No. 614,240. Patented Nov. 15, 1898.

E. A. UEHLING.

TRACTION DYNAMOMETER.

(Application filed Oct. 15, 1897.)

(No Model.) 3 Sheets--Sheet 1.

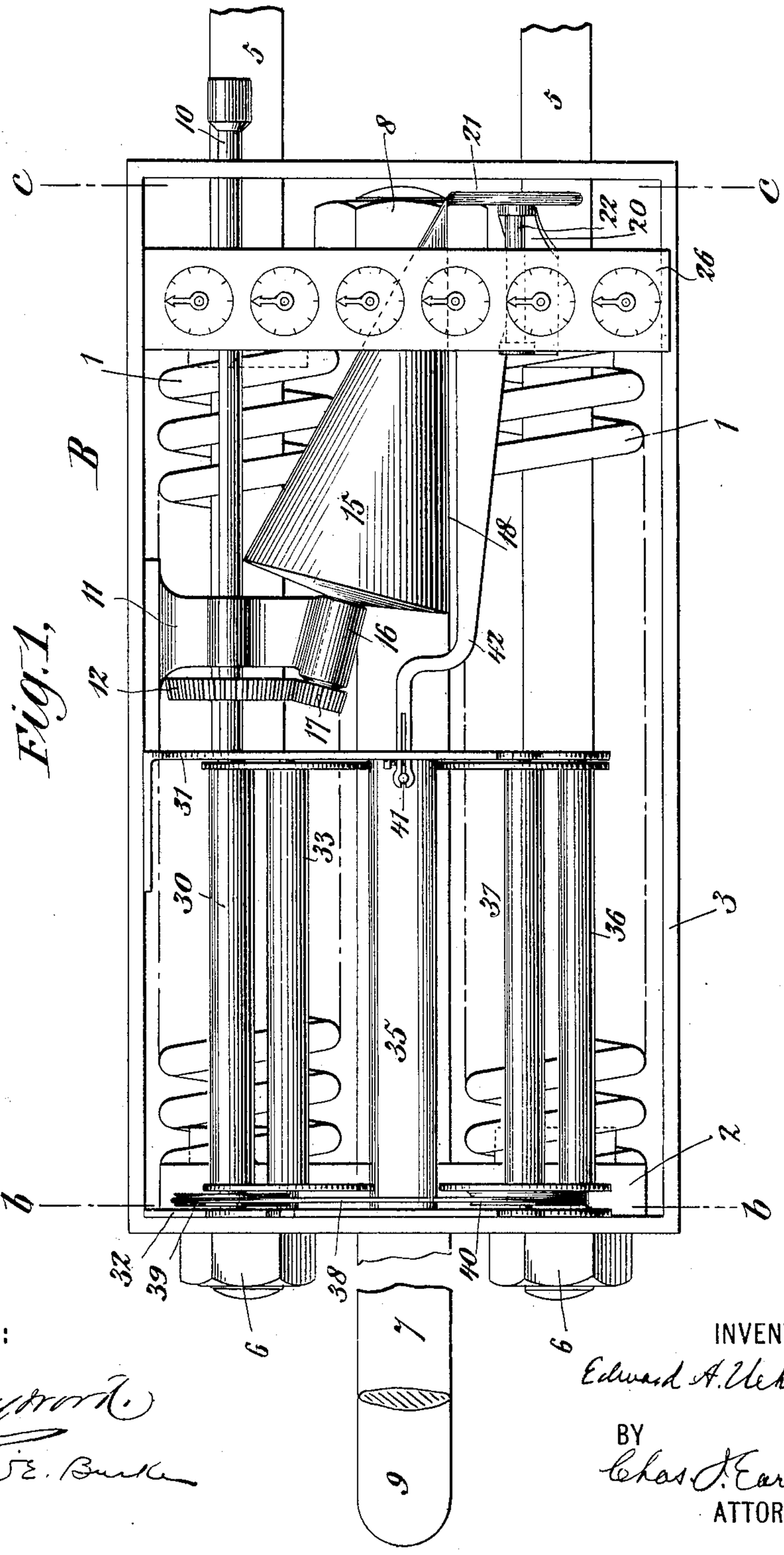

FIG. 1.

WITNESSES:

D. H. Haywood.

Daniel E. Burke

INVENTOR

Edward A. Uehling

BY

Chas. F. Earle

ATTORNEY

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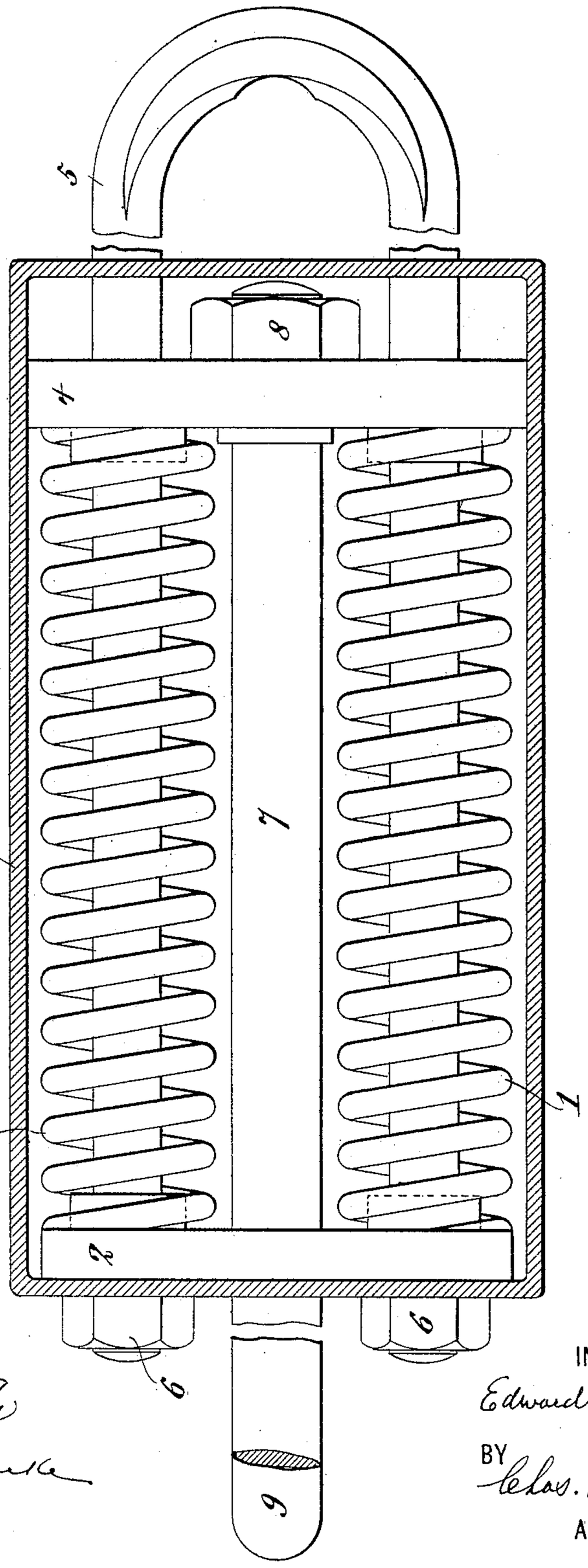
(No Model.) 3 Sheets—Sheet 2.

Fig. 2.



WITNESSES:

O. H. Haywood Jr.

Daniel W. Burke

INVENTOR

Edward A. Uehling

BY Chas. D. Earll

ATTORNEY

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Fig. 4.

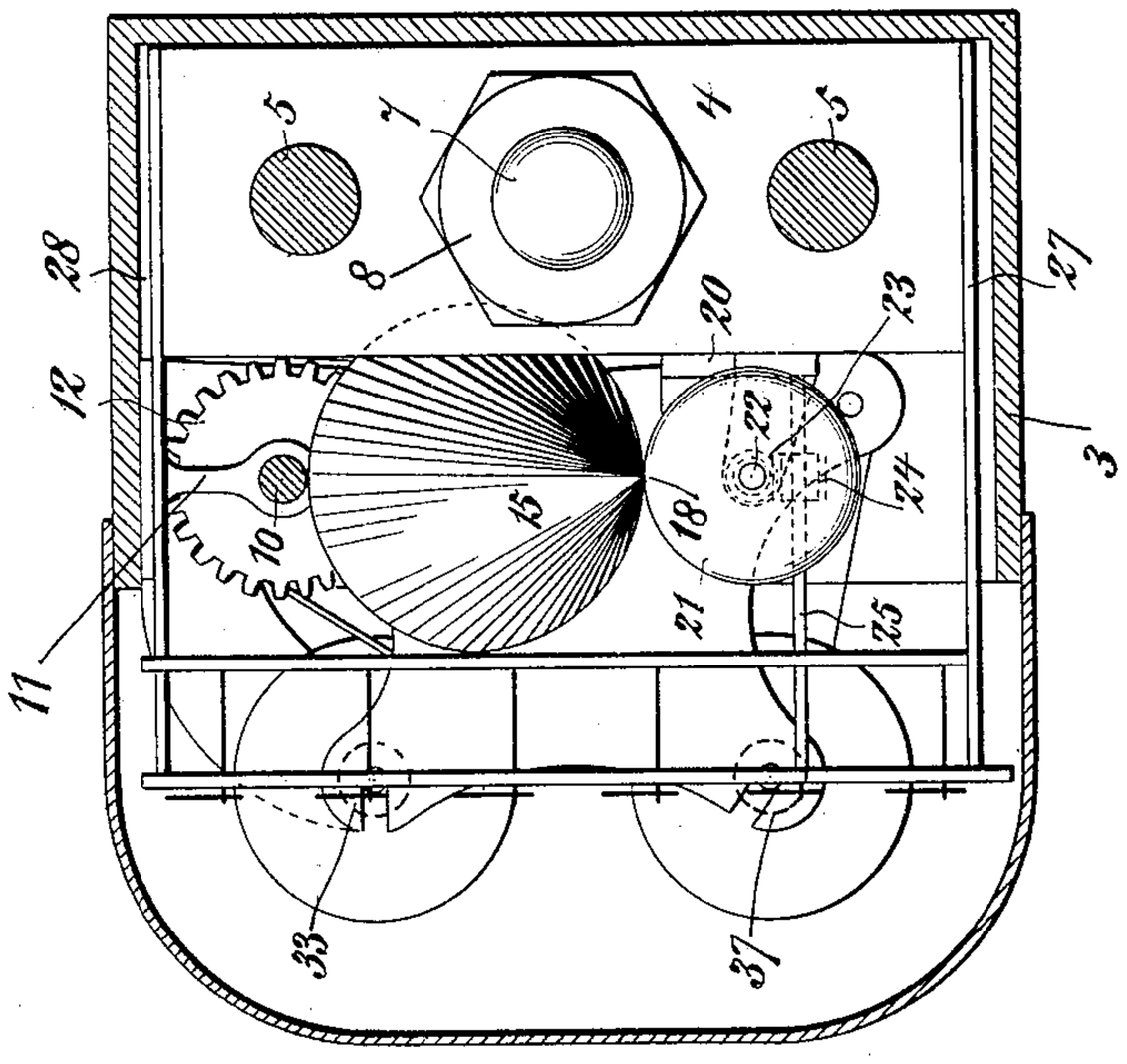
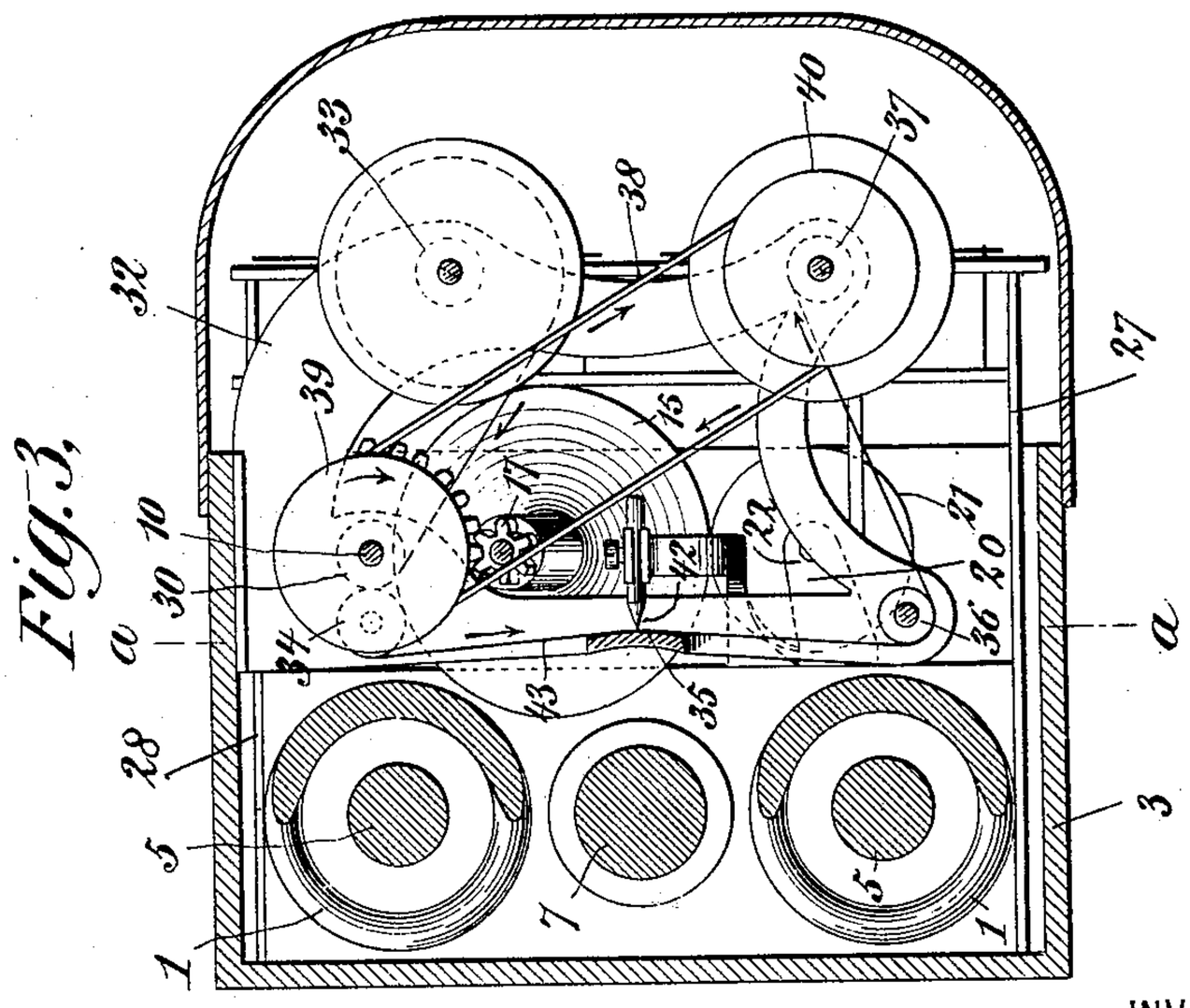


Fig. 3.



WITNESSES:

O. F. Raymond

Daniel W. Burke

INVENTOR

Edward A. Uehling.

BY

Chas. J. Earll.

ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD A. UEHLING, OF NEWARK, NEW JERSEY.

TRACTION-DYNAMOMETER.

SPECIFICATION forming part of Letters Patent No. 614,240, dated November 15, 1898.

Application filed October 15, 1897. Serial No. 655,255. (No model.)

To all whom it may concern:

Be it known that I, EDWARD A. UEHLING, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Traction-Dynamometers, of which the following is a specification.

My invention relates to traction-dynamometers, the object being to produce an apparatus for indicating the amount of power consumed or work done in hauling a vehicle.

The object is further to produce a record or diagram showing the intensity of the pull, at each instant, required to move the vehicle.

My invention consists in providing a cone arranged to be driven by the running-gear of a vehicle, and in providing a friction disk or wheel, arranged to have frictional engagement with the exterior surface of the cone in such a manner that the position of the friction-disk relative to the cone shall be determined by the intensity of the force exerted in moving the vehicle, and in providing a register or counting mechanism operated by the revolution of the friction-wheel.

My invention consists, further, in providing a chart or roll of paper which is adapted to be moved under the point of a pencil or tracing-point at a rate proportional at all times to the motion of the vehicle and in arranging a tracing-point so that its position transversely of the chart shall correspond to the intensity of the force required to move the vehicle.

My invention consists, further, in the novel organization and construction of parts hereinafter described.

In the drawings accompanying and forming part of this specification, Figure 1 is a top view of a dynamometer embodying my invention, the cover or cap having been removed for the purpose of better exposing the mechanism. Fig. 2 is a sectional view taken in a plane parallel to the plane of Fig. 1 on the line *a a*, Fig. 3. Fig. 3 is a sectional view on the line *b b*, Fig. 1, looking from the left end, as seen in Fig. 1; and Fig. 4 is a section on the line *c c*, looking from the right, as seen in Fig. 1.

Similar characters of reference designate like parts in all of the figures.

My invention comprises in a general way a spring mechanism (designated in a general way by A) interposed between the source of power and the vehicle which is being hauled and adapted to transmit the pull or force from the source of power to the vehicle; an integrating mechanism (designated in a general way by B) consisting of a cone driven by the running-gear of the vehicle, a friction-wheel having frictional engagement therewith, controlled in its relation to the cone by the action of the spring mechanism A, and a register or counting mechanism operated by the friction-disk; and a stress-recording mechanism (designated generally by C) consisting of a chart or scroll operated by the running-gear of the vehicle, and a pencil or tracing point having contact with the chart and controlled in its movement by the action of the spring mechanism A.

The register of the integrating mechanism B is of any suitable construction and indicates the amount of work done, which is usually expressed in foot-pounds.

The stress-recording mechanism C produces a diagram on a chart or roll of paper, which indicates what the pull required to move the vehicle is for each instant. This will usually be measured in pounds. It also indicates the distance traversed by the vehicle.

In the preferred form of my invention herein shown and described the spring mechanism (designated generally by A) comprises the two springs 1 1, which rest against the cross-piece 2 in the end of the casing 3 on their fixed ends and against the cross-head 4 on their movable ends. The U-bolt 5 passes through the cross-head 4 and the springs 1 1 and terminates in nuts 6 6 outside of the casing 3, forming a guide for the cross-head 4 and the springs 1 1 and forming also a means of connection with the vehicle. The cross-head 4 is attached to the draw-bar 7, to which it is secured by means of the nut 8, the draw-bar passing out through the end of the case and terminating in a hook or eye 9 for the purpose of forming a convenient means of attachment with the source of power. It will be seen that the draw-bar 7 is pulled to the left, as seen in Fig. 2. The springs will be compressed thereby, and the cross-head 4 will be given a movement proportional to the intensity of the pull. Within the casing 3

is mounted the cone 15, attached to the shaft 16, said shaft being supported in a bearing in the bracket 11. On the end of the shaft 16 is secured the gear 17, and meshing therewith is the gear 12, secured to the shaft 10, the latter shaft also having a bearing in the bracket 11. The shaft 10 is connected with the running-gear of the vehicle in any suitable manner. The edge 18 of the cone 15 is arranged to lie parallel to the line of motion of the cross-head 4. Attached to the cross-head 4 is the bracket 20, carrying the friction-wheel 21 upon the shaft 22, so that the friction-wheel 21 shall have contact with the cone 15 along the edge 18. On the shaft 22 is the worm 23, engaging with the worm-wheel 24 on the shaft 25, the shaft 25 being geared in any suitable manner to the register 26, the register 26 being attached by means of the plates 27 and 28 to the cross-head 4.

The mechanism for imparting motion to the chart or roll of paper is located between the frame-pieces 31 and 32. The roll is put in place upon the shaft 33, whence it is led between the driving-roll 30, secured to the extension of the shaft 10, and the tension-roll 34, thence passing over the platen 35 around the idle-roller 36 to the roll 37, upon which it is rewound, the roll 37 being driven by the belt 38, passing over the wheel 39 on the shaft 10, and wheel 40, secured to the roll 37, in the direction indicated by the arrows. The tracing-point 41 is held in the end of the arm 42, said arm being secured to the cross-head 4.

The operation of the mechanism is as follows: When the draw-bar 7 is pulled with a certain force, the springs 1 1 are compressed or deflected an amount corresponding to the intensity of the pull and the friction-wheel 21 is moved along the edge 18 of the cone 15 a distance from the apex of the cone corresponding to the intensity of the pull. The cone 15, being geared to the vehicle in the manner described, makes a number of revolutions proportionate to the distance passed over by the vehicle. The revolutions of the friction-wheel 21 will therefore be proportional to the distance passed over by the vehicle and to the circumference of the cone at the point of contact, and as the circumference of the cone at this point is proportionate to its distance from the apex, and as this distance is proportionate to the intensity of the pull, it is obvious that the number of revolutions made by the friction-wheel 21 during a certain time will be proportionate to both the distance passed over by the vehicle and the intensity of the pull—that is, proportionate to the product of the distance passed over by the vehicle into the intensity of the pull. This product is a measure of the work done or power expended upon the vehicle. The register 26 is geared to the friction-wheel 21 in such a way as to indicate the amount of work done in appropriate units—as, for instance, foot-pounds. Thus, assuming that the cone 15 makes a certain number of revolutions equal to r for every foot passed over by the vehicle, and that the ratio of the circumference of the cone at the point of contact corresponding to a pull of one pound to that of the friction-wheel is s, the friction-wheel will make a number of revolutions equal to r times s for each foot of space passed over by the vehicle during which the pull exerted upon the draw-bar equaled one pound. The velocity ratio of the gearing connecting the friction-wheel with the register must be such, therefore, in the case assumed, that the index-pointer indicating units shall indicate one every time the friction-wheel makes a number of revolutions equal to r times s.

In the operation of the stress-recording mechanism the chart 43 is fed along by the roller 30 at a rate proportionate to the speed of the vehicle, and, the tracing-point 41 being attached to the cross-head 4, it is evident that the distance measured from any point on the line traced by the tracing-point to a longitudinal line corresponding to zero stress will indicate the intensity of the pull at the instant this point was being traced. It is also obvious that the distance between any two points on the line traced by the tracing-point measured longitudinally of the roll, according to an appropriate scale, will indicate the distance passed over by the vehicle. The roll 37 is driven by the belt 38, so as to wind up the chart as fast as it is fed by the roll 30. As the roll 37 increases in diameter this increase is compensated by the belt 38 slipping on one or both of the wheels 39 and 40.

In cases where from any cause it is inconvenient to connect the shaft 10 with one of the regular wheels of the vehicle and in certain cases where the thing hauled has no wheels—such as certain forms of plows, harrows, and other agricultural machines—the shaft 10 may be connected with a special wheel of appropriate diameter adapted to come in contact with the ground.

Having thus described my invention, what I claim is—

1. In a traction-dynamometer, the combination with a friction-cone adapted to be geared to one of the wheels of a vehicle, of a spring attached at one end to the vehicle, a cross-head engaging the other end of said spring and connected to a draw-bar, a friction-wheel carried by said cross-head and contacting said cone, and a register also carried by said cross-head and geared to said friction-wheel.

2. In a traction-dynamometer, the combination with a U-bolt adapted to be attached to a vehicle, of a cross-head sliding upon, and guided by, the legs of said U-bolt, spiral springs carried by the legs of said U-bolt and engaging said cross-head, a register carried by said cross-head, a friction-wheel also carried by said cross-head and geared to said register, and a friction-cone fixed with reference to said U-bolt and arranged to have one of its sides parallel to the line of motion of

said cross-head and to make contact with said friction-wheel, said friction-cone being adapted to be geared to one of the wheels of said vehicle.

3. In a traction-dynamometer, the combination with a U-shaped bolt adapted to be secured to a vehicle carrying a spiral spring on each of its two legs, a cross-head slidably mounted on said U-bolt forming an abutment for the movable ends of said springs, a draw-bar attached to said cross-head, a friction-cone adapted to be geared to a wheel of the vehicle having one of its sides parallel to the line of motion of said cross-head, a friction-wheel carried by said cross-head and contacting said cone, and a register also carried by said cross-head and geared to said friction-wheel.

4. In a traction-dynamometer, the combination with a vehicle of the U-bolt 5, adapted to be attached to the vehicle, the springs 1, 1 mounted thereon, the cross-head 4, the draw-bar 7 attached thereto, the roll 33, the driving-roll 30, mounted upon the shaft 10, adapted to be geared to one of the wheels of the vehicle, the tension-roll 34, the platen 35, the idle-roll 36, the roll 37, and the arm 42, carrying the tracing-point, attached to the cross-head.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 13th day of October, 1897.

EDWARD A. UEHLING.

Witnesses:
WM. BONDY,
ARTHUR FALK.