(No Model.)

2 Sheets—Sheet 1.

L. SCHULER.
DYNAMOMETER.

No. 575,176. Patented Jan. 12, 1897.

Fig. 1.

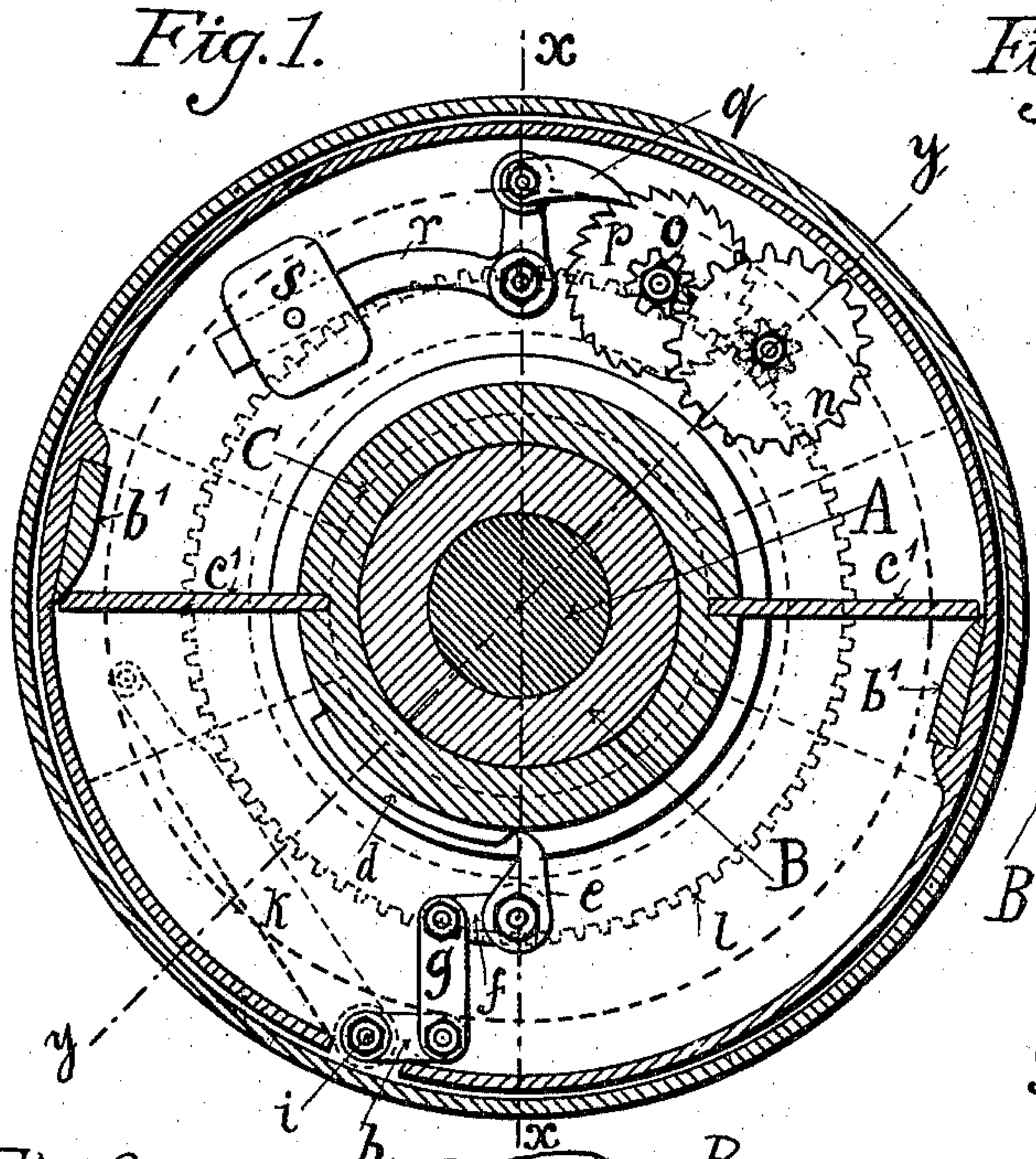


Fig. 2.

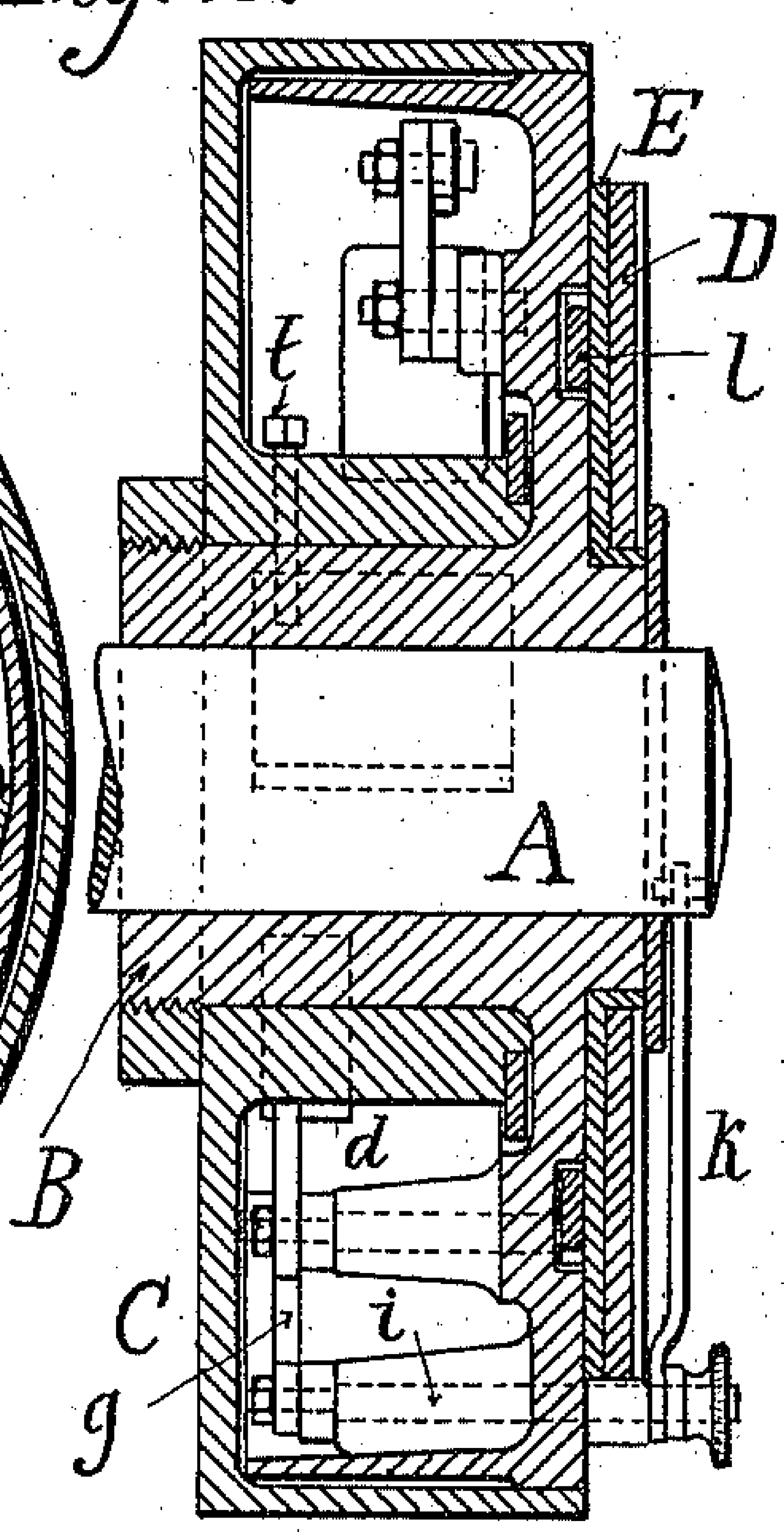


Fig. 3.

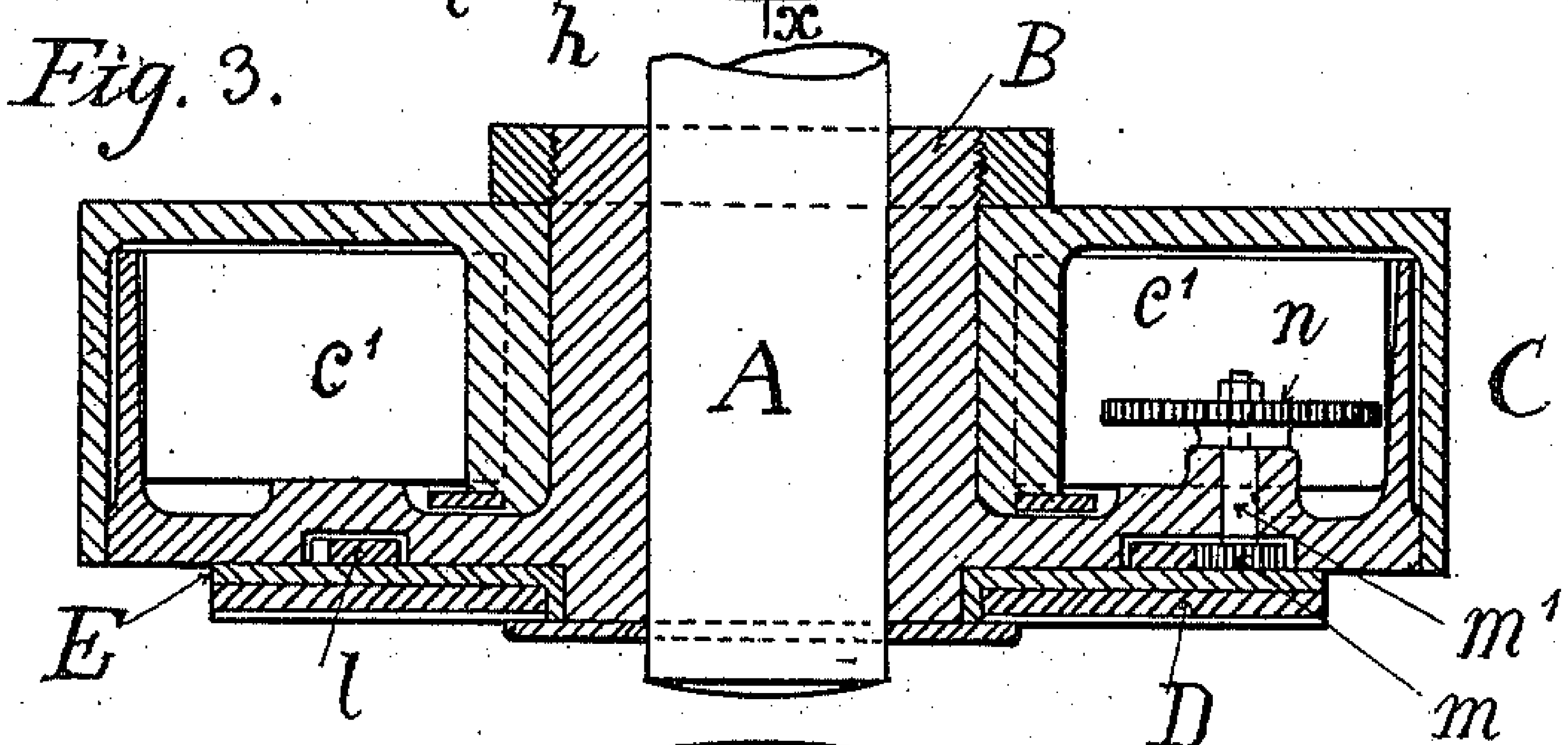
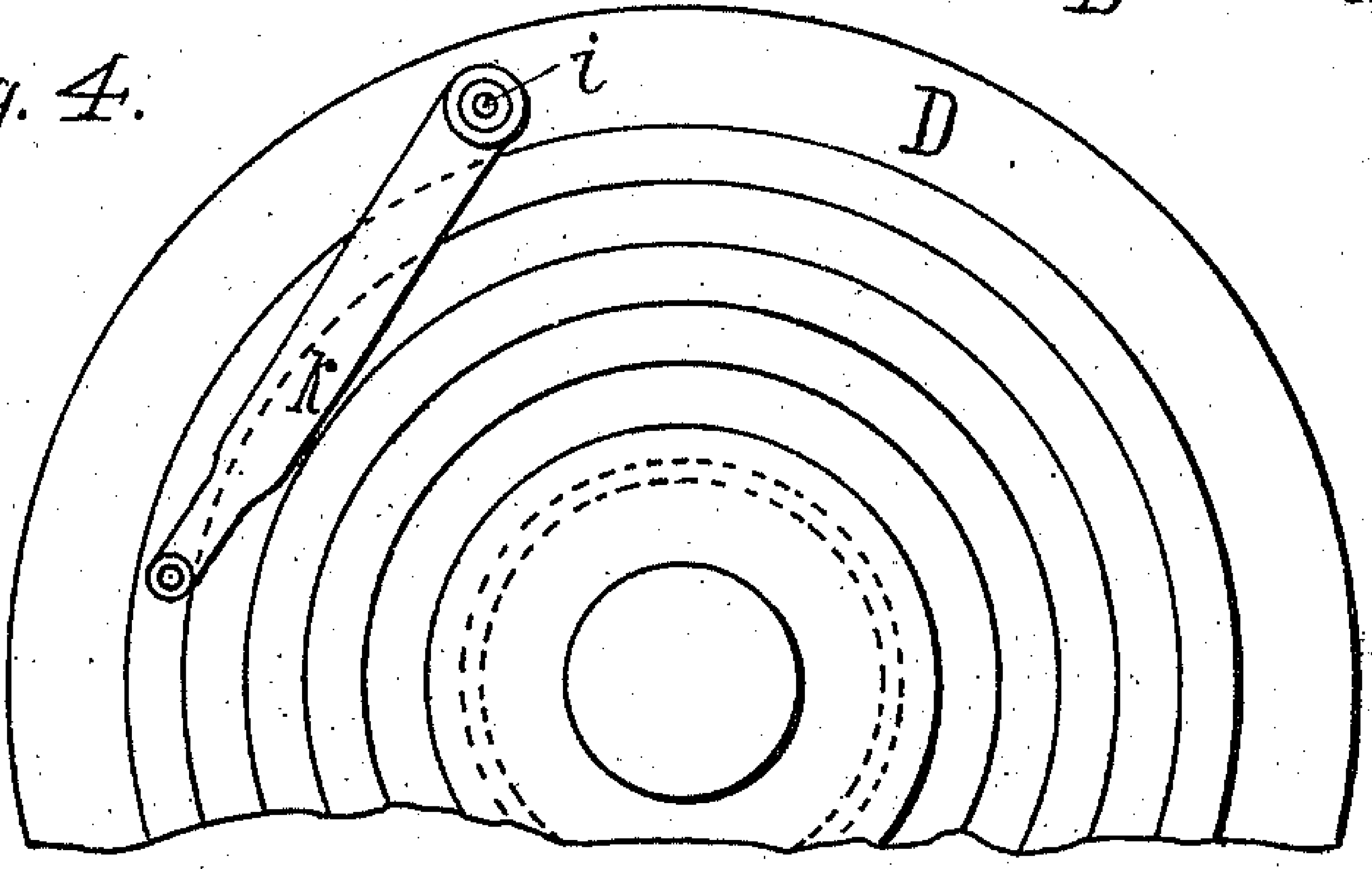


Fig. 4.



Witnesses.
H. van Oldenneel
E. H. Sturtevant

Inventor
Louis Schuler
by [signature]
Attorneys

(No Model.)

2 Sheets—Sheet 2.

L. SCHULER.
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Fig. 5.

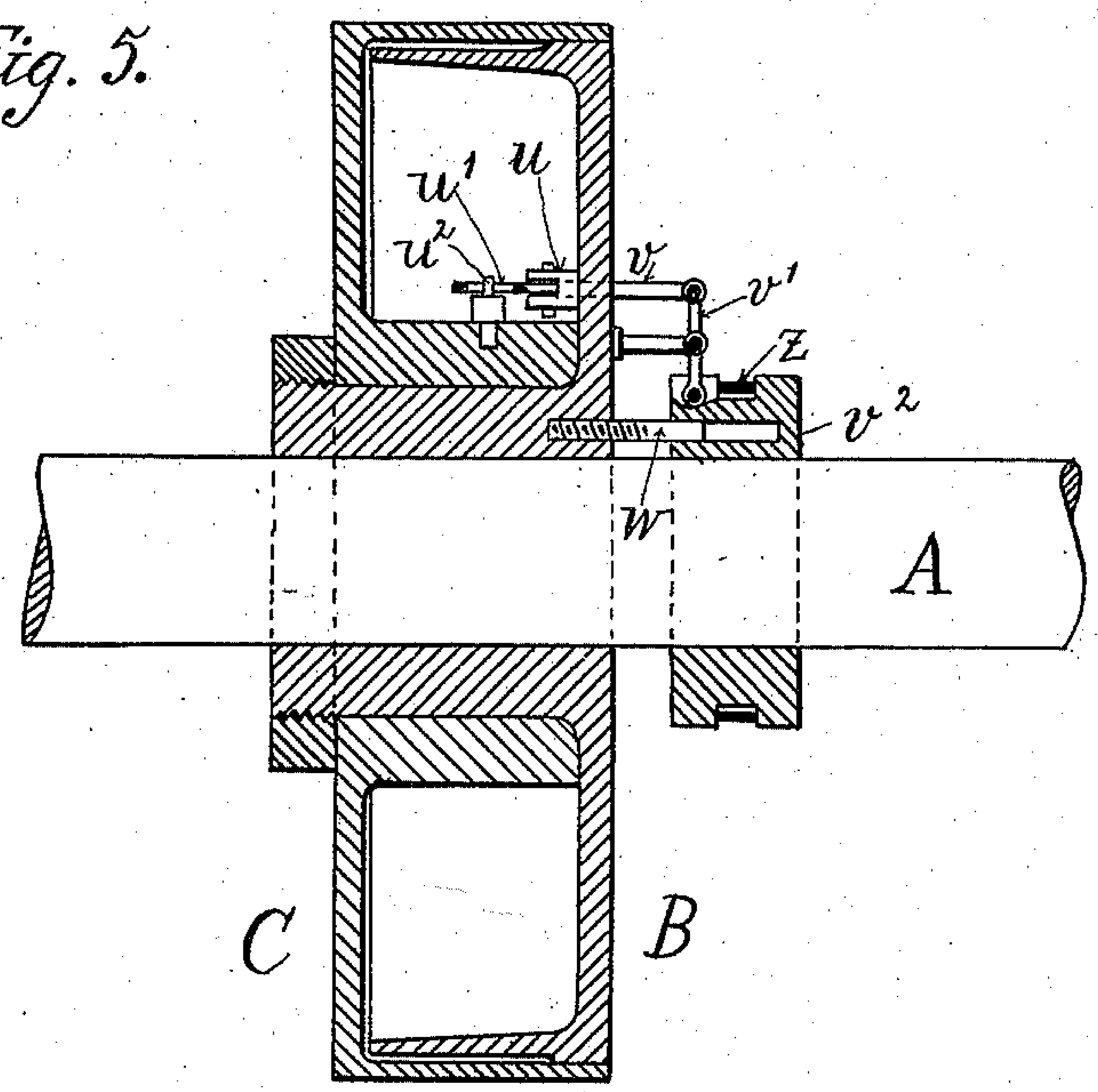
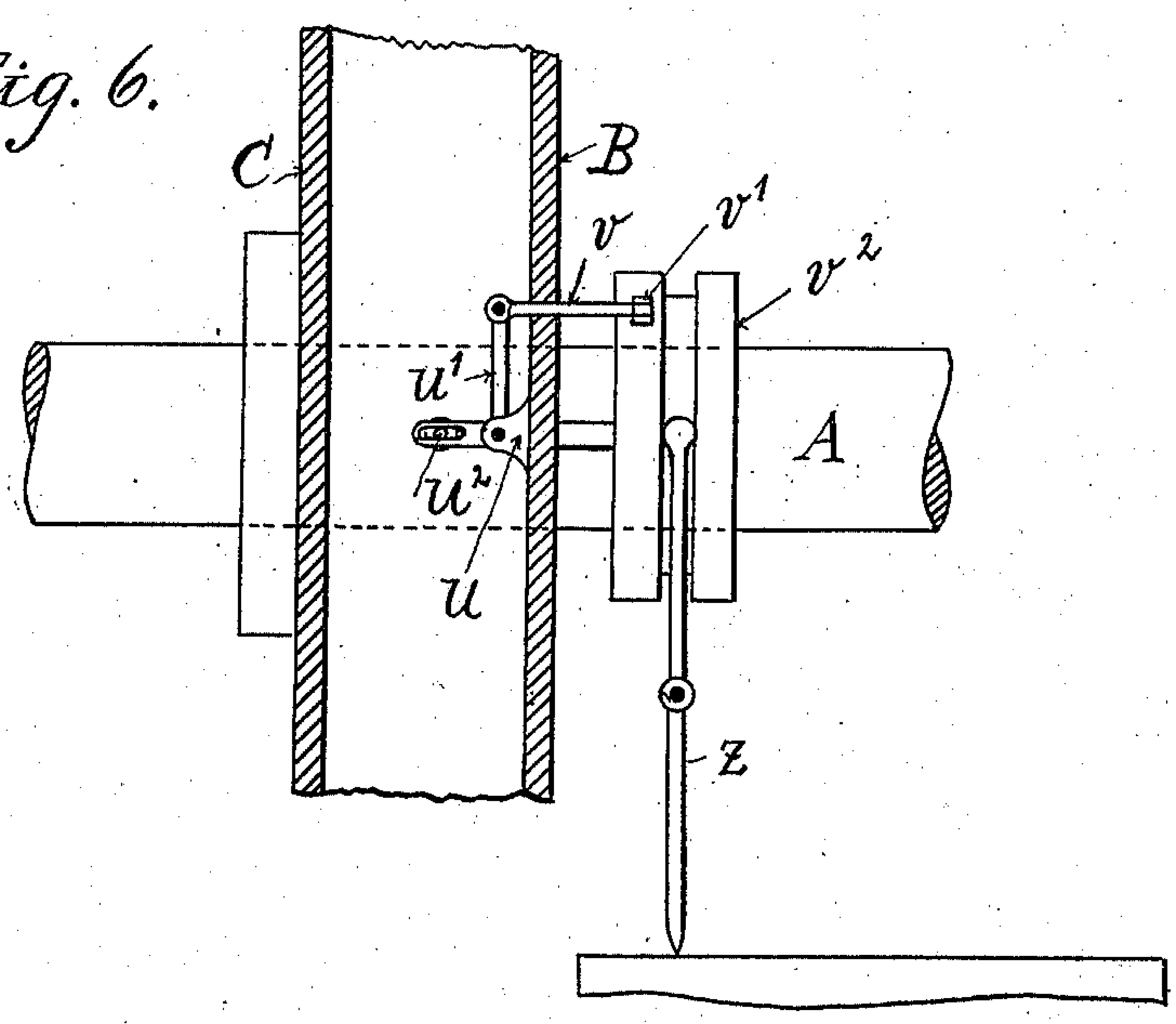


Fig. 6.



Witnesses
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Louis Schuler
by [signature]
Attorneys

UNITED STATES PATENT OFFICE.

LOUIS SCHULER, OF GÖPPINGEN, GERMANY.

DYNAMOMETER.

SPECIFICATION forming part of Letters Patent No. 575,176, dated January 12, 1897.

Application filed March 30, 1895. Serial No. 543,840. (No model.) Patented in Hungary February 11, 1895, No. 1,956.

To all whom it may concern:

Be it known that I, LOUIS SCHULER, a subject of the King of Würtemberg, residing at Göppingen, Kingdom of Würtemberg, Germany, have invented a certain new and useful Improved Dynamometer, of which the following is a specification.

The invention has been patented in Hungary, No. 1,956, dated February 11, 1895.

My invention relates to an improved dynamometer which has, as compared with other forms of apparatus for the same purpose, the important advantage that it can be directly applied to the machine to be investigated and may be also employed instead of the belt-pulley. For this purpose there are made use of two disks which engage with each other, the outer one of these carrying flat springs which so act upon tappets on the inner disk that by means of a series of levers a pointer is set in motion, and by this latter the force applied is indicated upon a divided disk which is set in intermittent rotation by the inner disk. Contrivances for removing the load upon the flat springs may be combined with the above arrangements, so that if it be desired to read off the power used at certain intervals the dynamometer may be put out of action without its being necessary to remove it or take it to pieces.

A further advantage of this dynamometer consists in the fact that the disk apparatus is susceptible of being removed from the dynamometer itself, so that the former may be placed in the vicinity of the latter and the power read off even while the machine is in action.

To enable my invention to be fully understood, I will describe how it can be carried into practice by reference to the accompanying drawings, in which—

Figure 1 is a vertical section of a dynamometer constructed according to my invention. Fig. 2 is a vertical section of the same along the line *x x* of Fig. 1. Fig. 3 is a section along the line *y y* of Fig. 1. Fig. 4 is a front elevation of the dynamometer; and Figs. 5 and 6 are a vertical section and an elevation, respectively, with the indicating apparatus acting outside the dynamometer.

On the driving-shaft A of the machine to be investigated there is placed a disk B, which carries on its boss the outer disk C, which revolves freely. In the boss of the disk C are slits, as shown in Fig. 1, and these serve for the reception of the number of flat springs c' which are required for the experiment. Flat springs are shown in the drawings, but springs of other forms may be made use of. The outer ends of these springs c' press upon a corresponding number of tappets b', which are arranged upon the crown of the inner disk B.

If now the outer disk C be set in rotation by means of a belt, the first effect is the exercise of pressure upon the springs c', and this pressure is transmitted to the outer ends of the springs and acts upon the tappets b', and, since the tappets are connected with the crown of the inner disk B, upon the latter also. As the result of this, the springs, according to the resistance which the dynamometer experiences from the machine under experiment, become more or less curved and rotate the inner disk B relatively to that of the outer disk C, that is to say, that, in consequence of the tension of the springs c', the disk B will be left behind the disk C. The result of this is that a tenon-piece *d* sets in action a system of levers *e f g h*, arranged on the inner wall of the disk B, and the levers in turn, by means of the axle *i*, set in motion the pointer *k*, which is situated upon the outer side of the disk B. The pointer *k* carries at its outer end a pencil, whereby the pressures evinced are graphically recorded upon a disk scale D.

The disk scale D is set in intermittent rotation in the following way: On the projecting boss of the disk B is placed a metallic disk E, Figs. 2 and 3, which is lagged with wood in order to allow a layer of paper or the before-mentioned disk scale to be stretched upon it. On the inner side the disk E is furnished with a crown of teeth *l*, in which the pinion *m* on an axle m' in the disk B engages, Figs. 2 and 3. The pinion *m* is set in motion by a toothed wheel *n* on the other end of the axle m', the wheel *n* being in engagement with a smaller toothed wheel *o*. A ratchet-wheel *p* is connected to the toothed wheel *o* and is made to rotate by means of the pawl *q*, cranked lever *r*, and weight *s*, the action of the weight s being such that at each rotation of the dynamometer the same executes a to-and-fro movement.

By corresponding transference in the gearing n o the relative times of revolution of the disk scale D may be determined or fixed.

The disk scale D is furnished with circular lines of different diameters, which indicate the corresponding pressures in kilograms. Since, in addition to the pressures, the speed of rotation in meters must be determined for each set of revolutions, the kilogram-meters or horse-power exercised may be indicated upon the several circles on the scale. It is then only necessary to observe what circles the pencil cuts in order to read off at once the expenditure of power. If, for instance, the dynamometer be graduated for one hundred turns, the expenditure of power may be directly read off when the excursions of the indicator have rendered the corresponding line upon the scale D visible. A variation in the number of revolutions only calls for a calculation, which may be dispensed with by the use of a table. If now it be desired to determine the expenditure of power in a given time without removing the apparatus, the flat springs c' are relieved of their load by inserting a pin or screw t through the two disks B C at any point, so as to couple the two together, Fig. 2. This coupling may also be effected by other means, as, for example, by an eccentric-pin, which turns in the eye of the one disk and presses on a lug on the second disk, so that the latter is simply taken around.

The recording mechanism may also be removed from the dynamometer itself and be so arranged in its vicinity that the power may be read off while working. For this purpose, as shown in Figs. 5 and 6, the indicating mechanism which is to work away from the dynamometer is constructed of a cranked lever u', pivoted in a bracket u upon the inner face of the disk B, the said lever receiving its motion from the impulses of a pin u^2, which is fixed in the boss of the outer disk C. This motion is transferred to a ring v^2 by means of a rod v, which passes through the disk, and a lever v', the ring v^2 being placed outside the dynamometer, but connected with it by guide-pins w, and thus partaking of its rotary motion. The ring v^2 may, however, be shifted in the horizontal plane and moves to and fro on account of its connection with the lever v'. By means of a groove in the ring v^2 and a fork z, which engages in the groove, the motion is again transferred and passed onto a recording apparatus. The latter does not call for consideration here. In general terms it may be said to consist of a roller which is surrounded by a strip of paper. The roller, which may be placed either vertically or horizontally, is set in slow rotation by the transmitting mechanism or by a clock-train, and the expenditure of power is recorded by the curves described by the indicator. The scale might also be set in motion by prolonging the axle A to such an extent that a star-disk may be placed upon it outside the apparatus. In any suitable spot, *e. g.*, in the cover, a pin may then be fastened, by impinging on which the star-disk may cause the scale to rotate through a certain distance at each revolution.

In order that the dynamometer may be more easily attached to and removed from shafting, the disks B C may be made each in two parts, and, further, the boss of the disk B may be provided with a centering attachment, in order to allow of the application of the apparatus to spindles of varying sizes.

The dynamometer, which is suitable to mechanical arrangements of every kind, may also be made use of by connecting it to the driving-pulley or other moving part, which permits of its being used to determine the expenditure of power by a single machine as well as that of a whole installation.

As is clear from what has been said above, the dynamometer, by a suitable arrangement of the scale, may be employed to determine the expenditure of power of tools, stamps, in turning, screw-cutting, boring, and similar operations with great advantage.

What I claim, and desire to secure by Letters Patent, is—

1. In combination the two disks B, C, the former having the tappets b' and the latter the spring-arms to engage said tappets, the indicator, the system of levers connected therewith and means for operating said lever system from the disk C, substantially as described.

2. In combination, the two disks, the tappets on one disk, the spring-arms carried by the other disk and engaging the tappets, the indicator and the system of levers for operating the same and the projection d for operating said lever system, substantially as described.

Signed at Stuttgart, Kingdom of Würtemberg, Germany, this 24th day of January, in the year 1895.

LOUIS SCHULER.

Witnesses:
AUG. W. ATLINGER,
ALBERT KEPPELMAYER.