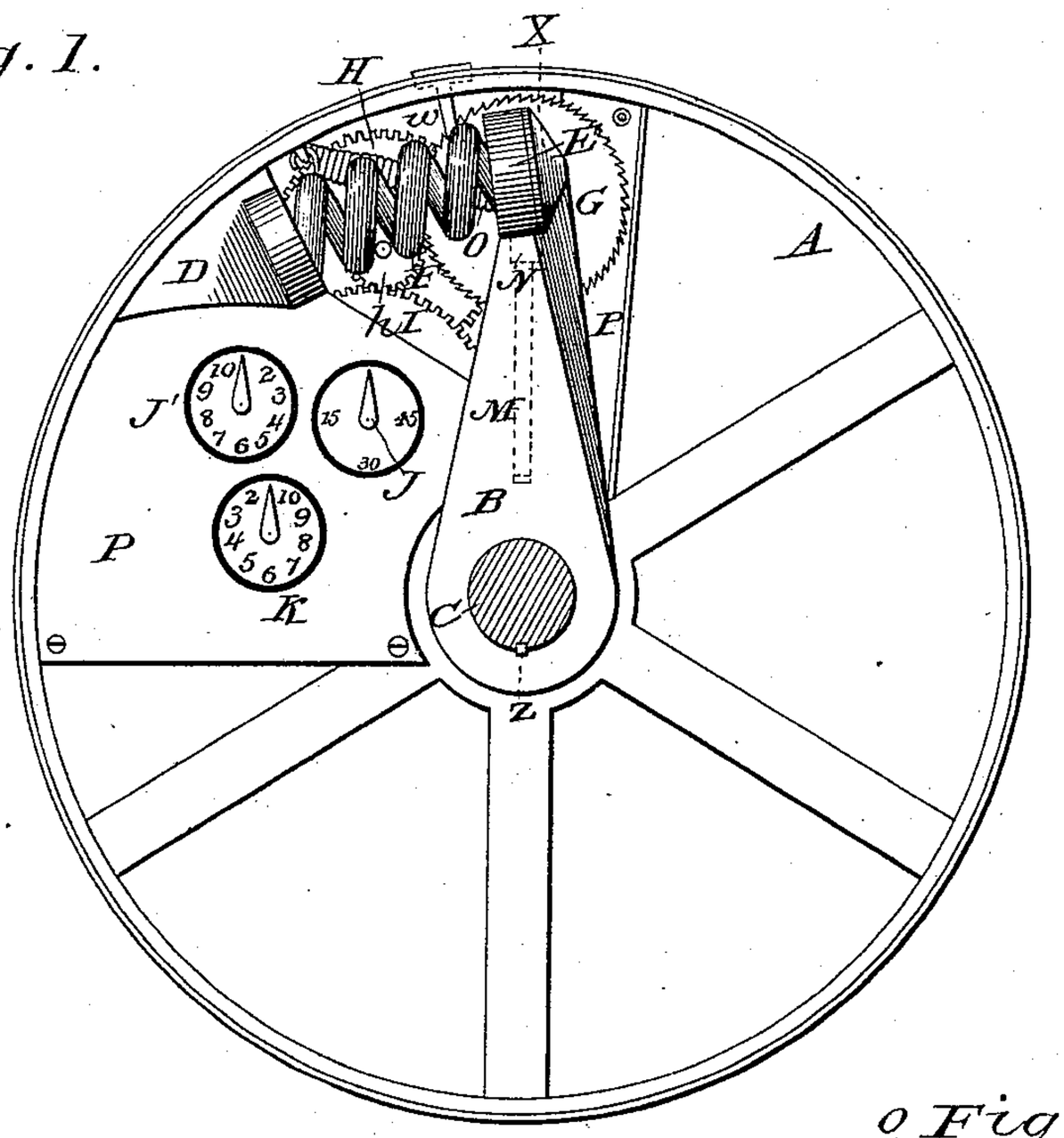


Fig. 2.

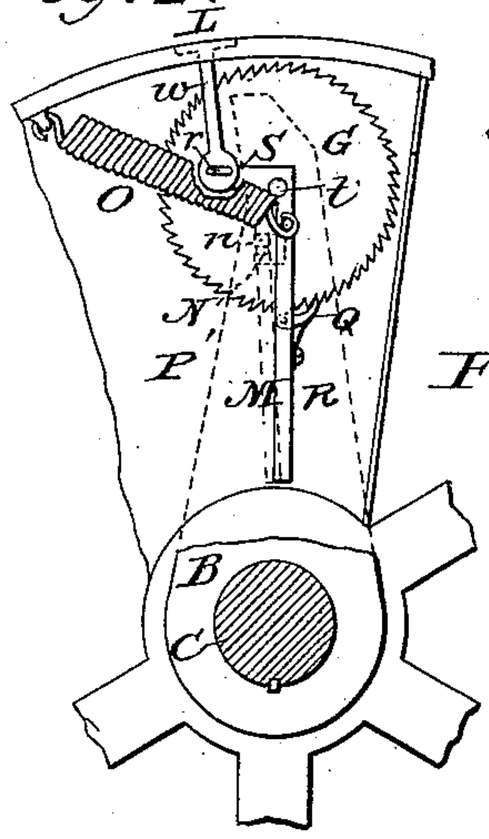


Fig. 3.

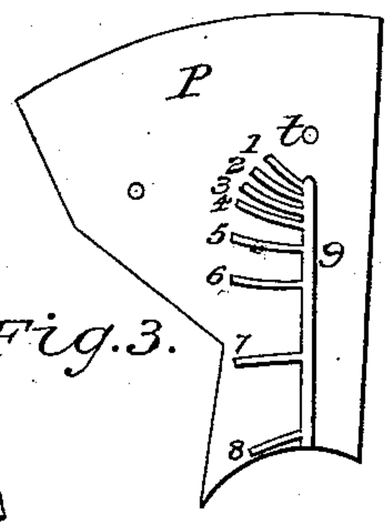


Fig. 4.

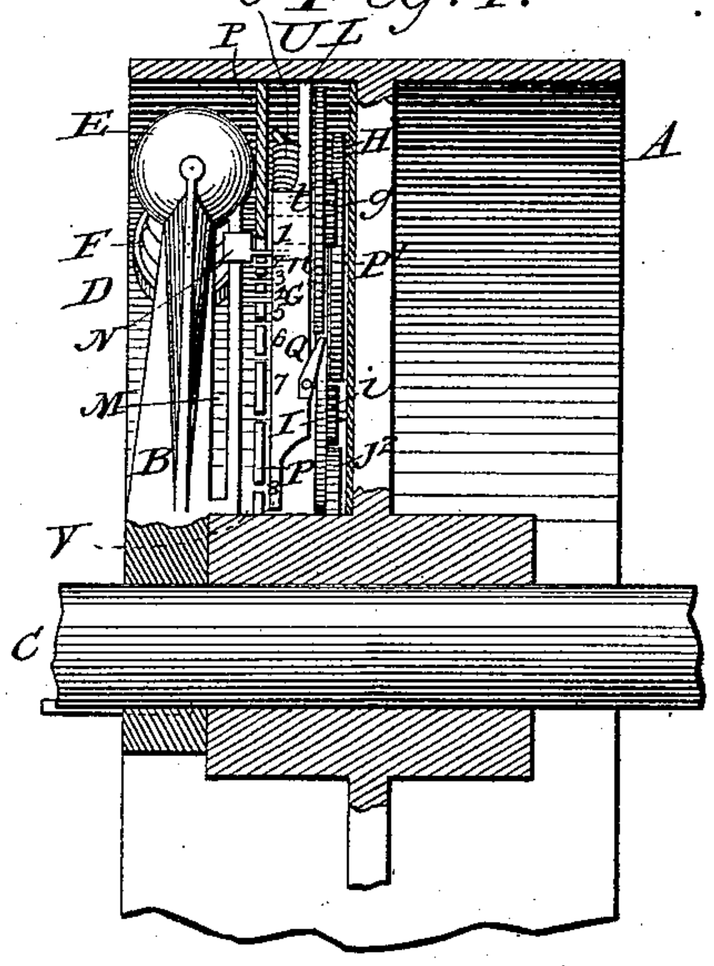
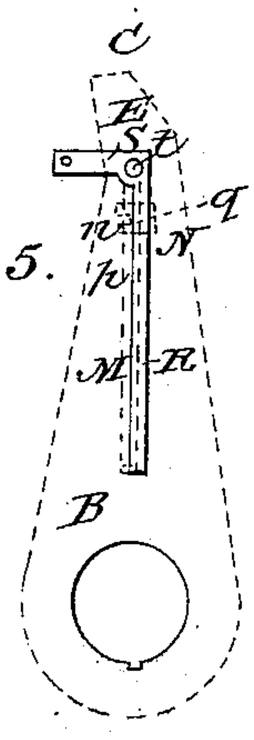


Fig. 5.



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Inventor.
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(No Model.) 2 Sheets—Sheet 2.

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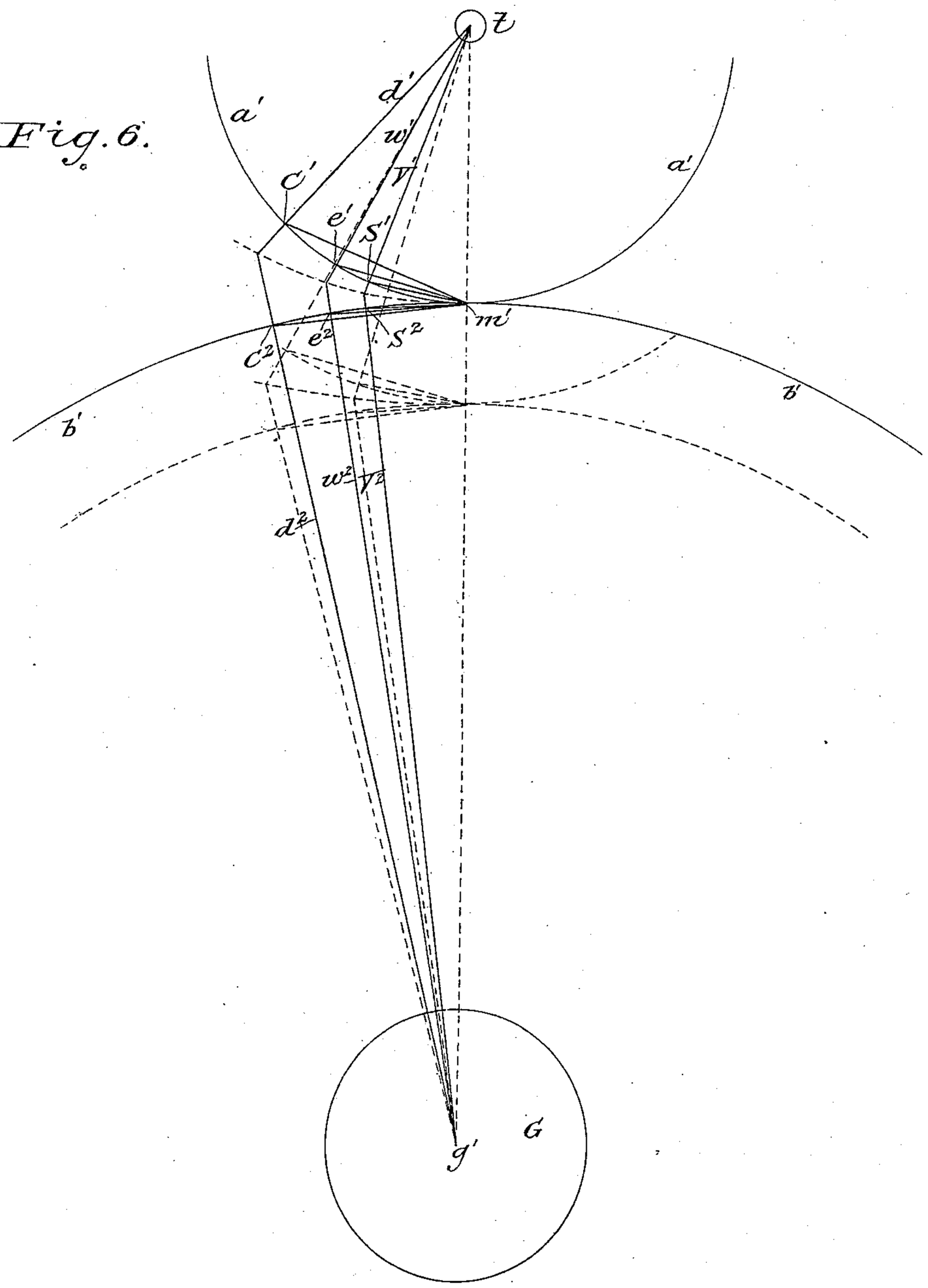
DYNAMOMETER.

No. 300,821. Patented June 24, 1884.

Fig. 6.



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UNITED STATES PATENT OFFICE.

ANDREW WILSON, OF NEW YORK, N. Y.

DYNAMOMETER.

SPECIFICATION forming part of Letters Patent No. 300,821, dated June 24, 1884.

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

To all whom it may concern:

Be it known that I, ANDREW WILSON, of the city, county, and State of New York, have invented certain new and useful Improvements in Dynamometers, of which the following is a specification.

My invention relates to rotary dynamometers which register without diminishing the power; and it consists in reducing the power exerted and the speed to a common unit of measurement, and making a record thereof upon a set of indices, so that any one can in a moment determine the amount of power taken off from the dynamometers.

My invention also relates to means whereby the same dynamometer may be adjusted to record with exactness greatly-divergent degrees of power.

In the drawings, Figure 1 is a plan view of my dynamometer, with part of the case and guide-plate removed to show the interior mechanism. Fig. 2 is a view of a section of the same, taken on the line U V of Fig. 4. Fig. 3 is the part of the side P of the case or frame not shown in Fig. 1, showing the guide-slots. Fig. 4 is a vertical cross-sectional view taken on the line X Z of Fig. 1. Fig. 5 is a vertical view, partly in section, of the driving-arm and oscillating rotation and power recorder. Fig. 6 is a diagram showing the manner of locating the guide-slots.

Similar letters of reference designate similar parts in all the drawings.

A is a loose pulley upon the shaft C.

B is an arm rigidly keyed to the shaft C, having on its end the socket E, adapted to hold one end of the spring F, the other end of which spring is held by the socket D, attached to the pulley A. For the purpose of regulating the pressure of the spring F the socket D may be made adjustable at different points on the pulley A. If power be applied to the shaft and resistance to the pulley, the spring F will be compressed between the sockets E and D, the degree of compression varying with the power exerted.

M is a rod attached to the arm B, on which rod M is the slide N, which slide can move upward and downward upon the rod M, but not turn thereupon.

R is an arm pivoted at *t* to the frame or case formed by the sides or plates P P′, which is rigidly attached to the pulley A. The arm S is attached to the arm R, and is connected in a sliding joint at *r* to the rod *w*, which carries the button L, which button L will rise, when the arm S is raised, above the surface of the pulley A.

O is a spring attached at one end to the pulley A and at the other end to the arm R.

Q is a ratchet on the arm R, which acts upon the ratchet-wheel G. This ratchet-wheel G carries the pinion *g*, which turns the gear-wheel H, which wheel H carries the pinion-wheel *h*. The pinion-wheel *h* gears with the wheel I, Fig. 1. On the end of the shaft of the wheel I is the pointer J. The wheel I carries the pinion-wheel *i*, engaging the gear-wheel J^2, and on the shaft of the wheel J^3 is another pointer, J′, and the pointer K is turned by a similar pinion-wheel and gear-wheel actuated by the wheel J^2. If the pinion-wheels have each ten cogs and the large gear-wheels have each one hundred cogs, except the wheel I, which has sixty cogs, and if the wheel G revolves once a minute, H will turn once in ten minutes, I once in an hour, J^2 once in ten hours, and so on. Additional indices may be added, if desired. The arm R is drawn forward by the spring O until it comes in contact with the point *n* of the slide N. When no power is being taken off the pulley, the spring F will not be compressed, and the point *n* will hold the arm R back, so that the button L will not project beyond the face of the pulley A. When the spring F is compressed, the slide N, moving with the rod M and arm B, will be carried forward, allowing the spring O to draw forward the arm R and raise the rod W and button L above the surface of the wheel, and the ratchet Q will pass one or more teeth of the wheel G, as the distance may be more or less. As the wheel revolves, the button L will come beneath the belt and be pressed down until it is level with the surface of the pulley, driving back the arm R, and, by the ratchet Q, turning the wheel G the number of teeth passed by the ratchet on its forward swing. If the stop N were rigidly attached to the rod M, although the arm B moved equal distances for each

horse-power applied, there would be a slight variation in the number of teeth passed as the power increased, because the point of contact with the arm R would be constantly retreating from the pivotal point *t* without any corresponding compensation in the rod M. To remedy this I use the guide-slots shown in Fig. 3.

1 2 3 4 5 6 7 8 are slots in the side P of the case or frame. The curve of these slots may be fixed by describing segments of two circles, *a'* and B', having respective centers, *t*, and the center *g'* of the shaft C, and touching on their circumferences at the point *m'*, from which the curve is to be drawn. In each of these circles, on the same side of the point *m'* of contact and starting therefrom, describe equal chords, *c' m'* and $c^2 m'$. Extend radii *d' d²* of each circle through the ends *c' c²* of the chords *c' m'* and $c^2 m'$ of their respective circles, farthest from the point of contact until these radii meet. The point *x'*, at which they intersect, will be one of the points through which the curve must pass, and the rest of its course may be determined by drawing other chords, as *e' m'*, $e^2 m'$, *s' m'*, $s^2 m'$, and extending other radii, as *w' w²* v^2, &c., in a similar manner. The curve of each slot is different from that of the others, and must be separately located. (See dotted lines, Fig. 6.) The slot half-way between *t* and *g'* will be straight. The point *n* of the slide N passes through one of these slots—for instance, 1. *q*, Fig. 5, represents a point on the arm R, and *p* a point opposed to it on the rod M. When the stop N is at *p*, if the spring F is compressed and the arm B and rod M moved forward, the slide N will move along in the slot 1, rising somewhat on the rod M above the point *p*, and always marking the point at which, when the rod R stops in its oscillations by coming in contact with the point *n*, the point *q* on the arm R will describe an arc the chord of which will be equal to the chord of the arc described by the point *p* on the rod M, and consequently an accurate measurement of the degree of compression of the spring F will be made by the ratchet Q upon the wheel G. If the pulley make one hundred revolutions per minute, and one horse-power compresses the spring F sufficiently to let the ratchet Q to pass one tooth at every oscillation of the arm R, the indices J J' K will mark the number of hours this power is exerted. If the resistance be increased, the ratchet will pass more teeth of the wheel G, and the indices record more horse-power hour-units; or, if the revolutions be increased, the ratchet will pass the teeth more rapidly, and the indices record more horse-power hour-units, it being evident that the aggregate is the same, whether the pulley deliver one horse-power for five hours or five horse-powers for one hour, the result in either case being five horse-power hour-units. If the power exerted is sufficient to pass several teeth on the wheel G at every oscillation of the arm R, it will be convenient to take the record from a lower point on the rod M, where the vibration is not so great. If the point 1 is one-eighth of the distance from the center of the pivot *t* to the center of the shaft C, and the compression of the spring F is such as to allow a certain number—for instance, seven—of the teeth to be passed by the ratchet Q at every oscillation of the arm R, the slide N being at 1, if the slide N be moved to one-seventh of the distance from *t* to the center of shaft C, as 2, with the same compression of the spring F, the ratchet will pass six teeth. If the slide be moved to one-sixth of the same distance, as 3, the ratchet will pass five teeth. If it be moved to one-fifth the distance, as 4, four teeth; to one-fourth the distance, as 5, three teeth; to one-third the distance, as 6, two teeth, and if to one-half the distance but one tooth. With the slide at two-thirds of the distance, the compression must be twice as great to allow one tooth to pass, at three-quarters, three times as great, and so on; so that at seven-eighths of the distance the compression of the spring F must be seven times as much, to permit one tooth to pass, and every tooth passed will represent seven horse-power units. When the dynamometer is adjusted to register with the slide N in a given slot, then, if the slide N be changed from that slot to another, the record of the indices must be increased or diminished in the ratio above given, as the new slot may be above or below the former one. Thus, if the dynamometer be set for slot 1, and the slide N be afterward moved to slot 7, each unit recorded on the indices will represent one-seventh of the actual number of units of horse-powers exerted. By swinging the arm B back until the point *n* of the slide N shall pass into the slot 9, the slide can then be moved up or down on the rod M to any desired guide-slot. Any suitable stop may be used to prevent the arm B swinging back into this position, except when desired, and if a lock be used for this purpose no one can then alter the record of the dynamometer without injuring or breaking its parts.

Any suitable mechanism that will cause the arm R to oscillate with regularity may be employed instead of the button L and rod *w* and arm S, and I do not confine myself to the devices shown for that purpose; and any mechanism may be employed which will cause the rod M to mark with regularity the divergence, under the application of power, of an extended radius of the shaft C, and a radius of the pulley A, and I do not confine myself to the particular devices shown for that purpose, nor to the particular arrangement of gear and index wheels, for the record may be taken off of the ratchet-wheel G by any suitable arrangement of gear-wheels. The slide N also might be placed on the arm R, and strike against the rod M; but this would produce more wear in the slots. Likewise, the ratchet-wheel G might be turned by the spring O, and the

opposite movement of the ratchet produced by the rod *w* and button L.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a dynamometer, the rod M and arm R, adjusted so that oscillations of the arm R shall be controlled by the rod M, substantially as and for the purposes set forth.

2. In a dynamometer, a plate having a slot or slots adapted to regulate the position of the slide N relative to the rod M and arm R, substantially as and for the purposes set forth.

3. In a dynamometer, a plate having slots therein to regulate the position of the slide N relative to the rod M and arm R, and having a slot by which the slide N can be moved from one of said regulating-slots to another, substantially as set forth.

4. In a dynamometer, the combination of the rod M, slide N, and a plate having a slot or slots to regulate the position of the slide N, substantially as and for the purposes set forth.

5. In a dynamometer, the combination of the arm R, rod M, slide N, and a plate having a slot or slots adapted to regulate the position of the slide N, substantially as and for the purposes set forth.

6. In a dynamometer, the combination of the ratchet-wheel G, ratchet Q, arm R, slide N, a plate having a slot or slots, and rod M, substantially as and for the purposes set forth.

7. In a dynamometer, the combination of the rod M, adapted to stop the arm R in its oscillations, with the arm R, ratchet Q, and ratchet-wheel G, substantially as and for the purposes set forth.

8. In a dynamometer, the combination of the rod M, adapted to stop the arm R in its oscillations, with the arm R, ratchet Q and ratchet-wheel G, and intermediate gear-wheels adapted to transmit and indices adapted to record revolutions of said wheel G, substantially as and for the purposes set forth.

9. The combination of the button L, rod *w*, arm S, arm R, ratchet Q and ratchet-wheel G, spring O, slide N, regulated by the slot or its equivalent, rod M, arm B, and spring F, substantially as and for the purposes set forth.

10. The combination of the button L, rod *w*, arm S, arm R, ratchet Q, ratchet-wheel G, with gear-wheels and indices to record the revolutions of the wheel G, spring O, slide N, regulated by a slot or its equivalent, rod M, arm B, and spring F, combined and operating substantially as and for the purposes set forth.

11. The combination of a swinging arm, means for oscillating the same to mark revolutions of the dynamometer, ratchet-wheel G, with indices to record the length and number of the oscillations of such arm in a common unit, and mechanism adapted to lengthen or shorten the swing of such oscillating bar in the same ratio as the power transmitted by the dynamometer is increased or diminished, substantially as set forth.

12. The combination of mechanism indicating revolutions or speed of a rotary dynamometer, with mechanism indicating resistance or power, by which such speed and power are reduced to a common unit of measurement, such mechanism being carried by the shaft from which the power to be measured is taken, and requiring no connection or contact with anything but such shaft and the belt or its equivalent taking power therefrom.

13. A swinging or pivoted arm, in combination with means for oscillating the same to mark revolutions of the dynamometer, and mechanism adapted to lengthen or shorten the swing of such arm in the same ratio as the power transmitted by the dynamometer is increased or diminished, substantially as set forth.

14. The rod M, adapted to indicate with uniformity varying degrees of resistance in the pulley A by its divergence from a radius of such pulley, in combination with mechanism for measuring and recording the extent of such divergence in a common unit with the revolutions of such dynamometer, for the purposes set forth.

ANDREW WILSON.

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